

**SCHEDA DELLE ATTIVITÀ SVOLTE NEL CORSO DI DOTTORATO DI RICERCA/
ACTIVITIES SHEET CARRIED OUT DURING THE PhD COURSE**

(1) INFORMAZIONI GENERALI DEL DOTTORANDO/GENERAL INFORMATION OF THE PhD STUDENT	
Cognome e nome/Surname and name	Tafuri Andrea
Corso di Dottorato/PhD course	PhD PROGRAMME IN PLANT AND ANIMAL SCIENCES
Matricola/Student ID number	804219
Ciclo/Cycle	<input type="checkbox"/> XXXIV <input checked="" type="checkbox"/> XXXV
Posizione/Position	<input checked="" type="checkbox"/> con borsa di studio/with scholarship <input type="checkbox"/> senza borsa di studio/without scholarship <input type="checkbox"/> altro/other

(2) ATTIVITA' DI RICERCA/RESEARCH ACTIVITY	
Cognome e nome del tutor (o dei tutor)/ Supervisor(s) surname and name	Cerioti Aldo, Baldoni Elena, Ravaglia Stefano
Università, Ente di Ricerca, Azienda/ University, Research institution, Company	Consiglio Nazionale delle ricerche – Istituto di biologia e biotecnologia agraria e Società Italiana Sementi
Breve descrizione dell'attività di ricerca/Short description of the research activity (Max 2500 caratteri, esclusi gli spazi/Max 2500 characters, excluded spaces)	
<p>Acrylamide (AA), an odourless, organic and water-soluble molecule, has been detected as a food-processing contaminant in a wide range of foods that have been exposed to high temperatures (<i>e.g.</i>, fried, baked, roasted). Due to its classification as probable human carcinogen, many efforts are being made to decrease its content in foods. AA is generated during Maillard cascade reactions involving free reducing sugars and free asparagine (fAsn), which has been identified as the limiting factor in AA formation in wheat derivatives. Therefore, the control of fAsn content is of great interest in contemporary crop and food sciences. This PhD project is aimed to study the natural variation i fAsn levels in durum (<i>Triticum turgidum</i> L. ssp. <i>durum</i> (Desf.) and bread (<i>Triticum aestivum</i> L.) wheat grains, and to identify candidate genes involved in fAsn accumulation in wheat seeds</p> <p>Three research activities related to these goals were carried out.</p> <p>The first activity aimed to explore genetic diversity in relation to fAsn content in durum wheat. To this purpose, 201 durum wheat genotypes, which originate from 35 different countries, were selected from an international collection (the Global Durum Panel). To increase genetic variability, a large number of durum wheat <i>landraces</i> were included in the study. The 201 genotypes were sown in experimental fields located in Fiorenzuola d'Arda for three years. Wholemeal flour was obtained from harvested grains and fAsn was measured. The analysis showed the presence of a good variability for this trait in the chosen population, with a fAsn content ranging from 0.16 to 4.73 mmol/Kg dry matter. A multi-locus genome-wide association study was performed to identify genomic regions associated with fAsn content. Single nucleotide polymorphisms (SNPs) on chromosomes 6A,7A,2B,4B,7B associated with grain fAsn content were identified.</p>	

A second study aimed to characterise elite varieties of bread wheat, relevant for Italian market, to identify genotypes with contrasting fAsn accumulation levels, and to evaluate their AA-forming potential. Eighteen bread wheat varieties, grown in 3 different Italian locations for 2 agronomic years, were analysed for fAsn content. Four genotypes were selected for their contrasting levels of fAsn accumulation: 2 genotypes showed low fAsn accumulation and 2 genotypes showed high fAsn accumulation across years and cultivation environments. AA content was measured in pizza produced using these genotypes, in order to assess the third activity of the PhD project consisted in setting up a gene editing protocol in durum wheat. To this purpose I spent 5 months at Rothamsted Research (Harpenden, Hertfordshire, UK) in the laboratory of Prof. Nigel G. Halford. During this period, 3 gRNAs for CRISPR/Cas9 were designed to target the first exon of *TdASN2* gene, a key gene in asparagine synthesis which is expressed at late stages of seed development. After the assembly of the vectors, particle bombardment technology was applied to deliver DNA into immature embryos. More than 700 immature embryos were bombarded and 10 plants completely regenerated from callus. The activity is still ongoing, and the results obtained so far have evidenced the need to optimise selection media for regeneration and transformant selection.

