



VERBALE N.31
RIUNIONE DEL COLLEGIO DEI DOCENTI DEL DOTTORATO DI RICERCA IN
“SCIENZE DELLE PRODUZIONI VEGETALI E ANIMALI” DEL 29.04.2025

Il giorno **29.04.2025**, alle ore **9.00**, viene aperta in modalità telematica la riunione del Collegio dei Docenti del Corso di Dottorato di Ricerca in Scienze delle Produzioni Vegetali e Animali, convocata con mail del 16.04.2025, e successiva integrazione del 23.04.2025, con i seguenti punti all’OdG:

- (1) Comunicazioni**
- (2) Ratifica disposti**
- (3) Proposta di nomina della Commissione di esame finale del Dottorando Federico MANGANELLO (37° ciclo), finanziato con fondi PON DM 1061/2021; proposta di giorno, ora e luogo di esame finale**
- (4) Proposta di nomina della Commissione di esame finale dei Dottorandi Mariam ATAIT, Ludovica FUMELLI, Michela LUPO, Cristiano TIBERI (37° ciclo); proposta di giorno, ora e luogo di esame finale**
- (5) Proposta di nomina della Commissione di esame finale della Dottoranda Antonella CARDACINO (37° ciclo) per l’acquisizione del titolo di *Doctor Europaeus*; proposta di giorno, ora e luogo di esame finale**
- (6) Approvazione del “Documento di analisi dei risultati relativi agli indicatori ANVUR del Corso di Dottorato di Ricerca in Scienze delle Produzioni Vegetali e Animali (SMA PhD) 2024”**
- (7) Varie ed eventuali**

Sono presenti: Prof.ssa Stefania ASTOLFI, Prof. Giorgio Mariano BALESTRA, Prof.ssa Loredana BASIRICO, Prof. Umberto BERNABUCCI, Prof.ssa Roberta BERNINI, Prof.ssa Laura BERTINI, Prof.ssa Mariateresa CARDARELLI, Prof. Giuseppe COLLA, Prof. Mario CONTARINI, Prof. Valerio CRISTOFORI, Prof. Marco ESTI, Prof.ssa Katia LIBURDI, Prof.ssa Ljiljana KUZMANOVIC, Prof. Roberto MANCINELLI, Prof.ssa Stefania MASCI, Prof. Angelo MAZZAGLIA, Prof. Andrea MAZZUCATO, Prof. Maurizio MICHELI, Prof. Rosario MULEO, Prof. Simone PRIORI, Prof. Francesco ROSSINI, Prof. Roberto RUGGERI, Prof. Luca SANTI, Prof. Francesco SESTILI, Prof. Cristian SILVESTRI, Prof. Stefano SPERANZA, Prof.ssa Anna Maria TIMPERIO, Prof. Andrea VITALI, Dott.ssa Elena BALDONI, Dott. Gianfranco DIRETTO, Dott.ssa Simona PROIETTI, Dott. Franco VALENTINI, Prof. Eduardo Gabriel VIRLA, Dott.ssa Chiara VOLPI.

Sono assenti giustificati: Prof. Raffaele CASA, Prof. Nicola LACETERA, Prof.ssa Maria Nicolina RIPA, Prof. Daniel Valentin SAVATIN, Dott. Gianluca BURCHI.

Svolge la funzione di Presidente la Prof.ssa Roberta BERNINI, Coordinatrice del Corso di Dottorato di Ricerca, e di Segretario verbalizzante la Dott.ssa Katia LIBURDI.

(1) Comunicazioni

(1a) La Coordinatrice comunica che il 21.02.2025 si è svolto con successo l’evento denominato “Seeds of Innovation: SPVA PhD Student Research Symposium”, finanziato dal Progetto Dipartimenti di Eccellenza DI.Ver.SO e patrocinato dalla Fondazione Rome Technopole. Protagonisti sono stati i Dottorandi in Scienze delle Produzioni Vegetali e Animali che, con la presentazione delle loro attività di ricerca, hanno voluto promuovere la condivisione di conoscenze interdisciplinari e multidisciplinari, stimolare le collaborazioni scientifiche tra i diversi gruppi di ricerca del Corso di Dottorato, coinvolgere le Parte Interessate (enti di ricerca pubblici/privati ed imprese che svolgono attività di ricerca). L’evento ha rappresentato anche una giornata informativa sul Corso di Dottorato e sulle tematiche di ricerca del Dottorato per gli studenti italiani e internazionali interessati ad intraprendere un percorso dottorale dopo la Laurea Magistrale.

A conclusione, il Comitato Scientifico dell’evento ha assegnato ai Dott.ri Antonella CARDACINO e Matteo NAVA il premio per le migliori comunicazioni orali e al Dott. Federico BRUGNETTI per il miglior poster. Inoltre, ha attribuito ai Dott.ri Giuliana BRUNO, Nicolò DI SORA, Chiara FABRIZI, Francesco



GIOVANELLI e Valeria POSCENTE una menzione per le abilità comunicative e per il trasferimento tecnologico delle attività di ricerca.

La Coordinatrice ringrazia tutti i Dottorandi che hanno animato l'evento e i Colleghi che hanno fatto parte del Comitato Organizzatore e Scientifico per l'impegno profuso.

(1b) La Coordinatrice comunica che il 14.04.2025 hanno discusso la tesi di Dottorato Caterina MAZZOCCHI e Michele VOMERO (37° ciclo). Ai neo-Dottori di Ricerca sono state rivolte le congratulazioni del Collegio dei Docenti del Corso di Dottorato.

(1c) La Coordinatrice comunica che sta riorganizzando l'attività formativa del nuovo ciclo di Dottorato sentendo le disponibilità dei docenti dei corsi erogati negli anni precedenti e raccogliendo le disponibilità per i nuovi seminari da erogare, coinvolgendo anche le Parti Interessate. Coglie l'occasione per ringraziare quanti hanno manifestato la loro disponibilità.

(2) Ratifica disposti

La Coordinatrice allega al verbale i seguenti atti firmati ai sensi dell'art.8, comma c) del Regolamento di Ateneo in materia di Dottorato di Ricerca:

- Disposto N.6 del 19.02.2025 avente per oggetto la proposta di Commissione e data di esame finale dei Dottorandi Caterina MAZZOCCHI e Michele VOMERO (37° ciclo)

- Disposto N.7 del 07.03.2025 avente per oggetto la proposta di nomina valutatori esterni tesi della Dottoranda di Ricerca Mariam ATAIT (37° ciclo)

Il Collegio dei Docenti ne prende atto.

(3) Proposta di nomina della Commissione di esame finale del Dottorando Federico MANGANELLO (37° ciclo), finanziato con fondi PON DM 1061/2021; proposta di giorno, ora e luogo di esame finale

La Coordinatrice comunica di aver ricevuto dai valutatori esterni della tesi del Dottorando Federico MANGANELLO (37° ciclo) i report positivi allegati al presente verbale; pertanto, il Collegio dei Docenti lo ammette all'esame finale esprimendo le proprie congratulazioni.

Di seguito la Commissione, la data, l'ora e il luogo di esame proposti al Magnifico Rettore, in accordo al Regolamento di Ateneo in materia di Dottorato di Ricerca.

Componenti effettivi

- Prof.ssa Fulvia BOVERA, SSD AGRI-09/D, Università degli Studi di Napoli Federico II
E-mail: bovera@unina.it
- Prof.ssa Maria Grazia CAPPALÀ, SSD AGRI-09/B, Università degli Studi di Sassari
E-mail: mcappai@uniss.it
- Prof. Riccardo PRIMI, SSD AGRI-09/C, Università degli Studi della Toscana
E-mail: primi@unitus.it

Componenti supplenti

- Prof. Mario CONTARINI, AGRI-05/A, Università degli Studi della Toscana
E-mail: contarini@unitus.it
- Prof. Fiorenzo PICCIOLI CAPPELLI, SSD AGRI-09/C, Università Cattolica del Sacro Cuore di Piacenza
E-mail: fiorenzo.piccioli@unicatt.it

Data: 22.05.2025, **ore:** 11.00

Luogo: Aula Blu, Dipartimento di Scienze Agrarie e Forestali (DAFNE), Università degli Studi della Toscana.

Modalità: in presenza.

Il Collegio dei Docenti approva la proposta.

(4) Proposta di nomina della Commissione esame finale dei Dottorandi Mariam ATAIT, Ludovica FUMELLI, Michela LUPO, Cristiano TIBERI (37° ciclo); proposta di giorno, ora e luogo di esame finale

La Coordinatrice comunica di aver ricevuto dai valutatori esterni della tesi dei Dottorandi Mariam ATAIT, Michela LUPO, Ludovica FUMELLI, Cristiano TIBERI i report positivi allegati al presente verbale; pertanto, il Collegio dei Docenti li ammette all'esame finale esprimendo le proprie congratulazioni.



Di seguito la Commissione, la data, l'ora e il luogo di esame proposti al Magnifico Rettore, in accordo al Regolamento di Ateneo in materia di Dottorato di Ricerca.

Componenti effettivi

- Prof. Giuseppe CELANO, SSD AGRI-03/A, Università degli Studi di Salerno
E-mail: gcelano@unisa.it
- Prof. Pier Paolo DANIELI, SSD AGRI-09/B, Università degli Studi della Tuscia
E-mail: danieli@unitus.it
- Prof. Lorenzo RAGGI, AGRI-06/A, Università degli Studi di Perugia
E-mail: lorenzo.raggi@unipg.it

Componenti supplenti

- Prof. Alberto MANTINO, AGRI-09/B, Università degli Studi di Pisa
E-mail: alberto.mantino@unipi.it
- Prof. Rinaldo BOTONDI, SSD AGRI-07/A, Università degli Studi della Tuscia
E-mail: rbotondi@unitus.it

Data: 21.05.2025; **ore:** 9.30

Luogo: Aula Blu, Dipartimento di Scienze Agrarie e Forestali (DAFNE), Università degli Studi della Tuscia.

Modalità: in presenza.

Il Collegio dei Docenti approva la proposta.

