UNIVERSITÀ DEGLI STUDI DEL MOLISE

The PhD School of the University of Molise presents

UNIMOL PhD EXPO

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PREFAZIONE

UniMol PhD EXPO è la prima iniziativa organizzata dalla Scuola di Dottorato UniMol dopo la sua inaugurazione a maggio 2022. A quarant'anni dalla nascita dell'Ateneo, la Scuola di Dottorato UniMol riunisce tutti i corsi di dottorato e, con la sua offerta scientifica trasversale e di qualità, intende valorizzare l'alta formazione universitaria. L'avanzamento e la disseminazione della conoscenza, la sinergia e la collaborazione con altre Università, italiane e straniere, Enti, Istituzioni e Centri di ricerca nazionali ed internazionali, e con il sistema delle imprese e delle pubbliche amministrazioni del territorio sono obiettivi cardine della Scuola di Dottorato UniMol che contribuiranno allo sviluppo sociale, culturale ed economico delle realtà in cui l'Ateneo molisano è radicato.

In questo contesto, l'*UniMol PhD EXPO 2022* è un congresso evento, una vetrina istituzionale e accademica aperta e rivolta al territorio durante la quale i dottorandi presentano i loro progetti, le loro idee ed i risultati di ricerca ottenuti in un'ampia varietà di ambiti: dalle aree tecnico-scientifiche e biomediche, a quelle umanistico-letterarie, economiche e giuridiche.

La formula, scelta per consentire una interazione individuale, ma anche per intavolare e stimolare discussioni tematiche di gruppo, ha l'obiettivo di favorire il dialogo, il confronto e lo scambio reciproco tra dottorandi, giovani ricercatori, docenti universitari, mondo imprenditoriale, degli enti, delle associazioni e delle istituzioni che operano nei diversi contesti regionali e nazionali.

Un'opportunità unica per entrare in contatto con le ricerche più avanzate e le competenze sviluppate da UniMol e per creare le condizioni che consentono di trasformare e valorizzare la conoscenza in prodotti, processi, metodi e sistemi a vantaggio di enti, aziende e territorio. L'*UniMol PhD EXPO*, perciò, diventa una modalità di incontro e dialogo tramite cui condividere innovazione e alta tecnologia per dare risposte alle richieste del mondo del lavoro, delle professioni ed anche alle nuove sfide del Piano Nazionale di Ripresa e Resilienza (PNRR).

Maggiori informazioni sulla Scuola di Dottorato e sui Corsi di Dottorato attivi presso l'Università degli Studi del Molise, è possibile collegarsi alla pagina web: https://www2.unimol.it/dottorato/

PREFACE

UniMol PhD EXPO is the first initiative organized by the UniMol PhD School after its inauguration in May 2022. Forty years after the birth of the University, the UniMol PhD School brings together all the doctoral courses and, with its transversal and quality scientific offer, intends to enhance the university highest education. The progress and dissemination of knowledge, the synergy and the collaboration with other Italian and foreign Universities, Institutions and Research Centers national and international, as well as with enterprises and public administrations of the territory are key objectives of the UniMol PhD School that will contribute to the social, cultural and economic development of the realities in which the University of Molise is rooted.

In this context*, UniMol PhD EXPO 2022* is a congress event, an institutional and academic showcase open to the territory during which PhD students present their projects, their ideas and research results obtained in a wide variety of fields: from the technical-scientific and biomedical areas, to those humanistic-literary, economic and law.

The formula, chosen to allow an individual interaction, but also to initiate and stimulate thematic group discussions, has the main objective of encouraging dialogue, discussion and mutual exchange between PhD students, young researchers, university professors, business, institutions, and associations operating in different regional and national contexts.

A unique opportunity to get in touch with the most advanced research and skills developed by UniMol and to create the conditions that allow to transform and enhance knowledge in products, processes, methods and systems for the benefit of institutions, companies and territory. The *UniMol PhD EXPO*, therefore, becomes a way of meeting and dialoguing through which share innovation and high technology, provide answers to the demands of the world of work, professions and also to the new challenges of the National Recovery and Resilience Plan (NRRP).

For more information about the UniMol PhD School and PhD courses in University of Molise, please visit the website: https://www2.unimol.it/dottorato/

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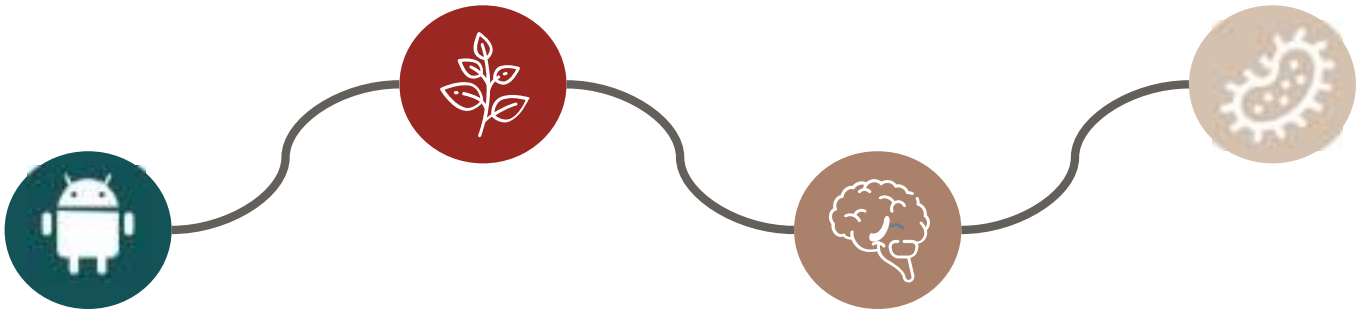
UNIMOL PhD EXPO 2022



Biologia e Scienze Applicate

DIPARTIMENTO DI BIOSCIENZE E TERRITORIO

Coordinatore:

prof. Ing. Filippo Santucci de Magistris

COLLUDING COVERT CHANNEL FOR MALICIOUS INFORMATION EXFILTRATION IN ANDROID ENVIRONMENT

Rosangela Casolare[1], Fabio Martinelli[2], Francesco Mercaldo[3,2], and Antonella Santone[3]

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[2] Institute for Informatics and Telematics, National Research Council of Italy, Pisa, Italy;
[3] Department of Medicine and Health Sciences "Vincenzo Tiberio", University of Molise, Campobasso, Italy;

GOALS:

- Cybercriminals work to develop new threats to evade the current antimalware.
- A new threats is represented by the collusion attack, which splits the malicious action in two or more applications able to perform a communication for sensitive data exfiltration and sharing using covert channels.
- We worked on a colluding covert channel in Android environment, exploiting the vibration sensor presents on the device as a communication channel to send sensitive information between applications installed on the same device

METHODOLOGY:

In order to launch a colluding attack, the source applications have the necessary permissions to access the data of their interest, while the sink applications have access permissions to internet so they can transmit this data to the attacker.
To encode the messages, the source applications exploit the vibration engine considered to modulate the sensor data able to detect device movements and the sink application extracts the data contained into the variation of vibrations.
This communication takes place during the night hours, when the device is less used, so as not to arouse suspicion in the unaware user.

RESULTS AND IMPACT:

The applications developed have been checked by VirusTotal, an online antivirus service. The analysis takes place with more than 60 scanning engines.
Once scanned, applications were not classified as malware. Only two applications have been classified as generic threat by the TrustLook antimalware, as shown in the following table.

Application Name	Trusted	Not Trusted	FP
SinkApp.apk	62/62	0/62	0
SMSSourceApp.apk	61/62	1/62	1
EmailSourceApp.apk	63/63	0/63	0
TelSourceApp.apk	62/63	1/63	1
IMEISourceApp.apk	62/62	0/62	0
ContactSourceApp.apk	62/62	0/62	0
CalendarSourceApp.apk	63/63	0/63	0

ACKNOWLEDGEMENTS
This work has been partially supported by MIUR - SecureOpenNets, EU SPARTA, CyberSANE and E-CORRIDOR projects.

HYDROCARBONOCLASTIC BACTERIA: BREAKTHROUGH IN ENVIRONMENTAL RECOVERY

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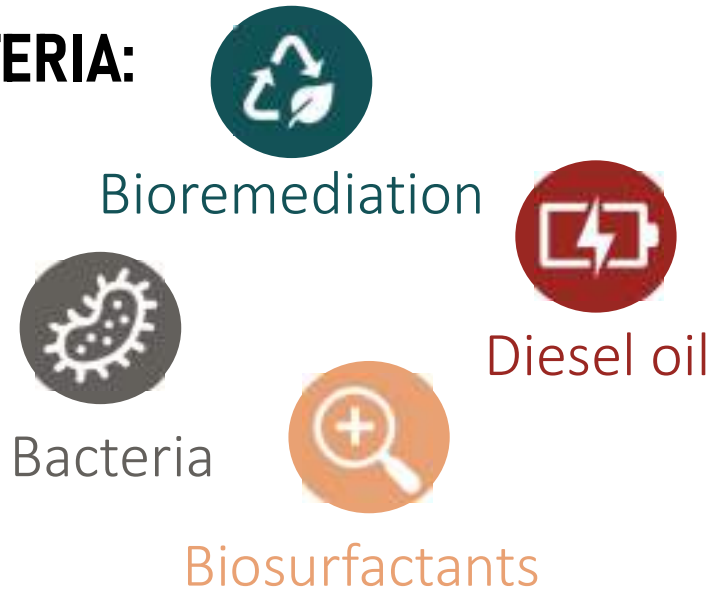

GOALS:

The extensive use of petroleum hydrocarbons has significant repercussions on the quality of the environment, leading to soil or water contamination, with dramatic consequences for flora, fauna and human health.

Therefore, the main purpose of this research is to:

- isolate hydrocarbonoclastic bacteria from natural hydrocarbon contaminated site and identify new strains never previously cultured;
- deepen the investigations on the capability of these microorganisms to produce bio-surfactants;
- Deepen knowledge on bioremediation in order to restore oil-polluted sites through bioaugmentation and/or biostimulation.

METHODOLOGIES:

Water and soil were sampled from two natural hydrocarbon outcrops, located in the Val d'Agri, Basilicata region.

In order to isolate hydrocarbonoclastic bacteria, enrichment cultures were set up, using Bushnell-Haas liquid mineral medium and sterile diesel oil as the sole carbon source.

The isolated strains are currently being characterized from a morphological, physiological, biochemical and genetic perspective.

Preliminary tests were conducted to verify the isolated strains capability to produce surfactants through the emulsifying capacity (EC) and emulsion index (EI) assays.

RESULTS AND IMPACT:

From the enrichment cycles, six different of aerobic hydrocarbonoclastic bacteria, belonging to the genera *Stutzerimonas*, *Acinetobacter*, *Rhodococcus*, *Gordonia*, and *Comamonas* were isolated.

The results obtained from emulsifying capacity (EC) and emulsion index (EI) assays showed that bacterial strains were able to produce emulsions with diesel fuel with high stability over time.

The production of biosurfactants is essential, because allows an increase in the contaminant biodegradation processes, favoring the solubilization of complex hydrophobic compounds in aqueous systems. Moreover, surfactants derived from microorganisms are an effective choice due to their structural diversity, low toxicity and higher biodegradability compared to their synthetic counterparts.

These preliminary results pave the way for further investigations aimed at defining in more depth the degradation capacity of isolated bacterial strains, and/or microbial consortia for the remediation of hydrocarbon-contaminated sites and their ability to produce molecules with a promoter effect for removal petroleum hydrocarbons.

EXPERIMENTAL TESTS ON POZZOLANIC CEMENT PASTES

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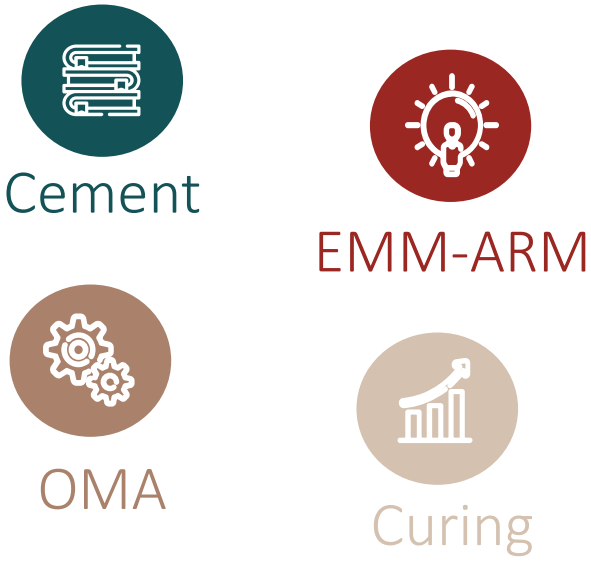
GOALS:

- Study of the evolution of the E modulus from the initial casting phase and during the subsequent setting and hardening phases.
- Investigate the effects of storage during the curing of cement pastes.
- Investigate the effects of temperature during the curing of cement pastes.

METHODOLOGIES:

A CEM IV/B 32.5R pozzolanic cement was chosen to carry out a series of tests. The EMM-ARM (E-modulus Measurement through Ambient Response Method) is a non-destructive technique that is based on the identification of the first vibration frequency used for the evaluation and measurement of the evolution of the modulus E in cementitious pastes. The mould used for the preparation of the specimens is an acrylic tube with a length of 500 mm and with an internal and external diameter Φi = 16 mm and Φe = 20 mm, respectively. An accelerometer has been glued to the free end of the beam. After casting operations the beam was placed in a horizontal position in a clamping device. The observed frequencies were below 50 Hz and therefore a sampling frequency of 100 Hz was chosen.



RESULTS AND IMPACT:

During the hydration phase, it was possible to monitor the evolution of the stiffening contribution of the cement by increasing the natural vibration frequency of the beam. Tests were carried out with a new material and stored at 1, 8 and 12 months under the same conditions of temperature and relative humidity. It is possible to observe a progressive reduction of the E modulus and an increase in the setting and hardening time with increasing storage time. Tests were carried out with different curing temperatures at 15°, 21° and 24° C. After 120 hours, the material stored after 1 month shows a 4% reduction in modulus, the material after 8 months 14% and the material after 12 months 19%. The test at 20°C after 120 hours of maturation shows a minimum variation of less than 1%, while the test at 15°C shows a variation of 25%.

NGF MODULATES CHOLESTEROL METABOLISM AND STIMULATES APOE SECRETION IN GLIAL CELLS CONFERRING NEUROPROTECTION AGAINST OXIDATIVE STRESS

Mayra Colardo[1], Michele Petraroia[1], Letizia Lerza[1], Daniele Pensabene[2], Noemi Martella[1] , Valentina Pallottini[2,3], Marco Segatto[1]

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GOALS:

- ✓ To assess whether the trophic support elicited by NGF could involve the regulation of cholesterol metabolism in glial cells.
- ✓ To evaluate NGF effects on neuronal survival under oxidative stress conditions.

METHODOLOGIES:

U373, an astrocyte-derived cell line, and N1E-115, a neuronal-derived cell line, were used as experimental models. Both cell lines were grown at 5% CO_2 in high glucose DMEM containing 10% FBS. N1E-115 differentiation was induced at 0.5% FBS for 96 hours. Fully differentiated N1E-115 were treated with rotenone (0.1 μM) for 16 hours to induce oxidative stress. Thereafter, N1E-115 were co-cultured with U373 cells, previously stimulated with NGF (100 ng/mL) for 48 hours. Data were obtained by Western blot and morphological analysis, enzymatic cholesterol assay and ELISA test.

RESULTS AND IMPACT:

Our experiments highlights that NGF increases the expression levels of the main proteins and enzymes involved in cholesterol biosynthesis, intracellular transport and efflux in U373 cells. Furthermore, NGF significantly increases cholesterol content and ApoE secretion in the culture medium of glial cells.

In co-culture experiments, NGF-treated astrocytic cells efficiently counteract neurite retraction and cell death induced by rotenone-mediated oxidative stress in N1E-115 cells. Conversely, beneficial effects mediated by NGF are abolished when neuronal cells are co-cultured with ApoE-silenced U373 cells.
Despite these experiments need to be confirmed on primary cell lines, these results identify NGF as a crucial modulator of astrocytic cholesterol metabolism, proving that this neurotrophin can mediate neuroprotection through ApoE secretion. These data are of particular interest for biomedical research, since they set the basis to identify new pharmacological targets in the treatment of neurodegenerative diseases.

MACHINE LEARNING FOR AUTOMATING PLANT STRESS DETECTION BASED ON IMAGE ANALYSIS

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[2] Datasound s.r.l., spinoff of the University of s and Molise

GOALS:

- study plant responses to abiotic stresses through innovative phenotyping methods based on image analysis

- build a machine learning model that can automatically identify, classify, quantify, and predict plant stress from image-based inputs

METHODOLOGIES:

Model species *Arabidopsis thaliana* was used to compare standard laboratory techniques to digital phenotyping ones. Seedlings were grown on different substrates (soil and perlite) and exposed to "medium" and "high" salinity stress levels (50 mM and 150 mM NaCl) for 10 days. Biomass (DW), relative water content (RWC), and electrolyte leakage (EL) were measured along with morphological and colorimetrical parameters obtained from manual and automated image analyses. The dataset generated from both kinds of procedures was then used to test the performance of decision trees on 2-classes (binary/presence or absence of stress) and 3-classes (absence, medium, and high-stress levels) classification models.

RESULTS AND IMPACT:

Growing conditions strongly affected plants' phenotype. Visible symptoms of stress included a reduction in the number of leaves and the size of the rosette, as opposed to a chlorosis incrementation.

Values of RWC, EL and DW also changed in response to stress conditions. However, while observed differences were significant among high-stressed plants and control plants, medium-stressed plants could not be easily distinguished.

This result was also confirmed by the Principal Component Analysis, which grouped high and medium-stressed plants together. Tested algorithms ulteriorly supported these outcomes: the binary model scored 90% of accuracy, while the 3-classes one reached 73%.

To overcome these challenges and completely avoid destructive methods in plant stress detection, it is necessary to implement and improve the model's robustness and reliability.

Thus, future perspectives will involve larger-scale experimentations on various species (i.e. *Phaseolus vulgaris, Pisum sativum*) growing under different abiotic stresses (i.e. *heat, cold, drought*), followed by extraction and selection of relevant morphological traits (features).

ACKNOWLEDGEMENTS

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NETWORK-BASED ANALYSIS FOR HUB GENES IDENTIFICATION IN BENT POPLAR ROOTS

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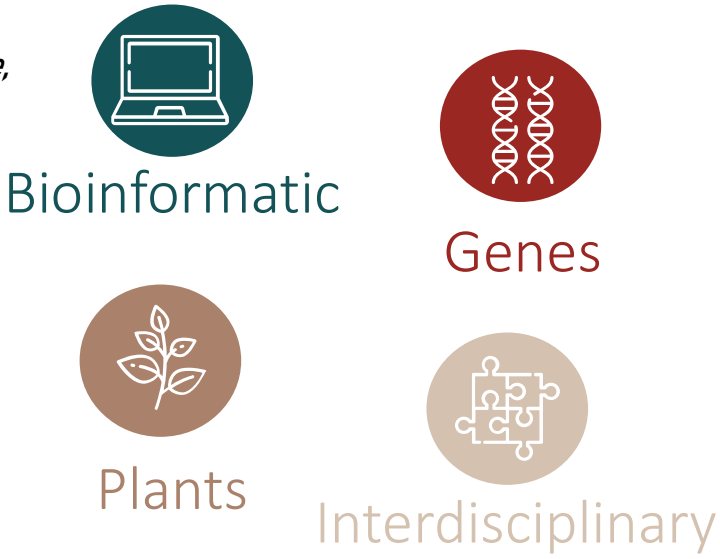


GOALS:

- Expand the knowledge of the mechanical stress (MS) impact on woody poplar roots.
- Construct a bioinformatical pipeline capable to identify the hub genes in bent poplar taproot sectors (on the convex-cx and concave-side of above-ABS, bending-BS and below-BBS).
- Functional characterization of the identified hub genes.

METHODOLOGIES:

Protein abundance profiles were created using normalised values from 66 previously identified proteins expressed across sectors of bent poplar taproots. The proteins were grouped into 6 clusters using k-means analysis, and the sector-specific PAP peaks were determined (≥0.3 score). The *Populus trichocarpa* interactome was then used to build cluster-related sub-networks by selecting the most confident set of protein-protein interactions between cluster-specific proteins and their first direct neighbours. The 'Maximal Clique Centrality' algorithm from plugin *cytoHubba* was used to identify the top 3 hub genes in each subnetwork after visualisation in the open software Cytoscape. All genes were then functionally characterized using UniProt, Blast, and PopGenie.

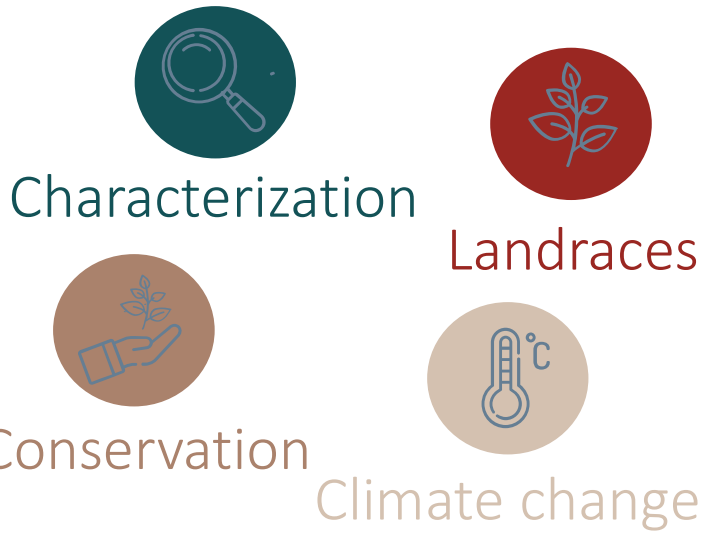
RESULTS AND IMPACT:

By this bioinformatical pipeline, we were able to correlate the 6 clusters with at least one of the 6 sectors of bent poplar taproot, as well as identify and functionally characterise the top three hub genes involved in MS response. The results show that plasticity is maintained on both sides of the ABS by the degradation of misfolded target proteins, and protein synthesis is especially important in the ABS-cx. The involvement of V-type ATPase genes in three sectors (ABS-cx,-cv, BS-cv), with differences in biochemical response to MS and position, highlights the importance of short-distance chemical and electrical signalling via the plasma membrane network, via the Ca2+ signature. The adjacent BS-cx and BBS-cx responses are identified as highly energy demanding. As a result of the tension force that affects the root here, the BBS-cx was further characterised by genes that regulate energy and metabolic processes. The previously identified involvement of the ROS gene network in the BBS-cv sector was confirmed as a strategy to ensure tissue reinforcement under compression forces. The findings add to our understanding of the asymmetrical response induced in the convex and concave sides of bent poplar taproots as a strategy for ensuring stability and water uptake. The study also laid the groundwork for future research by *in vivo* validation of the hub genes.

AN INTEGRATED APPROACH TO CHARACTERIZE SOME ITALIAN COMMON BEAN (*Phaseolus vulgaris* L.) LANDRACES UNDER A CHANGING ENVIRONMENT

Falcione Martina, Simiele Melissa, Renella Alessandra, Scippa Gabriella Stefania, Di Martino Paolo, Trupiano Dalila

Department of Biosciences and Territory, University of Molise, C.da Fonte Lappone, 86090 Pesche (IS), Italy



GOALS:

- Characterization of seven endangered autochthonous Italian common bean (*P. vulgaris* L.) landraces, coming from Molise (CV, MO, PI and SA), Basilicata (SMR and TR) and Tuscany (MA), by using an integrated approach: morphological, genetic and phaseolin pattern characteristics, along with stress related studies, were combined in order to explore their diversity and the ability to counteract salt and osmotic stress, frequently occurring in the Mediterranean basin to due climate change.
- Enhance the conservation activities towards threatened plant genetic resources and promote the socio-economic development of the marginal areas where they come from.

METHODOLOGIES:

Seed descriptors and ISSR molecular markers were used to perform morphological and genetic analysis, respectively. Identification of populations' gene pool (Andean or Mesoamerican) was carried out by analyzing phaseolin banding pattern with 2-DE and SCAR technique. Stress response was evaluated analyzing the main plant morphological parameters, along with proline, malondialdehyde (MDA), chlorophylls and carotenoids.

RESULTS AND IMPACT:

Morphological data divided CV and SMR from MO, SA, MA, TR and PI, while ISSR analysis showed genetic relatedness among Molise bean populations and the ones coming from Basilicata and Tuscany. All the populations belong to Andean gene pool, exhibiting the four typical phaseolin banding pattern (C, H, T, A types). Salt stress decreased biomass accumulation in SMR, SA (root, stem and leaf), PI (root and stem) and in MA (leaf), with increased levels of proline, while osmotic stress negatively affected dry biomass only in SA (root, stem and leaf), SMR and MA (leaf), with no relevant changes in proline contents. MDA levels were found unchanged or decreased both in stress sensitive (SMR, SA, PI, MA) and in stress tolerant populations (CV, MO, TR). However, in these latter, the higher levels of chlorophylls and carotenoids might play an antioxidative role against stress. The integrated approach of this study resulted to be an efficient method to explore landrace diversity and identify climate change resilient populations, with a consequent promotion of their marginal areas of origin. To promote more conservation efforts, it could be worthwhile to explore the nutritional potential of these landraces.

ACKNOWLEDGEMENTS

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DANGEROUS PERMISSIONS IN ANDROID: OPEN ISSUES AND PITFALLS

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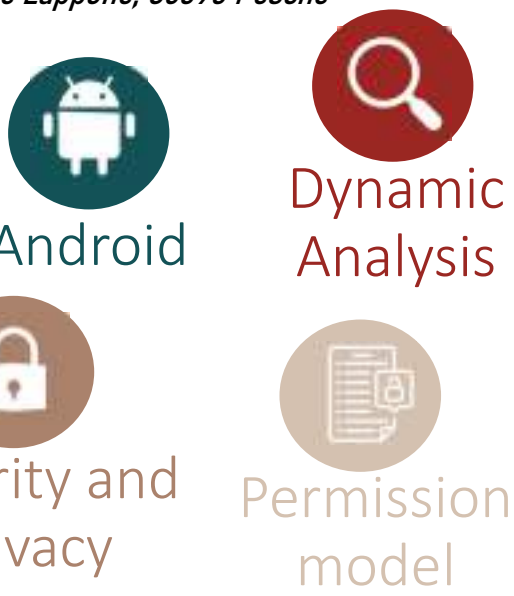
GOALS:

The increasing diffusion of mobile devices has promoted the development of numerous applications in which developers find new ways to exploit the possibilities offered by access to resources such as the camera. As a result, we are increasingly used to seeing applications that make extensive use of sensitive-related resources, potentially dangerous for our privacy. To address this problem, the latest approach to support user awareness in terms of privacy is represented by the Privacy Indicators(PI), a solution implemented by Android to provide a visual led to inform users whenever the app exploits a dangerous resource. For these reasons, our goal was to investigate the effectiveness of PI in helping users identify the use of a resource. We also wanted to investigate the behavior of applications in terms of permissions used and possible malicious behavior at runtime. As a final goal, we proposed a software solution that protects users from misused permissions.

METHODOLOGIES:

We conducted a controlled experiment with 90 participants to explore the effectiveness of PI in latent and explicit contexts. We used eight interactive prototype apps and implemented two versions of each prototype, with and without PI.
Due to the results obtained, we developed a dynamic analysis tool that, when installed as an Xposed module on the Android emulator, allows obtaining information in identifying the contexts in which permissions have been used through an injection mechanism based on hooks and callbacks. We define the usage context as a combination of the dangerous resource the app is executing and the user action on the UI.



In addition, we have built a system that contextualizes permission access requests with the same mechanism, showing the explicit consent popup to the user.

RESULTS AND IMPACT:

As a result, we noticed that the contribution of PI to the identification of resource use is not statistically significant. As a matter of fact, despite an increment in the total number of correctly identified cases, PI do not adequately enhance the users' awareness of when and where an application accesses a specific sensitive resource.
To assess the effectiveness of the developed tool to automatically discriminate between different kinds of accesses to the same resource, we studied 10 popular apps. The results confirm that, in many cases, when the app accesses a sensitive resource, this is done in more than one context, and we can give the user a chance to choose their preferences in each of these identified contexts.

SUPPORTING VIDEO GAME MAINTENANCE BY MINING GAMEPLAY VIDEOS

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GOAL:

We aim to evaluate the effectiveness of the analysis of gameplay videos to extract meaningful information to provide support for professional developers for testing video games. To achieve this goal, we aim at proposing:

- a strategy for automatically identifying issues in gameplay videos from streaming platforms, which are increasingly used by video gamers to share their gaming experiences (i.e., streamers);
- a methodology to replicate the specific issue identified during gameplay.

We formulate our research thesis as follows:

"*The mining of gameplay videos can be particularly useful to automatically identify problems in games and help developers replicate the problem.*"

METHODOLOGIES:

We will define methods and techniques based on machine-learning to extract meaningful information from gameplay videos. One of the main features of gameplay videos are the live comments of the streamers. We will try to extract this piece of information through textual analysis of subtitles. In addition, it we plan to use both audio- and video-based features.

Finally, we will define an approach to replicate the issues reported through game inputs if command widgets are present in the video.

RESULTS AND IMPACT:

We trained and tested a machine learning model for identifying gameplay video segments with issues by using textual features. Specifically, we explored three types of NLP features extracted through doc2vec, word2vec and bag of words. To do this, we manually defined a dataset from 170 gameplay videos, totaling about 17 hours of gameplay. We collected and labeled 1,250 video segments with subtitles (instances). The accuracy obtained (60.9%) shows that textual features alone are not sufficient to correctly categorize video segments.

We also defined HASTE, an approach that allows video game developers to detect stuttering events in gameplay videos by looking at the presence of repetitions of frames in the video itself and excluding repetitions in parts not regarding the game. We evaluate HASTE on 105 videos. Overall, HASTE achieves 71% recall and 89% precision.

We expect that our research will impact the game industry: Our new recommendation systems will support developers in testing games.

IN SILICO INSIGHT INTO THE ROOT AND SHOOT BIOLOGY OF *ARABIDOPSIS HALLERI*

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A. halleri

WGCNA

Heavy metal stress

Genes

GOALS:

Despite of the several establishments, a comprehensive understanding of the mechanisms laying *Arabidopsis halleri* as a hyperaccumulator is still lacking. Thus, the present study, towards a comprehensive systematic-analysis of root and shoot of *A. halleri* by weighted gene co-expression network analysis (WGCNA), highlights pathways and genes crucial to organ functions, and screens hub and bottleneck genes for their possible involvement in plant metal stress responses.

METHODOLOGIES:

The already published RNA-seq dataset of *A. halleri* was used to construct the co-expression network by applying WGCNA. Further, significantly enriched molecular functions, biological processes and Kyoto Encyclopedia of Genes and Genomes pathways were identified by integrating the information coming from WGCNA. Top 10 hub and bottleneck genes in each module (group of genes) were identified. Further, most differentially expressed modules (DEMs) across treatment and control groups were identified based on accumulative expression of multiple genes in that module. Finally, an interolog approach was used to examine DEMs to analyze existing data on protein-protein interactions to identify important genes to be compared with those identified from WGCNA.

RESULTS AND IMPACT:

A total of 19,653 genes of root and 18,081 genes of shoot were categorized into 14 modules, respectively. We identified "photosynthesis" and "photosynthesis–antenna proteins" among the most enriched pathways in both root and shoot. The pathway "circadian rhythm - plant" was identified as uniquely enriched in shoot. While some pathways were enriched only in the root including "glucosinolate biosynthesis", "autophagy – other" and "SNARE interactions in vesicular transport". The interolog approach revealed two (AT1G06390 and AT4G34670) and five over-lapping genes (AT1G23020, AT2G40300, AT4G16370, AT5G04150 and AT5G61410) in most DEMs.

The identified genes might serve as promising biomarkers for metal stress of root and shoot of *A. halleri.* Moreover, this type of approach can also be useful to hypothesize the function of unknown proteins and to improve knowledge about hyperaccumulator plants in order to promote phytoremediation technologies.