(3) PRINCIPALI ATTIVITÀ FORMATIVE SVOLTE/MAIN TRAINING ACTIVITIES

(Elencare tutte le principali attività svolte e, per ciascuna di esse, indicare i dati richiesti/List the main activities and for each specify of them the requested data)

Partecipazione a seminari, corsi, convegni, workshop, scuole/Partecipation in seminars, courses, conferences, workshop, schools	Titolo/Title	Località/Location	Data, ore o giorni/Date, hours or days
Trainin course	"Genomic-selection assisted of Wheat"	Bologna (BO)	28 th -29 th October 2019
Annual Meeting	"CREA-GB IV Annual Meeting"	Fiorenzuola d'Arda (PC)	16 th -17 th -18 th December 2019
UniMi course	"Novel strategies to accelerate crop improvement"	Milan (MI)	January 28 th - February 13 th 2019
CNR-IBBA project meeting	"sPATIAL ³ presentation conference"	Milan (MI)	4 th February 2020
UniTus course	"Genetica e fisiologia della produzione"	On-line	8 th -12 th June 2020
UniTus course	"introduzione alla statistica descrittiva"	On-line	8 th -11 th June 2020
SIGA meeting	"SIGA Young Web Meeting"	On-line	7 th July 2020
UniTus course	"Meccanismi di difesa delle piante"	On-line	9 th - 12 th July 2020
UniTus course	"Disegni sperimentali"	On-line	13 th - 15 th July 2020
UniTus course	"Principi di scrittura scientifica"	On-line	13 th - 15 th July 2020
Congress	Virtual Durum Meetings (VDMs) 1 st edition	On-line	27 th - 28 th July 2020

Meeting	"SIGA Commemorative Online Congress"	On-line	23 rd September 2020
Meeting	"SURF Kick-off Meeting"	On-line	29 th September 2020
Webinar	"Horizon Europe: strumento di attuazione di obiettivi politici, scientifici e strategici dell'UE – novità e opportunità per la rete scientifica"	On-line	29 th April 2021
UniTus course	"Plagas emergentes de interés para la agricultura en la UE"	On-line	October - December 2020
Congress	Virtual Durum Meetings (VDMs) 2 nd edition	On-line	30 th November- 1 st December 2020
Web symposium	"Web symposium on plant health"	On-line	16 th December 2020
Web workshop	"Young scientists for plant health"	On-line	16 th December 2020
Webinar	"Innovazione tecnologica e ruolo della ricerca pubblica nel settore sementiero italiano: il caso del frumento duro"	On-line	19 th February 2021
Webinar	"Efforts to obtain cereals and/or pseudocereals with better performance, grain composition or quality"	On-line	4 th March 2021
Webinar	Polyphenol oxidase genes as integral part of the evolutionary history of domesticated tetraploid wheat"	On-line	17 th March 2021
UniTus course	"Statistica Base con R"	On-line	24 th -27 th May 2021
UniTus course	"Statistica Avanzata con R"	On-line	31 st May- 4 th June 2021
UniTus course	"Tecniche molecolari innovative per lo studio del microbioma del latte e del formaggio"	On-line	15 th -27 th June 2021
UniTus course	"Approccio metabolomico per la caratterizzazione e la valorizzazione dei"	On-line	14 th -22 nd June 2021