(5) Proposta di nomina della Commissione di esame finale della Dottoranda Antonella CARDACINO (37° ciclo) per l'acquisizione del titolo di *Doctor Europaeus*; proposta di giorno, ora e luogo di esame finale

La Coordinatrice comunica di aver ricevuto dai valutatori esterni della tesi della Dottoranda Antonella CARDACINO i report positivi allegati al presente verbale; pertanto, il Collegio dei Docenti la ammette all'esame finale esprimendo le proprie congratulazioni.

Di seguito la Commissione, la data e il luogo di esame proposti al Magnifico Rettore, in accordo al Regolamento di Ateneo in materia di Dottorato di Ricerca.

Componenti effettivi

- Prof. Elena DI MATTIA, SSD AGRI-08/A, Università degli Studi della Tuscia
E-mail: dimattia@unitus.it
- Prof. Emilio MONTESINOS, University of Girona (Spagna)
E-mail: emilio.montesinos@udg.edu
- Prof. Thomas THOMIDIS, International Hellenic University, Thessaloniki (Grecia)
E-mail: thomi-1@otenet.gr; thomidis@ihu.gr

Componenti supplenti

- Prof. Marcella PASQUALETTI, SSD BIOS-01/B, Università degli Studi della Tuscia
E-mail: mpasqual@unitus.it
- Prof. Aleksa OBRADOVIĆ, University of Belgrade (Serbia)
E-mail: aleksao@agrif.bg.ac.rs

Data: 20.05.2025, ore 16.00

Luogo: Aula 5, Dipartimento di Scienze Agrarie e Forestali (DAFNE), Università degli Studi della Tuscia

Modalità: mista (telematica per i Commissari stranieri)

Il Collegio dei Docenti approva il punto all'OdG.

(6) Approvazione del “Documento di analisi dei risultati relativi agli indicatori ANVUR del Corso di Dottorato di Ricerca in Scienze delle Produzioni Vegetali e Animali (SMA PhD) 2024”

La Coordinatrice comunica che, a seguito della richiesta del Presidio di Qualità di Ateneo (PQA) inviata il 05.03.2025, la Struttura AQ del Corso di Dottorato, presieduta e coordinata dalla Prof.ssa BERNINI, ha elaborato il “Documento di analisi dei risultati relativi agli indicatori ANVUR del Corso di Dottorato di Ricerca



in Scienze delle Produzioni Vegetali e Animali (SMA PhD) 2024”. Con Nota Prot. N.11053 del 18.04.2025, il PQA ne ha attestato la *compliance*. Il Documento è stato inviato ai componenti del Collegio dei Docenti ed è allegato al presente verbale.

Dopo averne presa visione, il Collegio dei Docenti approva seduta stante il “Documento di analisi dei risultati relativi agli indicatori ANVUR del Corso di Dottorato di Ricerca in Scienze delle Produzioni Vegetali e Animali (SMA PhD) 2024”.

(7) Varie ed eventuali

Nulla da discutere.

Il Collegio dei Docenti del Corso di Dottorato approva il verbale.

La riunione si conclude **alle ore 18.00.**

Il Segretario

Prof.ssa Katia LIBURDI

Il Presidente

Prof.ssa Roberta BERNINI



**DISPOSTO N.6 DELLA COORDINATRICE DEL CORSO DI DOTTORATO DI RICERCA
IN “SCIENZE DELLE PRODUZIONI VEGETALI E ANIMALI” DEL 19.02.2025
*ai sensi dell’Art.8, comma c) Regolamento di Ateneo in materia di Dottorato di Ricerca***

Oggetto: *proposta di Commissione e data di esame finale dei Dottorandi Caterina MAZZOCCHI e Michele VOMERO (XXXVII ciclo)*

La Coordinatrice comunica di aver ricevuto dai valutatori esterni della tesi dei Dottorandi Caterina MAZZOCCHI e Michele VOMERO (XXXVII ciclo) i report positivi allegati che, pertanto, sono ammessi all’esame finale.

Di seguito la Commissione, la data e il luogo di esame proposti al Magnifico Rettore, in accordo al Regolamento di Ateneo in materia di Dottorato di Ricerca.

Componenti effettivi

Prof. Maurizio Servili - Professore Ordinario SSD AGRI-07/A, Università degli Studi di Perugia

E-mail: maurizio.servili@unipg.it

Prof.ssa Maria Elena Menconi - Ricercatore SSD AGRI-04/C, Università degli Studi di Perugia

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Prof. Fabio Recanatesi - Professore Associato SSD AGRI-04/C, Università degli Studi della Toscana

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Componenti supplenti

Prof. Alvaro Marucci - Professore Ordinario SSD AGRI-04/C, Università degli Studi della Toscana

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Prof. Gianluca Veneziani - Professore Associato SSD AGRI-07/A, Università degli Studi di Perugia

E-mail: gianluca.veneziani@unipg.it

Data e ora: 14.03.2025, ore 14.30

Luogo: Aula Blu, Dipartimento di Scienze Agrarie e Forestali (DAFNE)

Modalità di svolgimento: in presenza

Sulla base della documentazione prodotta, *per motivi di necessità e urgenza*, la Coordinatrice propone al Magnifico Rettore la nomina della suddetta Commissione.

Il presente disposto sarà ratificato alla prima riunione utile del Collegio dei Docenti.

La Coordinatrice

Prof.ssa Roberta BERNINI

roberta

bernini

19.02.2025

13:45:08

GMT+02:00



PhD Program in Plant and Animal Science, University of Tuscia, Viterbo (Italy)

Coordinator: Prof. Roberta BERNINI

PhD student: dott.ssa **Caterina Mazzocchi**

Title of the thesis: GREEN APPROACH FOR THE RECOVERY OF CHLOROPHYLL FROM UNSOLD SPINACH: STABILIZATION AND ENCAPSULATION

Reviewer: prof.ssa **Anna Lante** – Department of Agronomy, Food, Natural Resources, Animals, and Environment—DAFNAE, University of Padova .

Scientific quality	Excellent	Good	Fair	Poor
Originality of the research	x			
Suitability of the title with respect to the content	x			
Efficacy of the abstract	x			
Clarity of the aims	x			
Exhaustiveness of the introduction/state of art	x			
Suitability of the methodology	x			
Description of the experimental procedure	x			
Interpretation of the results	x			
Appropriateness of the discussion	x			
Completeness of references	x			
Overall evaluation	Excellent			

General comments and remarks:

The thesis is well organized, the objectives are clear, and they are achieved. The methodologies are explained clearly and in detail. The experimental approaches and analytical and statistical methods are described with the necessary information indicating their knowledge level. The doctoral student's methodological preparation is at a very good level.

She has mastered and skillfully applied various classical and modern analytical methods, allowing her to perform all the assigned tasks. Her formulated conclusions are clear, definite, and well-written.

The advance of the presented and discussed results in the research field can be defined as confirming previously stated ones, with potential for application in the food industry.

No modifications are required.

The thesis is accepted:

- ***In the present form***

Padova, 21.12.2024

Signature



PhD Program in Plant and Animal Science, University of Tuscia, Viterbo (Italy)

Coordinator: Prof. Roberta BERNINI

Reviewer report

PhD student: Caterina Mazzocchi

Title of the thesis: A Green Approach for the Recovery of Chlorophyll from Unsold Spinach: Stabilization and Encapsulation

Reviewer: Bavaro Teodora, Department of Drug Sciences, University of Pavia, Viale Taramelli 12, I-27100 Pavia, Italy

Scientific quality	Excellent	Good	Fair	Poor
Originality of the research	x			
Suitability of the title with respect to the content	x			
Efficacy of the abstract	x			
Clarity of the aims	x			
Exhaustiveness of the introduction/state of art	x			
Suitability of the methodology	x			
Description of the experimental procedure	x			
Interpretation of the results	x			
Appropriateness of the discussion	x			
Completeness of references	x			
Overall evaluation	x			

General comments and remarks:

The PhD Thesis of Caterina Mazzocchi is focused on the development of a customized protocol for the extraction, stabilization, and encapsulation of chlorophyll (Chl) from vegetable waste, to be used as a natural food colorant. The study proposes an innovative method of enzyme-assisted extraction (EAE), which aims to reduce environmental impact while achieving high-yield recovery of Chl from spinach. This method addresses the growing market demand for eco-friendly, natural food colorants and aims to overcome the limitations of conventional solvent-based extractions.

Based on the cell wall polysaccharide composition of the plant matrix, a tailored enzyme mix (cellulase, xylanase, and polygalacturonase) was formulated and all process parameters were optimized by using Response Surface Methodology. The Chl-based extract was successfully applied to food products, where it maintained its green color and sensory properties. This approach is nicely described in the paper *Food* 2023, 12 3440. The main drawback of this process is the cost of the biocatalyst and the intrinsic instability of the extracted pigment. These limitations have been addressed in the paper *J. Food Science* 2024, 89, 5270, using an organic solvent-free method, based on limited dosing options (biocatalyst and ZnCl_2) for the quick and mild recovery of Chl. Considering the extraction kinetic, the recovery yield, and the colorimetric data, the suitable conditions to produce a stable green and food-grade colorant are: 0.10 U/g of enzyme, 3h, and 150ppm of ZnCl_2 at 25 °C. The extraction yield of Chl (4863 $\mu\text{g}/\text{U}$) was about 51% greater than control, with a higher extraction rate constant (5.43×10^{-4}

g/($\mu\text{g min}$)). It would be interesting to evaluate the possibility of recovering the enzyme mix and reusing it through immobilization techniques, provided that enzymatic activity is maintained. This approach could help reduce process costs and improve its sustainability, aligning with the current needs of the food industry.

Successively, the Candidate focuses on the development of a tailored approach for the recovery of intact chloroplasts from spinach leaves by EAE in presence of zinc and copper ions in a synergistic combination. This research demonstrates the potential of EAE and metal ion stabilization as a sustainable, scalable alternative for the production of natural, eco-friendly green colorants for use in the food industry.