CHARACTERIZATION OF SEED OIL FROM SIX IN-SITU COLLECTED WILD *AMARANTHUS* SPECIES.

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GOALS:

- To evaluate the chemical composition of seed oil extracted from six *Amaranthus* species collected *in situ* using the Accelerated solvent extraction (ASE) apparatus.
- To understand the value of seed oils of wild species belonging to the genus *Amaranthus* providing guidelines for future studies on food chemistry and industrial applications.

METHODOLOGIES:

In the wild fields in Italy, six different types of Amaranth species were collected. The *Amaranthus* seeds were cleaned, dried in an oven, and then ground into powder. An ASE350 apparatus (Dionex) was used for oil extraction. When the extraction was finished, a rotary evaporator (Büchi) was used to evaporate any extra solvent. Using gas chromatography with a flame ionization detector (GC-FID), the amount of squalene in the oil was measured. The results of the analysis were assessed with the help of Chromeleon 6 software.

RESULTS AND IMPACT:

For the six *Amaranthus* species that were examined, the color of seeds is very consistent, ranging from black to dark brown. However, there was a considerable variation in seed size. According to our findings, there were significant differences in the oil and squalene content in the seeds of the six *Amaranthus* species collected in the wild fields in Italy. The seeds of *Amaranthus tuberculatus* showed the highest oil content, while the seeds of *Amaranthus hypochondriacus* showed the highest squalene content. *Amaranthus muricatus* showed the lowest oil and squalene content. Our finding demonstrates that the free fatty acids in *Amaranthus* oil are Linoleic acid and Palmitic acid. On the other hand, the majority of phytosterols are beta-sitosterol, brassicasterol, campesterol, and stigmasterol. The total sterol content is much higher than that of the other studied plants like Olive, Peanut, Palm, Coconut, Walnut, Cashew, and Almond. Based on our studies, the primary tocopherol in *Amaranthus* oil is alfa-tocopherol, beta-tocopherol, and delta-tocopherol. Expanding the range of Amaranth species that may be grown as a good source of squalene and the other component is important due to the increasing interest in the seed of the genus Amaranthus around the world for applications in industries like nutraceutical, industrial, and medicinal.

Italy

Squalene

Amaranthus

Medicines

ACKNOWLEDGEMENTS

We thank for their support: Carlo Argenti, Daniela Bouvet, Fabrizio Martini, Hannah Krupa, Nicole Hoffman, and Rizzieri Masin.

BOVINE LACTOFERRIN AFFECTS TAT-INDUCED OXIDATIVE STRESS AND IRON DYSREGULATION

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GOALS:

The expression of the most important proteins involved in iron metabolism, Ferroportin (Fpn), Transferrin Receptor 1 (TfR1), and Ferritin (Ftn), is perturbed during viral infection, leading to higher intracellular iron content. In turn, iron excess gives rise to reactive oxygen species (ROS), with consequent damage to biological molecules. Recent studies have shown that HIV-1-Tat protein promotes oxidative stress in astrocytoma cells. This state triggers a compensative cell response implemented by increased Nrf2 nuclear translocation, which promotes the transcription of genes containing antioxidant response element, including Glutathione Peroxidase 4, Glutamate-cysteine ligase and a subunit of System Xc- cystine/glutammate antiporter (SLC7A11). In this scenario, Lactoferrin (Lf), an iron-binding glycoprotein of the innate immunity, may play an important role as modulator of iron homeostasis as well as for its anti-oxidant and anti-inflammatory activities.

METHODOLOGIES:

U373 human glioblastoma astrocytoma cells and U373-Tat cells were seeded in 35 mm sixwell and grown up to 80% confluence before treatments with Nat- or Holo-bLf, at the concentrations of 100 µg/ml. The protein expression analysis has be performed by Western blot on cell lysates.

Lactoferrin

Iron proteins

Oxidative Stress

Tat

RESULTS AND IMPACT:

We evaluated the effect of both native and iron-saturated bLf against Tat-induced oxidative stress in an astrocytoma cell model. To investigate the molecular mechanism through which bLf acts, we first examined its sub-cellular localization. The results show bLf capacity to migrate into the nucleus, suggesting that bLf could exerts its effects modulating gene expression. Accordingly, bLf has a positive regulatory role towards the Nrf2 pathway, which boosts antioxidant defence not only by up-regulating System Xc synthesis but also by the increase of iron cell efflux via Fpn. Further, bLf, mainly in the Holo-form, counteracts intracellular metal accumulation, associated to Tat-induced ferritinophagy, by reducing Tf-bound iron uptake, thus limiting the excess of pro-oxidant iron. Although more studies are needed to corroborate and deepen the present findings, the efficacy of bLf in counteracting Tat- induced oxidative stress makes this glycoprotein an interesting candidate for the treatment of HIV-infected patients in association with standard therapies.

PLANT ROOT EARLY RESPONSE TO MECHANOSTIMULATION

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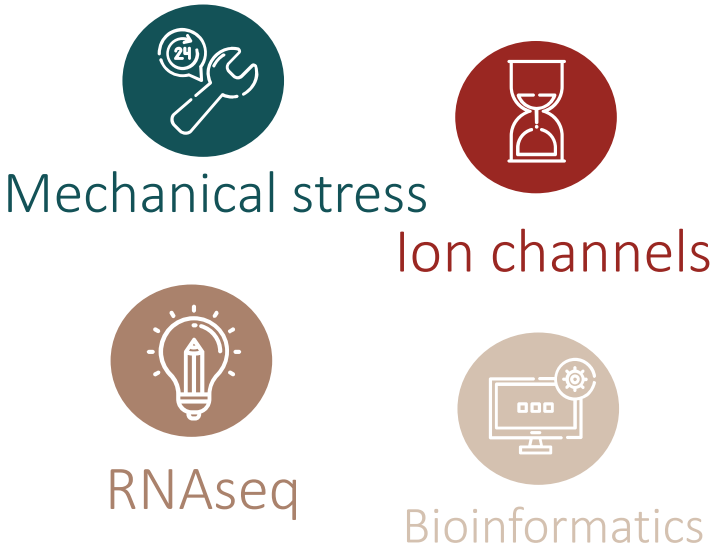
GOALS:

- Identification of the specific stress perception mechanisms and signaling pathways.
- Revealing the early transcriptomic response to short-term bending treatment.
- Generating a comparative transcriptional network analysis to identify conserved plant stress response strategies.

METHODOLOGIES:

Root bending was manually applied whether by immobilizing the zone of interest onto a solid medium (1% agar) for *Arabidopsis thaliana* (herbaceous annual plant) or by attaching the *Populus nigra* woody root to a flexible plastic mesh (woody perennial plant). Bending treatment was applied following a specific time course (from 1 h to 6 h) and different taproot sectors (above, below, and bending sector) and sides (convex or concave sides) were sectioned and harvested. Total RNA was extracted using the SIGMA mirPremier® microRNA Isolation Kit. Complementary DNA (cDNA) was synthesized using the Promega ImProm-II™ Reverse Transcription System. Further, RT-PCR analysis was run with primers of Cyclic nucleotide-gated channels CNGCs (1, 6, 10, 14) and Mid1-Complementing Activity MCAs (1 and 2) genes. cDNA libraries will be generated using commercial kits (Illumina and PacBio). RNA sequencing will be performed using Illumina Sequencing PE150. After read trimming, mapping, annotation, and differential expression analysis, the list of the differentially regulated genes will be determined.



RESULTS AND IMPACT:

In *Arabidopsis thaliana*, RT-PCR analysis of calcium (CNGC6, 10, 17) and mechanosensitive ion channels (MCA1, 2) revealed a potential upregulation in the relative gene expression levels, following the short-term bending treatment.

RNA sequencing of bent poplar and *Arabidopsis* roots (in secondary structure) will shed the light on the differentially expressed genes in response to the short-term mechanical stress.
Drawing a comparison network between herbaceous and woody species will highlight parallels and differences in the two model plants' responses to mechanical stress.

Overall, studying root sensing mechanisms and early-stress responses to short-term bending would bridge a research gap, providing new insights into the complex terrain of plant-environment interactions.

LAVENDER ESSENTIAL OIL MODULATES CHOLESTEROL METABOLISM IN THE HEPATIC CELL LINE HepG2

Noemi Martella[1], Mayra Colardo[1], William Sergio[1], Michele Petraroia[1], Michela Varone[1], Daniele Pensabene[2], Miriam Russo[1], Sabrina Di Bartolomeo[1], Giancarlo Ranalli[1], Gabriella Saviano[1] and Marco Segatto[1]

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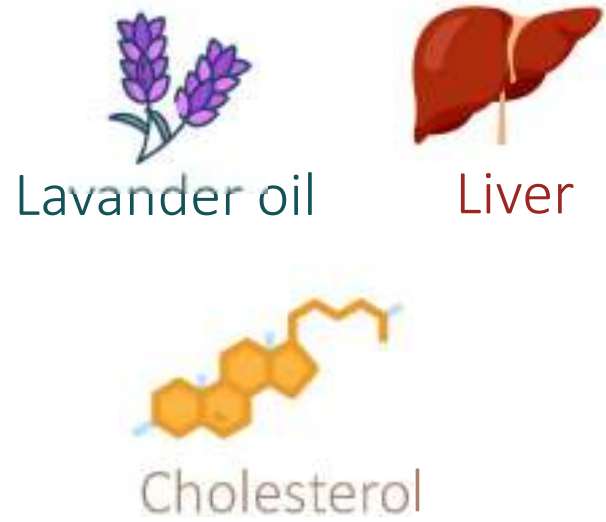
GOALS:

Cholesterol is involved in numerous biological functions and deregulations in its homeostasis maintenance have been identified in diverse pathological contexts. Starting from these notions, the identification of natural compounds able to modulate cholesterol metabolism is attracting considerable interest in biomedical research.
Therefore, the aim of our work was to evaluate whether Lavander Essential Oil (LEO) could regulate cholesterol metabolism in the hepatic cell line HepG2.



METHODOLOGIES:

HepG2 cells were grown at 5% CO_2 in high glucose DMEM containing 10% FBS. Subsequently they were treated with LEO (0.005%) isolated by fresh flowers (200 g) of *L. angustifolia*, or vehicle. After 24 h, the cells were fixed and subjected to filipin staining (10 mg/mL in PBS) and the signal was detected under a confocal microscope equipped with UV filters. In addition, immunofluorescences were set up, and the colorimetric enzyme assay was employed to quantify intracellular cholesterol levels.

RESULTS AND IMPACT:

As first step, we evaluated whether the administration of LEO (0.005%) could affect intracellular cholesterol content. Filipin assay highlighted an accumulation in intracellular free cholesterol.

This finding was confirmed by a colorimetric anzymatic assay, showing that both free and esterified cholesterol levels were increased upon LEO treatment.
With the aim of elucidating the molecular mechanism underlying the observed evidence, we evaluated whether LEO could modulate SREBP-2, a key transcription factor involved in cholesterol homeostasis.
Immunofluorescence and signal quantification illustrated that SREBP-2 immunoreactivity was significantly increased in LEO-treated cells, particularly at the nuclear level.
In conclusion, our results provide new insights into the biological activities of LEO, suggesting, for the first time, the molecular mechanism linking LEO to the regulation of cholesterol homeostasis.

PREPARATION AND PHYSICO-CHEMICAL CHARACTERIZATION OF KETANSERIN-LOADED LIPOSOMES FOR GLAUCOMA

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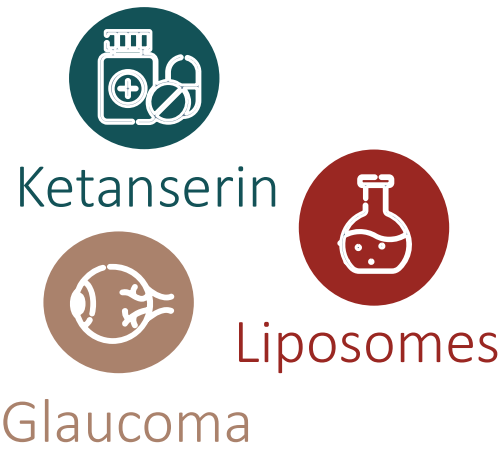

GOALS:

The aim of the research is to develop and characterize liposomes capable of releasing ketanserin in a controlled way, a drug that could be used in the treatment of glaucoma, a chronic and bilateral disease of the optic nerve, characterized by progressive damage of the nerve fibers that compose it and by an increase in intraocular pressure.

METHODOLOGIES:

Unilamellar liposomes made of Epikuron130 (EPK130), palmitoylethanolamide (PEA) and ketanserin in both amorphous (*SigmaAldrich*®) and crystalline (*ZheChem*®) forms were prepared according to the thin film method.

RESULTS AND IMPACT:

Ketanserin, a drug used to treat systemic arterial hypertension, was withdrawn from the market because it was ineffective at low doses; instead, at high doses it was extremely toxic. However, if administered topically and in effective *local* dosages, it could give good results in the treatment of intraocular hypertension. This molecule can exist in different polymorphic states which have different solubility in water. Therefore, it was thought to encapsulate the different forms of ketanserin in liposomes and, later, to use a surfactant (PEA) in the liposomal formulation. Once the liposomal formulations were prepared, the average hydrodynamic diameter, the poly-dispersity index (PDI), and the ζ-potential values were analyzed at different temperature (25, 30, 37 and 45 °C). Amorphous ketanserin-loaded liposomes exhibit a diameter between 160-180 nm, while those with crystalline ketanserin have a diameter between 140-150 nm. The different size is a consequence of the different solubility. In fact, the crystalline form, having a greater affinity for water, is positioned in the aqueous *core*. The amorphous form, on the other hand, given the low affinity with water, is positioned in the lipid bilayer, increasing the diameter of the liposome. The degree of crystallinity of ketanserin affects only the size and not the charge, since the ζ-potential is the same for the two formulations. In contrast, the PEA-modified liposomes loaded with the crystalline form showed a reduced diameter and increased negative surface charge. This behavior is to be attributed to the surfactant nature of PEA which, in this case, acts as a co-surfactant by intercalating in the lipid film and reducing the tension with consequent reduction of the total surface area of the liposome. Therefore, the formulations appear to be suitable for the transport of ketanserin in the eye. Therefore, if the *in vitro* and *in vivo* cytotoxicity tests demonstrate a low toxicity of ketanserin-loaded liposomes, lower cost and more effective drugs than those currently used in the treatment of glaucoma could be designed.

ACKNOWLEDGEMENTS
Centre for Colloid and Surface Science (CSGI) is acknowledged.

CHLOROPLAST DNA VARIATION AND DIFFERENTIATION ACROSS EUROPEAN TAXA OF WHITE OAKS (*QUERCUS* L.)

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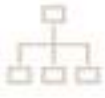
Quercus

Haplotype

Marker



Phylogeny

GOALS:

- reconstruct phylogenetic relationships between plastid DNA variants in the European white oaks
- improve knowledge on the genetic structure and the diversity of populations
- capture rare genetic variants important because they could subtend divergent evolutionary lineages

METHODOLOGIES:

Genomic DNA of 270 samples of *Quercus* genus (subgen. *Quercus*, sect. *Quercus*) was analysed by means of DNA sequence polymorphism at two plastid loci: trnH-psbA and trnK-matK. The main diversity values calculated for the two marker regions included: pairwise uncorrected p-genetic distances (p), number of haplotypes (H), haplotype diversity (Hd), number of polymorphic sites (S), nucleotide polymorphism (θw), nucleotide diversity (π), number of Parsimony Informative Characters (PICs). NETWORK 10.2.0.0 and Splitstree 4.18.3 were used to make inferences about biogeography and history of populations and to reconstruct phylogenetic relationships between cpDNA haplotypes.

RESULTS AND IMPACT:

Both two barcoding loci were successfully amplified and sequenced. The trnH-psbA intergenic spacer was the most variable marker region. Site variation observed, resulted in fourteen total haplotypes (H01-H14). Nine haplotypes (T01-T09) were observed with trnH-psbA, and five (K01-K05) were identified with trnK-matK. No species-specific haplotypes were detected. Considering the total chlorotypes, haplotypes H01-H04 were the most common across the area of study and the species analysed. Six haplotypes were rare (H05; H10-H14). Furthermore, while it was not found a relation between species and haplotypes, a more significative association was recognized with the geographic distribution. In the median joining network, one or two mutations differentiated the 14 chlorotypes, providing evidence that the populations and the species of section *Quercus* diverged rather recently. More evident is instead the separation in clusters observed in the median joining network built for the cpDNA sequences belonging to different sections of subgenus *Quercus*. According to the results of this study, modern Eurasian section *Quercus* species diverged rather recently, hence, their little differentiated plastome, which was probably highly exchanged across the ancestral forms.

ACKNOWLEDGEMENTS

Thank to Simeone M.C., Di Pietro R., Cardoni S. for their support.

THE KEY ROLE OF PLANT FUNCTIONAL TRAITS (PFTS) A CASE OF STUDY FOR THE MONITORING OF HABITATS

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GOALS:

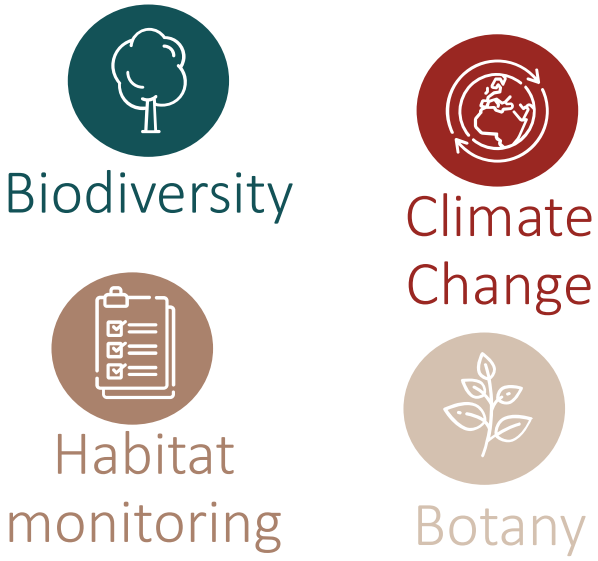
- Use Plant Functional Traits (PFTs) to monitoring habitats, creating a protocol useful to be applied in different habitat and condition.
- Assess the health status of three Quercus cerris L. Woods subjected to different forestry practices.

METHODOLOGIES:

Plant functional traits (PFTs) are defined as any morpho-, physio-, and phenological plant characteristics affecting overall plant fitness through their influence on survival, growth, and reproduction. They have often been used to interpret plant-environment relationships, to make previsions on possible consequences and to quantify a wide range of natural and/or human-driven processes in terms of species or community ecology. Five PFTs: Specific Leaf Area (SLA), Leaf Mass per Area (LMA), Leaf Dry Matter Content (LDMC), Leaf Thickness (Lth), Leaf Water Content (LWC) and Leaf Chlorophyll content (CHL) were measured in tree stands (Selva di Castiglione – SC; Bosco della Ficora – BF; Bosco San Leo – BSL).

RESULTS AND IMPACT:

SLA measurements showed the highest mean value in the SC stand while BF e BSL showed higher LDMC values. For Lth, the low value was obtained for the SC stand that exhibited also the highest average value for CHL. High levels of SLA are correlated with a greater propensity for development by the plant, indicating a carbon investment oriented towards faster growth rather, on the contrary, the high LDMC values show a greater propensity to the longevity. The other PFTs accorded with the results of SLA and LDMC. The *in situ* studies on PFTs of forest species, provide crucial information on their ecology and may assume a great importance to address forest management practices.. The guidelines for the "urban and extra-urban forest plan" of the National Recovery and Resilience Plan, require specific references to natural forest communities and native woody flora to propose models of new urban forests that are consistent with the environmental characteristics of the sites and with the natural potential vegetation types. The new EU forestry strategy, which plans to plant 3 billion more trees in the European territory by 2030, can become an opportunity to apply the principles of ecology and vegetation science to sustainable land management.



BIODIVERSITY CONSERVATION OF MOLISE AUTOCHTHONOUS LENTIL (*LENS CULINARIS* MEDIK.) LANDRACES

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Plant biology

Biodiversity

Autochthonous landraces

Conservation

GOALS:

- Characterization of autochthonous lentil (*Lens culinaris* Medik.) landraces of Molise region.
- Supporting and promoting conservation activities of landraces.

METHODOLOGIES:

Characterization of three autochthonous lentil landraces from different villages of Molise Apennines - Capracotta, Rionero Sannitico, and Agnone - with a multi-integrating approach (morpho-physiological, genetic and metabolomic analysis), in comparison to three other populations one from Umbria (Castelluccio di Norcia, IGP), one from Lazio (Rascino) and one commercial variety (Turca Rossa). In the first phase, the morpho–physiological analysis was performed through the germination seed test and 9 IBPGR descriptors, to explore the quality of autochthonous germplasm and diversity among populations. Instead, the genetic analysis was carried out through 8 ISSR molecular markers, to define genetic variability and phylogenetic relationships among different accessions.

RESULTS AND IMPACT:

The results of the germination tests showed that all the populations had a good germination capacity, reaching a germination percentage (%G) above 80%, except for the Castelluccio di Norcia lentil (%G < 66.67%; T50 = 6.60 days). Instead, the morphological descriptors revealed high similarity among populations, except for the Rascino lentil, confirmed also by the Principal Component Analysis (PCA) and clustering analysis. The PCA and clustering analysis of the genetic profiles showed the presence of two groups: one formed by the three autochthonous populations of the Molise region, and one formed by the other three. In the future, the genetic analysis will be completed and improved. Furthermore, we will start the metabolomic characterization and we will test the bioactive compounds identified in plant extracts of lentil landraces, respectively with the collaboration of the Chemistry and Physiology research groups of the University of Molise, in order to valorize them from a nutraceutical, nutritional, and health point of view.

DEVELOPMENT OF NOVEL COMPUTATIONAL METHODS FOR QUASI-BRITTLE MATERIALS IN THE SIMULATION OF LARGE-SCALE CIVIL ENGINEERING WORKS

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Non-local damage

Numerical simulations

Quasi-brittle materials

Leakage rate

GOALS:

- Implementation of the non-local Eikonal anisotropic damage model in a 3D framework.
- Proposition of a transition approach from regularized continuum damage to a strong discontinuity model.
- Definition of the link between cracking to the local variation of the material's transfer properties.
- Numerical simulations of nuclear power plant containments under accident conditions and estimation of the leakage rate.

METHODOLOGIES:

Development of variational formulations adapted to the differential equations studied to solve the structural problem. A second-order anisotropic damage tensor is used to describe the material behavior at the local level. Evolving non-local behavior at the structural scale is coupled to damage by the means of a damage dependent Riemaniann metric. Upon strain localization, a transition to an explicit description of the crack is studied, based on the dissipated energy. The thermodynamics framework is then used to propose a poromechanics coupling. Numerical simulations are hold by a finite element software developed at CEA Saclay.

RESULTS AND IMPACT:

The need to predict the mechanical behavior of the structures and to evaluate its level of damage during extreme situations requires the use of numerical modeling with reliable and robust material models. Thus, all the numerical approaches developed and implemented will allow to have a better representation of the cracking in a real structure. They will allow to predict in a more realistic way the life span of new structures or to have a better estimation of the residual strength of a structure being submitted to an accidental loading. The first numerical results for smaller structures , such as beams and walls, are encouraging. It is shown that the classic non-local gradient approach can regularize the response but leads to unrealistic "pseudo-crack" paths due to damage spreading, for instance. Conversely, the Eikonal model provides more physical results in terms of damaging behavior and localizes damage in narrow zones. It may provide essential information about localization, such as the zones (and directions) where a discontinuity should be introduced.

ACKNOWLEDGEMENTS

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MODEL UPDATING OF A HISTORICAL STRUCTURE

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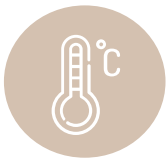
Douglas Reid method

Model updating

Structural Health Monitoring



Temperature effects

GOALS:

- Assessing Douglas Reid method for its integration into Structural Health Monitoring (SHM).

METHODOLOGIES:

Knowledge of the state of health of historical structures is becoming increasingly important nowadays due to the great heritage value of the historic buildings. However, the use of destructive tests for material characterization is not allowed in most cases and different strategies must be adopted. In recent years the choice increasingly falls on the combination of finite element models (FEM) with vibration-based dynamic tests to reduce the gap between numerical and experimental modal parameters and indirectly determine the unknown structural mechanical parameters. An important problem is the high computational burdens that often characterize these procedures. For this purpose, surrogate models, capable of replacing the complete finite element model and reducing computational time, can be adopted as strategies. Models such as Douglas-Reid (DR) or Response Surfaces Method (RSM) are the most used in the literature, but no studies have been found in the literature in which the reliability of surrogate models is tested in an exhaustive manner. Therefore, the need to understand whether models such as Douglas Reid can be used in a continuous monitoring system to indirectly determine the mechanical parameters of the structure over time becomes increasingly binding.

RESULTS AND IMPACT:

A real case study was selected to test the procedure and a natural frequency time series was generated considering temperature influence and noise measurements. Temperature influence has been considered defining expressions for the values of the elastic moduli of concrete and tuff masonry as a function of temperature and several analyses were repeated to calculate the corresponding natural frequencies considering a measured temperature time series DR method has been used for continuous model updating with the support of the simulated monitoring data in order to check its robustness to noise polluting the data and accuracy of structural parameter estimates under varying environmental conditions. Accuracy is evaluated by comparing the results of continuous model updating in terms of optimized values of elastic moduli of the materials with the corresponding input values of the FE model which have been used for natural frequency time series simulation. The results show a good agreement between the optimal values of the variables and the corresponding simulated variables with observed maximum deviations of about 0.8 % for the Young's modulus of concrete, and about 1.5 % for the Young's modulus of tuff masonry.

COMPUTATIONAL DESIGN METHODS FOR THE DIGITAL SURVEY OF THE HERITAGE

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VPL

Heritage

Digital Survey

Point Clouds

GOALS:

This study is an application of Computational Design methods to a specific case of a column, an object of quite an easy shape but still capable of many analyses and interpretations, in its role of an ancestral architectural item. Herein some aspects are discussed referring to the *Colegio de San Pío* V, a XIII century building housing the *Museo de Bellas Artes de Valencia.* The experimentation is developed in Grasshopper, the Visual Programming Language environment included in Rhinoceros.

METHODOLOGIES:

The first Grasshopper definition performs a segmentation of the point cloud in its three semantic parts: basement, shaft and capital. Giving in input the point cloud of the column, by using number sliders is possible to correctly place them, to be used for the segmentation of the cloud.
The second definition performs different methods of modelling and so to extract sensitive data to be useful in further analysis. Inputting the cloud of the shaft, its vertical domain is divided into N parts to obtain sections, then used to fit a circle in each one. As these won't be concentric, a convex hull is estimated to obtain a surface of dispersion of the centers. Then, is performed a 3d modelling in two steps: firstly executing a loft through the sections, so obtaining a NURBS surface strictly fitting them; after, by rebuilding it imposing only 3 control points.

In the last script, inputting the circles and the lofted surface, by building consecutive vectors linking the centres it's computed the local angular deviation of each section. These values are remapped in colour scale and printed in the model space the corresponding numeric values, in degrees.

RESULTS AND IMPACT:

This sequence of Grasshopper definitions delivers different kinds of NURBS surfaces extracted from the point cloud. The surfaces are affected by diverse levels of approximation enabling a critical restitution. The associated relevant parameters, i.e. dispersion of the centers and the angular deviations, point out irregularities in the shape maybe moving from local instabilities.
These computational design methods are then intended to obtain critical and focused lectures of a raw data – point clouds in the heritage case – suitable to be used within a framework of heritage conservation.

THE BET PROTEIN INHIBITOR JQ1 MODULATES AUTOPHAGY AND INDUCES DIFFERENTIATION IN GLIOBLASTOMA CELLS

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GOALS:

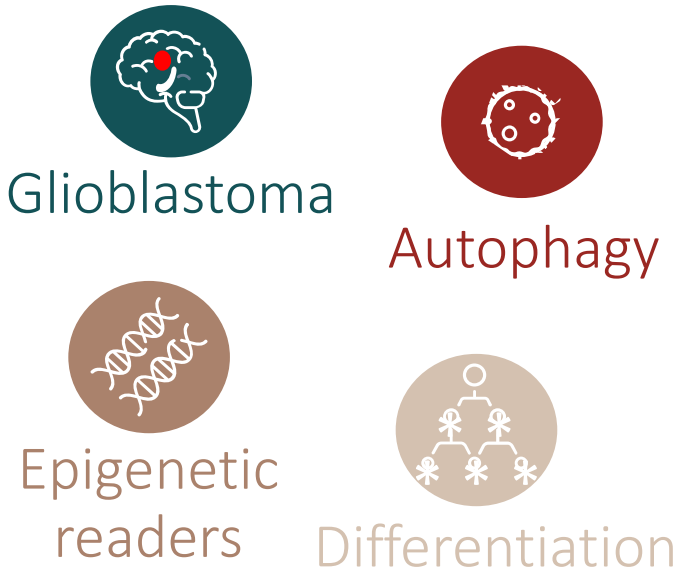
- Analyse the role of BET proteins in glioblastoma (GBM) biology
- Study the role of BET proteins in regulating the autophagy process in GBM human cell lines
- Assess the effects of the BET inhibitor JQ1 on the stemness properties of GBM cells
- Estimate the effects of JQ1 on GBM cell proliferation and response to chemotherapy
- Evaluate the role of autophagy on the cell fate reprogramming obtained through BET inhibition

METHODOLOGIES:

Microscopy Analysis and Western Blotting were used for phenotypic characterization of the cell lines. Proliferation rate monitored through cell counts experiments by using THOMA chamber. Data processing and statistical analysis were performed using computer software (Image Lab, GraphPad, Prism).

RESULTS AND IMPACT:

Stimulation of GBM cells with the BET inhibitor JQ1 resulted in de-regulation of PI3K/Akt/mTOR pathway. As mTOR is a known autophagy regulator, we analyzed autophagy occurrence by western blotting and immunostaining analyses. Significant changes in the expression of the main autophagy regulators and autophagy induction were observed in our GBM models.



Intriguingly, we observed that JQ1 induced a morphological change; a relevant increase in the number of cells with cytoplasmic projections was observed and the length of projections increased upon JQ1 stimulation. In order to test a possible cell fate reprogramming upon JQ1 stimulation we are analyzing the expression levels of stemness and neural and glial markers. We are also studying the effect of JQ1 alone or in combination with the chemotherapeutic drug Temozolomide on GBM cells proliferation and apoptosis. Finally, the functional role of autophagy activation, if any, on cell fate reprogramming induced by JQ1 will be investigated.

The results obtained suggest that BET protein regulation may be involved in the molecular alterations that occur during gliomagenesis and support the hypothesis that these epigenetic regulators may represent a novel therapeutic target in neuro-oncology field.

A REDUCTION TECHNIQUE FOR THE K-COLOUR SHORTEST PATH PROBLEM

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[2] University of Genova

GOALS:

- The k-Colour Shortest Path Problem (k-CSPP) is one of those variants.
- This problem addresses several real-world applications particularly related to network reliability or intermodal logistic.
- Define effective algorithms to provide good solutions in a reasonable amount of time.
- Reduce the size of the instance without affecting the possibility of finding the optimum solution.

METHODOLOGIES:

The k-Colour Shortest Path Problem (k-CSPP) is one of those variants. It consists of finding the shortest path on a weighted edge-coloured graph when the maximum number of colours used in a feasible solution is fixed apriori.

To solve this problem, we first propose a heuristic approach, namely Colour-Constrained Dijkstra Algorithm (CCDA) and a graph reduction technique, called the GRA. We present also an exact approach, called Reduced ILP (RILP), that, taking advantage of the heuristic and the Graph Reduction Algorithm, can provide optimal solutions in a reasonable amount of time, even for large instances.

RESULTS AND IMPACT:

This problem addresses several real-world applications; in particular, the k-CSPP can model problems related to network reliability or intermodal logistic.