	prodotti agroalimentari"		
UniTus course	"Determinazione della sequenza aminoacidica utilizzando la spettrometria di massa"	On-line	14 th -22 nd June 2021
UniTus course	"Tecniche di ingegneria genetica e proteica abbinate alle produzioni animali e vegetali"	On-line	17 th -23 rd June 2021
Congress	"Plant Biology Europe 2021" Virtual Conference	On-line	28 th June – 1 st July 2021
Congress	Virtual Durum Meetings (VDMs) 3 rd edition	On-line	20 th -21 st July 2021
Congress	"LXIV Convegno annuale SIGA"	On-line	14 th -16 th September 2021
CNR-IBBA project meeting	"sPATIAL ³ WP1 Meeting"	Milan (MI)	29 th September 2021
Workshop	"Virtual Ensembl Plants Browser Workshop"	On-line	2nd-3rd-4th November 2021
Workshop	"Virtual Ensembl Plants REST API course"	On-line	9th-10th-11th November 2021
Webinar	"30 years of Genetic Mapping in Rice - Science, Sustainability and Sanity BBSRC Institutional Sponsorship Fund Seminar"	On-line	17th February 2022
Symposium	"Rothamsted PhD symposium"	Rothamsted Conference hall (Rothamsted Research, England,UK)	1st-2nd March 2022
Workshop	AAB-PlantED training school on communicating the science of GE crops	Rothamsted Conference hall (Rothamsted Research, England,UK)	28th-29th April 2022
Congress	Acrylamide reduction in foods, from plant breeding to food processing	Discovery Park, Kent, UK	23rd-24th May 2022
Workshop	PlantEd WG1 Online Lecture Series	On-line	25th May 2022

UniTus course	"Corso Metodologie avanzate applicate ai processi di trasformazione alimentare"	On-line	6th-9th June 2022
Workshop	"Biotecnologie e adempimenti normativi - Le Neuroscienze applicate alla Sicurezza"	Milan (MI)	22nd June 2022
Workshop	Wheat Geneticd and genomics Workshop	Fiorenzuola d'Arda (PC)	23rd-24th June 2022
Congress	"LXIV Convegno annuale SIGA"	Piacenza (PC)	6th-9th September 2022
Webinar series	Webinar dedicated to the COST action: ACRYRED	On-line	15th September 2022
CNR-IBBA course	Statistical learning and deep learning: theoretical background and hands-on sessions.	Milan (MI)	30th-31st January 2023

(4) ATTIVITÀ DI DIDATTICA E DI RICERCA/TEACHING AND RESEARCH ACTIVITIES (Elencare tutte le attività svolte e, per ognuna, indicare i dati richiesti/List all activities and specify for each of them the requested data)	
Attività di tutoraggio e didattico-integrative/Tutorship activities (Specificare/Specify)	Tutoring of a bachelor's degree internship (Marco Libanore, University of Milano Bicocca)
Seminari/Seminars (Indicare il titolo, la località, la data/Specify the title, the location and the date)	
Pubblicazioni scientifiche/Scientific publications (Indicare tutte le informazioni bibliografiche dei lavori pubblicati e sottomessi/Indicate all references of published and submitted papers)	Zombardo, C. Crosatti, P. Bagnaresi, L. Bassolino, N.Reshef, S. Puccioni, P. Faccioli, A. Tafuri, M. Delledonne, A. Fait, P. Storch, L. Cattivelli and E. Mica. Transcriptomic and biochemical investigations support the role of rootstock-scion interaction in grapevine berry quality. BMC Genomics (2020) 21:468. https://doi.org/10.1186/s12864-020-06795-5
Comunicazioni a congressi/Conferences communications (Specificare se comunicazioni poster o comunicazioni orali/Specify if poster or oral communications)	<ul style="list-style-type: none"> Poster communication at 62nd SIGA Annual Congress: Tafuri A., Mica E., Giusti L., Faccioli P., Battaglia R., Masiero S., Cattivelli L., Crosatti C. "Identification and functional characterization of barley miR397a regulated during cold acclimation"