As the final effort, the Candidate switched to the encapsulation of Chl in whey protein isolate (WPI) alone or combined with alginate (ALG), as an effective and cost-saving method to improve stability, solubility, pH-response, and color properties of the green pigment. This study demonstrates that the encapsulation of Chl-Zn²⁺ with WPI and ALG may significantly prevent Chl-Zn²⁺ degradation across various pH, making it a viable option for a broader range of food applications, including aqueous foods at low pH. Addition of WPI to Chl-Zn²⁺ may prevent colorant precipitation in acidic solution except around the isoelectric point of WPI. This precipitation was avoided by addition of ALG. These results suggest that the complexation of Chl-Zn²⁺ with WPI and ALG is an effective and simple method for incorporating Chl into aqueous foods, particularly at acidic pH levels such as those found in juices and soft drinks.

The Thesis structure is clear and well-organized. The Introduction reports a well-balanced and, again, clear sketch of the state-of-the-art, thus making the topic easily accessible also to non-experts. The Methods appeared rigorous and properly described. It is undeniable that this Thesis has a remarkable applicative purpose: the results achieved are expected to contribute to the transition of the natural colorant industry towards sustainability.

I am pleased to recommend Caterina Mazzocchi for the admission to the final public defence of her Thesis. Nevertheless, I feel to suggest her to double-check the Thesis for minor inconsistencies (e.g. format style, capital letters, and so on, see below) as well as typos, particularly in the Introduction. A list of corrections, although non-exhaustive, is reported below. A peculiar attention to artwork revision and text accuracy would be desirable. I hope that these comments can assist the Candidate in the final revision process.

Minor revisions

- To improve clarity and ease of reference, I suggested adding a List of Abbreviations at the beginning of the Thesis.
- In the Abstract modify 150ppm and 0ppm with 150 ppm and 0 ppm
- Pag. 5: modify Indeed. this with Indeed, this
- Pag. 5: (Katsarova, 2019).
- Pag. 28-29: modify E140(i) and E140(ii) with E140 (i) and E140 (ii)
- Pag. 38, Fig. 1.5.4. Schematic representation of the properties and benefits of chlorophyll for human health
- Enzyme-Assisted Extraction and Enzyme Assisted Extraction are indifferently used in the text;
- Pag 106, line 278: (0, 1, 2, 3, 5, 7% w/w sugar based);
- Pag 113, line 10: (0-7% w/w sugar based);

- In the last paper submitted to Food Hydrocolloids (Abstract and Conclusion) modify Chl-Zn²⁺ with Chl-Zn²⁺
- Pag 122, line 68: (0-7% w/w sugar based);
- Pag. 139, line 347: The Figure 8 is referenced in the paragraph 3.6 Stability of Chl-Zn²⁺ complexes, however, it is neither included in the captions nor depicted in the artwork
- Pag. 139, line 357: 2007). As mentioned
- In Section 3, Conclusions and Future perspectives, verify “Chl-Zn²⁺”

The thesis is accepted:

- *In the present form*
- *After minor revisions* *X*
- *After major revisions*

With major revisions, is it requested a revised version after 6 months?

- *YES*
- *NO*

Date

5 January 2025

Signature

Teodoro Bararo

PhD Program in Plant and Animal Science, University of Tuscia, Viterbo (Italy)

Coordinator: Prof. Roberta BERNINI

Reviewer report (template)

N.B. The following template should be intended as a flexible model. The actual report may be adapted by the reviewer according to his/her needs.

PhD student: Michele VOMERO

Title of the thesis: IL QUADRO NORMATIVO E REGOLATORIO IN MATERIA DI FONTI ENERGETICHE RINNOVABILI, TRA TUTELA DELL'AMBIENTE E GOVERNO DEL TERRITORIO AGRICOLO NELLA REGIONE PUGLIA E NELLA REGIONE LAZIO

Reviewer (surname, name and affiliation): Marcheggiani Ernesto D3A Università Politecnica delle Marche

Scientific quality	Excellent	Good	Fair	Poor
Originality of the research		X		
Suitability of the title with respect to the content	X			
Efficacy of the abstract		X		
Clarity of the aims	X			
Exhaustiveness of the introduction/state of art		X		
Suitability of the methodology		X		
Description of the experimental procedure		X		
Interpretation of the results		X		
Appropriateness of the discussion		X		
Completeness of references		X		
Overall evaluation		X		

General comments and remarks:

Overall, this work is a good one on the topic. It provides a sound overview of European ecological transition policies and strategies, along with an excellent in-depth look at the Italian context and a well-selected pool of study cases. It's a well-structured contribution to this complex field.

Minors:

- My first advice concerns the requirement to comply with 'Clarity of aims'. Although the research aims are stated in the introduction (from pages 6 to 8) and in the four proceedings published by the candidate, a clear statement of the research aims and objectives should be included in a separate section.

- I also wish to draw the author's attention to the consistency of the "Description of the experimental procedure." The scope of the work looks twofold (analysing literature and sources surfing down from

the European to the national configuration, followed by study cases and GIS exercises), and I am pretty okay with how the author set it off. Although such an approach does not actually need a whole material and methods chapter, a quick section describing your working approach head-to-toe would be worth including. It would be helpful to have one discussing the reasons behind your choices and limitations in more detail, adding a few more specifics.

- Secondly, my attention was caught by the outline of the first two chapters. They aim to provide a solid foundation on the European Union architecture for climate, energy and agriculture -which the author has done comprehensively- however, they lack up-to-date information on the very momentum the Green Deal has been living in these last months. In a particular way, I am referring to the request for a revision of the Green Deal from its basement, as is being loudly requested by several Member States, including Italy. I suggest looking for some up-to-date sources, starting from the official repository of the European Union and tools of the second Ursula Von der Leyen Commission. Specifically, there's not enough discussion of how the ecological transition will be financed, particularly the increasing reliance on financial tools supported by the European Investment Bank (EIB) and raising capital in financial markets. Adding this perspective is crucial for more current and complete analysis, given the growing importance of these tools in European sustainability and green transition policies.

- lastly, Figura 1.2 contains a dead link leading to a Page not found warning https://www.consilium.europa.eu/it/press/press_releases/2020/12/17/multiannual-financial-framework-for-2021-2027-adopted/

The thesis is accepted:

- ***After minor revisions*** .

With major revisions, is it requested a revised version after 6 months?

- ***NO***

Date

08.01.2025

Signature 

PhD Program in Plant and Animal Science, University of Tuscia, Viterbo (Italy)

Coordinator: Prof. Roberta BERNINI

Reviewer report (template)

N.B. The following template should be intended as a flexible model. The actual report may be adapted by the reviewer according to his/her needs.

PhD student:

Title of the thesis:

Reviewer (surname, name and affiliation):

Scientific quality	Excellent	Good	Fair	Poor
Originality of the research		X		
Suitability of the title with respect to the content	X			
Efficacy of the abstract	-	-	-	-
Clarity of the aims		X		
Exhaustiveness of the introduction/state of art	X			
Suitability of the methodology		X		
Description of the experimental procedure		X		
Interpretation of the results		X		
Appropriateness of the discussion		X		
Completeness of references		X		
Overall evaluation		X		

General comments and remarks:

The thesis presents a valuable and in depth work of analysis of the regulatory framework on renewable energy at different levels. Despite this important work, the phase of GIS application is lacking: more details are needed.

Chapter 6 should be improved. While it is clear the phase of data collection, it is unclear the procedure utilized to define the “Aree classifica idonee” (Fig. 6.13).and the “Aree classifica non idonee” (Figura 6.14).

The following figures should be improved:

- Fig. 6.10 needs a legend;
- Fig. 6.11-6.12-6.13-6.13-6.14 need to improved. They cannot be “screenshots” of the GIS software. They should be prepared as maps;
- there two Figures 6.13.

Chapter 7 (Conclusions) should be improved. The conclusions should be related to the whole Ph.D. thesis, not only to the chapter 6.

The thesis is accepted:

- **After minor revisions**

With major revisions, is it requested a revised version after 6 months?

- **NO**

Date 21/01/2025

Signature

A handwritten signature in blue ink, appearing to read "Fábio Sérgio", is written over the "Signature" label.



**DISPOSTO N.7 DELLA COORDINATRICE DEL CORSO DI DOTTORATO DI RICERCA
IN “SCIENZE DELLE PRODUZIONI VEGETALI E ANIMALI” DEL 07.03.2025
ai sensi dell’Art.8, comma c) Regolamento di Ateneo in materia di Dottorato di Ricerca**

Oggetto: proposta di nomina valutatori esterni tesi della Dottoranda di Ricerca Mariam ATAIT (XXXVII ciclo)

In accordo al Regolamento di Ateneo in materia di Dottorato di Ricerca, la Coordinatrice, per motivi di necessità e urgenza, propone al Direttore di Dipartimento la nomina dei seguenti valutatori esterni al Collegio dei Docenti per la Dottoranda di Ricerca del 37° ciclo Mariam ATAIT (Tutor: Prof. Roberto MANCINELLI, Dr. Emanuele RADICETTI).

Valutatori effettivi

Dott.ssa Francesca Nocente, Ricercatrice CREA, E-mail: francesca.nocente@crea.gov.it

Prof. Enrico Francia, Università degli Studi di Modena e Reggio Emilia, E-mail: enrico.francia@unimore.it

Valutatore supplente

Dott.ssa Laura Gazza, Ricercatrice CREA, E-mail: laura.gazza@crea.gov.it

Il presente disposto sarà ratificato alla prima riunione utile del Collegio dei Docenti.

La Coordinatrice

Prof.ssa Roberta BERNINI

roberta

bernini

07.03.2025

18:46:21

GMT+02:00



PhD Program in Plant and Animal Science, University of Tuscia, Viterbo (Italy)

Coordinator: Prof. Roberta BERNINI

Reviewer report (template)

N.B. The following template should be intended as a flexible model. The actual report may be adapted by the reviewer according to his/her needs.