Several tests were performed to verify the effectiveness of the proposed approaches. First, we compared our algorithms with state-of-the-art methods using the benchmark instances proposed in Ferone et al. (2020). Furthermore, we performed other tests to understand the behaviour of our approaches for different kinds of instances. We analysed how the reduction process affects the instances in terms of the residual nodes and residual edges per colour.

The Colour-Constrained Dijkstra Algorithm (CCDA), in a small amount of time, provides very good solutions, regardless of the size of the instances. The GRA is able to remove on average more than 90% of the nodes and edges from the input graph, drastically reducing the size of the instances. Finally, the RILP, taking advantage of the heuristic and the Graph Reduction Algorithm, can provide optimal solutions in a reasonable amount of time, even for large instances.

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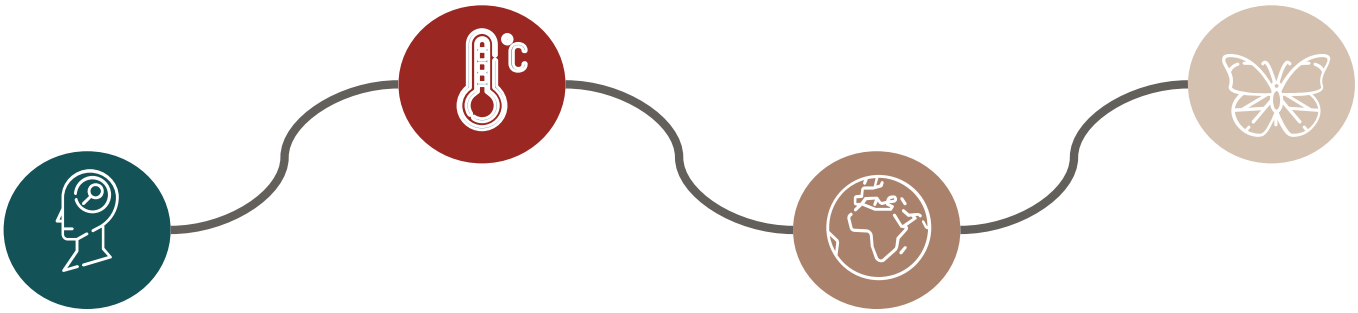


Ecologia e Territorio

DIPARTIMENTO DI BIOSCIENZE E TERRITORIO

Coordinatore:

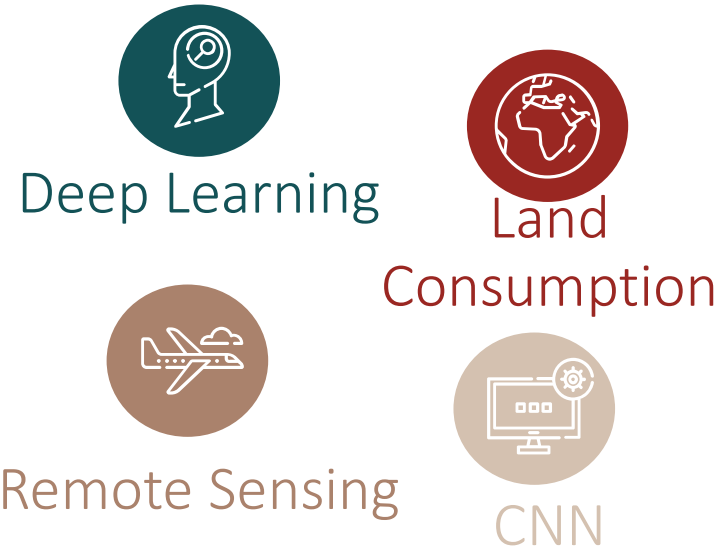
prof. Bruno Lasserre

LAND CONSUMPTION MAPPING WITH CONVOLUTIONAL NEURAL NETWORK

Case Study in Italy

Giulia Cecili

Department of Biosciences and Territory, University of Molise, C.da Fonte Lappone, 86090 Pesche (IS), Italy



GOALS:

- Testing of CNNs in consumed land mapping
- Automatic production of thematic maps to reduce costs and time compared with traditional techniques
- Analysis of the state of the territory and natural and anthropic processes.

METHODOLOGIES:

The proposed methodology shows an application of a Deep Learning (DL) algorithm called ResNet50 on high-resolution aerial images to test the feasibility of land cover mapping, with particular reference to the phenomenon of land consumption. The study consists of four phases: dataset preparation, model training, validation and testing. The methodology was tested with reference to a binary classification: consumed land and non-consumed land. Two AGEA orthophotos (20cm spatial resolution, 4 spectral bands) were labelled with the Land Consumption Map (LCM) produced by ISPRA-SNPA. This process consisted of combining the LCM elements with the orthophotos in order to obtain the training and validation datasets. Model training and validation were conducted on a first study area in Rome, which was chosen to represent a mixed composition of natural and artificial land cover classes. The methodology was then tested with reference to several configurations of parameters. The most suitable configuration has been applied to new test areas located in the Italian region of Tuscany.

Finally, the obtained classifications were compared with the LCM, which is the national benchmark for this topic.

RESULTS AND IMPACT:

Two levels of analysis were conducted: a visual comparison and evaluation through metrics analysis. The methodology is promising and shows high accuracy in built-up areas, even in small consumed areas. The comparison with the LCM shows a high capacity in permanent consumed land mapping and, in some cases, the CNN model is more effective than the LCM. On the other hand, mapping reversible consumed land is more challenging, due to the need to consider land use characteristics in addition to land cover. Anyway, the results show that although DL techniques are not widely exploited to map consumed land and to monitor land consumption, it might be a valuable support for monitoring and reporting data on highly dynamic peri-urban areas, which are among the areas most affected by the phenomenon.

ACKNOWLEDGEMENTS

I would like to acknowledge the University of Molise for founding my PhD study and Prof. Marco Marchetti for his supervision.

DISCOVERING *CYMODOCEA NODOSA* SEAGRASS AND MACROZOOBENTHOS COMMUNITIES ON THE MOLISE COAST

Coastal-marine habitats of European Conservation Concern in the Molise Natura 2000 network

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Biodiversity

Costal marine area

Ecological monitoring

Natura 2000 sites

GOALS:

The present research presents preliminary results describing the marine-coastal biodiversity in the Molise region and in particular represents the first attempt to: identify and map habitats of European conservation interest in the coastal seabed and evaluate the conservation status of the habitat of estuaries (Habitat Directive 92/43/EEC).

METHODOLOGIES:

The research was conducted in the coastal-marine area of included in the Natura 2000 site "Foce Biferno - Litorale di Campomarino“ (the ZSC IT7222216). To explore the presence and map the habitats of European conservation interest present in the coastal seabed, a diving campaign was carried out within 300 m of the coast. Seagrass samples were collected and analyzed in the laboratory. To monitor the Habitat "Estuaries" (EC: 1130) in the Biferno mouth of the sampling campaign on the macrozoobenthic coenoses according was done according with the ISPRA (www.isprambiente.gov.it/files/icram/macrozoo) protocol. Taxonomic analysis was carried out using a stereo-microscope and specialized guides.

RESULTS AND IMPACT:

We identified and mapped for the first time in the Molise coast the presence of *Cymodocea nodosa* seagrasses.

We revealed the presence of "Sandbanks which are slightly covered by sea water all the time (EC: 1110) in two different typologies: Type IV, "Sandbanks or seabeds permanently submerged by marine waters with vegetation of the Zosterion marinae" and Type I, “Sandbanks permanently submerged by marine waters without vascular vegetation”.

The monitoring campaign on the Biferno mouth highlighted a low macrozoobenthos richness with species referable exclusively to marine ecosystem (e.g. *Pagurus bernhardus*) and very high salinity values (average 34.08‰). Such conditions suggested an altered conservation status of habitat 1130.

The presence of directive marine habitats in the area facing the N2K site suggested the need to extend the site towards the sea in order to develop an integrated management plan combining biodiversity conservation and sustainable blue economy activities in the region.

ACKNOWLEDGEMENTS

Partially funded by the Project INTERREG V-A IT-HR CBC Programme (CASCADE – ID: 10255941), INPS (Istituto nazionale della previdenza sociale) PhD scholarship program Action III. PhD Tutor: M. L. Carranza

FOOD AS A NEW KEY TO UNDERSTANDING AND COMBATING MARGINALISATION

The Castel del Giudice Food Plan

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GOALS:

The Administration of Castel del Giudice initiated a co-participatory process that led to the definition of a Food Plan in 2019. The aim of the work is to understand, if and how, the application of a food Plan can activate virtuous mechanisms within a fragile territory and generate local development.

METHODOLOGIES:

Qualitative research methods were used to conduct the work, represented by participatory observation and semi-structured interviews with the main stakeholders. The use of these methodologies has made it possible to investigate value, cultural and organizational aspects that cannot be investigated remotely or through the in-depth study of the existing literature on the subject. The analysis of the socio-environmental context, formal and informal interactions were indispensable in order to investigate the effects generated by the implementation of the Food Plan.

RESULTS AND IMPACT:

As a result of the research work, it was possible to trace the consequences of the actions implemented and attributable to the Food Plan. In this regard, the most relevant actions were mapped, including: the adoption of the De.Co (Communal Denomination) by the municipality, with the function of linking a products to the territory; the establishment of a Grain Library by the Politeia association;

the realisation of information workshops, laboratory activities and excursions. The consequentiality of the actions put in place, induced impacts of a character: - environmental: protection and regeneration of soils and varieties of local animal and plant species; - socio-cultural: valorisation of ancient knowledge and flavours; promotion of forms of experiential tourism; greater possibility of determining an exchange of knowledge and practices between autochthonous and allochthonous people; creation of inter-municipal relations to support a re-balancing of city-countryside relations; - economic: new opportunities for employment inclusion; greater visibility of local products; greater income opportunities for companies in the agricultural, livestock, catering and hospitality sectors in the area. Finally, the fundamental role of the administration and certain local actors in driving these dynamics must be emphasised. For this reason, it would be desirable, in terms of continuity over time, for the inhabitants to be more involved, so that they can take an active part in inhabiting places in a conscious manner.

ACKNOWLEDGEMENTS

My sincere thanks go out to the entire community of Castel del Giudice and Prof. Davide Marino for his supervision

A SPATIALLY EXPLICIT APPROACH TO STRENGTHEN THE IMPLEMENTATION OF NATIONAL POLICY AGENDA AND MAXIMIZE THE CO-BENEFIT OF NATURE BASED SOLUTIONS IN ITALY

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Urban Sustainability

Environmental Health

Policy and Planning

Nature-Based Solutions

GOALS:

- This study aims to support national urban sustainability policies in a more efficient funds allocation for Nature Based Solutions (NBS) interventions and to guide their implementation on a local scale, to improve in turn their multifunctionality.
- Italy was adopted as a case study, since several policies were recently envisaged, allocating funds from the national government to the municipalities

METHODOLOGIES:

We identified and mapped with a spatial resolution of 1Km^2 areas harmful to human health, based on three environmental stressors, air pollution, thermal stress and flooding events that exceed specific Environmental Quality Standards (EQS). A spatial multi-criteria analysis assessed the cumulative occurrence of stressors by combining them into a single Aggregate Index of Challenge (AIC), and a hotspot analysis identified AIC spatial aggregation through the territory. Finally, 24 NBS were proposed, ranked and mapped according to their performance to mitigate stressors through the national territory.

RESULTS AND IMPACT:

Results evidenced that just 6% of the country does not exceed the respective EQS for any stressors. Seven different spatial combinations of stressors in exceedances were identified. Three for the individual stressors, 47% air pollution, 0.2% flood hazard, and 4.3% thermal stress, while four different combinations covering 42.5% of the territory shows the coexistence of at least two stressors in EQS exceedance.

AIC values allowed to establish the relative priority of intervention for each pixel(1Km^2), providing the magnitude of the challenge to be addressed. Considering their spatial aggregation, 18% of the national territory can be considered as a hotspot area of high AIC values, thus claiming for widespread interventions. For each of the seven combination identified, we provided a ranking of 24 NBS implementable to mitigate the stressors, both individually and aggregated. In this way, suitable and multifunctional NBS can be selected for each combination. Our results highlighted that administrative boundaries currently used by National policies do not perfectly match with stressors' distribution. Therefore, an evidence-based approach seems promising for enhancing the cost-effectiveness of funds allocation as well as their return in terms of human health and wellbeing. This study provides a novel approach to strengthen environmental policies and planning, giving insights for NBS implementation and multifunctionality.

ACKNOWLEDGEMENTS

"Establishing Urban FORest based solutions In Changing Cities" (EUFORICC), cod 20173RRN2S, funded by the PRIN 2017 program of the Italian Ministry of University and Research (project coordinator: C. Calfapietra).

THE ROLE OF COASTAL DEFENCE STRUCTURES AND DECREASED FLUVIAL SEDIMENT INPUTS IN COASTAL EROSION DYNAMICS

The case of southern Molise coast

Dilauro G., Di Paola G., Rosskopf C.M.

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GOALS:

Coastal erosion has complex reasons and depends on both natural and anthropogenic factor. Marine climate conditions, sea level changes and soil subsidence are among the most studied natural factors. On the other hand, anthropogenic impacts are probably the most common ones. The coastal equilibrium is strongly conditioned by the reduction of sediment supply and the presence/distribution of maritime and coastal defence structures. The present study investigated the Southern Molise coast, which is located along the central Adriatic coast.

The objective of this study is understand the possible role of the defence structures in coastal erosion by comparing data of local erosion rates and erosion susceptibility along with the types and distribution of defense structures.

METHODOLOGIES:

To verify the influence of hard defences coast on erosion rates along the Southern Molise, a three-step "back analysis" was carried out as follows:

- Analyzing the general longshore without any defence structure;
- Adding the jetties armouring the Biferno mouth;
- Adding of the entire coastal defence system.

RESULTS AND IMPACT:

Comparing the predicted shoreline with the measured shoreline changes shows that these changes well respond in the back analysis that considers the entire coastal defence system.

In addition, the presence and distribution of defence structures has conditioned both the location of erosion hot spot areas and the amount of shoreline change rates.

Direct observations of the shoreline variations over time, wave climate analysis and simulations performed with the model GENESIS have highlighted that the coast was governed by the wave component 10°N. The consequent equivalent direction of solid transport, coupled with a net decrease in sediment inputs from the Biferno River and its interference with coastal defences, has contributed to increase coastal erosion rates. Moreover, the observed bimodality of the wave climate may has influenced the recent beach dynamics.

In conclusion, this study highlights that the defence structures along with local marine climate conditions have deeply controlled shoreline erosion and must be taken in due consideration in future erosion control interventions on the coast

ACKNOWLEDGEMENTS

I would like to gratefully acknowledge Prof. Rosskopf and Dr. Di Paola for their supervision and guidance in my PhD study

A MULTISPECIFIC PROTOCOL FOR ENVIRONMENTAL DNA MONITORING OF ENDANGERED AND INVASIVE FRESHWATER SPECIES

Giovacchini S.[1], Mirone E.[1], Monaco P.[1], Bruno A.[2], Di Febbraro M.[1], Melchionna M.[1], Jamwal P.S.[1], Ramazzotti F.[2], Galimberti A.[2], Loy A.[1]

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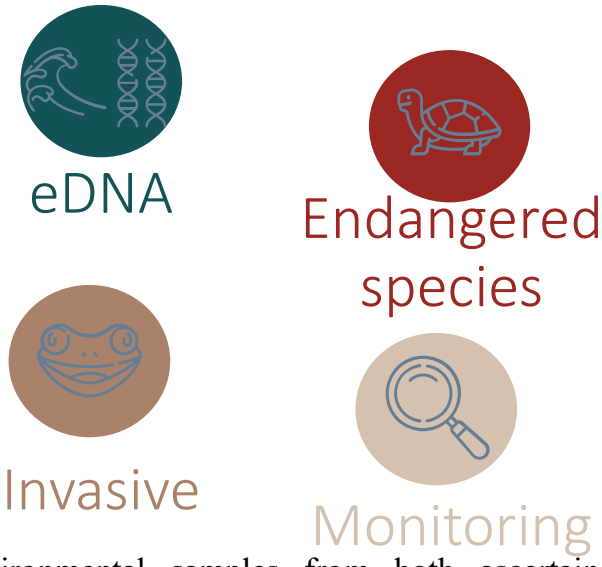
[2] University of Milano-Bicocca, Department of Biotechnology and Bioscience



GOALS:

Testing the applicability of an eDNA survey protocol for the simultaneous detection of both endangered and invasive alien species closely related to the riverine habitats.

METHODOLOGIES:

We selected 23 target species, including 14 species protected under the Habitat Directive and 9 alien invasive species that represent a threat to them. We collected water samples from 52 sampling sites in the Latium region, covering different habitats (eg rivers, lakes, ponds). We performed 2 different sampling sessions according to the phenology of the target species, collecting 3 liters of water per site and measuring 9 environmental parameters. Water samples were filtered employing cellulose mixed esters filters (0.22 µm) and prefilters (8 µm). Sterile water samples were used to keep track of possible contamination.

Developing genetic probes to detect the species of interest is an essential first step. Genetic probes have species-specific bounding to the animal's DNA scattered in the environmental matrix and is required a three-step probe validation process to ensure a proper accuracy in species detectability: i) in silico validation, checking genetic databases for possible matches with congeneric or sympatric species; ii) in vitro validation on target species tissues; and iii) in situ validation, on environmental samples from both ascertained presence and absence sites. After filtration, DNA was extracted from the filters by using a commercial extraction kit (DNeasy Power Soil Pro Kit, Qiagen), following the manufacturer's instructions with some modifications. To detect the presence of target species in water samples, the extracted DNA was amplified by using the genetic probes of the target species. Species distribution modelling was based on species occurrences and connectivity analyses were implemented to understand the potential distribution and dispersal routes of each target species using appropriate software (R, CIRCUITSCAPE).

RESULTS AND IMPACT:

The study is still ongoing, and definitive results have not yet been obtained. The use of eDNA techniques will be essential in monitoring wildlife on a large geographical scale. Their impact is on understanding species distribution and modeling their presence in space to infer their habitat requirements, comprehending connectivity among habitats, revealing the efficacy of protected areas on these endangered habitats and driving where to implement eradication plans for invasive species.

ACKNOWLEDGEMENTS

We are grateful to prof. G. Naclerio and prof. A. Bucci for sharing some useful materials in sampling collection.

ASSESSING RESILIENCE COMPONENTS IN MARITIME PINE PROVENANCES GRWON IN COMMON GARDENS

Concetta Lisella [1], Serena Antonucci [2], Giovanni Santopuoli[2], Marco Marchetti [1], Roberto Tognetti [2]

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[2] Department of Agricultural, Environmental and Food Sciences (DiAAA), University of Molise, Campobasso, Italy

Climate-smart forestry

Drought

Climate change

GOALS:

The knowledge acquisition on the response to drought in the Mediterranean hotspot represents an important step to improve the climate-smart forestry strategies. This is the case of *Pinus pinaster* (Ait.) an important ecological and economical Mediterranean species. The aims of this study were: i) assess whether differences in the growth response to drought stress occur between common gardens sites; ii) identify if any provenances with higher growth tolerance to drought events; iii) understand which climate variables could have the largest impact on resilience.

METHODOLOGIES:

The provenances studied were five (one Corsican, Portuguese, Tuscany and two Sardinia: Telti and Limbara) planted in 1981 in four common gardens in Sardinia. In 2018 were collected the structural data and two wood cores from 8-10 healthy trees per provenances. All elaboration and analysis of data were done with Rstudio software and its packages. From climate data was calculated the De Martonne Index for each sites, and defined the drought years: when the $SPEI_6$ in August ≤ -1. The resilience components (based on growth data), i.e., resistance, resilience and recovery, were calculated and analysed only for common drought years in all sites. To satisfy the first two aims, the non parametric tests were done. For the third aim the some Generalized Linear Models (GLMs) were built for each index.

RESULTS AND IMPACT:

2003 was the common drought year for all sites. The provenances showed differences in growth rates. The Corsican recorded the better growth rates, while the Tuscany the worse. The resilience components were influenced by prevailing environmental conditions at the common gardens. However in two sites, which had the lowest stand density, recorded the opposite trend during the drought year, probably cause to moderate thinning. From GLMs was found different probability in the response of resilience components to climate variables, highlighting the importance of temperature and the noticeable adaption of this species to the drought conditions. This study provided important insights for both productive tree plantations and assisted migration measures regarding this species in Sardinia Island where the studies are limited. The information obtained by this study suggested that the Corsican may provide appropriate material for forest plantations in Mediterranean conditions. Furthermore, it highlighted the importance of establishing long-term experiments to tackle future climate change.

ACKNOWLEDGEMENTS

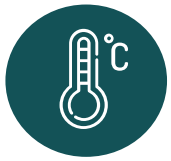
Thanks to: A. Tani, B. Mariotti, A. Maltoni, F. Salbitano, and A. Pierguidi (University of Florence), M. Mura (University of Sassari), C. Alvites, F. Caraglia, S. Versace (University of Molise), G. Palmas, M. Manca and personnel of FoReSTAS (Regione Sardegna).

NATURE-BASED SOLUTIONS AND CLIMATE CHANGE

Long-term perspectives on territorial planning

Panaccione M. , Lasserre B.

Department of Biosciences and Territory, University of Molise, C.da Fonte Lappone, 86090 Pesche (IS), Italy



Climate change

Urban sustainability

Green infrastructure

Risk assessment

GOALS:

- Systematically analyse how the literature on Nature-based Solutions (NBS) and climate change (CC) features time, future horizons and impacts.
- Gather and analyse the available information on the feasibility, effectiveness and limits of NBS across temporal scales and environmental changes.
- Provide an insight on future challenges regarding the implementation of NBS at different territorial scales and landcover.

METHODOLOGIES:

We performed a systematic literature review of peer-reviewed and gray literature through the Scopus search engine. A total of 506 documents was selected with the combination of the entries 'nature-based solutions' and 'NBS', with at least one other entry regarding climate change, temporal dynamics, resilience, adaptability, feasibility or effectiveness, in order to sort the relevant documents. The retrieved literature is currently being categorized based on the challenge-solving potential of specific NBS, along with spatial-temporal-knowledge scales, climate classification, landcover, methods, and type of NBS.

RESULTS AND IMPACT:

Preliminary results are articulated on the differentiation between documents supporting how Nature-based Solutions are effective in dealing with climate change, 'CC impacts addressed by NBS', representing 98% of the total, or how Nature-based Solutions face on their own the risk of climate change impacts, 'CC impacts on NBS', which is found in 10% of documents. These results show that there is almost complete agreement on the potential of Nature-based Solutions to provide resilience and diverse benefits, spanning across the ecological, sociocultural and economic dimensions. Nevertheless, the documents on 'CC impacts on NBS' advocate for the need to study, test and quantify in detail NBS behaviour, in order to ensure comparability and further replicability in different areas, climate-types and at different scales. Moreover, it is consolidated that future challenges are not only ascribable to climate change-related phenomena, but also to political and administrative directions, as well as to the enabling economic conditions and trajectories of human development.

ACKNOWLEDGEMENTS

Thanks to Sallustio L., Di Pirro E. for their support.

THE INTEGRATION OF RESILIENCE TO SOCIO-NATURAL DISASTERS IN TERRITORIAL PLANNING.

The link between preparedness and post-disaster recovery in landslide risk management in fragile areas

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GOALS:

- Building community resilience to landslides in fragile areas subject to depopulation
- Integration of principles, policies and strategies of risk management in the tools of ordinary planning
- Establish a connection between disaster preparedness and post-disaster reconstruction

METHODOLOGIES:

- Multiple case study methodology (Hall, 1982)
- Results are then placed in dialogue with interviews to selected experts in the field, policy makers, planners, scientists or activists on the questions that drive the research.

RESULTS AND IMPACT:

- Conceptual insights from the literature review on disaster and depopulation
- Knowledge base for the elaboration of territorial planning tools aimed at boosting preparedness and community resilience
- Insightful analysis of current Italian disaster risk reduction system: strengths, weaknesses, perspectives

The study aims to contribute to the integration of principles, policies and strategies for building community resilience to disasters in the tools of ordinary planning, particularly in territories characterized by depopulation. Particular attention is given to landslides because they affect those areas and because the types of disasters that are linked to climate change have seen the greatest increase in the frequency and destructive extent in recent years. The study makes use of the multiple case studies methodology. Cases are analysed: 1) in the light of current regulations and plans and their evolution 2) in the dynamics of the event, the behavior of the authorities and the (prepared or not) reaction of the community, read through the the media tale 3) in the ways in which post-disaster recovery is expressed.

Cases are compared through an abductive procedure, where even heterogeneous cases can reveal their specific transformative potential, the unexpected virtualities of change. The other parallel operation consists in a series of interviews addressed to experts in the field, policy makers, planners, scientists or activists on the questions that drive the research. The goal is to establish a dialectic capable of revealing planning latencies from which it will be possible to extract new perspectives, new paths to follow, new answers.

ACKNOWLEDGEMENTS

I would like to gratefully acknowledge the University of Molise for funding my PhD study and Mr Prof. Luciano De Bonis for his supervision and guidance

LEPIDOPTERA DIVERSITY IN THE CENTRAL ADRIATIC DUNES: PRELIMINARY RESULTS

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GOALS:

- Explore the relation between Lepidoptera diversity and dune plants in the Central Adriatic coast (NK2 site Petacciato Marina, Molise, Italy).

METHODOLOGIES:

Vegetation and Lepidoptera communities were sampled according with Long Term Ecological Research (LTER) protocol, (which determined data collection across the environmental gradient between seashore and backdune), with three replicates. **Vegetation** sampling was carried out following a random stratified protocol on 4x4m plots distributed on shifting dunes and backdunes. On each plot, the complete list of vascular plants was recorded and their relative abundance estimated. **Moths** specimens were collected using light traps equipped with UV LEDs, while **butterflies** were sampled by entomological net during day-time following Butterfly Monitoring Schemes (BMSs). Lepidoptera data was collected every 15 days (from December 2021 to November 2022), on shifting dunes and backdunes. Specimens are determined by the analysis of wing patterns (compared with scientific collections and specialized text illustrations) and by genitalia analysis.

RESULTS AND IMPACT:

Vegetation analysis evidenced the presence of several habitats (sensu 92/43/EC Directive) of dune zonation. We found 100 species of vascular plants belonging to 35 families, among which the most abundant are Poaceae, Asteraceae and Fabaceae. The taxonomic identification work is in progress, and the preliminary results obtained on the 50% of the specimens (collected on twenty-four samplings of nocturnal Lepidoptera and ten of diurnal) are attributable to 20 families (14 nocturnal and 6 diurnal) and 129 species (110 nocturnal and 19 diurnal). It is interesting that the family Noctuidae has the largest number of species (57). The high number of Lepidoptera species recorded in correspondence of dune vegetation may be likely related with the well preserved complex dune zonation which provides a wide variety of niches for the different life stages. Knowing the relation among Lepidoptera and dune vegetation is essential to establish which habitats and sites deserve of conservation actions.

ACKNOWLEDGEMENTS

Mr. Antonio Del Vecchio, the responsible of Regional Forestry Nursery Marinelle (Petacciato Marina, Molise, Italy), provided a fundamental support.

INVASIVE ALIEN PLANTS (IAPs) IN CENTRAL APENNINES: THE FIRST MIREN SURVEY

Santoianni L.A., Stanisci A.

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GOALS:

We analyze the distribution of IAPs in mountain ecosystems of Central Apennines, establishing the first MIREN (Mountain Invasion Research Network; http://www.mountaininvasions.org/) monitoring site in the Mediterranean basin and in Italy.

METHODOLOGIES:

We selected two roads that extend over a wide elevation range (around 500-2000 m a.s.l.) in Maiella National Park (MNP) and in Gran Sasso - Monti della Laga National Park (GSMLNP). Vegetation sampling was carried out into 20 sites evenly spaced from the lowest to the highest altitude along each road. At each site, we sampled 2 plots of 2m x 50m, arranged in a "T" shape during the period between mid-May 2022 to mid-July 2022, for a total of 80 plots. All the vascular plant species were recorded, and their abundance and cover percentage were estimated. Species identification was carried out in EnvixLab (UniMol), at the "Centro Ricerche Floristiche dell'Appennino" of GSMLNP, and at "Majella Seed Bank". Nomenclature follows Flora d'Italia (Pignatti 2019). The status of alien or native plant species has been defined according to Galasso et al. 2018.

RESULTS AND IMPACT:

We recorded more than 600 plant taxa of which 22 are alien plant species. The preliminary results indicate as the most frequent and abundant alien plant species: *Ailanthus altissima, Erigeron canadensis, Senecio inaequidens* and *Robinia pseudoacacia*. *Ailanthus altissima* reaches the highest altitude at 1195 m a.s.l., *Erigeron canadensis* doesn't exceed 870 m a.s.l in the study area, *Senecio inaequidens* reaches 978 m a.s.l. in Gran Sasso. The maximum altitude recorded for *Robinia pseudoacacia* in Central Apennines is 1140 m a.s.l.

Our results evidenced that Central Apennines are already facing processes of introduction and dispersal of IAPs and pointed out that mountain roads up to 1200 m a.s.l. are important sources and corridors for alien plant species propagules.

The obtained results may offer the baseline for monitoring and better exploring invasion processes on mountain ecosystems and gives new information needed for implementing efficient management strategies able to mitigate IAPs spread in mountain environments.

ACKNOWLEDGEMENTS

The research was partially funded by the ERC project MICROCLIM. It is part of Mountain Invasion Research Network; (MIREN, http://www.mountaininvasions.org/). We also acknowledge the MNP and GSMLNP staff for their technical support during the field campaign. Moreover, we acknowledge the "Centro Ricerche Floristiche dell'Appennino" for the identification of dubious plant samples.

THE HIDDEN BIODIVERSITY OF MANAGED FORESTS

Tree-related microhabitat diversity as a proxy for beetle communities' conservation in managed forests of Fagus sylvatica

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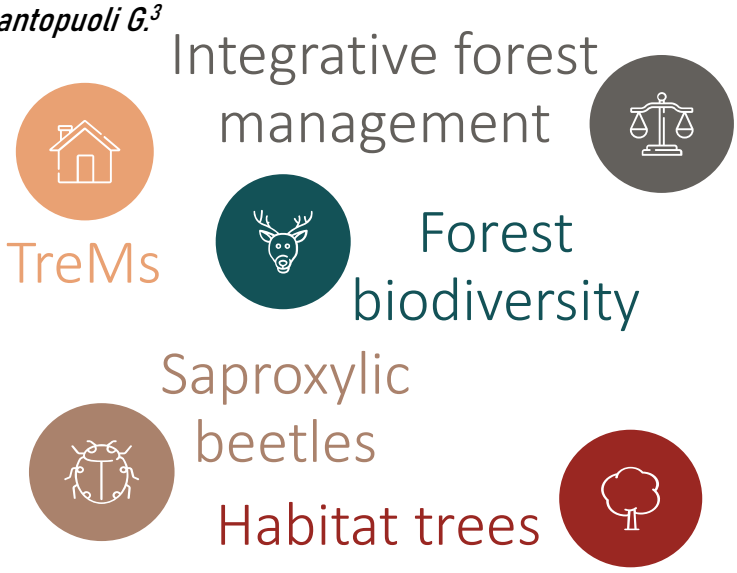
[3] Department of Agricultural, Environmental and Food Sciences (DiAAA), University of Molise, Campobasso, Italy



GOALS:

The study aims to assess the influence of environmental, forest structure, and biodiversity-related parameters on the abundance and diversity of beetles and saproxylic beetles.
We hypothesised that:

- the abundance and diversity of TreMs impact the abundance and diversity of beetle communities
- TreMs are significantly correlated with endangered saproxylic species
- the abundance and diversity of TreMs are influenced by local aspects such as the effects of site and environmental characteristics

METHODOLOGIES:

The study was carried out in a beech forest of the Apennine Mountains. The sampling scheme includes 60 circular plots (r = 13 m), within which biometric variables were recorded for all the living trees (DBH > 3 cm). For each standing living tree, tree-related microhabitats were observed and counted according to the reference field list of Kraus et al., (2016). Moreover, window flight traps were used to collect data on beetle communities. Four Generalized Linear Models (GLMs) were run to analyse the relationships between structural, environmental, and biodiversity parameters on beetles' community abundance and diversity. Two correlation matrices were realized to observe how and how much the single TreMs influence beetles' abundance and diversity.

