

**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	FRANCESCONI SARA
Corso di Dottorato/PhD course	SCIENZE DELLE PRODUZIONI VEGETALI ED ANIMALI (SPVA)
Matricola/Student ID number	
Ciclo/Cycle	<input checked="" type="checkbox"/> XXXIII <input type="checkbox"/> XXXII
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	BALESTRA GIORGIO MARIANO
Università, Ente di Ricerca, Azienda/ University, Research institution, Company	UNIVERSITA' DEGLI STUDI DELLA TUSCIA
Breve descrizione dell'attività di ricerca/Short description of the research activity (Max 2500 caratteri, esclusi gli spazi/Max 2500 characters, excluded spaces)	
<p>Wheat is one of the most economically important cereal crop. FHB is a major threat to wheat and is managed by the application of fungicides at anthesis. Stomatal closure is involved in the first line of defence against pathogens. The first aim of the research was to study the role of stomatal regulation in wheat after <i>F. graminearum</i> inoculation and explore its involvement in FHB resistance. RT-qPCR revealed that genes involved in stomatal regulation are induced in the resistant Sumai3 but not in the susceptible Rebelde cultivar. Seven genes involved in the positive regulation of stomatal closure were up-regulated in Sumai3, but two genes, <i>TaBG</i> and <i>TaCYP450</i>, involved in the negative regulation of stomatal closure, were strongly induced, suggesting that FHB response is linked to cross-talk between the genes promoting and inhibiting stomatal closure. Increasing temperature of spikes in the wheat genotypes and a decrease in photosynthetic efficiency in Rebelde but not in Sumai3 were observed, confirming the hypothesis that photosynthetic parameters are related to FHB resistance. The second aim of the research was the exploitation of the physiological changes (increase in temperature values and changes in chlorophyll content) after FHB infection to early-detect FHB in field to optimize fungicides treatments. We used unmanned aerial vehicle (UAV)-based thermal infrared (TIR) and red-green-blue (RGB) imaging to early detect FHB in durum wheat under natural field conditions. TIR and RGB data correlated with ground-based measurements such as spike's temperature, photosynthetic efficiency and molecular identification of FHB pathogens, demonstrating that these high-throughput phenotyping methodologies detected FHB at anthesis. The third aim of the research was to study an</p>	

eco-sustainable FHB management strategy. This study assayed the antifungal ability of chitosan hydrochloride against *F. graminearum*. Chitosan reduced *F. graminearum* growth and down-regulated the transcript of the major genes involved in the cell growth, respiration, virulence and trichothecenes biosynthesis. Chitosan promoted the germination rate, the root and coleoptile development and the nitrogen balance index in two durum wheat genotypes, Marco Aurelio (FHB-susceptible) and DBC480 (FHB-resistant). FHB severity in DBC480 was of 6% at 21 dpi after chitosan treatments compared to *F. graminearum* inoculated control (20%). The elicitor-like property of chitosan was confirmed by the up-regulation of *TaPAL*, *TaPR1* and *TaPR2*. Chitosan decreased the fungal spread and mycotoxins accumulation. This study demonstrated that the non-toxic chitosan hydrochloride is a powerful molecule with the potential to replace the conventional fungicides. The combination of a moderately resistant genotype (DBC480) with a sustainable compound (chitosan) will open new frontiers for the reduction of conventional compounds in agriculture.

(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/ Participation in seminars, courses, conferences, workshop, schools	Titolo/Title	Località/Location	Data, ore o giorni/ Date, hours or days
Course	English B2	UNITUS, Viterbo, Italy	March-May 2018, 50 hours
Course	Competences and skills of a Ph.D. student – an overview	UNITUS, Viterbo, Italy	January 30-31 and February 6-7 2018, 16 hours
Course	Principles of scientific writing	UNITUS, Viterbo, Italy	July 16-20 2018, 26 hours
Conference	XVIII national conference CIRIAF “sustainable development, environment and human safety protection”	PERUGIA, Italy	April 5-6 2018
Conference	GRIMPP “ Perspectives on the use of modeling approaches in the implementation of the European directive on the sustainable use of plant protection products”	BRESCIA, Italy	December 14 2017