- Poster communication at Plant Biology Europe 2021: Tafuri A., Pirona R., Ceriotti A., Ravaglia S., Giordano M., Cagliani L. R., Consonni R., Gasser M., Thomas A., Gilardi F., Rhogayeh N., Mazzucotelli E., Baldoni E. **“Exploring variability in free asparagine content to reduce acrylamide-forming potential of durum wheat seeds”**
- Poster communication at 64th SIGA Annual Congress: Pirona R., Tafuri A., Accotto G. P., Fricano A., Ravaglia S., Giordano M., Marian D., Matic S., Marra M., Vaira A. M., Mazzucotelli E., Rhogayeh N., Ceriotti A., Baldoni E. **“Exploiting the potential of Global Durum Panel for plant and human health”**
- Poster communication at 64th SIGA Annual Congress: Cominelli E., Baldoni E., Bernasconi A., Bernasconi M., Cagliani L. R., Capobianco A., Ceriotti A., Consonni R., Dougué K. R., Ferron L., Galasso I., Genga A., Libanore M., Liberatore C., Locatelli F., Mattana M., Pappalardo V., Pedrazzini E., Pirona R., Pozzo S., Ravasio N., Spatola F., Tafuri A., Zaccheria F., Zuccaro M., Sparvoli F. **“sPATIALS3 project: improvement of primary productions for a healthier diet”**
- Poster communication at 13th International Barley Genetics Symposium: Crosatti C., Tafuri A., Battaglia R., Gazzetti K., Guerra D., Mica E., Cattivelli L. **“The miRNA397a/laccase regulatory module control kernel size and shape in barley”**.
- Poster communication at New Phytologist "Next generation scientists 2022": Tafuri A., Pirona R., Ceriotti A., Zuccaro M., Ravaglia S., Giordano M., Cagliani L.R., Consonni R., Fricano A., Mazzucotelli E., Baldoni E. **“Genome wide association study of free asparagine content in durum wheat grain”**.
- Poster communication at 65^o SIGA Annual Congress: Crosatti C., Tafuri A., Battaglia R., Gazzetti K., Guerra D., Mica E., Cattivelli L. **“The miRNA397a/laccase regulatory module control kernel size and shape in barley”**

	<ul style="list-style-type: none"> ● Poster communication at 65° SIGA Annual Congress: Tafuri A., Pirona R., Ceriotti A., Zuccaro M., Ravaglia S., Giordano M., Cagliani L. R., Consonni R., Fricano A., Mazzucottelli E., Baldoni E. “Genome wide association study of free asparagine content in durum wheat grain”. <u>Awarded with one of the prizes for best posters communications.</u> ● Poster communication at 4th From Seed to Pasta congress Pirona R., Tafuri A., Marra M., Fricano A., Ravaglia S., Mazzucotelli E., Matic S., Accotto G., Ceriotti A., Baldoni E. “Exploiting the potential of Global Durum Panel for plant and human health”. ● Poster communication at Plant & Animal Genome Conference 2023: Crosatti C., Michelotti V., Tafuri A., Gazzetti K., Guerra D., Cattivelli L., Mica E., Battaglia R. “Identification and functional characterization of key genes influencing yield potential in barley”. ● Oral communication at Acrylamide reduction in foods, from plant breeding to food processing Congress. “Genome wide association study of free asparagine content in durum wheat grain”.
<p>Altre tipologie di pubblicazioni/ Other publications (Specificare/Specify)</p>	
<p>Partecipazione a progetti di ricerca/ Participation in research project (Indicare il titolo e la tipologia/Indicate the title and type)</p>	<ul style="list-style-type: none"> ● sPATIALS³: Miglioramento delle produzioni agroalimentari e tecnologie innovative per un'alimentazione più sana, sicura e sostenibile" Call: “CALL HUB RICERCA E INNOVAZIONE” nell’ambito POR FESR 2014-2020 di Regione Lombardia. Period: 01/02/2020 - 31/07/2022 Funding: Regione Lombardia
<p>Stage in Italia e/o all'estero/ Internship in Itali and/or abroad (Indicare la località e descrivere brevemente il tipo di attività svolta/Indicate the location and describe briefly the activity carried out)</p>	<p>Rothamsted Research (Harpenden, Hertfordshire, AL5 2JQ) at Prof. Nigel G. Halford group (January 2022-May 2022) The aim of the visit is to get trained in wheat genome editing, and to silence the ASN2 genes in durum wheat using the CRISPR/Cas9 genome editing system in order to reduce free asparagine accumulation specifically in the grains, without affecting physiological functions of the plant.</p>



<p>Altre attività formative/ Further educationa activities (Indicare la località e descrivere brevemente il tipo di attività svolta/Indicate the location and describe briefly the activity carried out)</p>	
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Data/Date

03/02/2023

Firma/Signature

to prof. Andrea