RESULTS AND IMPACT:

A total of 19 different TreMs groups and 48 TreMs types were counted within plots. The most frequent TreMs types were the small root buttress cavities. We collected 4022 specimens of beetles, belonging to 165 species, within which 65 species for a total of 2335 out of 4022 specimens, were in the Italian red list of saproxylic beetles. Based on the risk category defined by Carpaneto et al. (2015) the threatened Italian red-list saproxylic species captured were classified as Near Threatened (8) and Vulnerable (2). Results showed that TreMs greatly influence both the abundance and diversity of beetle communities, including saproxylic species. The study demonstrated that TreMs can be considered a proxy for enhancing forest biodiversity in managed forests. Retention of trees-bearing TreMs during forestry interventions can promote the conservation of beetles' biodiversity and, more in general, promote the conservation of biodiversity within forests managed for commercial purposes. In addition, the specific relationships between individual saproxylic species, particularly for those belonging to the red list, and TreMs facilitate forest managers to integrate biodiversity conservation with timber production.

ACKNOWLEDGEMENTS

This work was supported by the LIFE program in the framework of the project "AForClimate – Adaptation of FORest management to CLIMATE variability: an ecological approach" (LIFE15 CCA/IT/000089).

THE ECOLOGICAL IMPACT OF INVASIVE ALIEN PLANTS IN ADRIATIC COASTAL DUNES

Changes in native vegetation after invasion process

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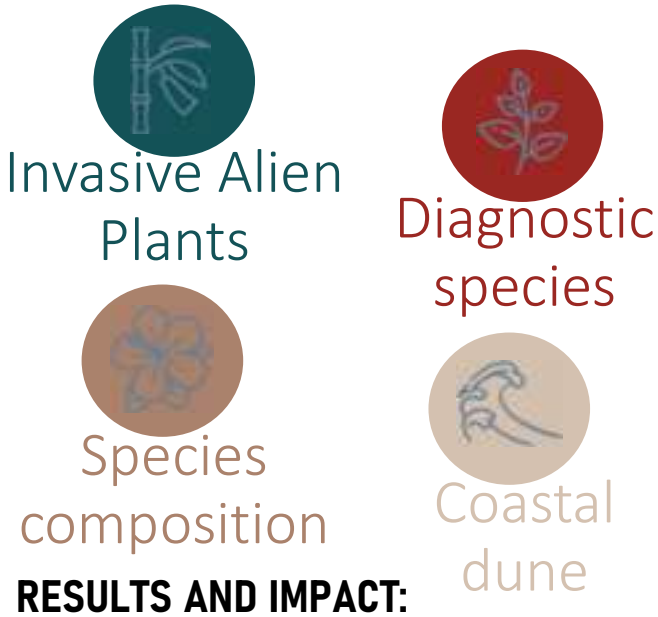

GOALS:

- analysis of changes in plant composition and structure of Mediterranean maquis in Molise and Apulia invaded by the IAP (Invasive Alien Plant) *Acacia saligna* (1° case study).
- analysis of impact thresholds of IAP occurrence/cover and of dune paths that may cause the decline in diagnostic species cover in shifting (SD hereafter) and transition dunes (TD hereafter) in Abruzzo, Molise and Veneto (2° case study).

METHODOLOGIES:

In the first case study, we sampled 20 plots (4x4 m) in *Juniperus* scrub and 20 in *Cistus* maquis in May-June 2020: in both habitats 10 plots were in invaded areas by *A. saligna* and 10 in pristine vegetation.

In the second case study, we sampled 56 plots in SD and 70 in TD in May-July 2021. Plots (1x1 and 2x2m) were randomly located in areas with and without IAP occurrence.

In both studies, for each plot the cover of every vascular plant was visually estimated by using Braun-Blanquet scale. The recorded species have been classified in ecological guilds and growth forms.

The data were processed by Non-Metric multiDimensional Scaling and ANalysis Of SIMilarities in the first study case and by Random Forest regression model in the second one.

RESULTS AND IMPACT:

The invasion of *A. saligna* promotes a decline of native species and a drastic change of vegetation structure in Mediterranean maquis; only *Juniperus* scrub preserves its specific composition and seems to be more resistant. These results provides useful insights for the implementation of restoration actions and for defining the long-term management plans requested by the Invasive Alien Species EU regulation.

In the second study case, the IAP cover and the number of individuals of *Oenothera stucchii* (selected IAP) affect the cover of diagnostic species in SD. The distance from dune paths was the most significant impact factor in TD. In SD the native taxa showed a low tolerance to IAP, so limiting their propagation prevents the decline of dune-building grasses that trap the sand. The degradation of TD could be attributable to the seaside tourism that cause native vegetation deterioration and making way for alien species spread. These findings can provide management information to protect the integrity of dunes, optimizing human accessibility to coastal habitat.

ACKNOWLEDGEMENTS

Thanks to European projects LIFE16 NAT/IT/000589 REDUNE, LIFE10 NAT/IT/000262 MAESTRALE, LIFE17 NAT/IT/000565 CALLIOPE and INTERREG V-A IT-HR CBC CASCADE – ID: 10255941 for supporting fieldwork activity.

GEDI4R: AN R PACKAGE FOR NASA'S GEDI LEVEL 4 A DATA DOWNLOADING, PROCESSING AND VISUALIZATION

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Forests

LiDAR

Ecosystem

Open acces

GOALS:

The aims of this study are:

- present the GEDI4R R package for GEDI level 4A data processing, providing a detailed description of GEDI4R functions and features
- test the package in Italy. We show an illustrative example by applying GEDI4R over the whole of Italy and by comparing GEDI AGBD estimates to estimates produced by the most recent (2015) Italian national forest inventory.
- explore the impact of this new package by highlighting the scientific and operative contribution of GEDI4R

METHODOLOGIES:

The package is developed in R 4.0 and is designed to facilitate the download and pre-processing of the GEDI level 4A data. The package follows a simple name convention: all function names start with the prefix "l4_" and are followed by a verb indicating the function's primary purpose. GEDI4R uses the data.table package (https://r-datatable.com) for the data structure, allowing fast and memory-efficient data aggregation and manipulation. Typically slower operations, such as downloading and reading files, are performed in parallel thanks to the functionalities of the snowfall and foreach R packages. The output of each function is standardized to be compatible with the most common R packages for spatial analysis and plotting, such as raster, sf, and ggplot2.

RESULTS AND IMPACT:

2175 files were downloaded, in approximately 3 h and a storage capacity of 620 GB (average file sizes of 280 MB). A total of 107 Shapefile were created in about 6 h, for a total of 8.36 GB of data (average file sizes of 3 MB).

Based on the processing settings, more than 11 million pulses (11,427,184) fall on the Italian territory. A total of 9,758,758 pulses fall within the national high-resolution forest mask produced by D'Amico et al. (2021). The mean AGBD in the forest was 124.3 t ha^{-1} with a standard deviation of 7.5 t ha^{-1}. The official estimation of AGBD from the last Italian NFI (INFC 2015) was 114.9 t ha^{-1}, with an increase of 19% between 2005 and 2015, which is consistent with the one estimated with the GEDI L4 data. Our package provides a ready-to-use tool that enables getting pre-processed data, allowing many researchers to make the most from GEDI level 4A. In addition, the simplicity of the developed functions allows even people with minimal knowledge of the R programming language to successfully interact with GEDI level 4 data. Plus, the function's parameter settings are intuitive and documented in detail. GEDI4R represents a step toward several future advancements in forest monitoring as it facilitates GEDI data usage by minimizing the effort needed to access innovative and groundbreaking data.

LOSER AND WINNER PLANT STRATEGIES IN HIGH MOUNTAIN VEGETATION

What happened in central Apennines during the last 20 years?

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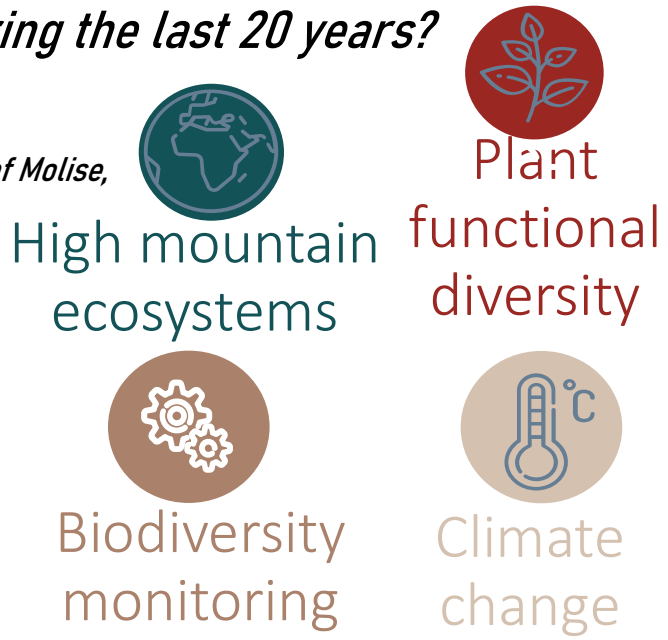

GOALS:

We explore temporal changes in functional diversity (FD) on high mountain vegetation occurred during the last 20 years in Central Apennines, based on a Vegetative Plant Height (H).

We focused on two questions: i) Does plant height functional diversity vary across the different plant communities? ii) How functional diversity vary over time?

METHODOLOGIES:

We analyzed 4 high mountain vegetation types, widespread in the Italian Apennine's alpine belt: *Galium magellense* community growing on screes, *Trifolium thalii* community of snowbeds, *Sesleria juncifolia* community of steep slopes and *Carex myosuroides* community of windy edges.

We conducted a re-visitation study of a set of 55 georeferenced vegetation plots firstly collected in 2003 (T1) and resampled in 2020/21 (T2). Plant height was measured on the most abundant species (>80% cover, 67 spp) by dedicated field measurements, conforming the standardized protocol (at least 10 different individuals of each species). We calculated the community-level functional diversity (FD) for this trait across the four plant communities with the Rao's quadratic entropy. Then, to quantify how much the observed pattern deviated from a random distribution, we calculated the standardized effect size (SES) for FD. Finally, we explored the variations in the SES-FD-H across the considered plant communities in the two time steps with Tukey's post hoc test.

RESULTS AND IMPACT:

In T1 three of the four plant communities presented low FD-H (e.g. functional convergence), while one had high FD-H (e.g. functional divergence) and such behavior changed in T2. Two plant communities increased FD-H: a) in snowbeds, we observed the increment of plant species with different sizes and, the increase of thermophilic species "climbing" high mountain mild habitats; b) in steep slopes, FD-H increased likely because a balancement among plant height categories was achieved. In screes FD-H remained low, probably because the environmental instable and limiting conditions promote functional convergence. Finally, FD-H remained high in windy edges probably because functional divergence allows to better exploit the resources during the short growing season.

Our results showed that the increment or high values of FD-H provide a winner strategy to face global change, as functional divergence allows to take advantage of the lengthening vegetative period. Still, in Mediterranean summits with calcareous substrate this FD varies following fine scale environmental mosaic drier local conditions (stress-tolerant species) and milder ones (competitive species).

ACKNOWLEDGEMENTS

The research was partially funded by the ERC project MICROCLIM and was supported by the LTER network, as it was carried out in LTER IT01-001-T Appennino centro-meridionale: Majella-Matese. We also acknowledge the Maiella National Park staff and the Maiella Seed Bank for their essential logistic and technical support during the field campaigns.

REMOTE SENSING AND INVASIVE ALIEN PLANTS IN COASTAL ECOSYSTEMS: A STATE OF THE ART CONTRIBUTION AND FUTURE PROSPECTS

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Remote sensing

Invasive Alien Plants

Coastal ecosystems

Literature review

GOALS:

- Analyze the main characteristics of the research articles that have employed Remote Sensing (RS) tools to survey Invasive Alien Plants species (IAPs) in coastal ecosystems.
- Examine how the utilization of the different observation platforms, sensors and methodologies on RS coastal invasions studies have evolved in the last decade.
- Analyze the interaction between different RS features (e.g., platforms, sensors, resolutions, etc.) and the coastal ecosystem types where the studies were conducted.

METHODOLOGIES:

We conducted a systematic literature review of 68 research publications that implemented, recommended, or discussed RS tools for IAPs mapping in coastal environments, published from 2000 to 2021.

RESULTS AND IMPACT:

Our research evidenced that most of the research has been carried out in China and USA, with Sporobolus (17.3%) being the better studied genus, while North America showed the highest frequency provenance of IAPs (31.4%). As for life forms, phanerophytes (33%) and geophytes (31.9%) were the most studied in our research. Although the number of studies increased from 2000 to 2021, this rise was more pronounced from 2015, and while most of them have primarily focused on the detection of IAPs, interest in modelling has increased at this time.

The most used platforms in the 2000s were aircraft, with satellites that increased from 2005 and unmanned aerial vehicles after 2014.

Multispectral resolution not only occurred in many studies, but also indicated a significant increase from 2005 to 2021. Ultra-high resolution, followed by very high resolution, were the most used spatial resolutions in the analyzed studies. However, ultra-high resolution showed a significant decrease, whereas very high resolution remained constant over time. Frequentist inference was the most adopted classification approach in the 2000s, as machine learning increased after 2009. RS applications vary with coastal ecosystem types and across countries. RS has a huge potential to further improve IAP monitoring. The extension of RS to all coasts of the world requires advanced applications that bring together current and future Earth observation data. Our account provides a benchmark of the available literature useful in supporting the creation of targeted approaches to address IAPs using RS techniques in coastal ecosystems.

ACKNOWLEDGEMENTS

Project PON R&S, DM 1061 /2021, PhD scholarship Action IV.6 - GREEN. and bilateral program Italy–Israel DERESEMII (Developing state–of–the–art remote sensing tools for monitoring the impact of invasive plants).

UNIVERSITÀ DEGLI STUDI DEL MOLISE

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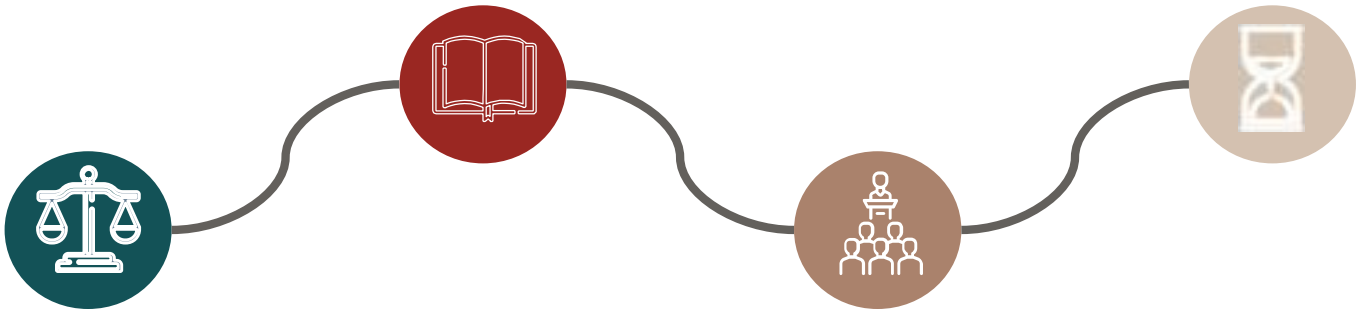

Innovazione e Gestione delle Risorse Pubbliche

DIPARTIMENTO GIURIDICO

DIPARTIMENTO DI SCIENZE UMANISTICHE SOCIALI E DELLA FORMAZIONE

DIPARTIMENTO DI ECONOMIA

Coordinatore:

prof. Francesca Di Virgilio

NUOVI DATI SULLA SIGILLATA ITALICA A ROMA: PRODUZIONE, COMMERCIO, CONSUMO, APPARATI DECORATIVI ED EPIGRAFICI

Elena Arbolino

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GOALS:

- reviewing the record of Italian Terra Sigillata in Rome;
- updating epigraphic corpora;
- highlighting differences in type and quality of Terra Sigillata among the studied contextes;
- investigating the provenance and tecnology of production;
- expanding our knowledge on Italic Terra Sigillata.

METHODOLOGIES:

• filing Terra Sigillata specimens from five unpublished archaeological contexts in Rome;
• filing unpublished stamps on Terra Sigillata collection from Vatican Museum;
• comparability with published data on Terra Sigillata in Rome;
• archaeometric analyses;
• prosopographical study;
• graffiti study.

RESULTS AND IMPACT:

Preliminary findings reveal the presence of new unpublished stamps and types of Terra Sigillata, a new chronological framework of the different attestations, and probably the presence of new centers of production. However, these issues will be detailed investigated during the next years. The material preserved in the Vatican collection consists of 531 specimens, referable to two different typological groups: 1) the first group include 501 specimens progressively numbered with Arabic numerals, 2) the second group include 30 specimens numbered with Roman numerals. Among the stamps impressed on the specimens, 390 can be referred to published variants while 20 are unknown in literature. In the Celio

context, two main chronological fases are identified: the first, dated back between the end of I century BCE and the beginning of the I century CE, when the site was devoted to agriculture, and the second, dated back ca. to the middle of I century CE, when prestigious residential building was here settled. Terra Sigillata is documented by more than 270 specimens, 16 of which were sampled for archeometric analyses. The Porta Labicana context is identified as a pozzolana quarry covered by a filling of giulio-claudian age. Terra Sigillata is documented by more than 200 specimens, 16 of which were sampled for archeometric analyses. The material collected from the so called Villa di Centocelle represents an interesting example of the last production and dissemination of Italian Terra Sigillata in Rome. Terra Sigillata is documented by more than 50 specimens, 6 of which were sampled for archeometric analyses.

Expected activities:

• completion of filing (others contexts);
• archaeometrich results and interpretations;
• realization of general catalog with graphic and photographic plates;
• realization of thematic map of archaelogical evidences on gis.

ACKNOWLEDGEMENTS

Sincerely thanks to: Prof. G.Soricelli, dott.ssa S. Morretta, prof. C. Grifa

TERRORISM AND SUBVERSION IN THE YEARS OF THE FASCIST REGIME

Michele Del Balso

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GOALS:

The objectives of this work aim to analyze the phenomenon of repression carried out by the fascist apparatus in the years 1922-1943 and to study the anti-fascist and subversive phenomenon through the attacks carried out and organized in those years.

METHODOLOGIES:

The methodologies used to start from the study and analysis of the manuals relating to the subject. Subsequently, the archival documentation regarding conspiracies, attacks, and repressive measures undertaken by the regime was identified. Numerous archival funds conserved in the Central State Archive (Rome) were analyzed. Among these are:

- Fund "H2, plots and attacks 1920-1958", concerning the attacks that occurred during the years of the regime;
- Funds "K/R - OVRA, 1927-1943" and "Reports of the quaestors and inspectors of the OVRA areas 1940-1943",

linked to the apparatus of repression and surveillance;

- Fund "Special Tribunal for the Defense of the State", containing the sentences issued against subversives and anti-fascists;
- Fund "K1 B/15, Quaestors' reports, 1937-1942", focusing on Quaestors' reports.

This documentation was accompanied by the study of the most important manuals connected to the chosen theme to highlight the innovations found in the archival documents.

RESULTS AND IMPACT:

The resistance and anti-fascism that emerged during the years of the Fascist regime in Italy presented a significant challenge to the Fascist State takeover of power. While the fascist regime was able to repress the opposition through censorship, surveillance, and violence, the actions implemented by the subversive movement helped to, directly and indirectly, affect the regime, despite a widespread system of repression.

In fact, the archival documentation reveals numerous attacks carried out, not only against the major Fascist hierarchs or Mussolini but also against strategic places and infrastructures of the Fascist State. The plots and attacks carried out had the aim of destabilizing the regime, hitting Fascism both in Italy and abroad.

The present work, therefore, will allow us to highlight the numerous subversive projects carried out or thwarted by the fascist security apparatus, revealing new unpublished elements.

ACKNOWLEDGEMENTS

I sincerely thank Università degli Studi del Molise for the opportunity granted.

THE CAST PROJECT. EXPLORING THE KNOWLEDGE OVER THE DARK.

Advanced multidisciplinary archaeology investigations from Pertosa-Auletta Caves, Italy

Andrea Di Meo

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GOALS:

The CAST project (Caves through Archaeology, Science and Technology) is configured as a methodological intervention program, which makes use of innovative technologies, enabling the acquisition of significant information on timeframes and on how the caves of Pertosa-Auletta (southern Italy) can be used. If on the one hand the objectives are the continuation of historical and archaeological research, on the other we want to develop an integrated museum system between nature and high impact popularization models using virtual survey technologies.

METHODOLOGIES:

Using innovative methodologies, the aim is to make the information acquired during the interventions available through a platform for continuous monitoring of the progress works. The direction marked by this pandemic phase has made the use of these methodologies even more urgent, favoring the spread of a New Digital Humanism that can determine a social impact capable of guiding future approaches to the management and scientific treatment of data.

RESULTS AND IMPACT:

The first step, towards a digital dissemination model, was the elaboration of a 3D archive of the most significant findings from the excavations carried out inside the caves. About 1200 archaeological findings have been collected in

various museums and, at the end of the work, a collection of about 600 findings will be digitally reconstructed. The 3D reconstructions can be integrated into museum visit paths for a wide spectrum of use: these models will therefore be accessible thanks to multimedia stations within the interactive path of the Museum in order to offer a vision of the object from every perspective.

Through the platform dedicated to the VR Experience it is possible to carry out a virtual tour of the 3D reconstruction of the pile-dwelling settlement, developed on the basis of archaeological data and the high-resolution three-dimensional survey carried out through the integration between laser scanner and photogrammetry. This platform contains virtual reproductions connected to the archaeological and natural history of the Caves, with diversified levels of access to information, which constitute a model of virtual experience with a strong scientific and social impact. The purpose of the platform, constantly implemented and updated, is also to allow you to check the progress of the research in a single environment that is easy to access.

ACKNOWLEDGEMENTS

Sincerely thanks to: Prof.ssa Antonella Minelli, Prof.ssa Rosanna Alaggio, dott. Federico Capriuoli, Fondazione Mida.

ITALIAN ARMY AND INTERNATIONAL TRUSTEESHIP OF SOMALIA

Emanuele Di Muro

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GOALS:

- The aim of the research is to provide a full study of the role of the Italian Army during the discussion about the former Italian colonies and the trusteeship in Somalia, considering the international situation and the local environment.

METHODOLOGIES:

A comprehensive approach method that will analyze the issue of the former Italian colonies from the international level, to the political and strategic level, underlining the military operational issues. The study will match the military method to study an historical event and the historical method of the contemporary history. Over all, it will be useful the PMESII ASCOPE matrix as background analysis tool.

RESULTS AND IMPACT:

The outcome of the research would show three different results:

1. Italian foreign policy integrated to the Cold War context;
2. The role of Italian Army to the Somali Nation Building, with a focus on the security forces;
3. The Italian Army lesson learned from that mission.

The impact is to give to the scientific community an key study from a military point of view in order to understand the situation in a instable area where Italy is still involved as training nation within European Training Mission.

Last impact is to give to the military community an overview of the one of the first Mission that involved the concept of Security Force Assistance..

THE RIGHT OF DEFENSE IN CRIMINAL TRIAL: AN EFFECTIVE GUARANTEE IN THE EUROPEAN AREA?

The need for the establishment of a European defense counsel

Giacomina Esposito

Department of Law, University of Molise, Viale Alessandro Manzoni, 86100 Campobasso, Italy

GOALS:

- Strength of the right defense in the instruments of European criminal cooperation
- The equalization of prosecution and defense faculties at the pre-trial stage in the European area
- Coordination of lawyers' rights among European states
- The foundation for an Euro defense system

METHODOLOGIES:

Research, with a view to normative harmonization, requires the study of the criminal procedural disciplines of the various Member States, in order to highlight similarities and differences as to the protection of the right of defense.

An in-depth look should also be taken at the instruments of judicial cooperation and the role and power reserved in them for the defense counsel.

The study is carried out through bibliographical, jurisprudential and normative insights.

Direct discussions with Italian and international legal scholars (so far, especially Spanish doctoral students and professors) were valued.

RESULTS AND IMPACT:

In the ever-widening panorama of investigative and judicial cooperation instruments in the European and international area, the impairment of the right of defense in the instruction phase, which is dominated by the prosecutor for the conduct of investigations, assumes relevance from the point of view of guarantees in criminal proceedings. The problem arises because, except for the Italian system, there is a lack of regulation of defensive investigations in most European states.

A lack of attention to the powers of the defense counsel is also found in the most widely used instrument for criminal judicial cooperation: the European Investigation Order. First, no autonomous power of initiative has been provided to the defender, but only a legitimacy to request the issuance of the EIO. Second, Article 9 in regulating the manner of execution of the EIO, does not guarantee the defender's right to be present at the time of execution.

This scenario has not changed with the establishment of the European Public Prosecutor's Office, in which there continues to be a so-called channeling of the defender's requests through the prosecutor.

From the current studies, the disparity of arms between prosecution and defense and the long-standing problem of the inability of the defense counsel to independently conduct defense investigations abroad, particularly due to the different regulations between states concerning the evaluation of evidence in criminal trials, are highlighted.

ON THE EARNINGS QUALITY OF STATE-OWNED ENTITIES

A Benford's Law Empirical Approach

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GOALS:

- We hypothesize that accounting manipulations in Municipally-owned entities (MOEs) operating in socially relevant industries are positively associated with the occurrence of an election in the controlling municipality, and we test this proposition in the context of the Italian utility sector.
- We also examine the effect that a new regulation, namely the introduction of a compulsory proportional appropriation system for local governments, has on the quality of MOEs' published financial statements.

METHODOLOGIES:

We base our empirical analysis on the application of Benford's Law (Benford, 1938). The main statement of Benford's Law is that the frequency of the first digit of many quantities in a number of real situations follows a distribution such that smaller numbers are more frequent than larger ones. In settings where Benford's Law is the norm, significant deviations from Benford's Law are taken as manifestations of low data quality or symptoms of possible data manipulations. We proceed by computing the standard chi-squared test and the adjusted MAD statistic proposed in Cerqueti and Lupi (2021). Since comparison of the results from samples of different sizes remains problematic, due to the different power of the tests in the presence of few or many observations, we use subsampling bootstrap (Politis and Romano, 1994), which allows us to overcome this issue.

RESULTS AND IMPACT:

We confirm that MOEs' pre-tax income numbers conform to Benford's Law in regular times, but we find signs of misleading financial reports concentrated in election years and even greater alteration in the financial statement data of utility sector MOEs entirely controlled by the local government (municipality owns 100% of shares). This implies that (i) auditors need to pay particular attention to the quality of accounting data in those crucial periods and specific environments; and that (ii) voters and media have to be critical in assuming MOEs' indicators of financial performance as proxies of the administrative efficiency of incumbent politicians. We also find signs of accounting data manipulation upon the introduction of a new regulation that forces Italian municipalities to appropriate resources proportionally to their ownership quota in controlled firms. The evidence is stronger as the quota increases, implying that as local governments face a greater reduction of spending power, in proportion to their quota, they show more incentives to have their entities engage in financial statements manipulations.

ACKNOWLEDGEMENTS

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UDL IN UPPER SECONDARY SCHOOL: A CASE STUDY

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GOALS:

- Analyze the relevance of UDL for learning;
- Determine whether there is a relationship between UDL and inclusive processes;
- Identify whether the UDL approach increases the level of inclusion perceived by students.

METHODOLOGIES:

The application part of the research project, conducted according to the experimental design, involves the following phases:

- presentation of the project and acquisition of teachers' availability;
- definition of the experimental group and the control group among the first classes of the school where the experimentation is to be held:
- 9-hour theoretical and practical training for the teachers participating in the experimentation;
- focus group with the teachers involved in the experimentation on research project expectations;
- recognition of inclusion level perceived by students before the experimental stimulus through a quantitative test consisting of 28 items that provide a response divided into five levels (much, enough, little, not at all, I need more information) and administered to the experimental and control groups (pre-test);
- experimentation in the classes participating in the research project;
- provision of a qualitative survey consisting of 4 questions on UDL-inspired teaching activities in the experimental groups;
- recognition of the inclusion level perceived by students after the experimental stimulus in the experimental and control groups through the same quantitative test (post-test);
- focus group with the teachers involved in the experimentation.

EXPECTED RESULTS AND IMPACT:

UDL is an educational approach valid for all students through methodological and operational guidance that supports teachers in the process of preparation and implementation of tools and resources. However, the lack of evidence-based studies and research on the impact of UDL on the learning process of students undoubtedly represents a limit to its validation, but is also the most significant challenge for its implementation in schools.

The real challenge is to test at school the effectiveness of UDL as a useful approach to providing inclusive and effective learning opportunities for all students. For this reason this research project aims at contributing to the validation of the UDL through:

- analysis of national regulation on the integration and inclusion of all students;
- critical examination of the scientific bibliography on the UDL produced so far;
- collection and analysis of experimental data;
- insight into of UDL in the light of regulatory sources, bibliography and processed data.

A TERRITORY WITH TWO LORDS: SAMNIUM BETWEEN SAMNITES AND ROMANS

Gabriella Iafanti

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GOALS:

- Explore the possibilities offered by digital tools in storing archaeological data and in the management of cultural heritage;
- Create digital models to improve the knowledge of settlements in pre-roman and roman times;
- Embed the historical knowledge and the digital products obtained through the research (such as spatial database and web GIS) in local governance projects for today's society's sustainable development.

METHODOLOGIES:

The research combines traditional methodologies of historical research with the numerous potentialities of digital GIS, therefore they are:

1. Analysis of literary sources;
2. Bibliographic examination;
3. Archaeological surveys;
4. Creation of a geospatial database;
5. Geomodelling with algorithms.

RESULTS AND IMPACT:

This research aims to investigate what kind of settlement structure the Samnites and Romans imposed on the same territory. Another intent is to identify the diverse phases of the conquest through archaeological evidence, using them as chronological markers.

Given the originality of the methodology, it is believed that the research will enhance the awareness of the potentiality of digital archaeology, and particularly of GIS, in the Italian approach to classical studies. Indeed, the topic chosen is not new in literature and is still debated: the proposal is to analyze it again in the light of current technological possibilities and reach, thanks to them, original insights. Furthermore, the knowledge acquired may be published on the Internet in web maps and open-access material.

Finally, the project takes into account the current difficulties of the local population. Hopefully, meetings with mayors, local institutions, and stakeholders, may put the results in the focus of local governance, helping plan the human-nature cohabitation, developing digital services for tourists, and improving employment opportunities for young people.

THE CULTURAL FACTOR IN COMPARATIVE LEGAL SYSTEMS. PARTICULAR REFERENCE TO LEGAL PLURALISM

Maldonado Smith Mario Eduardo

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GOALS:

- To provide a comparative perspective of how the cultural factor is evaluated in the different legal systems.
- Different realities are compared, such as the Mexican and the Italian.
- To justify the importance of this factor in contemporary multicultural societies, as well as to propose general reflections on the role of the state.
- Equally, a multicultural perspective is advocated without ignoring that this approach poses various problems: positive points, but also its complexities, especially when it comes to its link with fundamental rights and with the democratic system

METHODOLOGIES:

For this research, given the very nature of the subject under examination, we will use different methods, theories and concepts that will be of fundamental importance for the development of the work to be undertaken. The methods to be used will be: deductive, comparative, historical and systemic.

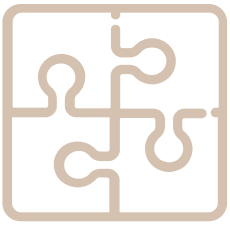
RESULTS AND IMPACT:

In this research I present starting points from which the right to cultural difference in the States can be guaranteed and thereby avoid radical needs which employ force, segregation, hatred and intolerance.