PhD student: Manganello Federico

Title of the thesis: Study of Sustainable Solutions for Apiculture Management in Central Italy

Reviewer (surname, name and affiliation):

Di Prisco Gennaro, CNR-IPSP The Italian National Research Council - Institute for Sustainable Plant Protection, Portici, Napoli, Italy

Scientific quality	Excellent	Good	Fair	Poor
Originality of the research	x			
Suitability of the title with respect to the content		x		
Efficacy of the abstract	x			
Clarity of the aims		x		
Exhaustiveness of the introduction/state of art	x			
Suitability of the methodology	x			
Description of the experimental procedure	x			
Interpretation of the results	x			
Appropriateness of the discussion		x		
Completeness of references	x			
Overall evaluation	x			

General comments and remarks:

The current global climatic conditions make the interpretation of the effects of environmental stress on honey bee colonies increasingly complex. This is reflected in the decision-making system for the actions to be carried out in beekeeping to support bee colonies and their related products. This complex system of activities requires in-depth and multidisciplinary basic research, which has been fully achieved in the present doctoral thesis. The thesis explores the effects of climate change through rigorous experimentation both in the field and in the laboratory, starting with the standardization of experimental procedures to minimize biases due to methodology. The work then delves into the topic of nutrition as a fundamental aspect of bee resilience, through a study of the nutrients (mainly proteins and minerals) present in pollen and their subsequent impact on the physiology of honeybees and the main pathogen related to nutrition (*Vairiormorpha* spp.). The results are linked to breeding programs through instrumental insemination strategies and breeding techniques in the field during the business phase, demonstrating that the combination of all the techniques used provides a feasible approach to addressing the main challenges of ecological and sustainable beekeeping, particularly in central Italy. Furthermore, is presented a scientific paper on the state of the art of precision beekeeping taking into account new technologies supporting modern beekeeping, which integrates perfectly into the thesis. In conclusion, this doctoral thesis has been well-designed, executed with the correct scientific rigor, and well-written. In my opinion, with the small revisions suggested in the text, it is worthy of consideration for the defense of the doctoral title.

The thesis is accepted:

- *After minor revisions (comments are included in the revised pdf file)*

With major revisions, is it requested a revised version after 6 months?

- YES
- NO

31st March, 2025

Signature


PhD Program in Plant and Animal Science, University of Tuscia, Viterbo (Italy)

Coordinator: Prof. Roberta BERNINI

Reviewer report

PhD student: Dott. Federico Manganello

Title of the thesis: Study of Sustainable Solutions for Apiculture Management in Central Italy

Reviewer (surname, name and affiliation): Prof.ssa Giulietta Minozzi, Dipartimento di Medicina Veterinaria e Scienze Animali, Università degli Studi di Milano.

Scientific quality	Excellent	Good	Fair	Poor
Originality of the research	x			
Suitability of the title with respect to the content		x		
Efficacy of the abstract	x			
Clarity of the aims	x			
Exhaustiveness of the introduction/state of art	x			
Suitability of the methodology	x			
Description of the experimental procedure	x			
Interpretation of the results	x			
Appropriateness of the discussion	x			
Completeness of references		x		
Overall evaluation	x			

General comments and remarks:

This doctoral thesis represents an outstanding contribution to the field of apicultural science, offering a comprehensive and innovative exploration of the multifactorial challenges currently affecting beekeeping. The research is scientifically robust, methodologically sound, and very well-written.

The candidate has skillfully integrated several complementary strategies—nutritional supplementation, pathogen management, genetic improvement, and precision beekeeping—into a coherent and forward-looking framework. Particularly noteworthy is the focus on environmentally sustainable and economically viable new approaches, aligning perfectly with the principles of green research as promoted by national directives.

The nutritional studies, especially the work on pollen-based diets with high biodiversity indices, demonstrate a clear understanding of bee physiology and ecology, and offer promising avenues to enhance colony resilience. While the mineral supplementation experiments yielded mixed results, the discussion reveals a mature and critical scientific perspective.

The section of precision beekeeping technologies adds further innovation to the thesis, offering a well-structured and insightful overview of available tools, their economic and practical feasibility, and their potential role in optimizing hive management.

Overall, the thesis is an excellent example of applied research with high relevance and potential impact. I strongly recommend the approval of this thesis and congratulate the candidate on this remarkable achievement.

The thesis is accepted:

- *In the present form.* **X**
- *After minor revisions*
- *After major revisions*

With major revisions, is it requested a revised version after 6 months?

- **YES**
- *NO.* **X**

Date

13/04/2025

Signature



Giulietta Minozzi
Universita' degli Studi di
Milano
13.04.2025 20:52:25
GMT+02:00

PhD Program in Plant and Animal Science, University of Tuscia, Viterbo (Italy)

Coordinator: Prof. Roberta BERNINI

Reviewer report (template)

N.B. The following template should be intended as a flexible model. The actual report may be adapted by the reviewer according to his/her needs.

PhD student: Mariam ATAIT

Title of the thesis: Effects of sustainable agricultural practices on growth, yield and quality of Potato and Durum Wheat grown under different cropping systems

Reviewer: Prof. Enrico FRANCIA, Department of Life Sciences, Università di Modena e Reggio Emilia

Scientific quality	Excellent	Good	Fair	Poor
Originality of the research		X		
Suitability of the title with respect to the content	X			
Efficacy of the abstract	X			
Clarity of the aims	X			
Exhaustiveness of the introduction/state of art		X		
Suitability of the methodology	X			
Description of the experimental procedure	X			
Interpretation of the results	X			
Appropriateness of the discussion	X			
Completeness of references		X		
Overall evaluation	X			

General comments and remarks:

The dissertation addresses a topic of central importance to crop science, as it focuses on improving the sustainability of agricultural practices. By taking as an example two fundamental crops for European and global agriculture (potato and wheat), the thesis examines management practices that can enhance production quality. An interesting aspect was to consider the two species under crop rotation and different soil tillage methods. Likewise, the evaluation of the agroecological effect of changing agronomic practices on the spontaneous flora accompanying the crops is also noteworthy.

The aim of the study was to identify suitable sustainable crop management practices and introduce adaptive measures to combat climate change and global warming to enhance crop yield and quality in the Mediterranean environment. The topics are treated in detail and with appropriate scientific rigor, while the bibliography (with reference to the introduction and general discussion) is sufficiently up-to-date and properly used.

Here are some suggestions (minor revisions) useful to further enhance the quality of the document:

- The objectives listed on pages 12-13 should be numbered from 1 to 4.
- Standardize the formatting style of the references in Chapter 1 (Introduction) to match those in Chapters 2, 3, and 4, while the reference style in Chapters 5 and 6 can remain unchanged.
- In the abstract section of page 40, the phrase in the "Results" paragraph appears incorrect: what does it mean "The 4th International Electronic Conference on Agronomy"?
- A text check of Chapter 7 is recommended, as some typos can be seen in the present version.

The thesis is accepted:

- *In the present form*
- *After minor revisions* X
- *After major revisions*

With major revisions, is it requested a revised version after 6 months?

- YES
- NO X

Date

Reggio Emilia, 21/03/2025

Signature



PhD Program in Plant and Animal Science, University of Tuscia, Viterbo (Italy)

Coordinator: Prof. Roberta BERNINI

Reviewer report

PhD student: Mariam Atait

Title of the thesis: Effects of sustainable agricultural practices on growth, yield and quality of Potato and Durum Wheat grown under different cropping systems

Reviewer (surname, name and affiliation): Nocente Francesca, CREA-Centro di ricerca Ingegneria e Trasformazioni agroalimentari, Roma.

Scientific quality	Excellent	Good	Fair	Poor
Originality of the research	x			
Suitability of the title with respect to the content	x			
Efficacy of the abstract	x			
Clarity of the aims	x			
Exhaustiveness of the introduction/state of art	x			
Suitability of the methodology	x			
Description of the experimental procedure	x			
Interpretation of the results		x		
Appropriateness of the discussion		x		
Completeness of references	x			
Overall evaluation	x			

General comments and remarks:

The PhD thesis of Dr. Mariam Atait covers the current and important topic of sustainable agriculture. In particular, the candidate analyzes the impact of sustainable agricultural practices (reduced tillage, organic fertilization, crop rotation, resistant varieties) on the growth, yield, soil characteristics and quality wheat and potato, in comparison with conventional management. The overall aim of the research was to identify suitable sustainable crop management practices to combat climate change and global warming by enhancing yield and quality of wheat and potato in the Mediterranean area. The thesis reports evidence, through interesting findings, on the effectiveness of the analyzed conservative agriculture strategies in enhancing the productivity and quality of wheat and potato, while preserving soil fertility and natural agroecosystems.

The Thesis structure is well conceived, with a logical sequence of the topics covered, which allows to well interpret the results. The thesis consists in seven chapters. The chapter 1 gives a clear overview of the novel sustainable agriculture practices, including organic farming, reduced soil tillage, crop rotation and selection of resistant varieties, for mitigating the effect of climate change on agriculture production.

Besides the state of art, also research motivation, objectives, scope of the study and structure of thesis are clearly explained in chapter 1.

Chapter 2 consists of a book chapter submitted for publication, which presents scientific evidence from the most recent studies conducted worldwide on the important role of reduced soil tillage and crop rotation in organic management for enhancing soil and food quality and health.

Chapter 3,4, and 5 report three scientific articles published between 2023 and 2025 concerning the effect of fertilization (mineral and organic) and tillage practices (plowing, spading, sub soiling) on wheat and potato cultivation in the mediterranean environment. Specifically, chapter 3 reports a study of two consecutive years, in which the efficacy of different combinations of soil tillage practices/fertilization on two potato genotypes was evaluated, with the objective to enhance plant growth, yield, disease resistance, and soil characteristics. In chapter 4, the two-years study examines the effects of different soil tillage and fertilizer source on potato yield and weed community during two years. In chapter 5, is reported a three-years study on the effect of tillage practices and fertilization sources on the accumulation of Arsenic in durum wheat, which represents a threat to food safety in the Mediterranean area, with the objective of identifying adequate agronomic practices to mitigate this risk. In chapter 6, is reported a manuscript under submission. The objective of the study was to evaluate, over two growing season, the effect of different treatments (i.e. two fungicides and growth regulators, irrigation, organic management) on a set of 27 durum wheat varieties, to select the best performing varieties. The interesting results evidenced the effectiveness of the different treatments and their interactions on the yield, thousand kernel weight, protein, starch and fiber content in the selected durum wheat varieties. Significant performance differences among cultivars were also observed, allowing to select the most performing varieties under specific agroclimatic conditions.

In chapter 7, the final chapter, the general conclusions derived from the results of the research activities are presented.