Diversity

Multiculturalism

Juridical sistems



Pluralism

All states, to varying degrees and for different historical reasons, have ethnic, linguistic and cultural minorities within them which constitute a great socio-cultural wealth. However, minorities coexist within state organizations not designed for them, but which are the expression of a prevailing culture that has imposed itself on the others. Many of the problems that contemporary societies are experiencing have their origins in the way states have been built. The human rights commitments made by contemporary states make it urgent to take steps to change this situation. However, the underlying problem is extremely complex as it requires the structural modification of a state not conceived from the point of view of cultural pluralism. In this perspective, it is necessary to conceive the foundations or foundations on which a theory of the multicultural state can be built. This is the problem and the purpose of this research.

ACROSS AMERICA.

Myth, Dream and Desert in Italian twentieth and twenty-First Century travel Literature

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GOALS:

- Mapping a literary genre: narrative reportage during 19th and 20th Century.
- Knowledge thanks to literature: the role of description, narration and invention in travelling literature.
- The representation of American through Italian writers.

METHODOLOGIES:

To use a close reading of the text and tools of narratology, stylistic and Cultural Studies. To structure the first part of the analysis on literary texts, the second on the context and American culture and the third as a synthesis of the work on the text and on the importance of literary genre as lens to understand better otherness and socio- cultural context.

RESULTS AND IMPACT:

This research intends to study the travel reportages of Italian writers on America over a wide chronological period, that is, from the early twentieth century to the more recent period, with a two-pronged approach: on the one hand, through the analysis of the characteristics of the literary genre and themes, as well as ideas and forms, and on the other, considering the essential tools of Cultural Studies. The precise spatial circumscription (the United States) and the temporal interval comprising the twentieth century and the year 2000 define the contours of the map or, metaphorically speaking, the canon of authors that we have decided to consider, with Mario Soldati's *America primo amore* and *Absolutely Nothing. Storie e sparizioni nei deserti americani* by Giorgio Vasta and Ramak Fazel as extreme.

The aim of this study would be to consider how the United States has shaped the imagination, how material and symbolic exchanges, as well as relations understood as a conflict of cultures, have transformed the initial constituent characteristics to the point of blurring the boundaries in the homologation that engulfs differences, and on the other hand, starting from this assumption, to understand and examine how abrupt, rough cuts in simplification, closely linked to the explosion of commonplaces, do not disperse a complexity that needs to be decrypted, discerned and verified.

The other aim of the diachronic comparison on a large sample is to provide the identification of a fertile space to develop new perspectives on odeporic studies following the approach of cultural studies while not renouncing the 'classical' analysis of themes and forms. Moreover, the other goal is to consider reportages in a cultural meaning that, starting from literary texts, and precisely because of the polysemy of the literary, open up other scenarios, other readings of what is commonly defined as reality and it is capable of construct more general hypotheses of sense.

TERRITORI DI PROSSIMITÀ.PROCESSI PARTECIPATIVI DI RIGENERAZIONE, CITTADINANZA ATTIVA E SERVIZI FONDAMENTALI

Barbara Mercurio

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GOALS:

This project finds its roots within the framework of Italy's National Strategy for "Inner Areas" (SNAI), mainly financed by national resources and EU funds (ERDF, ESF e EAFRD). The territory addressed for the study is the Fortore (CB) area, especially six of the twelve municipalities that are part of it (Gambatesa, Gildone, Jelsi, Pietracatella, Riccia, and Toro). Since from the title, the principal aim of the project lies in the following question: to facilitate the regeneration of the Fortore area, which elements would have to be considered "basic services" for its population?

The research, therefore, aims at analysing the dichotomy of co-participation and management of fundamental services between the local institutions and the citizens. Thus, the researcher has the task of observing and facilitating the territorial regeneration of the area (inspired by the principles of the Grounded Research, Actor Network Theory, studies of communities) while evaluating ethnographic case studies.

METHODOLOGIES:

The first year of the project's research has progressed as follows:

- Preliminary background analysis (bibliography, main national/international scientific literature on "Inner/Disadvantaged/Depopulated Areas" both in the anthropologic and historical field).
- In-depth analysis of the fieldwork according to socio-anthropological methodologies, to acquire the necessary expertise to carry out a proper reconnaissance on the territory of interest, and to proceed with a direct approach towards the local communities.

- Semi-structured, target-oriented interviews with: institutional representatives (Majors, administrative officials, and regional representatives) of the addressed area
- Focus groups with: local communities, aimed at a critical understanding of the perception of local population regarding the area.
- Participation in academic activities, conferences, seminaries, and workshops connected to the themes of the research and the area of interest.

RESULTS AND IMPACT:

In this first year of studies, the researcher had the opportunity to deepen her knowledge of the six municipalities of Fortore area and its communities. Particularly, in-depth interviews gave the researcher a preliminary idea of main directions and questions structuring her ethnographic as well as more general study. This awareness will disclose a full definition of ethnographic case studies to follow in the next year, in the mirror, moreover, of the incoming crucial phase of political campaign for the Molise Region's elections.

ACKNOWLEDGEMENTS

I would like to acknowledge my tutor, Professor of Cultural Anthropology Letizia Bindi. I would also like to acknowledge the Majors of Gambatesa, Gildone, Jelsi, Pietracatella, Riccia and Toro and their communities for their availability.

CLASSIC. HISTORY OF A CONCEPT

Giovanni Maria Molfetta

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GOALS:

- Mapping a literary genre: narrative reportage during 19th and 20th Century.
- Knowledge thanks to literature: the role of description, narration and invention in travelling literature.
- The representation of American through Italian writers.

METHODOLOGIES:

To try to combine the problem of the classic in a comparative perspective, entirely in line with the history of Ideas, an eclectic discipline that studies how the Ideas born, develop and how they communicate themselves through the history.

RESULTS AND IMPACT:

The aim of the research is classical. Undoubtedly "classical" belongs to one of those strange words of language that one knows on the condition that one never really has to define them. As long as someone does not ask us its meaning, it is also a convenient word that can give the listener a vivid yet indeterminate, concise yet articulate impression of the thing.

Regardless of the many contexts of use, there is perhaps a resonance in "classic" that always remains stable and that is the idea of something that returns, that recurs, sometimes as the sign of a loyalty documented over time, other times, instead, as the condemnation of what keeps repeating itself. Almost always then - and this perception grows the more the discourse narrows to the field of technical-artistic expression - the word is also accompanied by the image of a value that stands the test of time and finds in this test of strength the affirmation of its radicality. Therefore, before any subsequent analysis of the classics in the various disciplines in which certain works have established themselves as such throughout the centuries, the question to be answered is "What is a classic?" That is to say, "What defines a classic? Where does the need originate in history to trace it as a generative idea and, at the same time, to transmit it as an ideal comparison? What, therefore, does it generate in society?".

NON-VIOLENCE ACCORDING TO LANZA DEL VASTO AND THE ARK - *Philosophical, socio-political and juridical implications for possible paths of intercultural pedagogy*

Paolo Alessandro
Department of Law, University of Molise, Viale Alessandro Manzoni, 86100 Campobasso, Italy

GOALS:

- Retracing the biography of Lanza del Vasto (1901-1981) and the history of the Ark;
- Examining the broad and deep philosophy of the author;
- Assessing non-violence in Vedic, Upaniṣadic and Jain visions, as well as in Gandhi, Vinoba Bhave and Satish Kumar;
- Exposing a contemporary paradigm of non-violence under a triple juridical, negotiating and communicative lens;
- Offering an overview of pedagogical approach within the Ark;
- Comparing the thought of Lanza del Vasto and the Ark with spiritually oriented non-violent anarchisms.

METHODOLOGIES:

This research has been carried out during three years of bibliographic and ethnographic research, including readings, translations, selections, summaries, comparisons, reformulations, revisions of hundreds of books, essays, magazines, articles in Italian, English, French and Spanish, found in Italy, Switzerland, France and the United Kingdom during three periods of fieldwork abroad. The methodological posture has been generally (self)critical, reflective and interpretative. The interconnection between reflection and research underlying this thesis, which stemming from a biographical and intellectual reconstruction deals with multiple speculative and practical implications concerning the broad topic of non-violence, follows both a deductive approach and an inductive one.

Therefore, the research has been empirical, with the 'naturalist' care to minimize the artificial means for collecting data and testimonies; longitudinal, attentive to changes over a prolonged period of time; trans-cultural and comparative, focused on the examination of different case-studies.

RESULTS AND IMPACT:

Giuseppe Giovanni Lanza del Vasto, direct disciple of Mahatma Gandhi, has been one of the most prominent and prolific thinkers, authors and living witnesses of non-violence in the 20th century. As an insightful critic of violent structures (state, capitalism, authoritarian socialism) and a mentor for thousands of women and men from all around the world, affiliated with the Ark since late forties, Shantidas, 'servant of peace' as Gandhi named him, can be considered a pioneering figure for contemporary reflections, discourses and practices connecting the galaxy of non-violence with anarchism, deep ecology, yogic-ecumenical spirituality and decoloniality. His 'Gandhian tribe' has never lived entrenched in its strongholds, locked up in private happiness, oblivious to social struggles: its non-violent campaigns, actions and initiatives have rather been key milestones in the history of non-violence in the West, worthy of consideration for all those scholars and activists who engage themselves in struggles for justice, freedom and peace. Therefore, this thesis also examines the complexity of non-violence and its implications from socio-political historical, pedagogical, juridical and economic perspectives, suggesting many paths for debates and experimentations. Interviews to key protagonists, relevant analysis and unpublished translations are also included.

THE IMPACT OF ARTIFICIAL INTELLIGENCE ON CORPORATE GOVERNANCE

Legal basis and consequences of implementing AI in the governance of a company

Pier Paolo Picarelli

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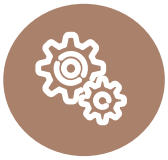
RoboBoard

CorpTech



Artificial Intelligence

Corporate Governance

GOALS:

- Encourage a lawful adoption of artificial intelligence in corporate governance.
- Ensure safety in a market where actors can use artificial intelligence to manage a company.
- Redefine shareholders and stakeholders rights in light of the implementation of artificial intelligence in corporate governance.
- Find out how third parties and stakeholders can enforce their rights when facing companies managed using artificial intelligence.

METHODOLOGIES:

A general overview on artificial intelligence regulation is the key to understand the impact of such technology, and the legislation that will impact on int, on company law and, namely, corporate governance.

As most of the regulation has to came into force in the future or is in an early stage of adoption, the study of legislative proposals, drafts, white papers and institutional studies is crucial to understand how legislators will regulate AI.

Furthermore, a comparative approach is required. For artificial intelligence, as technology in general, the same technological instrument (code/algorithm) may be treated in different ways depending on the legal system considered. Therefore an outlook to legal systems outside EU may be useful to understand how artificial intelligence is treated in different legal traditions (e.g. US).

The research will be carried out through a literature review of papers and works of scholars that are involved in this area of study.

Legislation, at the current stage, provide for the implementation of ethical codes by actors in the sector of artificial intelligence. Such codes, and the way they are drafted, should be analyzed.

RESULTS AND IMPACT:

- Determine whether the use of artificial intelligence in corporate governance tools is compatible with company law.
- Assess whether the use of artificial intelligence limits the liability of directors and management.
- Point out possible critical aspects in the use of artificial intelligence in corporate governance.
- Show to what extent it is possible to have a board of directors composed (fully or partially) by robots (i.e. RoboBoard).

DEBATE AS A PEDAGOGICAL PRACTICE FOR THE DEVELOPMENT OF CRITICAL THINKING IN THE ITALIAN SCHOOL SYSTEM

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GOALS:

- Study and analysis of relevant scientific literature
- Structuring a Debate protocol usable from primary school to University level
- Designing evaluation grids for regulated debate activities that take into account national ministerial guidelines.

METHODOLOGIES:

Educational research is a filed of scientific research that studies educational and formative processes, as well as human properties, interactions, organizations, and institutions that influence educational outcomes. In this context, describing, understanding and explaining how learning occurs and how context influences forms of learning are fundamental.

The research method employed in this study is mostly qualitative, aiming for a holistic understanding of the reality to comprehend the motivations underlying certain behaviors in the educational context. Therefore, questionnaires, experiential observations and direct monitoring during the activities.

RESULTS AND IMPACT:

The moment of the evaluation is considered the most formative within the debating experience, as it presupposes fundamental aspects not only of a didactic but also a pedagogical nature.

The judge who is tasked with evaluating a debate "promotes the acquisition of attitudes, skills, and contents relevant to personal, educational, and professional levels" (De Conti, Giangrande, 2017, p.137), understanding that beyond the competitive aspect, there is a higher educational purpose: to train young minds in the ability to listen, to reason critically, and to express their thoughts democratically. In order for Debate to be considered an educational practice, and even more so, a teaching/learning methodology, it is necessary that it be used to evaluate the degree of learning achieved by the student with respect to specific objectives defined and provided for at the ministerial level. It is necessary to formalize the evaluation process aimed at verifying the achievement of predetermined objectives for the recognition of debate as a useful tool for learning in the school context. To this end, evaluation rubrics have been designed and structured that, starting from national curriculum indications and Dublin Descriptors, can be used from primary school to university.

PEOPLE ENGAGEMENT IN DIRECT DEMOCRACY: COMPARISON OF ITALIAN REFERENDUM WITH UK AND CANADA.

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ABSTRACT:

Referendums are a tool used in direct democracy, allowing citizens to vote directly on specific issues. Referendums can be binding or non- binding, depending on the specific laws and regulations of the country in question. The use of referendums varies widely across countries and is often used to address important and controversial issues. This is a comparative study that examines the referendums in Italy, the UK and Canada based on people engagement (turnout and voting behaviour). Our analysis examines the campaign and discusses the factors like the extent of knowledge and awareness in the negotiation process between the state and non-state parties and the main drivers that influence voting patterns in these referendums, in subject states.

METHODOLOGIES:

The project will use a combination of quantitative and qualitative data collection and techniques for analysis. It will be a two-step process that will start with the quantitative data collection and analysis. There is no secondary data to cover all these variables at all three levels. Consequently, I will run an online representative survey in the Italy, UK and Canada asking questions about referendums at all three levels

RESULTS AND IMPACT:

To seeks and fill the gap in the literature and aims to identify the factors that determine citizens to vote in referendums. At the end of my research on the basis of "political participation" theory I would like to analyze the results for the purpose of explaining why citizens vote in referendum.

Theory creation is always done by qualitative analysis.

H1: Civicness.
H2: Internal Efficacy.
H3: Dissatisfaction with democracy.
H4: Preference for decision makers.
H5: Issue salience (Silent features).
H6: Lower trust in national politicians decreases chance of voting in referendum.

A key question is, "What are the patterns of support for a shift toward direct democracy?" From the existing political debates and scholarly research n direct democracy, one can extract two explanations that have contrasting implications. The New Politics explanation maintains that the new values and skills of people today are bringing about a sea change in the way they view politics. In contrast, the political dissatisfaction explanation argues that unease with the way representative democracy currently functions may be stimulating support for direct democracy as an alternative. "Ronald Inglehart" argues that, across the Western world, modernization processes are fostering a new range of "postmaterialist" political interests and altering expectations about the appropriate role of the citizen. These postmaterialist values should generate support for a new participatory style of politics that emphasizes basic democracy, public interest groups, and other forms of direct action, while simultaneously casting doubt on hierarchical authority structures such as parties and the representative system.

ACKNOWLEDGEMENTS

Sincerely thanks to: my Supervisor Prof. Fabio Serricchio, my Teacher Prof. Federico Pernazza, my parents Ammi, Abu , my father in- law Abbi Sahab mother in-law and my beloved husband Musa Raza

FROM THE KITCHEN TO THE TABLE.

Production, use and circulation of Medieval Pottery in Lower Molise.

Venditti Angela

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GOALS:

- The settlement, economic and social dynamics in the Molise countship in the Middle Ages;
- Analysis of the archaeological reality (excavations, written sources and iconographic data);
- Production, fruition and commercial dynamics of medieval tableware.

METHODOLOGIES:

The study focuses on the late medieval vessels, in particular pottery with lead (Graffito Ware) and stanniferous (Protomaiolica) coating from the site of Magliano, that are the object of a research project on the castle building in Lower Molise. Firstly, the study analyses the types and main decorative motifs in order to highlight morphological-decorative similarities with materials from other Molise and extra-regional areas. The analysis also considers the features of the clay mixtures, in order to trace the manufacturing areas, to deepen the knowledge of manufacturing dynamics and to evaluate the impact of technical innovation of applying the glass coating on the already fired vessel. Finally, it considers the socio-economic marker, to including the analyzed artefacts in a broader framework on the circulation and consumption of ceramic vessels.

RESULTS AND IMPACT:

The study is able to deepen the knowledge of the contexts analyzed and also to insert the artefacts in a broader framework on the production, consumption and circulation of these pottery by relating them to those found in the well-known production centers of the central Molise area (Protomaiolica) and the hinterland of Isernia (Graffito Ware). Even the clay mixtures encourage us to theorize the pertinence of the pieces to regional productions, specifically to the Type B recognized in the central Molise productions. However, there are also comparisons with the productions of Puglia, Abruzzo and Campania. The further in-depth analyses of the studies, in particular the archaeometric analyzes already planned, will allow us to ascertain the presence of production activities on site, conceivable from the discovery of three stone with traces of enamel and glaze. In this case, the link with extra-regional products could be dimonstrated by the location of the area, at the center of the Abruzzo-Apulian sheep-track network. This work intends to apply the principle of safeguarding the ceramic manufacturing heritage in a local perspective enhancing the local tradition also through forms of communication to the public developing forms of dissemination in the field of Digital Humanities (database of ceramic repertoires and mapping webGIS).

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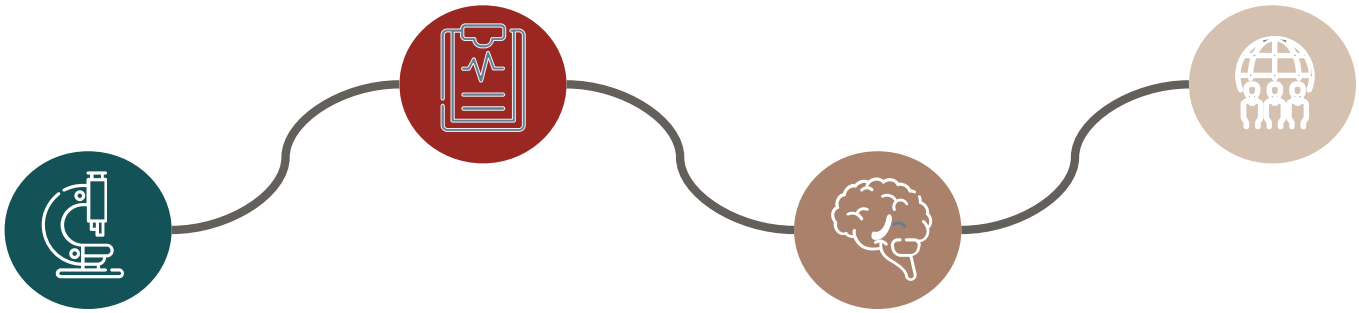

Medicina Traslazionale e Clinica

DIPARTIMENTO DI MEDICINA E DI SCIENZE DELLA SALUTE "VINCENZO TIBERIO"

Coordinatore:

prof. Giovanni Scapagnini

MENTAL HEALTH PROMOTION IN YOUTH MIGRANTS USING NEW TECHNOLOGIES

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GOALS:

- Promote youth migrants' mental health using the website www.allostaticmind.altervista.org
- Promote integration.

METHODOLOGIES:

Tools used on the website to promote mental health have been developed according to this model:

- Dissemination of adequate information regarding mental health in order to facilitate the development in young migrants of effective self-help strategies, for those problems that do not require professional intervention; the adoption of help-seeking behaviors for those forms of discomfort which, on the other hand, require it, favoring the reduction of the stigma surrounding the issue of mental health and the promotion of pro-social behaviour. This information focuses on specific topics such as anxiety, depression, bullying and stress. Particular emphasis was given to somatic symptoms as a manifestation of psychological distress.
- Specific insights into the key aspects of health determinants affecting mental health. The topics covered concern social networks, sport, lifestyle and nutrition. These topics have been treated in an essential, but more specialized, way and are mainly aimed at older and more sensible adolescents. In these insights there are also bibliographic notes that refer to specific topics.

The peculiarity of this site that makes it dynamic and partially interactive is the presence of an email that puts the user in contact with a group of mental health experts who can provide the necessary help.
Finally, a video section dedicated to interviews of young migrants present in the Abruzzo and Molise regions has been included, in which the protagonists young migrants talk about the importance of good life practices for mental health.

RESULTS AND IMPACT:

The pilot project presented is still ongoing.
New technologies are a valuable aid in conveying fundamental messages for good mental health practices. The exclusive use of a virtual reality, however, could contribute to aggravate situations that are already compromised in themselves. Therefore, it becomes essential to combine new technologies with concrete and real tools to help the subject to live the migration process in dynamic ("allostatic") equilibrium.

ACKNOWLEDGEMENTS

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EFFECTS OF PRESCRIPTION PHYSICAL ACTIVITY IN SEDENTARY AND HYPERTENSIVE PATIENTS

Bianco Antonio

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Hypertension

Physical activity

Sedentary

GOALS:

In Italy 35.2% of adults are sedentary. Some studies demonstrate the increased incidence of arterial hypertension in sedentary subjects.
The WHO guidelines underline the importance of prescription of physical activity (AFA) for the improvement of the quality of life and the prevention of non-communicable diseases.
The aim of the study is to reduce blood pressure through prescription of physical exercise in sedentary adults.

METHODOLOGIES:

The study was conducted on 61 sedentary patients (mean age 61.6 + 2.3 years), 20 of whom were hypertensive attending the Unimol sports medicine clinic.
All patients underwent family and personal anamnesis, bioimpedance analysis (Akern), strength tests of the upper limbs (dynamometer) and lower limbs (chair test), balance (blindfolded gait), flexibility and effort tolerance (stress test at ergometer).
At the end of the visit,AFA was prescribed with alternating programs of muscle strengthening, flexibility and aerobic physical activity between 60% and 80% of the maximum theoretical HR.

RESULTS AND IMPACT: Of the 67 patients enrolled in the AFA program, only 37 completed a minimum of 3 months of training (FU)(mean 213 + 3 days, median 141 days).

	Time 0	*Follow-up*	
TOTAL WATER (L)	*41,2+_1,4*	*38,4+_1,4*	*P<0,05*
FLEXIBILITY	*-5,6+_1,3*	*-2,5+_1,1*	*P<0,05*
CHAIR TEST (Number)	*14,3+_0,6*	*17,1+_0,8*	*P<0,05*
EFFORT DURATION (min)	*6,1+_0,4*	*7,6+_0,4*	*P<0,05*
RECOVERY DURATION (min)	*4,7+_0,5*	*3,5+_0,2*	*P<0,05*
DBP (mmHg)	*81+_1,8*	*76+_1,9*	*P<0,05*

Comparing the parameters measured at the time of enrollment with those at the last available FU, we observed an improvement in the anthropometric parameters (reduction in body weight from 73.2 + 2.3 to 71.1 + 2.9 kg) of strength of the lower limbs (Chair test repetitions from 14.3 +0.6 to 17.1 +0.8 P<0.05) exercise tolerance (exercise duration (min) from 6.1+0.4 to 7.6 +1.9 P<0.05) and PAD evaluated in recumbent position (from 81+1.8 to 76+1.9 P<0.05) despite no changes were made to the drug therapy of hypertensive patients.

VALIDATION AND OPTIMIZATION OF A MATHEMATICAL MODEL FOR RADIOFREQUENCY THERMOABLATION TREATMENT

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GOALS:

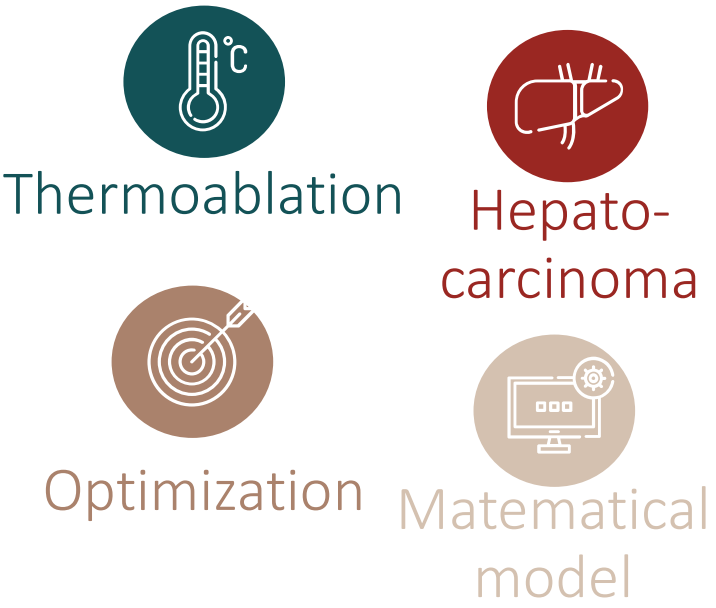
- Design of a mathematical model that predicts size and shape of necroted area in a thermoablation treatments
- Validate the model using experimental data from in vivo ablation treatments
- Use the validated model to optimize thermoablation treatments

METHODOLOGIES:

Computational domain is designed: tumor environment, healthy tissue and radiofrequency antenna are implemented. A modified Local thermal non equilibrium (LTNE) porous media model is used to design the model physics. Moreover, a variable porosity, to simulate decreasing in blood flow in tumor environment, is implemented. A brand-new variable blood flow vector is used to replicate different antenna insertion angles used by physicians. Twelve patients at Pineta Grande Hospital (CE) with solid liver lesions were enrolled between January and September 2022.

RESULTS AND IMPACT:

Results consider 3 different blood velocity to individuate equivalent velocity in the analyzed domain, and 36 different directions via the angle ϑ to individuate the insertion angle of the antenna. All combinations of selected directions and velocities are examined for each patient. Arrhenius equation for tissue damage calculation is used.



Model shows best approximation for a velocity u = 0.08 cm/s and insertion angle ϑ =180°-270°. Experimental and computational outcomes in terms of ablated areas are examinated with a statistical analysis to appreciate how much the optimization procedure for both direction and velocity has an impact on predictions. Mean Absolute Percentage Error (MAPE) and R^2 are evaluated. The MAPE is 6.4%, while R^2 = 0.92. Despite the good results in terms of ablated area, the results show a poor approximation in shape. Indeed, the results look overestimated in z direction, and underestimated in r direction. This error, that occurs systematically, is called bias error. In order to fix this bias error, the Ensemble Bias Correction technique has been used here (EnsBC). After correction. bias-corrected data show a MAPE of 1% and 2% on z and r axes, respectively, versus a MAPE of 10% and 5.5% for non-corrected data. The high precision of the model in predict area and shape of necrosis can be used to suggest the physician which parameters use during the treatments, in terms of power, duration and angle of insertion of the antenna.

ACKNOWLEDGEMENTS

Thank to the Pineta Grande Hospital in Castel Volturno (CE) for providing the experimental data.

RESPONSE OF PACHYCHOROID NEOVASCULOPATHY TO INTRAVITREAL BROLUCIZUMAB

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GOALS:

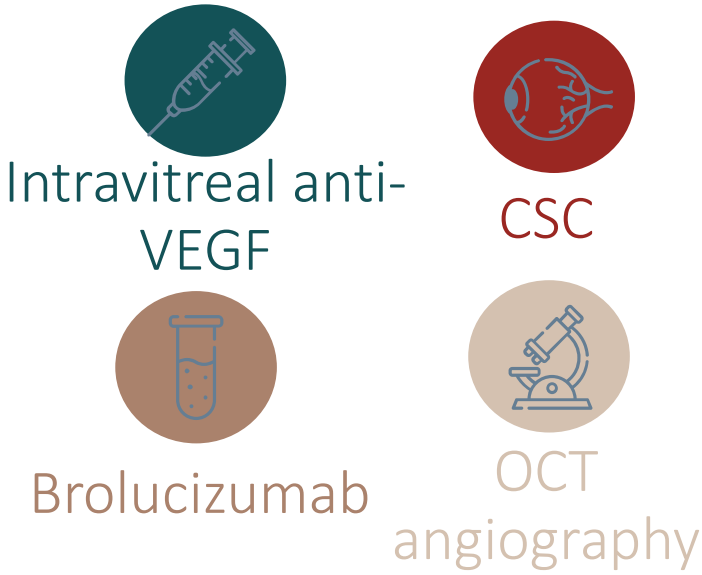
To investigate treatment response after intravitreal Brolucizumab injections for central serous chorioretinopathy (CSC) with secondary macular neovascularization (MNV) in patients not responders to other antivascular endothelial growth factor (anti-VEGF).

METHODOLOGIES:

Retrospective case series of patients attending five different tertiary referral centers. Eyes previously treated with photodynamic therapy and/or anti-VEGF and/or mineralocorticoid antagonist agents and eyes naïve for treatment were considered eligible for the study provided that previous treatments had been administrated ≥ 3 months prior to the date of the first Brolucizumab injection. Images were acquired using the SPECTRALIS® HRA+optical coherence tomography (OCT). Diagnosis of chronic CSC and MNV was obtained by fluorescein angiography (FA) and indocyanine green angiography (ICGA) and/or OCT and/or OCT angiography. Intravitreal injections of Brolucizumab were administered on an as-needed basis until complete resolution of subretinal fluid as determined using spectral domain OCT.

RESULTS AND IMPACT:

The study included 29 eyes. After the development of MNV, 25 eyes (86.2%) had been treated with anti-VEGF agents before receiving Brolucizumab.



The mean number of anti-VEGF injections per patient before switching to Brolucizumab was 10.3 ± 9.5 (range 3-33). The anti-VEGF injections had determined a partial reabsorption of sub/intraretinal fluid whereas 5 eyes had not showed any response to treatment. In no eyes a complete reabsorption of sub/intraretinal fluid had been documented after anti-VEGF therapy. After Brolucizumab injections, at the end of follow-up, 20 eyes (68.9%) presented with a complete reabsorption of both intra and subretinal fluid whereas subretinal fluid was still present in 7 eyes and both intra and subretinal fluid in 2 eyes. Mean number of Brolucizumab injections to obtain complete reabsorption of fluid was 2.8 ± 1.8. The reduction of sub/intraretinal fluid paralleled the mean visual acuity (VA) improvement. The preliminary results of this study show that Brolucizumab may induce fluid reabsorption in eyes with chronic CSC complicated by MNV poorly responsive to other anti-VEGF agents and show the safety and efficacy of this new anti-VEGF drug to treat this condition.

ACKNOWLEDGEMENTS

Thank to Prof. R. Dell'Omo for his support.

WHOLE BODY-ELECTROMYOSTIMULATION EFFECTS ON SERUM BIOMARKERS, PHYSICAL PERFORMANCES AND FATIGUE IN PARKINSON'S PATIENTS: A RANDOMIZED CONTROLLED TRIAL

Centorbi Marco [1], Di Cagno Alessandra [2], Buonsenso Andrea [1], Manni Luigi [3], Di Costanzo Alfonso 1, Casazza Giusy [1], Parisi Attilio [2], Guerra Germano [1], Calcagno Giuseppe [1], Iuliano Enzo [4], Soligo Marzia [3], Fiorilli Giovanni [1]

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Parkinson's disease

Physical activity

Muscle stimulation

GOALS:

Whole-body electromyostimulation (WB-EMS) was never previously applied to Parkinson's disease (PD) patients. This randomized controlled study aimed to find the most effective and safe WB-EMS training protocol for this population.

METHODOLOGIES:

Twenty-four subjects (age: 72.13 ± 6.20 years), were randomly assigned to three groups: a high-frequency WB-EMS strength training group (HFG) (rectangular stimulation at 85 Hz, 350 μs, 4 s stimulation/4 s rest), a low-frequency WB-EMS aerobic training group (LFG) (rectangular stimulation 7 Hz, 350 μs, with a continuous pulse duration), and an inactive control group (CG). Participants of the two experimental groups underwent 24 controlled WB-EMS training sessions, with a duration of 20 min each, during 12-week intervention. Serum growth factors (BDNF, FGF-21, NGF and proNGF), α-synuclein, physical performance and Parkinson's Disease Fatigue Scale (PFS-16) responses were analyzed to evaluate the pre-post variation and differences among groups.

RESULT AND IMPACT:

Significant interactions of Time∗Groups were detected for BDNF (Time∗Groups $p = 0.024$; Time∗CG, $b = -628$, $p = 0.008$), FGF-21 (Time∗Groups $p = 0.009$; Time∗LFG $b = 1{,}346$, $p = 0.005$), and α-synuclein (Time∗Groups $p = 0.019$; Time∗LFG $b = -1{,}572$, $p = 0.026$). Post hoc analyses and comparisons of 1S (post–pre), performed independently for each group, showed that LFG increased serum BDNF levels and decreased α-synuclein levels, while HFG showed the opposite effects. CG showed a significant BDNF reduction over time. Both LFG and HFG showed significant improvements in several physical performance outcomes and the LFG showed better results than HFG. Concerning PFS-16, significant differences over time and among groups (among all groups $p < 0.001$) were found, and the LFG exhibited better results than the, and CG with this last one that worsened over time.

LFG training was the best choice for improving or maintaining physical performance, fatigue perception and variation in serum biomarkers.

ACKNOWLEDGEMENTS

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NUMERICAL AND EXPERIMENTAL INVESTIGATION OF PATIENTS THERMAL COMFORT IN SURGERY DEPARTMENT OF AN ITALIAN HOSPITAL

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GOALS:

The purpose the research is the critical analysis by means of experimental and numerical approaches of the application of static standard for the control of thermo-hygrometric comfort inside surgery department of existing hospitals. The outcomes of developed case studies help to understand how management strategies of HVAC system can influence the healing of patients.

METHODOLOGIES:

The adopted approach consist of an experimental campaign and numerical simulations. Firstly, the indoor conditions were fully monitored in two rooms of the surgery department of the "Cardarelli" hospital in Campobasso from July to August 2022. Different standard was applied to evaluate the comfort conditions also by taking into consideration the answer of patient to a questionnaire. Subsequently, the numerical model was calibrated and simulated using the Energy Plus by means of the graphical interface, DesignBuilder. Several simulations was performed for evaluate how the passive control, and thus different technologies for the building envelope can influence the indoor conditions.

RESULTS AND IMPACT:

Internal air temperature, air speed, relative humidity, carbon dioxide and carbon monoxide concentrations were measured through the two monitoring stations installed. The monitored values suggests that in naturally ventilated room, without local cooling system, patient express not comfortable sensation.

The calculated Predicted Mean Vote (according to UNI EN ISO 7730) is length to ventilation rate, but it is always out of prescribed comfort zone. Also other comfort indices were calculated and the comparison of normalized values suggest that for the healthcare facilities the use of traditional approach may be not adequate. By comparing the opinion expressed by the patients with the measured values, it was found higher deviation between answer and static standard in the multiple room compared with the one for the single room. Briefly the degree/hours index is characterized by a deviation of 9% with respect to the occupant's judgment, therefore this better represents the comfort conditions in multiple-rooms.

Simulations indicated the high insulation of building envelope and adoption of finishing with high density can contribute to stabilize the indoor conditions and to improve the sensations also without an active system. Finally, even if ventilation loads induce the highest heating and cooling demands, however the envelope refurbishment is an effective retrofit action.

ACKNOWLEDGEMENTS

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COULD VENOUS IMPEDANCE INDEX BE MORE HELPFUL THAN ARTERIAL RESISTIVE INDEX IN THE EVALUATION OF RENAL OBSTRUCTION?

Preliminary results

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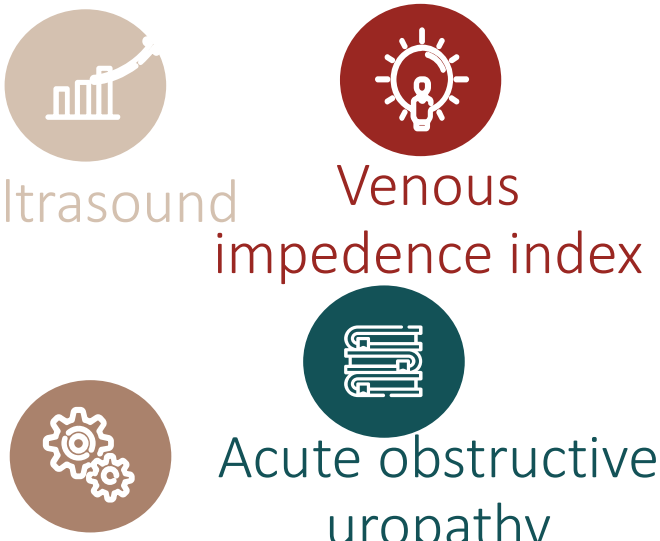

GOALS:

We aimed to determine the accuracy of interlobar renal venous pulsed-wave Doppler (PWD) ultrasound (US) impedance index (II) in patients with acute renal colic to diagnose acute obstructive uropathy compared to interlobar arterial PWD-US resistive index (RI) study as the standard method.

METHODOLOGIES:

From May 2022 to November 2022, we recruited 25 patients with acute renal colic from the emergency departments of the Antonio Cardarelli and Pausilipon Hospitals in Naples. The patients comprised 17 males and 8 females, with ages ranging from 14 to 87 years and a mean age of 46 years. All had a history of unilateral acute renal colic (<1 week) and US-positive evidence of calculus obstruction. Non-contrast low-dose computed tomography was performed for each patient as a reference diagnostic test. The exclusion criteria were bilateral acute obstructive uropathy, unilateral or bilateral chronic obstructive uropathy, congenital or systemic conditions affecting the kidney, acute or chronic infections, and solid kidney masses. 25 healthy patients with no history of obstructive uropathy were randomly selected as the control group. US B-mode imaging was first performed for a morphological evaluation of the kidneys (size, shape, echo texture), pelvicalyceal system and bladder. The obstructive urinary pathology was diagnosed by the presence of strong echogenic calculus with a distal acoustic shadowing or twinkling artefact on colour Doppler and dilated urinary tract above. A PWD-US study was performed, measuring the II and RI respectively in the interlobar veins and arteries of the affected side, compared with the values of the contralateral healthy kidney. The venous II and arterial RI were calculated from the peak systolic velocity (PSV) end diastolic velocity (EDV) using the formula: (PSV) - (EDV) / PSV.

RESULTS AND IMPACT:

The results are expressed as mean ± SD, with proportions as percentages. No significant differences existed between the right and left kidneys in the arterial and venous IIs of the control group ($p = 0.119$) or the age ($p = 0.0557$) or gender composition ($p = 0.282$) in either group. In the affected acute obstructive kidney, the RIs were increased (0.69±0.05) and the IIs decreased (0.27±0.03) compared to the undamaged side (RI 0.66±0.04 and II 0.58±0.09). The extent of the variation was more significant for the II ($p = 0.0001$) than the RI ($p = 0.42$) which had values at least partially overlapping the normal range and was therefore more subject to errors than interpretation. II may be clinically effective in cases of US diagnostic doubt for acute urinary obstruction since variation in venous flow is more pronounced.

ACKNOWLEDGEMENTS

Thanks to Maria Laura Schillirò [2] and Roberto Ronza [2] for data curation.

A COMPUTATIONAL PATHOLOGY APPROACH AS A COMPUTER-AIDED DIAGNOSTIC TOOL IN PRIMARY COLON CANCER DIAGNOSIS

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GOALS:

Colon cancer currently has a high incidence rate. Early detection, through histological analysis, is essential for the identification of cancer and the subsequent formulation of an accurate diagnosis. Tumor risk stratification currently depends on pathological staging and assessment of biomolecular markers through dedicated molecular biology techniques.

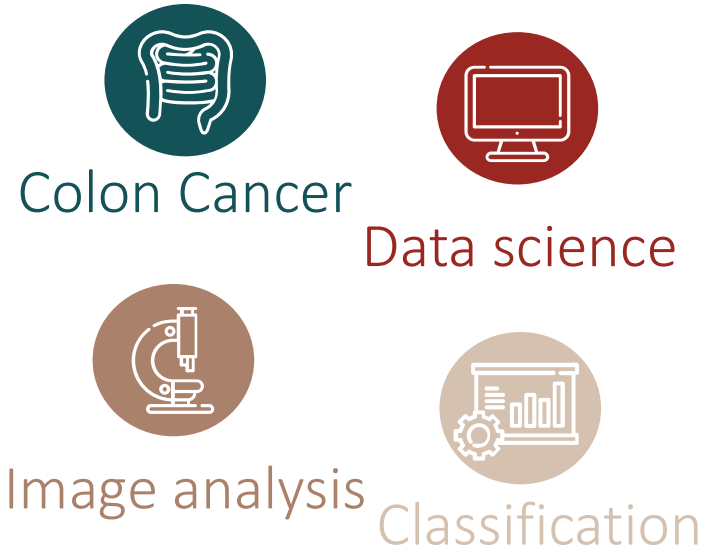
Hematoxylin/Eosin staining is the gold standard in the histopathological evaluation of cancer morphology, but its informative potential is limited to the qualitative assessment of tumor features as pathologists can visually determine at the microscope. The onset of digital pathology paved the way for computational approaches to histopathological image analysis of tumor tissues, providing pathologists with new tools to be used as CADs (computer-aided diagnostic).

We aimed to build a classification model that would allow us to predict the outcome of colon cancer, based on morphometric features extracted from colon cancer WSI (whole slide images).

METHODOLOGIES:

We took advantage of the TCGA colon cancer dataset and build the case series retrieving all the clinicopathologic data along with WSI. Then we sorted out a subset of metastatic cases, comparing them with a series of non-metastatic tumors.

We generated a QuPath project and used the cell detection function to detect cell nuclei as a single object. The algorithm also allows us to assign several morphological and colorimetric features to each detected object.



All the dataset collected was used to perform a random forest analysis to build a classifier and to sort out the importance of each variable analyzed.

RESULTS AND IMPACT:

The results of our analysis will be presented.

This approach allows us to build a model with "handmade" feature sets, we believe that this strategy is more suitable for this kind of task since we don't reach the critical mass of images needed for a classification model based on a Deep Learning approach. Nevertheless, following this strategy we are able to accurately discriminate between features choosing the ones that, in our opinion, give the best results making the model more explainable.

CROSS-CULTURAL ADAPTATION AND PSYCHOMETRIC PROPERTIES OF THE ITALIAN VERSION OF THE PATIENT SPECIFIC FUNCTIONAL SCALE (PSFS) IN PATIENTS WITH PAINFUL SHOULDER.

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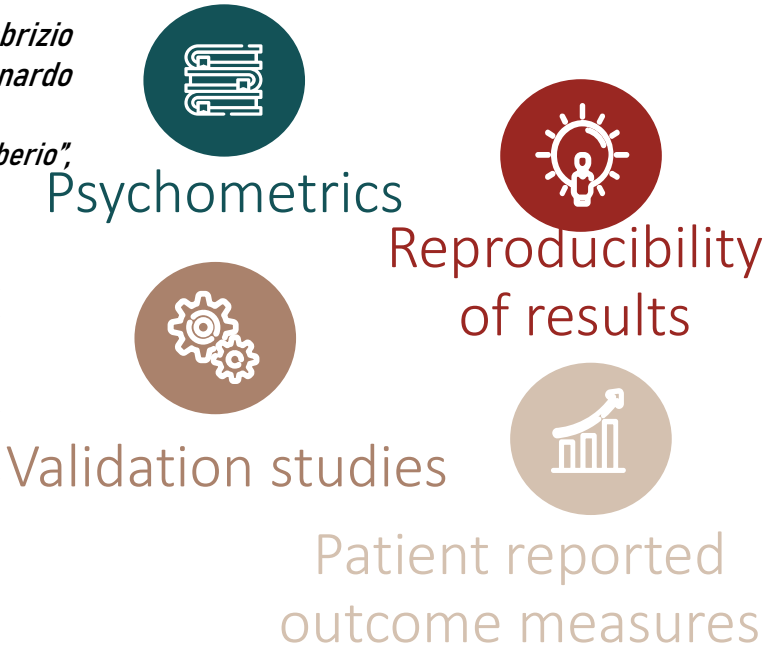
INTRODUCTION

Painful shoulder causes functional limitations in patients' activities of daily living and consequently impacts their quality of life. In recent years, several metrics have been developed to assess function in patients with shoulder disorders. Among these, the Patient Specific Functional Scale (PSFS) [1] is very widespread. In the PSFS, patients are asked to list 5 activities in which they complain of difficulty or are unable to perform due to their condition, and to rate their current ability level associated with each activity on an 11-point scale. An Italian version of the PSFS is not currently available. The aim of this study is to translate and transculturally adapt the PSFS into Italian and to study its psychometric properties in patients with painful shoulder.

METHODS

PSFS was translated and cross-culturally adapted according to international guidelines [2] and subsequently administered to 93 patients with painful shoulder (Table 1) together with the Disability of the Arm, Shoulder and Hand (DASH), Numerical Pain Rating Scale (NPRS) and Health Survey Short-Form 36 (SF-36). Structural validity (Confirmatory Factor Analysis [CFA]), internal consistency (Cronbach's alpha [α]), test-retest reliability (Intraclass Correlation Coefficient [ICC2,1]), measurement error (Standard Error of the Measurement [SEM] and Minimal Detectable Change [MDC]) and construct validity (hypotheses testing [Spearman coefficient, rs] with DASH, SF-36 and NPRS [Table 2]), were studied according to COSMIN guidelines [3].



RESULTS

The translation and the intercultural adaptation were carried out without significant criticalities to be reported (Figure 1). The CFA revealed a one-dimensional structure of the scale (Comparative Fit Index=0.997, Tucker Lewis Index=0.998, Root Mean Squared Error of Approximation=0.070, Standardized Root Mean Squared Residual=0.027). Internal consistency was excellent (α=0.925), test-retest reliability good (ICC2,1=0.866 95% CI:0.749-0.931), measurement error low (SEM=0.7 points and MDC=1.9 points) and satisfactory construct validity (Table 2).

CONCLUSIONS

PSFS has been successfully translated and cross-culturally adapted into Italian and has been shown to be valid and reliable in patients with painful shoulder. PSFS can be used for individual measurement in clinical practice and research.

ACKNOWLEDGEMENTS

Sincerely thanks to Prof. Germano Guerra

IN SILICO EVALUATION OF PHYTOCHEMICALS AS POTENTIAL SIRT1 INTERACTORS AGAINST AGING

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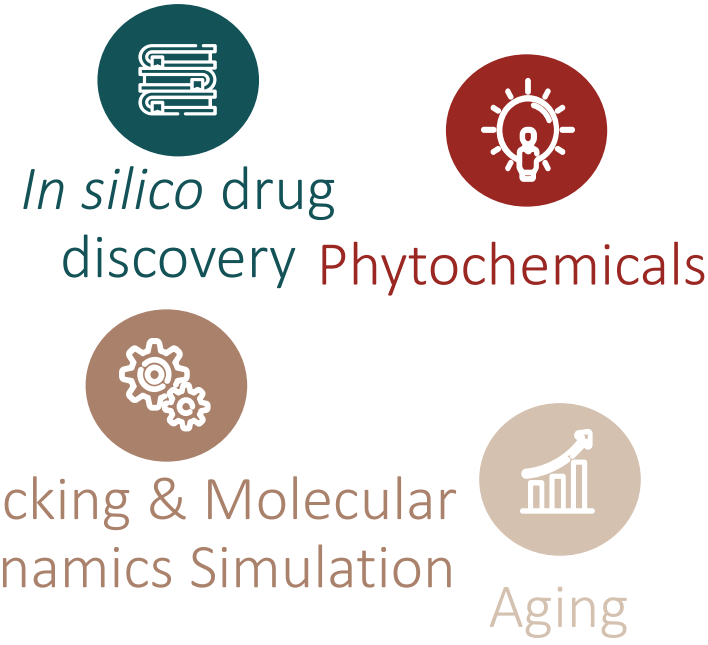

ABSTRACT:

Sirtuin 1 (SIRT1) belongs to the histone deacetylase enzyme family and its activity regulates various signaling networks associated with aging. SIRT1 is widely involved in a large number of biological processes, including senescence, autophagy, inflammation, and oxidative stress. In addition, SIRT1 activation may improve lifespan and health in numerous experimental models. Therefore, SIRT1 targeting is a potential strategy to delay or reverse aging and age-related diseases. Although SIRT1 is activated by a wide array of small molecules, only a limited number of phytochemicals that directly interact with SIRT1 have been identified. Using the Geroprotectors.org database and a literature search, this study aimed to identify geroprotective phytochemicals that might interact with SIRT1. We performed molecular docking, density functional theory studies, molecular dynamic simulations (MDS), and absorption, distribution, metabolism, excretion, and toxicity (ADMET) prediction to screen potential candidates against SIRT1. After the initial screening of 70 phytochemicals, crocin, celastrol, hesperidin, taxifolin, vitexin, and quercetin had the lowest binding affinity scores. These six compounds established multiple hydrogen-bonding and hydrophobic interactions with SIRT1 and showed good drug-likeness and ADMET properties. In particular, crocin was further analyzed using MDS to study its complex with SIRT1 during simulation. Crocin has a high reactivity to SIRT1 and can form a stable complex with it, showing a good ability to fit into the binding pocket. Although further investigations are required, our results suggest that these geroprotective phytochemicals, especially crocin, are novel interacting partners of SIRT1.

ACKNOWLEDGEMENTS
Sincerely thanks to Prof. Gennaro Guerra

EVALUATION OF ORAL CITICOLINE THERAPY IN PATIENTS WITH PRIMARY OPEN ANGLE GLAUCOMA

Morphological and Functional Evaluation

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GOALS:

To study the long-term effects of oral citicoline therapy in combination with vitamins A, B, C, E and black currant (BC) on the retinal nerve fiber layer (RNFL),ganglion cell-inner plexiform layer (GCIPL), macular (MVD) and peripapillary (MVD) vessel density in patients with primary open angle glaucoma (POAG),

METHODOLOGIES:

60 eyes of 30 patients with a diagnosis of POAG were followed up in the Eye Clinic Federico II University between January 2022 and December 2022. Group A received oral dietary supplement (Citizin bustine, Bruschettini), whereas the group B did not receive any oral treatment. Clinical ophthalmologic examination was performed at the beginning of the study, and then at 1,6 and 12 months. The measurement of GCIPL thickness, RNFL, MVD and PVD was calculated by OCT and OCT-A examination.

RESULTS AND IMPACT:

Mean RNFL and GCC thickness in group A were significantly ($p < 0.001$) higher (70.39 and 71.19 µm, respectively) than in group B (64.91 and 65.60 µm, respectively) after 12 months of follow up. Mean PVD and MVD in group A (40,2□4,1 and 39,7□6,1, respectively) was significantly higher($p< 0.001$)than those in group B (36,25□4,6 and (34,5□4,8)) at 12 months of follow up.

Neuro-protection

Citicoline

Glaucoma

OCT

Citicoline, a precursor for neurotransmitter acetylcholine mediates neurodegenerative events through reducing glutamate excitotoxicity, oxidative stress, elevating neurotrophin level, ameliorating axonal transport deficits. Berries are known to be a fine source of polyphenols, especially anthocyanins (ACs), micronutrients and induced upregulation of endothelial NO synthase, decreased oxidative stress, and inhibition of inflammatory gene expression. These findings suggest that CT therapy in combination with vitamins A, B, C, E and black currant (BC) seems to be effective in slowing POAG progression and playing a neuroprotective role. We suppose that early glaucoma treatment might show better and more long-lasting effects than treatment to more severe glaucoma, though practically most cases of glaucoma have already experienced severe RGC damage by the time they are diagnosed. In this regard, pilot studies aiming at detecting glaucoma early via advanced imaging and quality-of-life assessments may be helpful. Further studies on a larger population and with a longer follow-up are needed to confirm this pilot investigation.

USE OF PROBIOTICS IN PATIENTS AFFECTED BY CHRONIC-RECURRENT UVEITIS

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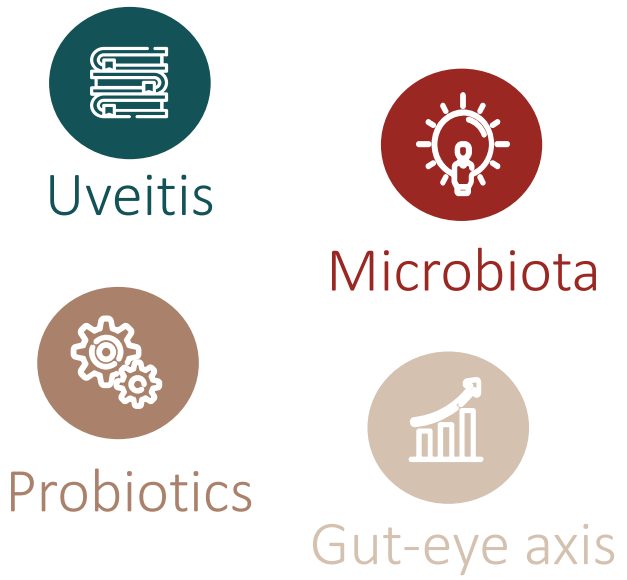

GOALS:

- Demonstrate that adjuvant therapy with probiotics, reducing the systemic low grade inflammation and modulating the immune response, is able to reduce the number of relapses during a one-year follow-up in patients affected by chronic-recurrent uveitis.
- Set up new therapeutic scheme in treatment of uveitis.
- Introduce probiotics as pharmacological choice.

METHODOLOGIES:

A single-blind prospective comparative pilot study was conducted (investigators were blinded to treatment) of 24 patients (9 males and 15 females; age range 10 to 45 years; mean age was 29.6 years) randomized (https://www.random.org/lists/) divided into two groups. Group A treated with a combined therapy of topical steroids (standard treatment) and probiotic supplementation. Group B treated with a combined therapy of topical steroids (standard treatment) and placebo integration. In both groups we decided to continue the steroid treatment only during the acute phases of the uveitis.

RESULTS AND IMPACT:

In both groups, steroid treatment reduced the signs of inflammation during the exacerbation phases, with no statistically significant differences in response to treatment based on age.

We found a statistically significant difference between the two groups ($p<0.05$) in the number of recurrences and in the intensity of the inflammatory symptoms associated with them. Notably, the number of signs of uveitis activity was statistically lower in the group treated with probiotic supplementation than in the group treated with placebo supplementation.

Alterations in the balance of the gut microbiome have been associated with immune-mediated inflammatory diseases, both enteric and extra-enteric. The rationale behind probiotic integration carried out in our work lies in the fact that the content of the prepared mixture is capable of beneficially influencing the host. This would stimulate the growth of some species of intestinal bacteria, modulating the intestinal microbiome and immune status and conferring a health benefit when administered at the right doses and for an adequate period of time. Furthermore, probiotic supplementation was found to be safe and effective and therefore not related to the occurrence of adverse effects.

ACKNOWLEDGEMENTS

Acknowledgments are due to the Eye Clinic of Department of Medicine and Health Sciences "V. Tiberio", University of Molise, Campobasso.

WEARABLE DEVICE REMOTE MONITORING TO PREVENT FRAILTY PROGRESSION IN ELDERLY: A PILOT STUDY

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GOALS:

- to standardize a study protocol to develop a useful model to enhance local care in small population isolates, by remotely monitoring the health status of pre-frail subjects;
- to improve the progression of the frailty condition, in order to support a healthy ageing.

METHODOLOGIES:

Frailty is a frequent condition in elderly, leading to an increased risk for disability, hospitalization and death. It is a multidimensional dysfunctional condition, including decreases in physiologic capacity, mechanical performance and energy metabolism.

Subjects aged ≥ 65 years, resident in Salcito, a village in Molise region, Italy, are invited to participate in order to evaluate their frail condition. During the pre-screening phase, the AGILE questionnaire is used to select pre-frail participants. The AGILE score was created starting from the 10 more predictive items of the Italian Frailty Index and stratified in "light" (0-3, pre-frail), "moderate" (4-7, frail) and "severe" (8-10).

The study protocol requires a random selection of 30 pre-frail elderlies to be equipped with the wearable device able to daily and remotely collect body temperature, blood pressure, heart and respiratory rate.

The 30 pre-frail elderlies will be trained to the use of the wearable devices and in addition, information on dietary and lifestyle habits, cognitive impairment and clinical history, as well as venous blood sample to study potential biomarkers of frail condition, will be collected.

After a follow-up of 6 months, participants will be re-examined to evaluate if remote monitoring prevents the frailty progression.

RESULTS AND IMPACT:

During the preliminary pre-screening phase (Oct-Dec 2022), 49 subjects (51% men, mean age: 77.4 ±7.3 years) were visited showing a mean AGILE score of 5.5 ±1.7.

In particular, the prevalence of "light", "moderate" and "severe" frail subjects were 12.3%, 73.5% and 14.2%, respectively.

The screening is ongoing and the selection of the pre-frail subjects should be finalized in the coming months, to start the monitoring phase with the wearable device.

Focusing on the great impact of frail condition in global population, the development of intervention programs to prevent frailty progression is essential to improve the quality of life.

In this context, this study looks at the standardization of a protocol to develop a useful model in order to support a healthy ageing for future investigation including a larger number of subjects.

EVALUATING LUNG PERFUSION SPECT/CT IMAGING IN PATIENTS WITH COVID-19 THROUGH RADIOMICS AND FORMAL METHODS

G. Varriano[1], D. D'Arienzo[2], A. Santone[1], F. Mercaldo[1], T. Valente[3], A. Annunziata[4], G. Fiorentino[4], L. Brunese[1], M. L. De Rimini[1]

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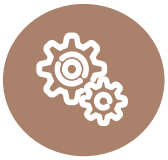
Covid-19

Formal Methods



Data science

Radiomics

GOALS: The inflammatory cascade in pts with COVID-19 may lead to PE, worsening prognosis. Lung perfusion SPECT/CT (Q-scan) in symptomatic pts discharged after COVID-19 can confirm or rule out pulmonary vascular involvement, helping the differential diagnosis with other respiratory diseases. We aim to investigate an innovative methodology based on Radiomics and Formal Methods, as a virtual second look able to detect perfusion abnormalities to better define appropriate patient-centered diagnostic and therapeutic strategies.

METHODOLOGIES: A total of 23 pts with a recent history of COVID-19, without any previous pulmonary disease (e.g. lung cancer or pathological findings at CT such as lung bullae) were enrolled for Q-scan for persistent dyspnea 1 month after discharge. They were classified as negative (14 pts) and positive (9 pts) for lung perfusion abnormalities by visual and semiquantitative analysis. Q-Lung software by GE Healthcare was used to obtain percent evaluation of pulmonary lobar perfusion (cts/volume % for each lobe), assuming as a normal value any defect lower than 10% for each lobe. We analyzed these data using the innovative Formal Methods techniques centered on mathematical logical reasoning, to build a rigorous representation of a system merging patients clinical conditions and disease-specific characteristics, to confirm or exclude the disease.

RESULTS AND IMPACT: In a comparative analysis with Q-Scan results, the model showed concordant features in 13/23 pts, identifying perfusion defects in 8/9 pts with a positive Q-Scan exam and excluding perfusion defects in 5/14 pts with a negative Q-Scan. Discordant results were observed in the remaining 10/23 pts, in particular in negative pts: in this sub-group, the Q-Lung semiquantitative analysis revealed perfusion defects <10% per lobe, which we considered unsignificant but may deserve further evaluation. Although our data are still preliminary and based on a limited population, this formal methodology showed promising concordance with Q-scan results and needs to be implemented with further analyses including co-registered CT data.
When compared to AI techniques, this mathematical reasoning may enable: *(i)* to use reduced dataset of patients and/or images, without having impact on the robustness of the model; *(ii)* to produce intuitive models easy to understand; *(iii)* to be used by medical specialists in a clinical setting as a rigorous and formal tool.

Notes
PTS: patients; PE: pulmonary embolism; AI: artificial intelligence.

UNIVERSITÀ DEGLI STUDI DEL MOLISE

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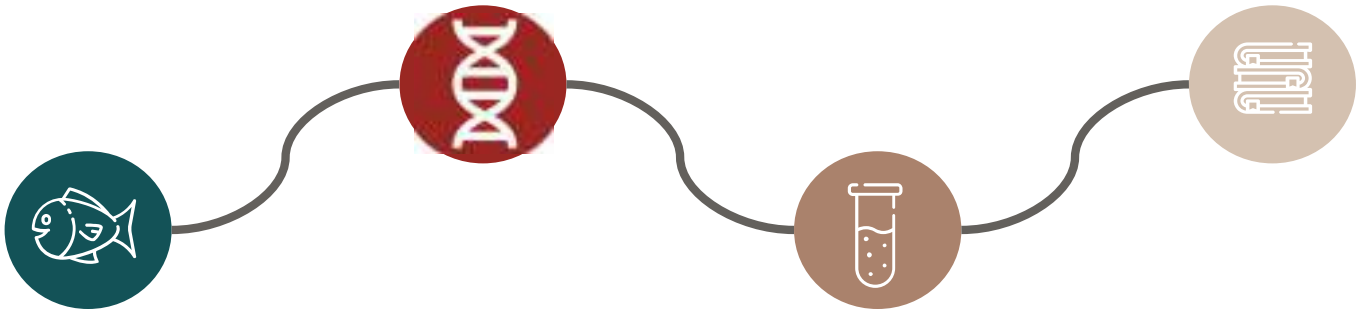


Tecnologie e Biotecnologie Agrarie

DIPARTIMENTO AGRICOLTURA AMBIENTE E ALIMENTI

Coordinatore:

prof. Giuseppe Maiorano

GEOGRAPHICAL AND SEASONAL ANALYSIS OF THE HONEYBEE GUT MICROBIOTA

Gianluca Albanese, Massimo Iorizzo and Antonio De Cristofaro

Department of Agricultural, Environmental and Food Sciences (DiAAA), University of Molise, Via De Sanctis snc, 86100 Campobasso, Italy

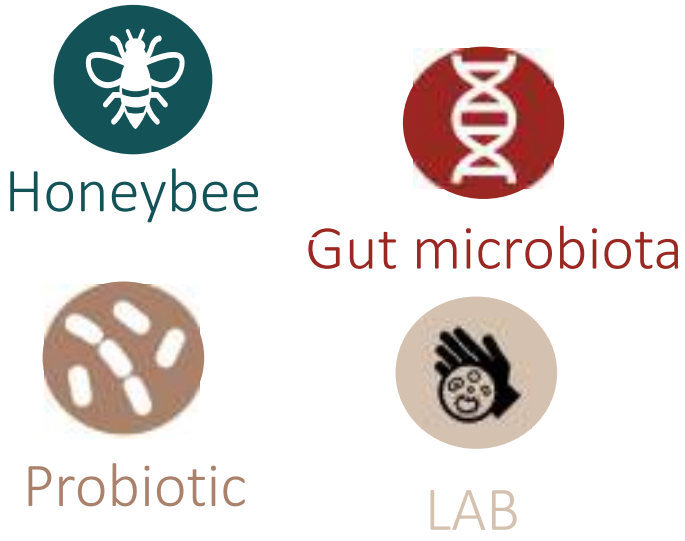
GOALS:

- Gaining more knowledge on the variability of the honeybee gut microbiota as a function of geography and seasonality;
- Monitoring of microbial communities by dependent and independent culture methods (Next Generation Sequencing -NGS)
- Isolation and characterization of probiotic lactic acid bacteria (LAB) strains for honeybees

METHODOLOGIES:

With regard to the study of the microbiota, bee sampling was carried out during the winter and summer of the years 2021 and 2022 in two apiaries located in Castelpoto (Benevento province, Campania, Italy; 41° 8' 42"S, 14° 42' 14"E, altitude 280 m a.s.l.) and in Montenero di Bisaccia (Campobasso province, Molise, Italy; 41° 59' 40"S, 14° 47' 09"E, altitude 109 m a.s.l.). Six hives were considered for each apiary. The sampling phase began in May and continued until the end of September and samples were taken 15 days apart. Samples were then stored at -80°C while awaiting further processing.

For the isolation of lactic acid bacterial symbionts in honeybees, worker bees were sampled, housed in queen bee cages, and immediately transported to the laboratory. Complete digestive system of the worker bee was dissected and processed for bacterial isolation. Gram-positive and catalase-negative strains, presumed LAB, were chosen for subsequent characterization steps.