Some negligible revisions of the thesis are suggested: in the Indices, the font of the characters should be checked; ensure that the names of the journals are italicized consistently throughout all chapters of the thesis; there are several typos throughout the text.

Each chapter is well and clearly written and logically and sequentially organized. All graphical applications, figures and tables are readable and clear.

The methodology and methods are consistent, appropriated and scientifically sound and described in a way that allows reproducing it. The candidate demonstrates a thorough mastery of the experimental methods described and a solid understanding of the state-of-the-art in the research area, derived from an in-depth knowledge of the most important and current literature. This literature was selected based on logical criteria and includes a large number of references related to the topics. The results, obtained through appropriate and robust statistical analysis, are clearly presented and discussed in relation to the

work of other authors, demonstrating a good understanding of the implications of the work in a broader scientific context.

The candidate Dr. Atait is co-author in the chapter book and in the three published papers, and first author in the submitted research paper, thus indicating its contribution in the main aspects of the thesis (conceptualization, methodology, etc.).

In conclusion, the reviewed thesis meets all the requirements for a PhD degree. I recommend that the candidate, Dr. Atait, pass without further examination or amendment, as his thesis presents original results that contribute valuable knowledge to the international scientific community on sustainable agriculture."

The thesis is accepted:

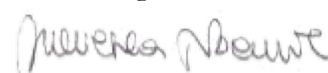
- *In the present form*
- X After minor revisions*
- *After major revisions*

With major revisions, is it requested a revised version after 6 months?

- *YES*
- *NO*

Date 22/03/2025

Signature



PhD Program in Plant and Animal Science, University of Tuscia, Viterbo (Italy)

Coordinator: Prof. Roberta BERNINI

Reviewer report

N.B. The following template should be intended as a flexible model. The actual report may be adapted by the reviewer according to his/her needs.

PhD student: Ludovica Fumelli

Title of the thesis: Approaches to improve firmness in tomato by biotechnological and conventional breeding strategies

Reviewer (surname, name and affiliation): Rodriguez Monica, University of Sassari

Scientific quality	Excellent	Good	Fair	Poor
Originality of the research	x			
Suitability of the title with respect to the content	x			
Efficacy of the abstract	x			
Clarity of the aims	x			
Exhaustiveness of the introduction/state of art	x			
Suitability of the methodology	x			
Description of the experimental procedure	x			
Interpretation of the results	x			
Appropriateness of the discussion	x			
Completeness of references	x			
Overall evaluation	x			

General comments and remarks:

The PhD thesis from dr. Ludovica Fumelli thoroughly explores an important topic related to tomato firmness and shelf life. This topic has significant scientific and economic implications for future research on this species and other fleshy fruit species, for which tomato serves as a model.

The thesis stands out for its excellent organization and clear presentation of research content and analyses. The objectives are well-defined, and the discussion of data aligned with the results contents. The structure is divided into five chapters, starting with a general introduction and following the stages from material selection - leveraging both participatory selection and advanced biotechnological approaches to identify ideal genotypes for analysis - to phenotyping and the identification of candidate genes related to fruit firmness. Of particular interest, the attention posed to local varieties and the importance to further study and exploit these genetic resources. Overall, the topic is approached with thoroughness and methodological rigor, and the results strongly support the final conclusions. The bibliography is comprehensive and up to date.

Below are some considerations/questions that emerged after reading the thesis:

Please consider if it would be valuable to include a final consideration on how the results from the different experiments can be integrated and whether certain approaches or genotypes should be prioritized for identifying or developing improved varieties with enhanced firmness, while also taking into account factors such as time and costs required to achieve these results.

Were landraces investigated in the first chapter and the parental lines evaluated in chapter 5 included in the GWAS panel? It may be interesting to see which are the alleles at the loci targeted for firmness in these genotypes.

Chapter 1:

Pag. 19: citing Posadinu et al., 2022 immediately after the sentence “Italy is one of the richest countries for tomato landraces” may be inappropriate; it should be added at the end of the whole paragraph. An additional suggestion: Posadinu et al 2023 (<https://doi.org/10.1371/journal.pone.0290166>), performed a study on shelf-life of local varieties from Sardinia that may be cited in the Results and discussion section from Chapter 1.

Chapter 2:

I am not an expert of this technology, so I am wondering if you have already an idea on which changes need to be applied to set up a protocol adapted to the landraces used in this experiment.

Minor changes suggested:

Page 18: “In Chapter 3 a CRISPR/Cas9 editing approach [...] metabolism, which effects fruit firmness” -> “In Chapter 3 a CRISPR/Cas9 editing approach [...] metabolism, which **affects** fruit firmness”

Page 30: “Once the bacterium get infected by a virus, a short sequence of the invader-DNA” -> “Once the bacterium **gets** infected by a virus, a short sequence of the invader-DNA”

Page 74: “easily transfer material, knowledge and skills.” -> “easily transfer **materials**, knowledge and skills.”

Page 76: “Missing genotyped were imputed using LD” -> “Missing **genotypes** were imputed using LD”

Page 77: “that fell within an intergenic region the SNPs the effect on the protein” -> “that fell within an intergenic region **the SNP effect** on the protein”

Figure 4.8: maybe the figure can be improved ordering genotypes according to decreasing membership to each group?

Page 86: “Table 4.1. Associated markers in at least two models. X represents the model that gave association for that specific marker. SNPs in the same LD block are evidenced in grey”. No grey highlight visible, at the moment.

Page 87: “for four the corresponding SNP produced a synonymous variant” -> “**four of the** corresponding SNP produced a synonymous variant”

Page 93: “Further analysis will be required” -> “Further **analyses** will be required”

Page 99: In Supplementary Figure S4.2. it might be of help to draw the threshold line for significance.

Page 105: “5.2.1 Plan material” -> “5.2.1 **Plant** material”

Page 127: “even though was obtained under different farming” -> “even **though** was obtained under different farming”

The thesis is accepted:

- *In the present form*
- ~~*After minor revisions*~~
- ~~*After major revisions*~~

With major revisions, is it requested a revised version after 6 months?

- YES
- NO

Date

Signature

Monica
Rodriguez
29.03.2025
19:27:14
GMT+01:00



PhD Program in Plant and Animal Science, University of Tuscia, Viterbo (Italy)

Coordinator: Prof. Roberta BERNINI

Reviewer report (template)

N.B. The following template should be intended as a flexible model. The actual report may be adapted by the reviewer according to his/her needs.

PhD student: Ludovica Fumelli

Title of the thesis: APPROACHES TO IMPROVE FIRMNESS IN TOMATO BY BIOTECHNOLOGICAL AND CONVENTIONAL BREEDING STRATEGIES

Reviewer (surname, name and affiliation): Giovanna Frugis, National Research Council (CNR), Istituto di Biologia e Biotecnologia Agraria (IBBA), Unit of Rome.

Scientific quality	Excellent	Good	Fair	Poor
Originality of the research	X			
Suitability of the title with respect to the content	X			
Efficacy of the abstract	X			
Clarity of the aims	X			
Exhaustiveness of the introduction/state of art	X			
Suitability of the methodology	X			
Description of the experimental procedure	X			
Interpretation of the results	X			
Appropriateness of the discussion	X			
Completeness of references	X			
Overall evaluation	X			

General comments and remarks:

This thesis investigated traditional and innovative breeding methods to improve tomato fruit firmness and quality. It explored the *in vitro* regeneration of three Lazio landraces with poor firmness and short shelf-life, aiming to identify suitable genotypes for genetic transformation. CRISPR/Cas9 gene editing was used to enhance fruit firmness and pathogen resistance by targeting the *SPL* gene encoding a cell wall-remodeling enzyme. The research also identified QTLs and candidate genes for ripening and softening through a genome-wide association study. Additionally, participatory breeding in the framework of a European project led to the selection of improved, more productive lines with better firmness.

Overall, the work conducted in the field of tomato research to improve fruit firmness and quality is excellent and very well-presented.

Only minor revisions need to be addressed, as indicated below.

Page 16: please substitute “didn’t” with “did not”

Page 18: Please substitute “which effects fruit firmness and enhances resistance to pathogens.” with “which affects fruit firmness and enhances resistance to pathogens.”

Page 19: Please divide it into two sentences for clarity. “A field trial was set up to characterize the chosen material for the traits to be improved and an in-vitro experiment, to check the regeneration capacity of the selected material in order to identify the genotypes more suitable for the genetic transformation, was performed for the first time.”

Page 22. Please divide it into two sentences for clarity.: “Since traditional varieties marketability is reduced, as they usually lack commercial attributes that make them suitable for large retailers, and it is common knowledge in the field that big flattened-fruited landraces tend to soften easily, fruit firmness decay occurring during ripening was assessed on SCA, SPA, PAN and CTR varieties at five ripening stages spanning from MG to RR”.

Page 34: Please divide it into two sentences for clarity.: “Since no results about SILOB1 CRISPR/Cas9 editing in tomato landraces are publicly available to date and we wanted to increase our understanding of the effect of SIPL knock out on fruit firmness, shelf-life, cell wall remodeling and pathogen susceptibility, a gene editing approach was set up in three different genetic backgrounds: Scatolone di Bolsena (SCA), Spagnoletta di Gaeta e Formia (SPA) landraces and Micro-Tom (MTO) model varieties, used as control.”

Page 58: Please remove the bracket at the end of the sentence: “knock-out (unpublished data) in tomato).”

Page 66: Please correct Supplementary Table S3.3 that is a mix of Italian and English terms.

Page 79: I would change the following sentence “In our population, the Pearson correlation revealed a significant negative correlation between fruit firmness and fruit weight at all three ripening stages” with “In our population, the Pearson correlation revealed a significant **but weak** negative correlation between fruit firmness and fruit weight at all three ripening stages” because the r values are mostly below 0.4.