RESULTS AND IMPACT:

In this first phase of the research activity conducted, 325 presumptive LAB strains were isolated; these will be subjected in the continuation of scientific activities to phenotypic, physiological and biochemical characterization. Taxonomic classification of the isolates will be carried out by 16S rRNA gene sequence analysis.

Furthermore, through these research activities, it is intended to deepen the knowledge about the composition of the microbiota as a function of apiary location and seasonality.

AMT-MEDIATED INSERTIONAL MUTAGENESIS IN *PAPILIOTREMA TERRESTRIS* PT22AV FOR ACCESSING THE ROLE OF EPS PRODUCTION IN BIOCONTROL ACTIVITY.

Exopolysaccharides role in biocontrol activity

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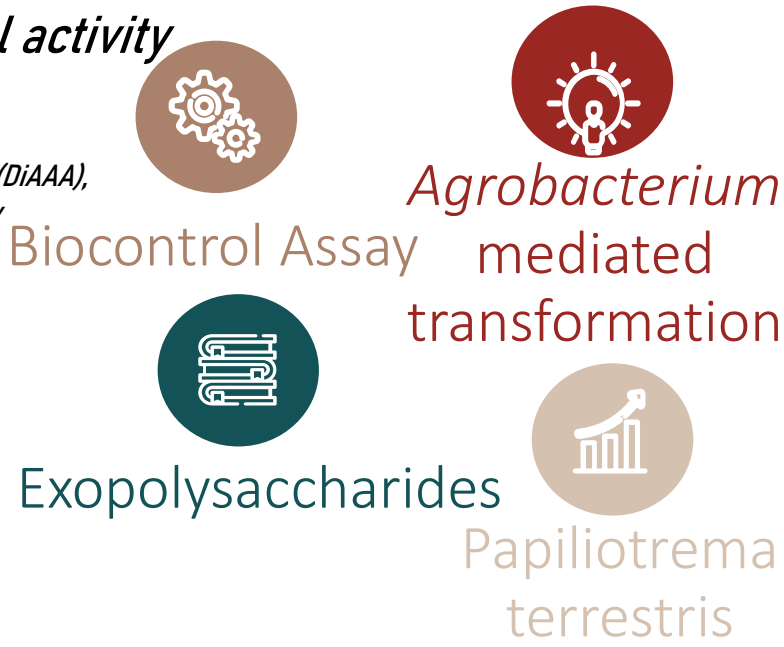

GOALS:

Assessing phenotypic characterization of *Papiliotrema terrestris* transformants with impaired ability to form EPS for:

1) Their ability to grow in different nutritional conditions.
2) Their biocontrol activity against *P. expansum.*

METHODOLOGIES:

In a forward genetic screen on *P. terrestris* several transformants with different ability to produce EPS compared to the WT were isolated.

The growth of the transformants was determined by optical density in Liquid Minimal medium with 30 different nutritional sources. Four technical replicates were used for each experiment, and each experiment was repeated three times. Data were analyzed by Single linkage clustering and Euclidean distance measurement method.

Selected transformants were also tested for biocontrol activity against *P. expansum* using apples as a pathogen susceptible host. Apple wounds were treated with 30 µL of yeast cell suspension at $5x10^6$ and $1x10^7$ CFU/ml, and 15 µL of a of $2x10^4$ conidia/ml of *P. expansum*. Apples were incubated at 25°C and monitored for up to 12 days. For each transformant, the means of the infected wounds were calculated on 4 replicates (apples) with 4 wounds per apple (16 wounds per transformant). Data were submitted to one-way ANOVA and means were compared by Tukey's multiple-comparison test.

RESULTS AND IMPACT:

Seventeen transformants were selected based on their impaired ability to produce EPS under different nitrogen sources. In cell growth experiments, transformants clustered into four groups based on their growth in the tested conditions. Transformants #1, #4, #12, and #14 showed the lowest growth, and #13, #8, #10, and #WT showed the highest growth.

All the selected transformants displayed different biocontrol abilities respect to *P. expansum* WT, with #4, #12, #13, #14, and #16 being the most impaired. Although the experiments are in progress, our results are suggesting a putative role of biofilm in the biocontrol activity of PT22AV. Future experiments aim to identify the mutated gene(s) in the selected transformants and to carry out their functional and phenotypic complementation.

ACKNOWLEDGEMENTS

I want to thank the Plant Pathology laboratory team, including Professors and Collogues, and our Ph.D. coordinator for supporting us during the research activities.

THE ROLE OF OVARIAN FLUID ON FROZEN SPERM MOTILITY PARAMETERS OF MEDITERRANEAN BROWN TROUT IN THE ARTIFICIAL FERTILIZATION PRACTICES

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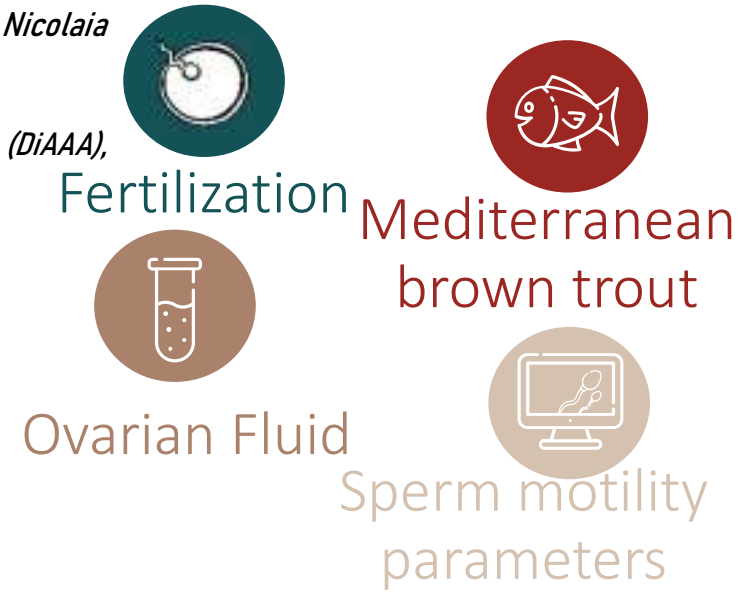

GOALS:

- To assess the potential effect of Ovarian Fluid (OF) on sperm motility parameters of cryopreserved Mediterranean trout semen by comparing it with fertilization solution (FS D-532) and their combination (50% OF+ 50% FS).
- To identify the best activation medium, to maximize reproductive success.
- To recreate a reproduction environment that is as close as possible to the natural one.

METHODOLOGIES:

The trial was conducted using eight native breeders. (n= 7 native males and 1 = female). The semen samples were frozen using the protocol reported by *Rusco et al. (2020)*, whilst the OF was obtained from eggs of one female that was stripped by gentle abdominal massage. The frozen semen was thawed at 40°C for 5 s and some aliquots were diluted (ratio of 1:30) to be activated respectively with 1) OF 100%; 2) OF 50%+ 50% FS; 3) FS 100%. Sperm motility parameters were measured by computer-assisted sperm analysis (CASA). Within each treatment, the data obtained were subjected to analysis of variance (ONE-WAY-ANOVA) and differences among treatments were compared utilizing the Scheffe's test. Significance was set at $p < 0.05$.

RESULTS AND IMPACT:

The results showed a significant increase of total motility and duration of movement (longevity) using 100% OF and 50% OF + 50% FS in respect to FS alone.

On the contrary, higher values ($p<0.05$) of the linear movement of sperm (straight-line velocity [VSL], straightness [STR] and linearity [LIN]) were obtained with FS.

Furthermore, a significant increase of the amplitude of lateral head displacement (ALH) was recorded when the semen was activated in OF 50% + 50% FS compared to FS alone.

In conclusion, our *in vitro* results showed that most suitable reproductive microenvironment for Mediterranean trout was the solution consisting of 50% OF and 50% FS. This solution could maximize the success of egg fertilization during artificial reproduction practices and confirms the beneficial effect of both solutions as reported in the literature (*Dietrich et al., 2005, 2008*).

In addition, this solution could maximize the success of egg fertilization during *in vivo* practices.

However, further studies are needed to evaluate a dilution rate lower than 50% in order to recreate the natural reproduction environment as much as possible and overall to validate the fertilizing ability *in vivo*.

ACKNOWLEDGEMENTS

This study was financed by the LIFE project Nat. Sal. Mo. (LIFE17 NAT/IT/000547)

ANALYSIS AND INTERPRETATION OF NGS DATA THROUGH THE USE OF TOOLS FOR THE INTEGRATED MANAGEMENT OF "OMICS" DATA

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Bioinformatics

DNA

Sheep cheese

Grape

GOALS:

Two commonly used pipelines (QIIME2 and DADA2 running on the Linux operating system) were compared to evaluate the impact of the bioinformatics pipeline on the taxonomic classification of the microbiota of 4 samples of sheep's milk and 16 samples of sheep's cheese collected from 3 farms located in the provinces of Caserta, Salerno and Avellino and 6 samples of grapes (3 of cv. Aglianico and 3 of cv. Cabernet Sauvignon) collected from 3 farms located in different areas of the provinces of Catania, Benevento and Campobasso.

METHODOLOGIES:

The workflow for NGS data analysis included quality control, data pre-processing, classification of reads. Quality control of the reads was performed using FastQC v.0.11.9; adapter trimming was performed with Trimmomatic v.0.40; removal of contaminating reads was performed with FastQScreen v.0.15.2. Read classification was performed using the DADA2 v1.16 and QIIME2 v.2020.8 pipelines.

RESULTS AND IMPACT:

Bioinformatic analysis of sequencing data is a challenging task because it involves many different complex operations. However, there are several fully automated and free pipelines for metagenomics that cover all the steps of the analysis. The analysis of mixed microbial communities based on shotgun metagenomic sequencing requires multiple preprocessing and analytical steps to interpret the microbial composition of the samples. Microbial identification could be affected by several factors, including the choice of bioinformatics software.

Data preprocessing included, in addition to quality control of raw data sequences, trimming of adapters and removal of contaminating reads. Sequencing with the Illumina MiSeq platform generated over 1.5 million and 450000 raw sequences from sheep's milk and pecorino and grapes, respectively. 3.6% and 12.5% sequences, respectively, were filtered according to the quality control parameters. In both cases, a low percentage (<0.7%) showed similarity with the sheep and grapevine reference sequences, demonstrating the very low level of animal and plant DNA. The results of metagenomic classification obtained from the use of the two pipelines were almost similar. In particular, QIIME2 allowed the identification of many more genera of bacteria and yeasts compared with DADA2, although with very low and sometimes negligible identification rates.

THE SPUN PASTE CHEESE VALUE CHAIN IN ALTO MOLISE

First outcomes from a Participatory Action Research

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GOALS:

- Understand and generate an overview of the current role of the Spun Paste Cheese Value Chain (SPC-VC) in the territorial regeneration processes of Alto Molise.
- Assessment of the extent of SPC-VC tele-coupling and assemblage.

METHODOLOGIES:

The research carried out took place in Alto Molise, in a small pilot area called MRL (Mountain Reference Landscape), which involves five municipalities (Agnone, Capracotta, Carovilli, Pescolanciano, Vastogirardi). The methodology used in the current research refers to MOVING project (oriented to improve mountain value chains in order to build more resilient mountain territories). The research has so far consisted of three distinct phases:

- analysis of the vulnerability to climate change of the MRL (Beniston, 2003; Ingty, 2017), considering the land use system (agro-silvo-pastoral and its key resource permanent grassland and meadows);
- definition of the structure and extent of the SPC-VC through desk analysis together with in depth interviews. The results were validated and discussed with local actors and external experts in two participatory workshops;
- SPC-VC vulnerability analysis (Cardona et al., 2012), through expert assessment and participatory workshops.

RESULTS AND IMPACT:

The MRL is characterised by a strong tendency towards depopulation, lower average incomes than in the region and very low population density. The final product of the value chain has been identified as spun paste cheese. At the production stage, pasture meadows are the main and strongly characterizing element. The cheesemakers rely mostly on raw milk from local breeders. The marketing strategy connects the dairy productions with the traditions and local natural resources of Alto Molise. The VC generates profits for companies and leads to investments, as well as incomes for families, which allow a part of the population to remain in the area (despite the depopulation trend), as well as a revival of cultural tradition and heritage and, from an ecological point of view, it contributes to the maintenance of the landscape and biodiversity. The findings indicate that the assemblage with tourism and meat production, in sustainable ways, can generate awareness and income diversification; however, investments in infrastructure are needed.

In next steps, VC vulnerability and sustainability will be assessed, in order to build strategies to improve the resilience and sustainability of the VC assemblage. In addition, a foresight exercise is being conducted (with reference to the VC assemblage), which will be the starting point for policy design for the mountains.

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ACKNOWLEDGEMENTS

Thanks to MOVING project

ANIMAL WELFARE

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Animal welfare is a multifaceted issue that can be approached from different viewpoints, depending on human interests, ethical assumptions, and culture. The intent of this abstract is to analyze the regulatory and ethical aspects of 'Animal Welfare', in view of the fact that food safety is directly related to animal welfare, given the close links between animal welfare, animal health and food-borne diseases. Animal welfare depends on how animals are managed by humans, as the overall objective is to ensure that animals are not subjected to avoidable suffering or hardship.

With the Treaty of Amsterdam, animals are, for the first time, defined as 'sentient creatures' and are no longer considered merely as foodstuffs. US agronomists began studying the effects of animal welfare with the CAST Report, which stated that the necessary conditions for animal welfare were the productivity of the animal. A productive animal was an animal that enjoyed high welfare, while an unproductive animal, on the contrary, was an animal that enjoyed low welfare.

According to the 'Farm Animal Welfare Council', animal welfare is instead the same as receiving water, food and shelter, as expressed in the following five freedoms: 1. freedom from hunger and thirst; 2. freedom from discomfort; 3. freedom from pain, injury and illness; 4. freedom to express one's behavioural repertoire; 5. freedom from fear and distress (Five Freedoms Concept). Animal welfare has also become an integral part of the European Union's Farm to Fork strategy, which aims to make farming practices more sustainable through an integrated food policy involving the entire production chain. The Farm to Fork strategy emphasized the importance of sustainable, healthy and animal-friendly diets in order to achieve the objectives of the European Green Deal.

Attention to welfare reduces the incidence of disease and improves production and reproductive performance; it prolongs the longevity, and profitability when estimated through margins calculated over the replacement costs.

Recently, it has been proposed a modified and extended version of an earlier animal welfare concept, the Dynamic Animal Welfare Concept. It is based on the adaptability of the animal, and taking the importance of positive emotional states and the dynamic nature of animal welfare into account, an individual animal is likely in a positive welfare state when it is mentally and physically capable and possesses the ability and opportunity to react adequately to sporadic or lasting appetitive and adverse internal and external stimuli, events, and conditions.

In conclusion, Animal welfare is a complex issue that can be approached from different viewpoints. The goal to safeguard and improve animal welfare calls for unifying concepts that are theoretically sound, objectifiable and quantifiable. To properly assess, safeguard and promote animal welfare, concepts are needed to serve as guidelines in any context the animal is kept in.

PRELIMINARY RESULTS ON THE DEVELOPMENT OF A MEDIUM DENSITY SNP CHIP FOR *CAMELUS DROMEDARIUS* IN THE CONTEXT OF THE 2019 ILLUMINA® AGRICULTURAL GREATER GOOD INITIATIVE.

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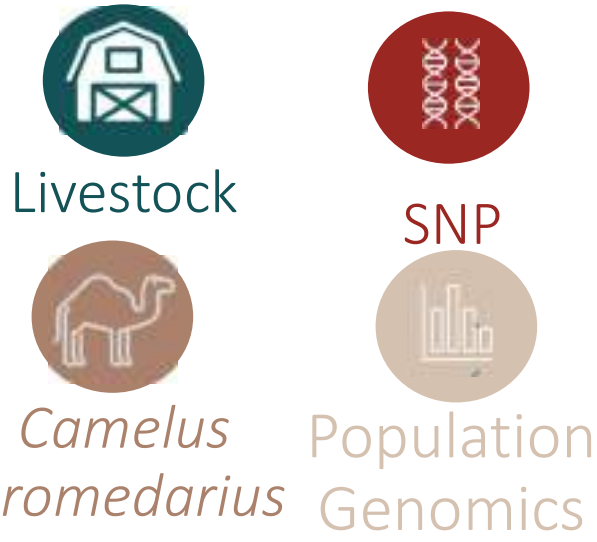

GOALS:

- Dromedary camels are one of the livestock species that is attracting increasing interest.
- This research is a part of the Illumina® Agricultural Greater Good 2019 initiative, whose primary application goal is the development of a medium density SNP chip for dromedary camels.
- Based on this, the goal of this study is to increase our understanding of dromedary camels' diversity at the whole genome level and to investigate the species' global population structure.

METHODOLOGIES:

358 *Camelus dromedarius* samples from 22 countries, representative of the whole geographic distribution area of the species, were Whole Genome Sequenced (WGS) through Illumina® NovaSeq sequencing platform. A total of 354 samples and 505,662 SNPs passed the quality control performed using the PLINK software. To explore the genetic differentiation and population structure of the entire dataset, Multidimensional Scaling (MDS) plot and Admixture analysis were performed. Finally, the genetic Reynolds' distance was used to estimate the phylogenetic relationships among populations.

RESULTS AND IMPACT:

The MDS plot highlights a weak genetic structure in accordance with the geographic origin of the samples, emphasizing the separation of sub-Saharan populations from the rest.
The ADMIXTURE outcomes revealed an optimum k repartition at 4 clusters. In fact, four geographic groups can be distinguished: i) Horn of Africa (i.e., Ethiopia and Kenya); ii) North Africa (i.e., Mauritania, Morocco, Algeria, Tunisia, and Libya); iii) Middle East (Pakistan, Iran); iv) Arabian Peninsula (i.e., Yemen, UAE, and Qatar). Moreover, Yemen can also be thought of as a potential center for the domestication and spread of dromedary camels throughout the world. The above results largely parallel the dendrogram constructed using Reynolds' distances, which attests to a significant similarity with the historical networks of various recognized caravan routes (the trans-Saharan route and the Silk Road). This research will be applied to the development and commercialization of the SNP panel to promote genome-wide association studies and genomic selection of this attractive species.

USE OF 11 ESSENTIAL OILS FOR EAG TEST ON *APIS MELLIFERA*

Future prospects of application for Varroa destructor control

Dalila Di Criscio, Sonia Ganassi , Cosimo Tedino, Antonio De Cristofaro

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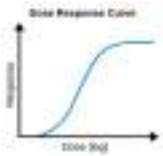
GOALS:

Apis mellifera ligustica is a polymorphic species endowed with a great adaptability that allowed it to became one of the most successful and cosmopolitan insect species. In particular, the *ligustica* subspecies is one of the European subspecies with the greater economic value due to its wide use by many beekeepers. In the honey bees, olfactory communication is crucial for many coordinated functions inside and outside the honeybee colony, such as caste and mate recognition, foraging activities, food reward, detection of danger, and alarm broadcasting. In addition, honeybees have a strong olfactory learning ability that takes place through olfactory receptor neurons, localized on antennae, that change these odor cues to chemical signals. In the frame of eco-compatible treatments to protect the bee colonies, natural products, such as plant extracts, and essential oils (EO) could offer a solution to control the mite *Varroa destructor* due to their lower environmental impact and health risks for humans and bees.

Apis mellifera ligustica

Varroa destructor



Dose-response

Essential oils

METHODOLOGIES:

The antennal sensitivity of *A. m. ligustica* to EOs was assessed using the electroantennographic (EAG) technique described in previous studies.

For the EAG tests, only adult foragers of *A. m. ligustica* were used. The olfactory stimuli were provided by eleven essential oils. In order to prevent the rapid evaporation of the compounds under examination, the EOs were dissolved in mineral oil to obtain five dilutions with increasing concentration (0.001; 0.01; 0.1; 1; 10; µg / µL) and stored at -20 °C until use.

RESULTS AND IMPACT:

EAG is a technique used to measure response of an isolated antenna to a given odor or volatile compounds. EAG is widely measured by examining responses of insects to fractions of a compound mixture identified using chromatography. EAG compounds active towards a species often have ecological significance. 11 different EOs were tested: lavender, arabian frankincense, indian frankincense, bergamot, citronella, lemon balm, carnation, thyme, oregano, geranium and cayeput at different concentrations to detect the olfactory sensitivity of bees and calculate the dose-response curves. The mean EAG responses obtained from the right and left antennae for each essential oil at the same concentration were compared with Student's ttest ($P< 0.05$). Volatile compounds present in all oils elicited EAG responses. There are no significant differences between the responses of the right antenna and those of the left antenna to EO and the two most active oils were found to be geranium and lavender. These tests require further experimentation both on *A. m. ligustica* and on the *V. destructor* mite.

MICROPLASTIC QUANTIFICATION AND QUALYFICATION IN SOME FOOD PRODUCTS

Microplastic contamination in foods

Cristina Di Fiore , Pasquale Avino

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GOALS:

Microplastic contamination is a topic of great concern given their potential impact on post-exposure human health. Food is the main carrier of microplastics in the human body. This PhD project aims to develop a standardization of analytical methodologies for the identification of the chemical nature of microplastics (qualification) and a precise and accurate method for quantification by chromatographic technique, and not only by visual count that leads to imported errors. However, to achieve this result it is necessary to develop a technique of pre-treatment of food matrices, since the organic component causes significant interference in the analysis.

METHODOLOGIES:

Different digestion agents, temperatures and times were tested on pasta, red meat and fish samples. More specifically, for each matrices, H2O2 (30%), KOH (1 and 5 M), Fenton's reagent and nitric acid (65%) were tested at both room temperature (25°C) and 50°C for 24 and 48 h. All solutions obtained were filtered using GF/D 1.6 µm to determine the digestion efficiencies achieved. The same procedures was applied to spiked samples. However, to spike a low concentration of polymers (100 ppb), a solubilization of them was necessary. Hence, dissolution of plastic polymers in organic solvents was studied, considering the Hansen Solubility Parameters theory (HSP). Polymers tested were polyethylene, polyethylene terephthalate and polystyrene. Quali-quantification of microplastics was then performed by pyrolysis gas chromatography mass spectrometry.

RESULTS AND IMPACT:

Results showed that the highest digestion efficiency for pasta sample (94.4±5.0%) was achieved using Fenton's Reagent (20 min at 50°C). For red meat, KOH 5M allowed to achieve a digestion efficiency of 98.0±0.5%, at room temperature for 24 h. For fish fillet the most suitable agent was KOH 5M at 60°C for 48 h. The digestion efficiency achieved was of 97.4±0.4%. Solubilization of polymers was coherent with HSP theory only in the case of polystyrene that was dissolved in a mixture of dichloromethane and toluene (2:1). Polyethylene terephthalate was dissolved in 1,1,1,3,3,3-hexafluoro-2-propanol. Hence, dissolved polystyrene and polyethylene terephthalate were filtered on glass filters (1.6 µm pore size) and analysed . The results of the chromatographic analysis showed the identification of the pyrolysis products of polyethylene terephthalate and polystyrene. However, for quantification, further analysis is needed. The impact of this research is aimed at the development of an innovative method for the correct chemical analysis of microplastics in order to understand the real density of food pollution to ensure consumer safety.

ACKNOWLEDGEMENTS

The authors would like to thank Dr. Fabiana Carriera for her important help during the analysis.

APPLICATION OF FUNDAMENTAL RHEOLOGY TO CHARACTERIZE BRAN-ENRICHED FLOURS

Fundamental and empirical rheology coupled in a combined approach

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GOALS:

- Rheological characterization of flours through the combination of empirical and fundamental rheology;
- Application of the combined approach for the calculation of empirical rheology indices of bran-enriched flours.

METHODOLOGIES:

Wheat flours with different extraction rate and bran-enriched flours were analysed for proximate composition (Official Methods), empirical rheology (farinograph and alveograph analysis, AACC International Methods) and fundamental rheology (rotational rheometer).

RESULTS AND IMPACT:

The adopted combined approach for dough characterization showed a good correlation between empirical and fundamental rheology (**Fig. 1**), demonstrating its reliability and usefulness. These correlations were used to predict and collect information on empirical rheology data, through fundamental rheology, of bran-enriched flours because empirical methods' showed some analytical limits (i.e. alveograph standard conditions at fixed hydration level were not suitable for bran-enriched flours, thus the analytical indices were not determinable). Particularly, bran can be added into flour to improve its fiber content but its presence affects dough rheological properties, thus fundamental rheology at optimum hydration level was used. In this respect, 15% and 20% of wheat bran addition were selected to obtain formulations containing more than 6 % of fiber, satisfying the "high fiber" nutritional claim's (EU Reg. 1924/2006).

Then, alveograph indices were calculated from rheometer outcomes through a linear regression method. As it can be seen from the parity plots (**Fig. 2**) showing the experimental data versus the extrapolated ones, in the adopted approach the fundamental rheology allowed to overcome the analytical limits of empirical methods.

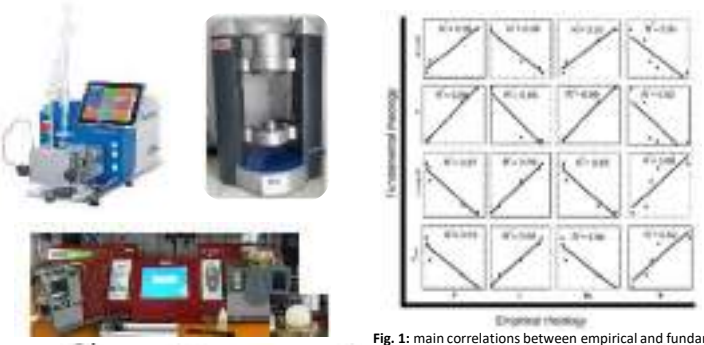

Fig. 1: main correlations between empirical and fundamental rheology.

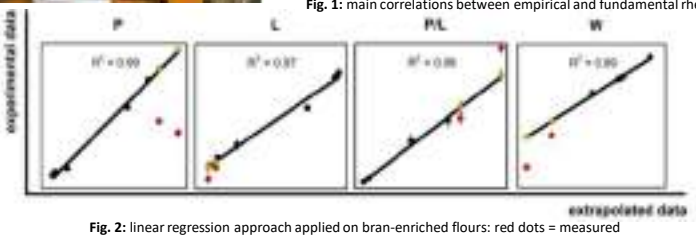

Fig. 2: linear regression approach applied on bran-enriched flours: red dots = measured values from incomplete alveograph curves; Yellow dots = extrapolated data.

Extrapolated indices	P (mm H_2O)	L (mm)	P/L (-)	W (10^{-4} J)
B-15%	212.4 ± 3.4	10.4 ± 1.9	11.1 ± 1.2	116.5 ± 2.3
B-20%	237.9 ± 4.2	15.9 ± 2.1	15.4 ± 2.1	89.5 ± 2.6

Tab. 1: alveograph indices of bran-enriched flours obtained from the linear regression.

Moreover, the obtained alveograph indices (**Tab. 1**) allowed to perform correct comparisons among the samples, togheter with the individuation of the better productive destination of the selected blends. Particularly, because of the very high tenacity P values at L extensibility's expenses, the enriched flours cannot be suitable for leavened baking products (i.e. good quality bread), but it is possible to individuate a good employment in the production of cookies with enhanced nutritional value.

WILD EDIBLE PLANTS: A SOURCE OF BIOACTIVE COMPOUNDS AND STRATEGIC ENVIRONMENTAL POLLUTION INDICATORS

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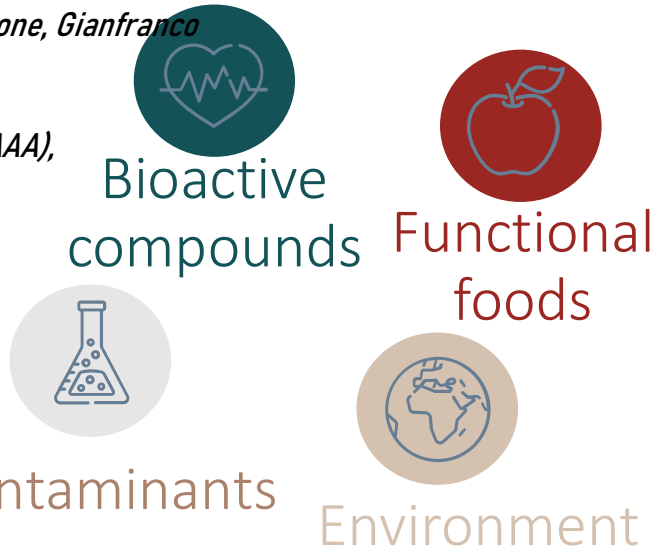

GOALS:

- Characterisation and quantification of the bioactive compounds content of three wild edible plant (WEPs) species, in the specific; *Feniculum vulgare, Malva sylvestris and Portulaca oleracea;*
- Production of new functional foods, such as pasta and juice, with the addition of WEPs as ingredients;
- Use of WEPs as environmental indicators through the assessment of the level of polycylcic aromatic hydrocarbons (PAHs) contamination.

METHODOLOGIES:

The extraction of tocols and carotenes from edible plants was carried out following the method proposed by Panfili et al., 2003. Instrumental analyses of tocols and carotenes were conducted with an HPLC equipped with UV-Vis and fluorescence detectors. The extraction of PAHs was carried out using cyclohexane and an ultrasonic bath. Subsequent volume reduction with nitrogen (N_2) and instrumental analysis in GC-q/MS were carried out.

RESULTS AND IMPACT:

The analysed samples (*F. vulgare* and *M. sylvestris*) contain the following carotenoids: lutein, zeaxanthin, violaxanthin, neoxanthin, antarexanthin, α- carotene, 13-cis-β-carotene, β-carotene, 9-cis- β-carotene and the following tocols: α-tocopherol, β-tocopherol and γ-tocopherol. The average amounts of carotenoids in *F. vulgare* and *M. sylvestris* were 40.6 and 37.4 mg/100g fresh weight respectively. As for tocols, the average quantities *in F. vulgare* and *M. sylvestris* were 3.0 and 13.7 mg/100g fw respectively. The two species of wild edible plants subjected to analyses showed good quantities of bioactive compounds. This allows them to be used as ingredients in new food formulations in order to reach the recommended daily allowance (RDA).

PAHs analyses concerning environmental monitoring were carried out on two *P. oleracea* samples collected in two areas with different anthropic impact, specifically Rotello (CB) and Rome (RM). Rotello *P. oleracea* shows no presence of PAHs, while in *P. oleracea* sampled in Rome, traces of PAHs (naphthalene, anthracene and pyrene) were found in quantities ranging from 12 to 31 ng/g fresh weight. We found low molecular weight PAHs. In fact, these contaminants are generally emitted by car traffic. Furthermore, analysis of other types of contaminants will be carried out in the future.

ACKNOWLEDGEMENTS

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NOVEL LACTIC ACID BACTERIA FOR FREE-FROM FOOD

Bioreserves and Novel Food

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GOALS:

Isolation, selection and characterisation of new cultures of lactic acid bacteria from typical and atypical matrices to cover the gaps of free-from products, such as reduced nutritional value and safety. Free-from food is a term that has started to be used as an umbrella term for food that is free from something: for example gluten-free, lactose-free, fat-free, meat-free.

METHODOLOGIES:

Serial decimal dilutions of samples of kombucha, miso, tempeh, raw milk, natural whey starter, fresh acid cheese and gioddu, were prepared in NaCl 0.9% solution. The cell suspensions were plated and incubated as follows: (I) on the Man, Rogosa, and Sharpe (MRS) agar, incubated aerobically and anaerobically for 48 h at 30 and 44°C, for mesophilic and thermophilic rod LAB, respectively; (II) on M17agar, incubated aerobically and anaerobically for 48 h at 30 and 44°C, for mesophilic and thermophilic cocci LAB, respectively. Five to ten colonies of each different growth condition were isolated from the highest plate dilution by double streaking on agar media. All cultures were stored at -80°C in 20% (v/v) glycerol. In order to identify at genus levels, phenotypic characterization analyses were carried out on the isolates. The purified isolates were evaluated under an optical microscope to evaluated the morphology, Gram identification, catalase test and CO_2 production test.TIM

RESULTS AND IMPACT:

The 300 purified isolates were collected and examined under the microscope to determine their cell morphology and Gram staining was performed. From an initial observation, the isolates had a cell morphology ascribable to lactic acid bacteria, cocci and bacilli. To determine the differentiation among the genera, catalase tests and the Durham bell gas test were performed. From these tests, 248 bacteria were found to be Gram +, catalase negative and therefore compatible with lactic acid bacteria. Of these, 189 were found not to be gas-producing, while the remaining 67 showed gas production. Based on these results, a preliminary identification was made at the genus level. Thermophilic lactobacilli were the most common genus in several products; in particular, it was the group found in milk, tempeh, miso, soft cheese, whey and predominant in gioddu. Mesophilic lactic acid bacteria were mainly isolated from dairy products such as milk, whey and soft cheese; while *Weissella* and *Pediococcus* represented the microbial population of tempeh and Kombucha, respectively. Also of interest was the presence of *Limosolactobacillus* spp. in miso.