Page 90-91: Please divide it into two sentences for clarity: “As *Soly01g108770* is annotated as methyl jasmonate esterase in the ITAG3.2 version and the respective protein shared high percentage of identity with methyl jasmonate esterases from different *Solanaceae* species on blastp (<https://blast.ncbi.nlm.nih.gov/>), the role of this enzymes in fruit ripening has been investigate in the literature, and two papers described as methyl jasmonate application delayed cell wall degradation in raspberries (Shah et al., 2025) and accelerates the fruits ripening process in strawberry (Han et al., 2019).” Here is one possible suggestion: “As *Soly01g108770* is annotated as methyl jasmonate esterase in the ITAG3.2 version, and the respective protein shared high percentage of identity with methyl jasmonate esterases from different *Solanaceae* species on blastp (<https://blast.ncbi.nlm.nih.gov/>), the role of these

PhD Program in Plant and Animal Science, University of Tuscia, Viterbo (Italy)

Coordinator: Prof. Roberta BERNINI

Reviewer report (template)

N.B. The following template should be intended as a flexible model. The actual report may be adapted by the reviewer according to his/her needs.

PhD student: Michela Lupo

Title of the thesis: Tissue culture and biotechnology for the study and valorisation of Mediterranean's fruit biodiversity with a focus on secondary metabolites production

Reviewer (surname, name and affiliation): Regni Luca – Department of Agricultural, Food and Environmental Sciences, University of Perugia

Scientific quality	Excellent	Good	Fair	Poor
Originality of the research	x			
Suitability of the title with respect to the content	x			
Efficacy of the abstract	x			
Clarity of the aims	x			
Exhaustiveness of the introduction/state of art		x		
Suitability of the methodology	x			
Description of the experimental procedure	x			
Interpretation of the results	x			
Appropriateness of the discussion	x			
Completeness of references	x			
Overall evaluation	x			

General comments and remarks:

The present thesis represents a significant and original contribution to plant biotechnology, particularly in the optimisation of micropropagation protocols and the valorization of Mediterranean tree species biodiversity.

The introduction provides a well-contextualized overview of the research topic, effectively outlining the ecological and economic importance of Mediterranean plant biodiversity.

The experimental design is well-structured, employing clearly defined protocols and rigorous statistical analyses to ensure the reliability and reproducibility of the results. The investigation into the effects of LED lighting and media composition on micropropagation and *in vitro* conservation of various tree species not only optimizes experimental protocols but also highlights their potential contributions to ecosystem services (i.e. production of secondary metabolites). The results are systematically presented, thoroughly analyzed, and critically interpreted.

The discussion effectively synthesizes the findings, situating them within the broader scientific literature and drawing well-supported conclusions. The proposed future perspectives highlight the potential for further advancements in the field, demonstrating the candidate's critical engagement with the addressed scientific topic.

The thesis is accepted:

- *X In the present form*
- *After minor revisions*
- *After major revisions*

Date

22 March 2025

Signature

A handwritten signature in black ink, appearing to read "Anne Regan". The signature is written in a cursive, flowing style with a large initial 'A'.

PhD Program in Plant and Animal Science, University of Tuscia, Viterbo (Italy)

Coordinator: Prof. Roberta BERNINI

Reviewer report

PhD student: Michela Lupo

Title of the thesis: Tissue culture and biotechnology for the study and valorisation of Mediterranean's fruit biodiversity with a focus on secondary metabolites production

Reviewer: Chiancone Benedetta, Food and Drug Department

Scientific quality	Excellent	Good	Fair	Poor
Originality of the research		x		
Suitability of the title with respect to the content	x			
Efficacy of the abstract		x		
Clarity of the aims	x			
Exhaustiveness of the introduction/state of art			x	
Suitability of the methodology		x		
Description of the experimental procedure		x		
Interpretation of the results	x			
Appropriateness of the discussion	x			
Completeness of references		x		
Overall evaluation		x		

General comments and remarks:

The thesis is a very interesting discussion on the importance of biodiversity, the methods to valorize and preserve it, resorting to biotechnological methods. Moreover, a really exhaustive evaluation of the use of LED as abiotic elicitor for *vitro*-derived plants has been reported; in particular, up to date, it is the research on the production of non-morphogenic callus as a source of bioactive compounds with proven cytotoxicity activity on human breast cancer cells. Even if the general state of art could be integrated with a wider literature citation, in the studies the state of the art is well presented. The aim of the thesis is very clear. The research papers are of good quality, lacking clarity in some of the methods described, but some of them have been accepted and published in important journals, so their scientific value has already been proven. On the whole, the thesis is well written and represents a step forward in the use of tissue culture, not only for micropropagation and germplasm preservation, but also as a valuable method for the production of bioactive compounds potentially useful in several productive sectors.

The thesis is accepted:

- *In the present form* x
- *After minor revisions*

- *After major revisions*

With major revisions, is it requested a revised version after 6 months?

- *YES*
- *No x*

Date

27/3/2025

Signature

Fredon - Chavane

PhD Program in Plant and Animal Science, University of Tuscia, Viterbo (Italy)

Coordinator: Prof. Roberta BERNINI

Reviewer report (template)

N.B. The following template should be intended as a flexible model. The actual report may be adapted by the reviewer according to his/her needs.

PhD student: Cristiano Tiberi

Title of the thesis: Gestione della fertilità dello scoiattolo grigio (*Sciurus carolinensis*): analisi dei fattori che influenzano l'assunzione di esche contraccettive e sviluppo di tecniche automatizzate di distribuzione selettiva tramite algoritmo di *object detection*

Reviewer (Esposito, Luigi Department of Veterinary Medicine and Animal Productions – University of Napoli Federico II):

Scientific quality	Excellent	Good	Fair	Poor
Originality of the research		X		
Suitability of the title with respect to the content		X		
Efficacy of the abstract			X	
Clarity of the aims		X		
Exhaustiveness of the introduction/state of art		X		
Suitability of the methodology		X		
Description of the experimental procedure		X		
Interpretation of the results		X		
Appropriateness of the discussion		X		
Completeness of references		X		
Overall evaluation		X		

General comments and remarks:

The thesis is accepted:

- *In the present form*
- *After minor revisions X*
- *After major revisions*

With major revisions, is it requested a revised version after 6 months?

- *YES*
- *NO*

minor revisions required

Pagina 18 riga 2 sostituire invasivi con invasivi

Pagina 34 Fig. 12 impaginare meglio la didascalia sotto la foto, nella stessa pagina.

Pagina 72 5.2.6 se si sottolinea il capoverso L'accuratezza (A) bisogna sottolineare tutti i capoversi: La precisione (P) e così via. Se accuratezza e precisione sono con lettera minuscola deve esserlo anche il Richiamo.

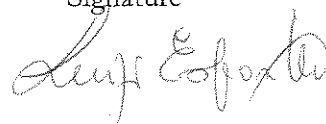
Pagina 74 Tabella 11 formattare in modo che vada su di un'unica pagina.

Pagina 85-96 Verificare tutta la bibliografia con particolare attenzione nel riportare tutti gli anni in parentesi.

Date

11 marzo 2025

Signature



PhD Program in Plant and Animal Science, University of Tuscia, Viterbo (Italy)

Coordinator: Prof. Roberta BERNINI

Reviewer report (template)

N.B. The following template should be intended as a flexible model. The actual report may be adapted by the reviewer according to his/her needs.

PhD student: Cristiano Tiberi

Title of the thesis: Gestione della fertilità dello scoiattolo grigio (*Sciurus carolinensis*): analisi dei fattori che influenzano l'assunzione di esche contraccettive e sviluppo di tecniche automatizzate di distribuzione selettiva tramite algoritmo di *object detection*

Reviewer (surname, name and affiliation): Zaccaroni Marco, Dipartimento di Biologia Università di Firenze

Scientific quality	Excellent	Good	Fair	Poor
Originality of the research	X			
Suitability of the title with respect to the content	X			
Efficacy of the abstract	X			
Clarity of the aims	X			
Exhaustiveness of the introduction/state of art		X		
Suitability of the methodology	X			
Description of the experimental procedure	X			
Interpretation of the results		X		
Appropriateness of the discussion	X			
Completeness of references		X		
Overall evaluation	X			

General comments and remarks:

The management of invasive alien species by oral contraceptives requires an analysis of the ecology of the target species. For this reason, the topic covered in this doctoral thesis is actual and approached according to recent technologies involving artificial intelligence.

The general introduction accompanies the reader in the three-study described. On this part, I suggest inserting the publication of Mori et al. 2016 "Alien Shades of Gray: New West and Relevant Spread of *Sciurus Carolinensis* in Italy" and then updating the distribution map of the grey squirrel in Italy.

The three parts of the thesis are exhaustive, and the results are convincing. Overall, I believe that more emphasis should be given to the risks connected to the use of wildlife oral contraceptives.

Finally, in the third study, the wrong classification by artificial intelligence of grey squirrels could cause the administration of food treated with fertility control drugs to non-target species. Also, in this case, the risk should be carefully considered.

The thesis is accepted:

- *After minor revisions*

With major revisions, is it requested a revised version after 6 months?

- *YES*
- *NO*

Date 01/04/2025

Signature



Firmato
digitalmente da:
MARCO
ZACCARONI
Data: 01/04/2025
16:49:25 CEST

PhD Program in Plant and Animal Science, University of Tuscia, Viterbo (Italy)

Coordinator: Prof. Roberta BERNINI

PhD student: Antonella Cardacino

Title of the thesis: New survey to investigate biotic and abiotic factors involved in the outbreak of Kiwifruit Vine Decline Syndrome (KVDS) in the Latium Region

Reviewer (surname, name and affiliation): Stéphane Compant, AIT Austrian Institute of Technology

Scientific quality	Excellent	Good	Fair	Poor
Originality of the research	x			
Suitability of the title with respect to the content	x			
Efficacy of the abstract	x			
Clarity of the aims	x			
Exhaustiveness of the introduction/state of art	x			
Suitability of the methodology	x			
Description of the experimental procedure	x			
Interpretation of the results	x			
Appropriateness of the discussion	x			
Completeness of references	x			
Overall evaluation	x			

General comments and remarks:

The PhD candidate Antonella Cardacino submitted her PhD thesis for evaluation. The thesis is entitled “New survey to investigate biotic and abiotic factors involved in the outbreak of Kiwifruit Vine Decline Syndrome (KVDS) in the Latium Region”. The thesis starts with a general introduction followed by three scientific chapters, a conclusion, and an acknowledgment section. The thesis is of excellent scientific quality and is very well written.