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ASSAYING INNOVATIVE INGREDIENTS IN EMULSION SYSTEMS AS OIL/VINEGAR DRESSING

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Novel functional food

New seed oil blend

Olive leaf vinegar

Circular economy

GOALS:

Vinegar and vegetable oil are frequently used in emulsion formulations. In the current study:

- An enriched omega-3 fatty acids sunflower/soybean oil blend **(OB)** and an olive leaf vinegar **(OLV)** were assayed as innovative ingredients in the formulation of oil/vinegar dressing based on emulsion systems.
- Specifically, the effect of these ingredients was evaluated on the composition and oxidative stability of the obtained products.

METHODOLOGIES:

OLV was obtained by macerating dried milled olive leaves in 18% alcoholic vinegar (10:90 w/v) for 15 days.

OB was prepared by mixing manually a high-oleic sunflower and soybean oil at 85:15 v/v ratio. Two main formulated products, an oil/vinegar dressing (**DR**) and a vegetable sauce (**VS**), were fabricated by mixing **OB** with **OLV** and 18% alcoholic vinegar in the test and control samples, respectively.

DR was prepared by homogenising the vinegar and oil in an ultrasound bath at 80W for 60 min without adding any other additives/ingredients.

VS was prepared by homogenizing the ingredients with an immersion knife blender until a stable emulsion was obtained.

RESULTS AND IMPACT:

Quality parameters of the oil blend, vinegar and formulated products revealed that blend formulation of two or more oils with different characteristics is a simple way to produce oil/fat with improved nutritional quality and technical performance. Here, **OB** was designed just to obtain a blend with a good satisfactory content of both oleic acid and ω-3 essential unsaturated fatty acids. Actually, linolenic acid reached a final 0.9% w/w concentration in **OB** that was about nine-fold higher than that of high-oleic sunflower. **OLV** resulted to be a good source of total phenols, which were estimated 0.4-0.7 mg/L GAE. Moreover, linolenic acid content in **VS** reached 1.7 g/100g sauce on average due to the soymilk contribution.

Phenols present in **OLV** showed significant antioxidant activity in both formulated products As evidenced by lower peroxide value (2.0 meqO2/kg for **VS** and 1.9 meqO2/kg for **DR**). As to the sustainability of production, this study shows that **OLV** can enhance the valorisation of olive oil industry by-products, by implementing practices for a circular and sustainable economy.

RHEOLOGICAL AND FUNCTIONAL PROPERTIES OF SOYMILK FERMENTED BY *LACTIPLANTIBACILLUS PLANTARUM* LP95

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L. plantarum

Microbiology

Functional food

Probiotic

GOALS:

- Application of the *Lactiplantibacillus plantarum* LP95 strain for laboratory scale production of fermented soymilk with high bioavailable isoflavone, without the use of stabilizers, thickeners and acidity correctors.
- The fermentative and technological abilities of LP95 are assessed to increase the bioavailability of molecules that are beneficial to human health.

METHODOLOGIES:

Soymilk was prepared by soaking 400 g of mature yellow soybeans in sterile distilled water for 12 hours. Subsequently, soybeans were drained, dried and blended with 1400 mL of water. The resulting product was filtered, sterilized (121°C for 15 min), and cooled for inoculum phase. The fermentative stage, conducted at 37°C for 24 hours, has been obtained by inoculating the soymilk with *L. plantarum* LP95 (10^8 CFU/mL). Subsequently, the clot was broken and the fermented product was placed at 4°C for 49 days for the storage stage. Microbiological and physico-chemical changes were analyzed immediately and later on every 7 days. Rheological parameters determination of the fermented soymilk was accomplished by a rotational rheometer, with a plate–plate measuring system. The content of isoflavones in soymilk during fermentation stage was determined by HPLC along with antioxidant activity.

RESULTS AND IMPACT:

After establishing the optimal fermentation conditions, we performed qualitative analysis both during fermentation (37°C) and storage (4°C) stages. The viable cell count was maintained for 7 days over 10^9 CFU/mL. After 7 days, cell viability decreased progressively but maintained concentrations above 10^7 CFU/mL after 49 storage days. Rheological analysis showed that the LP95 strain produced an increase in apparent viscosity during fermentative and storage stage. Moreover, during fermentative stage, the LP95 strain showed a good β-glucosidase activity towards several soy isoflavones such as daidzin, glycitin and genistin, thus increasing their bioavailability and antioxidant activity. The results for antioxidant assay showed a variation of antioxidant activity of soymilk during fermentation stage, in fact the metabolic activity of starters could increase the bioavailability of polyphenols, mitigating the negative action of reactive oxygen species and increasing the stability of foodstuffs. In conclusion, our results indicate that *L. plantarum* LP95 strain showed promising technological soymilk fermentation traits.

ASSESING SOIL ORGANIC CARBON STORAGE

According to land use change and soil taxa in central Apennine (Molise region)

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GOALS:

- Study 145 profiles sampled thirty years ago in Molise region for the Soil Region classification map
- Resample all 145 points in order to understand how the carbon storage has changed after 30 years.
- Study the total organic carbon (TOC) spatial variability with qGis and Vis-NIR spectroscopy
- Assess how other parameters such as land use, water erosion, climatic factors, and vegetation affected TOC distribution has changed through the years.

METHODOLOGIES:

The sampling plan consisted in small pit excavation, reaching 40 cm depth and taking two soil sampling at 20 and 40 cm. The sampling will be followed by different chemical and physical analyses such as texture, TOC analysis using Walkey Black technique, nitrogen analysis, water holding capacity. All soil samples and TOC fractions of the FH (heavy fraction) and LF (light fraction) will be analyzed with Vis-NIR spectroscopy. The final step will be to apply geostatistical approach to soil parameters, map using qGIS and then validate the field data with indirect variables obtained from the use of Sentinel 2 (and also the NDVI and NDMI indices).

RESULTS AND IMPACT:

The main ecological functions of soils, beyond technical and cultural aspects, are biomass production, storage and filtration of water, storage and recycling of nutrients, habitat for biological activity and carbon storage (Wiesmeier et al. 2019).

Carbon storage is a fundamental ecosystem function of soils. Changes in soil C impacts on, and feedbacks to, the Earth's climate system through emissions of CO_2 and CH_4 as well as storage of carbon removed from the atmosphere during photosynthesis (Smith et al., 2015). At local scale, several parameters can influence and determine the change of carbon stock in soils.

This research will be able to show how the fundamental carbon reserve has evolved, as result of natural and anthropogenic pressures, in 30 years. Also shows how the temperature's growth has accelerated the process of soil erosion and decreased the amount of water present in it at the molecular level. Moreover, the bad management of soils, the decrease of the heads of cattle, has altered the macro and micro molecular components present in the soil. So as result also the vegetation and therefore the biodiversity of the area has definitely changed and has altered during time.

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HIGH-SAFETY PLANT BASED READY-TO-EAT FOOD

Protective Coating Based on Lactiplantibacillus plantarum-derived Bioactive Metabolites

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GOALS:

- Antimicrobial activity screening
- Post-biotics characterization
- Coating activation

METHODOLOGIES:

Sixty-three lactic acid bacteria (LAB) were typized by RAPD-PCR and their antifungal and anti-*Listeria* spp. activities were tested [1]. Post-biotics showing the most inhibitory activity were analysed by high-performance liquid chromatography (HPLC) and characterized by a "temperature test" of the cell-free ultrafiltrate (CFSu). Specifically, 1ml of CFSu was incubated at temperatures from 4°C to 80°C for 1h; 90°C and 100°C for 30 minutes; 121°C for 15 minutes. The antimicrobial activity against *Ryzopus oryzaea* and *Listeria monocytogenes* was evaluated [2]. A coating consisting of an aqueous solution of carboxymethyl cellulose [1%] was activated with the post-biotics of two selected LAB strains and then used as a coating of dried hazelnuts. A challenge test was adopted to evaluate the antimicrobial efficacy of the active coating [3].

RESULTS AND IMPACT:

Primary screening showed different effects of post-biotics against indicator strains (mould and bacteria). The results highlighted that each RAPD_biotype was characterized by a specific antimicrobial profile. Two strains, A_Lp31 and Lp_46, were selected from the clusters reporting the greatest antimicrobial activity.

The results from the temperature test highlighted that the antimicrobial activity produced by the strain A_Lp31 was attributable to thermolabile compounds, preventively represented by a putative peptide, while those produced by Lp_46 were due to thermostable compounds identified by HPLC as phenyl-lactic acid (PhLA) and phenyl-acetic acid (PhAA).

The supernatant (CFSu) was directly added to the mixture of carboxymethyl cellulose and water.

The results from the challenge test highlight the effectiveness of the activated edible coating. The uncoated or methylcellulose-only coated nuts showed rapid growth of intentionally inoculated fungi or bacteria. In contrast, the activated coating prevented this growth.

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EVALUATION OF HEAVY METALS ON ALGERIAN RIPARIAN SOILS ALONG AN INCREASING GRADIENT OF ANTHROPOGENIC PRESSURE

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Pollution

Urbanization

Ecological risk

Soil indices

INTRODUCTION:

Riparian soils are peculiar and highly dynamic because of a large variation in chemical composition due to water flooding. The combined action of urbanization and agriculture can strongly affect soil quality, especially in rapid extension cities such as Souk-Ahras (Algeria).

GOALS:

- To measure heavy metal concentration of Cd, Cu, Fe, Mn, Ni, Pb and Zn in riparian soils vocated to agriculture located near the Medjerda river (Souk-Ahras, Algeria) at 0-60 cm depth along an increasing gradient of anthropogenic pressure (profiles non-urban NU, peri-urban PU, urban U);
- To assess the degree of pollution and the ecological risk of the studied soils by means of integrated indices, PLI and RI respectively.

METHODOLOGIES:

The total content of heavy metals was quantified by atomic absorption spectroscopy. The pollution load index (PLI) and the potential ecological risk index (RI) were calculated according to Tomlinson et al. (1980) and Ahmad et al. (2020) respectively.

RESULTS AND IMPACT:

The values of Fe and Mn for all the sites ranged from 5571 to 7088 ppm and from 261 to 521 ppm respectively, reflecting the geochemical composition of the parent material deriving by sedimentary rocks. The other heavy metals in the investigated soils ranged as follows: Cd 0.65–1.81, Cu 3.99–12.36, Ni 0.21–0.42, Pb 2.15–2.98 and Zn 77–222 ppm.

Profile U was the richest in Cd and Ni whereas profile PU showed the highest values of Cu, Fe and Zn. In addition, the soils of urban and periurban sites had a similar Mn and Pb content, but higher than NU. Despite this, no heavy metal exceeds the French regulatory limit (AFNOR, 1996).

PLI index highlighted no pollution for all the sites, displaying values < 1 whereas RI showed considerable risk for U and moderate risk for NU and PU.

The results of this study show an important anthropogenic impact on the soil quality along the Medjerda river in Algeria due to urbanization and agriculture, where the increasing gradient of anthropogenic pressure reflects the degree of pollution. The ecological risk index displays high to moderate risk factors as we move from urban to non-urban and peri-urban area despite the pollution load index highlights an overall low impact of metal contamination with higher values in urban and peri-urban sites. This study shows how urban development can worringly raise soil heavy metal pollution in these fragile ecosystems and the need to apply corrective measurements.

ACKNOWLEDGEMENTS

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EXPERIMENTAL STUDY OF A MINI AND STANDARD SOILLESS CULTIVATION SYSTEM IN CONTROLLED ENVIRONMENT AGRICULTURE

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GOALS:

- The main aim of the research was the design, realization and study of a fully closed small-scale hydroponic cultivation system for lettuce with artificial light. Beside its developments, the work regarded the acquisition of the main microclimatic and agronomic data.

METHODOLOGIES:

The experimental hydroponic system was placed in a climatized controlled environment and further insulated in a metal box (perforated on one side), with a LEDs bar, properly arranged for the purpose. Four lettuce plants were managed through a nutrient solution and monitored during one production cycle of 30 days, thanks to a network of sensors, which could work both offline and cloud-based to monitor the cultivation system real time. A constant daytime indoor temperature of 21 °C, with a dead band of ± 2 °C and a relative humidity set-point of 65 %, with a dead band of ± 5 %, were fixed as set-points and were regulated by the sensor probe at air inlet holes. The light cycle for the lettuce cultivation was of 16/8 hours (day/night: switching on the LED bar at 6:00 a.m. and switching off at 10:00 p.m.).

RESULTS AND IMPACT:

In general, temperature and relative humidity trends were homogeneous in each measured point. However, it was reached a temperature value of 17.5 °C in few points due to door environment openings for the worker management operations. Therefore, this not affected the lettuce plant growth and confirmed that the experimental environment was well insulated.

Also in this case is evident how relative humidity is related to the temperature: also, for relative humidity there were lower values compared to the average, reaching a value of about 60 %. For each parameter observed trends were consistent at night, which supports the suitability of the location where the hydroponic system was installed. During the experimental test, the inlet air flow rate at holes level was of 338.78 m^3/h, reducing to only 328.72 m^3/h in the growth box. CO_2 level was had a mean of 451.42 ppm and it did not required enrichment taking to account that the experimental test was conducted in an industrial area, well compatible with a big city where small hydroponics finds potential application. The final weight of the head plant was of about 180 g for each plant. This final weight was obtained with only 10 Liters of nutrient solution and varies according to variety, and it is acceptable, especially if compared with that obtained in the traditional hydroponic greenhouse. Finally, this system's reliable environment microclimatic management makes it possible to guarantee a quicker and more effective lettuce cultivation. Research is therefore promising and can be used in the development of industrial products.

INFLUENCE OF COMMERCIAL SYNBIOTIC AND MODE OF ITS ADMINISTRATION ON BROILER CHICKEN PERFORMANCE AND MEAT QUALITY

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INTRODUCTION:

There are growing concerns about using antibiotics in feed, accompanied by an increasing number of laws and regulations related to the ban on the use of antibiotics in feed as animal growth promoters over the world. In recent years, substantial scientific progress has been made to find non-antibiotic alternatives such as probiotics, prebiotics, and their synergistic combination (synbiotics), mainly focused on regulating intestinal microbiota to improve animal health and resilience. In addition, the techniques and methods for administrating those alternatives are also important aspects that have not been yet studied exhaustively.

Objective: This study was aimed to compare two different routes of administration (*in ovo* vs the recommended in water administration) using two doses for the *in ovo* injection of the commercial symbiotic (Poultry Star®) and observing the effects on hatchability, growth performance and meat quality traits of broiler chickens reared in semi-extensive condition.

EXPERIMENTAL DESIGN:

On day 12 of egg incubation, 660 fertile eggs obtained from the same breeder flock (Ross 308) were divided into synbiotic group injected with 2 mg/egg (T1) and 3 mg/egg (T2), saline group (S) injected with physiological saline and an uninjected control group (C). After hatching, 120 male chicks/group were reared, chicks from S group were supplemented with the synbiotic in water (T3). Data were analysed by one-way analysis of variance. Scheffe's test was applied to compare the differences among means.

RESULTS:

The hatchability was high in the control group (94.5%) and in the S group (95.1%); while the groups injected with the commercial synbiotic showed lower hatchability values (T1: 85.4%, T2: 80.6%). Growth performance were not significantly affected by the treatment. However, in the second rearing phase (15-36 days), birds from C and T3 groups were heavier ($P<0.05$) compared to T1 birds due to a higher feed intake and daily weight gain. Mortality was similar among groups. Both routes of synbiotic delivery did not affect final body weight (56 days), weight and yield of carcass and commercial cuts. Physicochemical properties, total lipid, cholesterol and fatty acid composition of breast muscle were not affected by treatments.

CONCLUSION:

The *in ovo* administration of the commercial Poultry Star® sol at two different doses had:

- a dampening effect on hatchability;
- no negative effects on the growth performance, carcass traits and meat quality of Ross 308 broiler chicken.

ACKNOWLEDGEMENTS

This study has been supported by the Polish National Agency for Academic Exchange under Grant No. PPI/APM/2019/1/00003.

A GENOME-WIDE ASSOCIATION STUDY OF COMISANA SHEEP, UTILIZING EBV RANKING, IDENTIFIES GENETIC REGIONS LINKED TO RESISTANCE AGAINST GASTROINTESTINAL STRONGYLES.

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GOALS:

- To estimate breeding values for resistance to gastrointestinal strongyles in Comisana sheep.
- To determine the single nucleotide polymorphisms (SNPs) associated with the resistance to GIN infection.
- To identify genetic regions involved in sheep resistance to gastrointestinal strongyles, a common class of Gastrointestinal Nematodes (GIN).

METHODOLOGIES:

For a period of three years, 642 fecal samples were taken from Comisana ewes and evaluated for Fecal Egg Counts (FEC) using the FLOTAC method. The resistance of the sheep to gastrointestinal strongyles was first estimated by a BLUP animal model, which utilized pedigree data and logn(FEC+2) as phenotypes. The sheep were then ranked based on these estimates, and two groups of animals were selected, one consisting of 31 of the most genetically resistant individuals and the other made up of 29 of the least resistant. These selected animals were then genotyped using the Illumina OvineSNP50 beadchip. A case/control genome-wide association study (GWAS) was conducted using the software PLINK, with the less resistant group being considered as the case and the most resistant group as the control. The p-values were adjusted using the False Discovery Rate (FDR) with the Benjamini & Hochberg method, and the most significant p-values over a threshold of 0.005% were chosen.

RESULTS AND IMPACT:

18 SNPs linked to 13 genes were identified on 12 chromosomes, with a strong signal on chromosomes 1, 2, 4, 6, 13, and 20. This confirms previous studies that associate these chromosomes with resistance to GIN infections. The SNPs were found within genes related to the physiology or pathology of the gastro-intestinal tract, such as the UGT1A* family, which play a role in the metabolism of bilirubin and drugs at the intestinal level. Additionally, genes like KIF6, LOXL2, and CALN1 are involved in intestinal cancer, inflammation, immune response, and tissue regeneration and wound healing. TWISTNB is known to be involved in gastrointestinal tract infections. Other genes we found (LOXL2, GPC6, MYT1, and SS18L1) play a role in adaptive processes and production traits. The findings of this study, used in a breeding program, may have an impact on the reduction of the use of drugs in the fight against GIN, with benefits on animal welfare, environmental impact and economic losses in sheep farming.

ACKNOWLEDGEMENTS

The research was supported by the Italian National Sheep and Goat Breeders Association (ASSONAPA; Rome, Italy) through the CHEESR project PSRN 2014-2020. Sottomisura 10.2: Biodiversità

PROLONGED DOUGH LEAVENING TO MITIGATE ACRYLAMIDE FORMATION IN NEAPOLITAN PIZZA

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GOALS:

- Evaluation of an extraction procedure and a HPLC-UV analytical method for acrylamide determination.
- Assessment of acrylamide content of Neapolitan pizza.
- Utilization of lactic acid bacteria and extended rising times as a possible mitigation strategy.

METHODOLOGIES:

Pizza typologies with a topping of tomato sauce and without any topping were prepared following the recipe of Neapolitan pizza TSG. Samples of pizza without any topping have been produced from dough left to rise for 16, 24 and 48 hours using fresh brewer yeast and starters of Levilactobacillus brevis PA6, Leuconostoc pseudomesenteroides PD4, Fructilactobacillus sanfranciscensis SB52. On cooked pizza samples, acrylamide was determined in the external, internal part of a slice and on a whole slice. After samples extraction phase, the detection and quantification of acrylamide was performed with a HPLC-UV model Ultimate3000 of Dionex Corporation equipped with an UV-VIS detector. Chromatograms were elaborated with Chromeleon 6.6 (Dionex) data system.

RESULTS AND IMPACT:

With regard to system performances, acrylamide detection limit (LOD) and quantification limit (LOQ) were 0,00125 mg/L and 0,0025 mg/L, respectively. The calibration curves showed high linearity in the range of 0,0025-10 mg/L with a R^2=0,9999.

Acrylamide recovery tests on SPE cartridges revealed that the optimal loading volume was 0.5 ml for the standard solution, and 2 mL for the sample extracts.

Results highlighted differences between the two pizza typologies: external part of pizza with tomato sauce topping and internal part of pizza without topping had a significant higher amount of acrylamide (55,2 versus 26,9 µg/kg and 99,6 versus 16,4 µg/kg), ($p<0.05$ and $p<0.01$, respectively). These different results might be due to the thickness of the product, (Abt et al., 2019; Acar e Gokmen., 2009), the influence of tomato sauce on moisture of pizza, the effect of topping related to pH lowering and the possible presence of antioxidants. A decrease in acrylamide formation (-42%) was recorded as the leavening time increased, probably due to the consumption of acrylamide precursors (asparagine, reducing sugars) by the microorganism activity. Leavening carried out with both yeasts and lactobacilli contributes to decrease acrylamide content (-34,4%), which is most pronounced after 48 hours.

This study was carried out as part of the PRIN 2017SFTX3Y project "The Neapolitan pizza: processing, distribution, innovation and environmental aspects»

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GENOMICS AND MACHINE LEARNING APPROACHES FOR BIODIVERSITY STUDIES

A case study of the trout populations of Molise (Italy)

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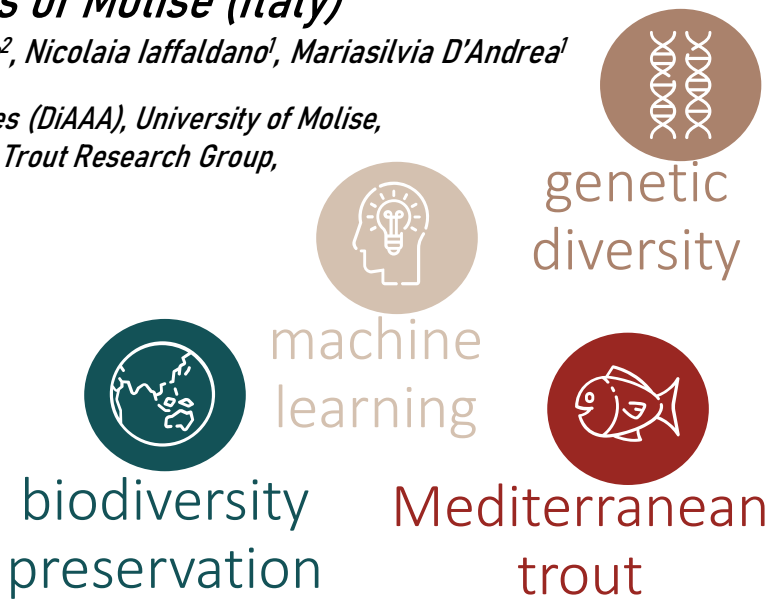

GOALS:

The aim of this research is to study and characterize the trout that inhabits two rivers of the Molise region. Mediterranean trout (*Salmo cettii* syn. *Salmo macrostigma*) is a freshwater fish of particular interest and it is seriously threatened by the introduction of commercial hatchery strains, which hybridizing with the native ones, have compromised the genetic integrity of the species. The selection of hybrids based only on morphomeristic characteristics is not sufficient to provide a clear taxonomic information. Recently high-density SNP chips have been developed for commercially important salmonid species, such as rainbow trout and Atlantic salmon, but they have not been tested yet on the Mediterranean trout.

METHODOLOGIES:

14 interesting sampling sites were identified for each basin and 288 specimens were enrolled in the study. A portion of adipose fin tissue was collected from live animals and individual genomic DNA was isolated. Genotyping was performed by the 57K rainbow trout Axiom SNP array (Affymetrix). All 288 samples were also genotyped for the 16S rDNA, and the LDH-C1* genes as a further control for non-native trout identification.

Pairwise weighted F_{ST} and overall F-statistics were estimated in Arlequin v.3.5.2.2. Genetic distance was investigated by Principal Coordinated Analysis (PCoA) with GenAlex v.6.503. Genetic ancestry was estimated using ADMIXTURE v.1.3.0.

Furthermore, other analyses were performed to obtain a reduced panel of markers with the most ancestry-informative markers (AIMs), using a Machine Learning approach based on Random Forest classifier. This allowed a very limited loss of information compared to initial Axiom 57K array genotyping solution.

RESULTS AND IMPACT:

A clear genetic difference between Biferno and Volturno samples was detected. An overlapping region was identified, representing Atlantic specimens detected in both rivers. Allochthonous genome is widely spreading into the wild of both rivers, but a different pattern of introgression appears to be present within the two basins. A 47 AIMs panel was identified and validated on simulated and real hybrid population datasets. The AIMs panel proposed may represent an interesting and cost-effective tool for monitoring the level of introgression between native and allochthonous trout population for conservation purpose, and this methodology could be also applied in other species.

ACKNOWLEDGEMENTS

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EFFECTS OF REARING SYSTEM ON NUTRITIONAL MEAT QUALITY: COMPARISON OF OUTDOOR AND CONVENTIONALLY RAISED NERO D'ASPROMONTE PIGS

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GOALS:

Meat is highly nutritious and contributes with several essential nutrients. With growing health awareness among consumers, the demand for healthier, tastier, higher quality and nutritional value pork is increasing. Influences of pig rearing systems on animal performance, carcass and meat traits result from the interactive effects of: i) housing conditions; ii) feeding level and composition; iii) genotype, particularly in production systems with local pig breeds. A partial goal of my doctoral thesis was to determine the effect of rearing systems (outdoor: O; indoor: I) on meat quality of barrows from Nero d'Aspromonte pigs, a local type reared in inner areas of Calabria region, Italy.

METHODOLOGIES:

Pigs reared in the I system were fed with a standard commercial diet. In the O system, pigs were kept on 3 ha land and feed consisted of pumpkin, acorn and pasture. Dietary supplementation with a standard commercial mixture was provided in periods of low pasture availability. Animals had *ad libitum* access to feed and water. When the pigs attained their target slaughter weight, they were transported to a commercial slaughterhouse. At slaughter, from 35 carcasses (O: n= 21; carcass weight: 116.0±7.8 kg; I: n = 14; carcass weight: 115.6±9.0 kg; $P > 0.05$) *Longissimus thoracis* (LT) muscle samples were removed between the 13th–14th rib for cholesterol, vitamin E and fatty acids analyses. Data were analyzed by non-parametric test (Mann-Whitney).

RESULTS AND IMPACT:

Meat from O pigs had higher ($P < 0.05$) vitamin E (4.84 *vs* 3.30 µg/g) and total lipid (3.81 *vs* 3.12 g/100g) contents but a lower ($P < 0.05$) cholesterol amount (56.4 *vs* 63.8 mg/100g) than that of I pigs. Concerning the fatty acid profile, meat from O group showed higher total saturated fatty acid (SFA) (+3.8%; $P < 0.001$) and lower polyunsaturated fatty acid (PUFA) (-2.6%; $P < 0.01$) compared to I group; while, monounsaturated fatty acids were not significantly affected by rearing system. The nutritional ratios were affected ($P < 0.01$) by the rearing system: compared with O group, I group showed higher n6/n3 and PUFA/SFA and lower atherogenic and thrombogenic indices. In conclusion, meat from pigs reared outdoor had a lower cholesterol content and n6/n3 ratio, a result favorable from a nutritional point of view; seems more suitable for technological transformation due to a lower PUFA content, which is prone to oxidation; had a higher vitamin E content, the nature's most effective lipid-soluble antioxidant.

ACKNOWLEDGEMENTS

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INFLUENCE OF VITAMIN E ON PAHs FORMATION IN GRILLED BEEF MEAT.

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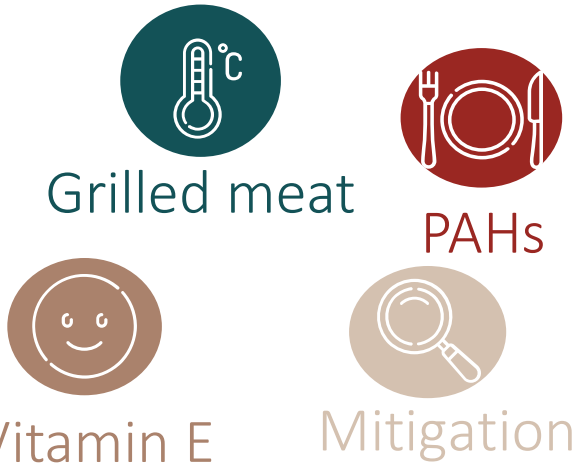


GOALS:

The increasing concern of consumers on the way red meat is cooked has led the attention to the study of polycyclic aromatic hydrocarbons (PAHs), considered potential carcinogenic agents to humans. They are formed during high-temperature cooking of meat such as grilling. The emerging issue of health risk from exposure to PAHs has led to mitigation strategies consisting in the use of antioxidants, such as vitamin E. This work aimed to evaluate the influence of the addition of different levels of vitamin E on the formation of PAHs in grilled beef hamburgers.

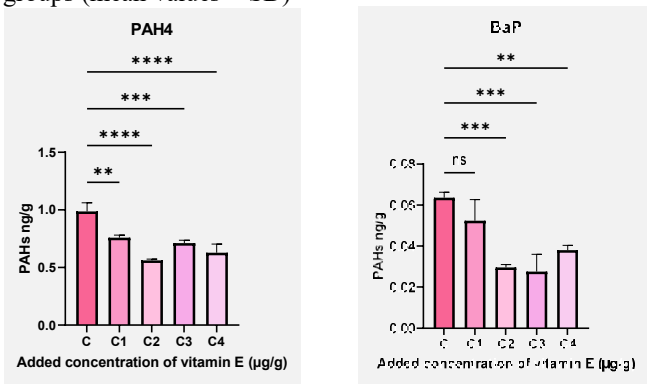
METHODOLOGIES:

Hamburgers of 80 g were prepared from a homogenous sample of beef meat (total lipid content 1,36 % ; vitamin E content 1, 32µg/g). The experimental groups consisted in control samples (n=2) without addition of vitamin E and treated groups (n=8) with the addition respectively of 2, 3, 4.5 and 6 µg/g of DL-α-tocopheryl acetate. Hamburgers were cooked in disposable barbecue obtaining well-done level of doneness. PAHs were extracted using an acetonitrile-based solution and quantified by HPLC with fluorescent detection. Data were analysed by one-way ANOVA.

RESULTS AND IMPACT:

The European Union has established PAH4 (sum of benz[a]anthracene, chrysene, benzo[b]fluoranthene and benzo[a]pyrene) as the benzo[b]fluoranthene and benzo[a]pyrene) as the most appropriate indicator for the occurrence and carcinogenic potency of PAHs in food. Benzo[a]pyrene is categorized by International Agency for Research on Cancer (IARC, 2010) into group 1 (carcinogenic to human).

Figure 1. PAH4 and BaP content in control samples and treated groups (mean values ± SD)



ns- not significant; ** P≤ 0.01, *** P≤ 0.001; **** P≤ 0.0001; C~control; C1~2 µg/g; C2~3µg/g; C3~4.5 µg/g; C4~6µg/g.

Vitamin E, in all concentrations added, reduced significantly PAH4, with a highly significant reduction (P≤ 0.0001) in hamburgers added with 3 and 6 µg/g. No effect on BaP's formation was observed in hamburgers added with 2 µg/g of vitamin E, while highly significant reduction (P≤ 0.0001) was observed on those added with 3 and 4.5 µg/g (Figure 1). In conclusion, the use of vitamin E suggests a promising effect in terms of safety of grilled red meat.

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