Within the thesis, there are three chapters dealing with i) Seasonal dynamics of kiwifruit microbiome: A case study in a KVDS-affected orchard; ii) Deciphering Kiwifruit Vine Decline Syndrome: insights into microbial communities, gene expression, and hormonal dynamics; iii) Assessing the fungal rhizosphere microbiome of *Ficus* as a potential replacement crop for KVDS-affected *Actinidia* orchards. The PhD candidate acquired knowledge and know-how on plant pathology, microbiome analyses, microbial functionality, as well as used quantitative PCR to monitor gene expression, and perform assessment of phytohormones and phenolic compounds concentration.

This study provides a comprehensive investigation into the microbial, physiological, and ecological factors influencing Kiwifruit Vine Decline Syndrome. The thesis led to 1 publication in Microbiological

Research in 2025 and we can expect that the two other scientific chapters will be published, as well in, scientific journals. The PhD candidate is congratulated for her research work, and the thesis should be easily defended.

The thesis is accepted:

- *In the present form x*
- *After minor revisions*
- *After major revisions*

With major revisions, is it requested a revised version after 6 months?

- *YES*
- *NO*

Date

31 March 2025



Signature

PhD Program in Plant and Animal Science, University of Tuscia, Viterbo (Italy)

Coordinator: Prof. Roberta BERNINI

Reviewer report (template)

N.B. The following template should be intended as a flexible model. The actual report may be adapted by the reviewer according to his/her needs.

PhD student: Antonella CARDACINO

Title of the thesis: New survey to investigate biotic and abiotic factors involved in the outbreak of Kiwifruit Vine Decline Syndrome (KVDS) in the Latium Region

Reviewer (surname, name and affiliation): Patrice REY, Professor at University of Pau and Pays de l'Adour (UPPA), France

Scientific quality	Excellent	Good	Fair	Poor
Originality of the research	X			
Suitability of the title with respect to the content	X			
Efficacy of the abstracts (in the chapters 2,3 and 4)	X			
Clarity of the aims	X			
Exhaustiveness of the introduction/state of art	X			
Suitability of the methodology	X			
Description of the experimental procedure	X			
Interpretation of the results	X			
Appropriateness of the discussion	X			
Completeness of references	X			
Overall evaluation	X			

General comments and remarks:

The PhD candidate, Antonella CARDACINO, submitted her thesis manuscript for evaluation. This manuscript, entitled "New survey to investigate biotic and abiotic factors involved in the outbreak of Kiwi Vine Decline Syndrome (KVDS) in the Latium Region", is divided into 4 chapters. The first, which is a general introduction to the subject, deals with the genus *Actinidia*, the evolution of kiwifruit cultivation, KVDS and the complex challenge it represents.

Chapters 2, 3 and 4 are the central core of the thesis and present the results obtained by the PhD student, which are also discussed for their relevance. Chapter 2: "Seasonal dynamics of the kiwifruit microbiome: A case study in a KVDS-affected orchard" was published in *Microbiological Research* in 2025. The other two chapters (3 and 4) are expected to be published in peer-reviewed scientific journals.

In my opinion, this work is clearly structured, pleasant to read and often illustrated with drawings and figures. The novelty of the project and its relevance to the scientific community, but also to farmers struggling with KVDS that is very difficult to control, are

important. The solution proposed in Chapter 4, replacing kiwifruit with other tree species, underlines the difficulty of controlling KVDS.

The PhD candidate, Antonella CARDACINO, has developed this thesis in a well-organised manner, with innovative approaches and using many different techniques. The candidate has shown a maturity in research and scientific writing that certainly deserves high recognition. My assessment of this scientific work is therefore extremely positive, and the thesis should be easy to defend.

The thesis is accepted:

- *In the present form: Yes*
- ~~*After minor revisions*~~
- ~~*After major revisions*~~

Date 15 April 2025

Signature

A handwritten signature in blue ink, consisting of stylized, flowing letters that appear to be 'S' and 'C'.

Documento di analisi dei risultati relativi agli indicatori ANVUR (SMA PhD)

Corso di Dottorato di Ricerca in Scienze delle Produzioni Vegetali e Animali 2024

Indicatori ANVUR¹

Descrizione Indicatore	Valore indicatore <i>DOTTORATO</i>		Valore indicatore <i>MACROREGIONALE</i>		Valore indicatore <i>NAZIONALE TRADIZIONALE</i>	
Percentuale di iscritti al primo anno di Corsi di Dottorato che hanno conseguito il titolo di accesso in altro Ateneo (D.M. 1154/2021)	2019	36,36	2019	39,38	2019	39,89
	2020	30,00	2020	42,87	2020	41,90
	2021	36,84	2021	41,81	2021	41,64
	2022	27,78	2022	43,57	2022	40,48
	2023	46,15	2023	48,60	2023	44,48
Percentuale di dottori di ricerca che hanno trascorso almeno tre mesi all'estero (D.M. 1154/2021)	2019	33,33	2019	19,67	2019	26,38
	2020	20,00	2020	20,51	2020	28,96
	2021	33,33	2021	17,84	2021	26,93
	2022	0,00	2022	14,85	2022	19,58
	2023	33,33	2023	18,47	2023	27,31
Percentuale di borse finanziate da Enti esterni	2019	0,00	2019	0,00	2019	2,24
	2020	0,00	2020	1,66	2020	5,67
	2021	0,00	2021	2,52	2021	5,76
	2022	100,00	2022	59,78	2022	64,30
	2023	100,00	2023	63,93	2023	69,77
Percentuale di dottori di ricerca che hanno trascorso almeno sei mesi del percorso formativo in Istituzioni pubbliche o private diverse dalla sede dei Corsi di Dottorato di Ricerca (include mesi trascorsi all'estero)	2019	0,00	2019	12,74	2019	18,20
	2020	0,00	2020	13,86	2020	21,58
	2021	16,67	2021	12,95	2021	22,15
	2022	0,00	2022	17,54	2022	20,16
	2023	22,22	2023	15,67	2023	22,94
Rapporto tra il numero di prodotti della ricerca generati dai dottori di ricerca degli ultimi tre cicli conclusi e il numero di dottori di ricerca negli ultimi tre cicli conclusi	2019	1,17	2019	10,48	2019	11,10
	2020	2,80	2020	11,79	2020	11,89
	2021	2,33	2021	13,96	2021	12,67
	2022	0,33	2022	11,98	2022	13,05
	2023	1,00	2023	10,99	2023	11,39

Presenza di un sistema di rilevazione delle opinioni dei dottorandi durante il corso e a 1 anno dal conseguimento del titolo	SI	
Utilizzo delle opinioni dei dottorandi nell'ambito della riformulazione/aggiornamento dell'organizzazione del Corso di Dottorato di Ricerca	SI	Le opinioni dei dottorandi rilevate nel mese di gennaio 2024 sono state utilizzate nella riformulazione/aggiornamento dell'organizzazione del Corso di Dottorato di Ricerca relativamente all'AA 2024/2025, in corrispondenza dell'attivazione 40° ciclo.

¹ Fonte: Cruscotto Indicatori Università (ANVUR) al 28.01.2025

		In particolare, l'offerta formativa è stata ampliata per soddisfare le diverse aree tematiche di ricerca con l'introduzione di corsi di statistica avanzata per l'elaborazione dei dati e con i corsi e le iniziative organizzate dallo Spoke 3 - University Education, Industrial PhD Courses, Internationalization del Progetto Rome Technopole, che vede il coinvolgimento di Atenei, Enti di ricerca ed imprese della Regione Lazio. Inoltre, è stata avviata la ricognizione degli spazi disponibili ai Dottorandi e della strumentazione del Dipartimento.
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Altri indicatori

Descrizione indicatore	Valore indicatore 2023/2024	Valore indicatore 2022/2023	Valore indicatore 2021/2022
Percentuale di iscritti che hanno conseguito il titolo di accesso all'estero	15,38	11,11	14,29
Percentuale di iscritti che hanno acquisito il titolo di accesso in altre Università italiane	36,36	16,67	28,57
Percentuale di iscritti con borsa ponderati con peso borse su totale iscritti	100	100	90,47

ANALISI

INDICATORE Percentuale di iscritti al primo anno del Corso di Dottorato che hanno conseguito il titolo di accesso in altro Ateneo (D.M. 1154/2021)

COMMENTO

Analisi sintetica dell'andamento dell'indicatore e del confronto con i dati di riferimento macroregionale e nazionale tradizionale. L'indicatore del Corso di Dottorato di Ricerca in Scienze delle Produzioni Vegetali e Animali (d'ora in poi indicato "Corso di Dottorato"), riferito al quinquennio 2019-2023, mostra un andamento alternante rispetto ai dati di riferimento macroregionale e nazionale tradizionale che presentano un andamento regolare crescente. Il valore minimo dell'indicatore del Corso di Dottorato (27,78%) è riferito al 2022; il massimo (46,15%) al 2023, evidenziando un significativo incremento (+39,8%). L'indicatore del 2022 è inferiore a quello macroregionale (43,57%) e nazionale tradizionale (40,48%), mentre quello del 2023 è in linea con i due set di dati di riferimento (48,60 e 44,48% rispettivamente per macroregionale e nazionale tradizionale).

Cause di criticità. I dati non soddisfacenti dell'indicatore in esame relativamente al 2022, già evidenziati nel "Documento di analisi dei risultati relativi agli indicatori ANVUR 2023", sono stati attribuiti ad una non adeguata pubblicizzazione del bando di concorso per l'ammissione ai Corsi di Dottorato, in parte causata dalla tardiva emanazione da parte dell'Ateneo, che spesso ha incluso il mese di agosto.

Azioni di miglioramento. L'anticipazione dell'emanazione del bando di concorso da parte dell'Ateneo ed una più capillare diffusione dello stesso da parte del Collegio dei Docenti del Corso di Dottorato, del Dipartimento e dell'Ateneo, sia sui canali istituzionali che sui social, hanno prodotto il risultato atteso, portando nel 2023 ad un significativo incremento dell'indicatore in esame (+39,80%). Tali azioni saranno potenziate o almeno mantenute per i cicli successivi.

INDICATORE Percentuale di dottori di ricerca che hanno trascorso almeno tre mesi all'estero (D.M. 1154/2021)

COMMENTO

Analisi sintetica dell'andamento dell'indicatore e del confronto con i dati di riferimento macroregionale e nazionale tradizionale. L'indicatore del Corso di Dottorato evidenzia un andamento alternante che varia dal 33,33% negli anni 2019, 2021 e 2023 al 20% nel 2020 rispetto all'andamento pressoché regolare degli indicatori macroregionale e nazionale tradizionale. Tuttavia, rispetto ai dati di riferimento, il Corso di Dottorato ha valori superiori sia rispetto all'indicatore macroregionale (2019: 19,67%; 2021: 17,84%; 2023: 18,47%) che a quello nazionale tradizionale (2019: 26,38%; 2021: 26,93%; 2023: 27,31%). Nel 2022 si evidenzia un dato minimo sia per l'indicatore macroregionale (14,85%) che per quello nazionale tradizionale (19,58) e pari a zero per il Corso di Dottorato.

Cause di criticità. Generalmente, i Dottorandi svolgono il periodo di studio e ricerca all'estero nel secondo e nel terzo anno del percorso triennale. I dati critici del 2022 si riferiscono agli iscritti del 34° ciclo che hanno svolto il percorso triennale nel pieno dell'emergenza da COVID-19 (01.11.2019 - 31.10.2021). Pertanto, i Dottorandi che a febbraio/marzo 2020 si trovavano all'estero sono stati costretti a rientrare in sede indipendentemente dal termine previsto; gli altri sono stati costretti ad annullare tali attività, pur avendole programmate.

Azioni di miglioramento. Usciti dall'emergenza da COVID-19, il Collegio dei Docenti, attraverso i tutor, ha raccomandato fortemente la ripresa della mobilità internazionale ai Dottorandi per un periodo di studio e ricerca di almeno tre mesi. Dai dati del 2023 si evince il successo di questa azione. I dati non ancora riportati per il 2024 e il 2025 evidenziano una tendenza in crescita, anche in considerazione delle posizioni di Dottorato finanziate dal PNRR che prevedono obbligatoriamente un periodo di 6 mesi all'estero.

INDICATORE Percentuale di borse finanziate da Enti esterni

COMMENTO

Analisi sintetica dell'andamento dell'indicatore e del confronto con i dati di riferimento macroregionale e nazionale tradizionale. L'indicatore del Corso di Dottorato evidenzia valori che vanno da zero negli anni 2019, 2020 e 2021 a 100% nel 2022 e 2023; i dati degli indicatori macroregionali risultano crescenti da zero nel 2019 a 59,78% nel 2022 e 63,93% nel 2023; analogamente, quelli degli indicatori nazionale tradizionale sono crescenti da 2,24% a 64,30% nel 2022 e 69,77% nel 2023. Gli indicatori del Corso di Dottorato evidenziano un trend crescente e superiore ai dati di riferimento, a dimostrazione del rilevante numero di collaborazioni scientifiche che i componenti del Collegio dei Docenti hanno instaurato con gli Enti di ricerca esterni, in particolare CNR, CREA, ENEA e Regione Lazio.

Cause di criticità. Nessuna.

Azioni di miglioramento. L'azione da attuare consiste nel mantenere l'indicatori a valori così elevati rafforzando ed incrementando le collaborazioni scientifiche esterne.

INDICATORE Percentuale di dottori di ricerca che hanno trascorso almeno sei mesi del percorso formativo in Istituzioni pubbliche o private diverse dalla sede dei Corsi di Dottorato di Ricerca (include mesi trascorsi all'estero)

COMMENTO

Analisi sintetica dell'andamento dell'indicatore e del confronto con i dati di riferimento macroregionale e nazionale tradizionale. L'indicatore del Corso di Dottorato evidenzia un andamento variabile che va dallo zero negli anni 2019, 2020 e 2022 al 16,67% nel 2021 e 22,22% del 2023 rispetto all'andamento pressoché regolare degli indicatori di riferimento per i quali si rilevano valori superiori sia per l'indicatore macroregionale (da 12,74% nel 2019 al 17,54% nel 2023) che per quello nazionale tradizionale (dal 18,20% nel 2019 al 22,94% nel 2023).

Cause di criticità. L'indicatore è correlato principalmente al numero di posizioni cofinanziate/finanziate da Istituzioni pubbliche o private che prevedono la mobilità dei Dottorandi presso le rispettive sedi. I dati pari a zero del 2019 e del 2020 sono correlabili a quelli dell'indicatore "Percentuale di borse finanziate da Enti esterni"; per il dato critico del 2022, associato alla pandemia da COVID-19, vale quanto già detto per l'indicatore "Percentuale di dottori di ricerca che hanno trascorso almeno tre mesi all'estero".

Azioni di miglioramento. Usciti dall'emergenza da COVID-19, il Collegio dei Docenti, attraverso i tutor, ha raccomandato fortemente la ripresa della mobilità dei Dottorandi presso le Istituzioni pubbliche o private diverse. L'indicatore del 2023 evidenzia che tale azione è stata efficace. I dati non ancora riportati per il 2024 e il 2025 evidenziano una tendenza in crescita in considerazione delle posizioni di Dottorato finanziate dal PNRR che prevedono obbligatoriamente un periodo di 6 mesi presso tali Istituzioni.

INDICATORE Rapporto tra il numero di prodotti della ricerca generati dai dottori di ricerca degli ultimi tre cicli conclusi e il numero di dottori di ricerca negli ultimi tre cicli conclusi

COMMENTO

Analisi sintetica dell'andamento dell'indicatore e del confronto con i dati di riferimento macroregionale e nazionale tradizionale. Gli indicatori del Corso di Dottorato sono estremamente bassi, variando dallo 0,33% del 2022 al 2,80% del 2020, rispetto agli indicatori di riferimento per i quali si rilevano valori significativamente superiori sia a livello macroregionale (da 10,48% nel 2019 al 13,96% nel 2021) che nazionale (dal 11,10% nel 2019 al 13,05% nel 2022).

Cause di criticità. Gli indicatori del Corso di Dottorato sono pesantemente sottostimati rispetto a quelli oggettivi desumibili sia dalle schede di attività svolte compilate dai Dottorandi ed esaminate dal Collegio dei Docenti nella fase di ammissione all'esame finale per il conseguimento del titolo di Dottore di Ricerca che dalle banche dati internazionali. Questa pesante sottostima, discussa anche con la CEV ANVUR nel corso della Visita di Accreditamento Periodica è attribuibile alla mancata registrazione dei Dottorandi di Ricerca sul sito LoginMIUR da cui ANVUR ha estrapolato i dati.

Azioni di miglioramento. L'Ateneo ha messo in atto una serie di azioni atte a far registrare i Dottorandi sulla piattaforma OpenSpace-Unitus in modo da trasferire i dati della produzione scientifica, costantemente aggiornata, sul sito LoginMIUR.

INDICATORE Percentuale di iscritti che hanno conseguito il titolo di accesso all'estero

COMMENTO

L'indicatore del Corso di Dottorato, fornito dall'Ufficio Post Lauream, non risulta elevato: varia dall'11,11% per l'AA 2022/2023 al 15,38% dell'AA 2023/2024 passando per il 14,29% nell'AA 2021/2022.

Cause di criticità. La non elevata percentuale di iscritti al primo anno del Corso di Dottorato che hanno conseguito il titolo di accesso all'estero, già rilevata nel "Documento di analisi dei risultati relativi agli indicatori ANVUR 2023", può essere attribuita ad una non adeguata pubblicizzazione del bando di concorso di ammissione all'estero.

Azioni di miglioramento. Nell'AA 2023/2024 l'indicatore è incrementato. In questi ultimi anni, l'Ateneo e il Dipartimento stanno attuando molteplici azioni per promuovere l'internazionalizzazione sia con l'attivazione di Corsi di Laurea Internazionali che dal punto di vista della ricerca con i progetti europei ed internazionali da cui reclutare candidati stranieri per il bando di ammissione al Corso di Dottorato.

INDICATORE Percentuale di iscritti che hanno acquisito il titolo di accesso in altre Università italiane

COMMENTO

L'indicatore del Corso di Dottorato, fornito dall'Ufficio Post Lauream, non è elevato: varia dal 16,67% dell'AA 2022/2023 al 36,36% dell'AA 2023/2024 mentre risulta 28,57% nell'AA 2021/2022.

Cause di criticità. Anche la non elevata percentuale di iscritti al primo anno del Corso di Dottorato che hanno conseguito il titolo di accesso presso altre Università italiane, già rilevata nel "Documento di analisi dei risultati relativi agli indicatori ANVUR" 2023, può essere attribuita ad una non adeguata pubblicizzazione dei bandi di concorso.

Azioni di miglioramento. Nell'AA 2023/2024 l'indicatore è aumentato in modo significativo. L'anticipazione dell'emanazione del bando di concorso per l'ammissione al Corso di Dottorato permette una maggiore diffusione dello stesso sia attraverso i canali istituzionali che i social.

INDICATORE Percentuale di iscritti con borsa ponderati con peso borse su totale iscritti

COMMENTO

L'indicatore del Corso di Dottorato, fornito dall'Ufficio Post Lauream, è elevato: varia dal 90,47% dell'AA 2021/2022 al 100% dell'AA 2022/2023 e dell'2023/2024.

Cause di criticità. Non sono presenti.

Azioni di miglioramento. Il Collegio dei Docenti applica il criterio del cofinanziamento tra Ateneo, Enti di ricerca pubblici e privati, imprese per l'attivazione delle posizioni con borsa. Ricorre alle posizioni senza borsa solo quando rappresentano l'unico strumento formativo nell'ambito di specifiche collaborazioni scientifiche. La scelta è correlata al fatto che i titolari di posizioni senza borsa tendono ad abbandonare il percorso formativo prima del completamento. In ogni caso, il numero delle posizioni senza borsa rispetta il limite previsto dal DM 226/2021. Il Collegio dei Docenti si propone di mantenere elevato tale indicatore, continuando ad attuare il suddetto criterio.