Summer school	Effective management of pests and harmful alien species – integrated solutions	TORINO, Italy	July 2-6 2018, 25 hours
Seminar	Kick-Off meeting MIUR departments of excellence project sustainability of agricultural and forestry systems in the Mediterranean environment in a context of global change	UNITUS, Viterbo, Italy	October 10 2018, 5 hours
Seminar	Wheat: from the field to the table to the intestine	UNITUS, Viterbo, Italy	January 25 2019, 5 hours
Course	Exploratory data analysis with R	UNITUS, Viterbo, Italy	March 13 – April 10 2019, 15 hours
Seminar	Genome editing for a sustainable agriculture	UNITUS, Viterbo, Italy	March 7 2019, 5 hours
Course	Plant metabolomics	IFA-TULLN, Tulln an der Donau, Austria	December 4-8 2019, 48 hours
Course	Plant defense mechanisms	UNITUS, Viterbo, Italy	July 9-12 2020, 8 hours
Course	Experimental designs	UNITUS, Viterbo, Italy	June 10-12 2020, 8 hours

(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)	Subject expert in the Bachelor's Degree Courses in Agricultural and Environmental Sciences (L25) and Seed Production and Nurseries (L25) and in the Master's Degree Courses in Agricultural and Environmental Sciences (LM69) and Biotechnology for Agro Safety and Quality -Food (LM7)
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	<p>for the following courses: Crop protection-module of Plant Pathology, Protection of seeds and nurseries, Eco-sustainable strategies in the protection of agricultural crops-module of strategies in plant pathology, Agro-industrial phytopathological biotechnologies, Relevant Bacterial Plant Diseases.</p> <p>Co-rapporteur for a Master's thesis (SAA LM69) entitled "Evaluation of bacterial strains isolated from the rhizosphere of olive trees affected by CO.DI.R.O. as biocontrol agents of <i>Pseudomonas savastanoi</i> pv. <i>savastanoi</i> and <i>Rosellinia necatrix</i>", candidate Gabriele Pizzileo.</p> <p>Co-rapporteur for a Master's degree thesis (SAA LM 69) entitled "Early diagnosis of fusarium head blight in durum wheat by remote sensing techniques", candidate Linda Felici.</p> <p>Co-rapporteur for a Master's thesis (SAA LM69) entitled "Activity of tannins against <i>Pseudomonas syringae</i> pv. <i>tomato</i> (Pst) and their potential biostimulant activities towards tomato plants", candidate Paolo Canzoniere.</p> <p>Master's thesis tutor (SAA LM69) of an experimental thesis entitled "Innovations in packaging for the sustainable control of the main post-harvest diseases", graduate student Vittorio Fiore, experiment in progress.</p> <p>Tutor of Master's thesis (SAA LM69) of an experimental thesis entitled "Innovative solutions for the control Kiwifruit vine decline graduate student Luigi Valente, experimentation in progress.</p> <p>Tutor of Master's thesis (SAA LM69) of an experimental thesis entitled "Analyses of the soil microbioma in fields affected by Kiwifruit vine decline", graduate student Sonia Iannacci, experimentation in progress.</p>
<p>Seminari/Seminars (Indicare il titolo, la località, la data/Specify the title, the location and the date)</p>	<p>Supplementary seminars for the master's degree course in Agricultural and Environmental Science LM69 as part of the teaching "Eco-sustainable strategies in the protection of agricultural crops - strategies in plant pathology" (a.y. 2018-2019). Topics covered: principles of mycology, infectious mechanisms, resistance mechanisms, case studies of fungal diseases, control strategies, classical, serological and molecular diagnosis, abiotic stress, in-depth analysis of plant defense mechanisms, in-depth analysis of molecular diagnosis (loop mediated isothermal amplification LAMP), in-depth study of techniques for GMO generation and genome editing techniques. UNITUS, Viterbo, March-May 2019, 16 hours.</p>

	<p>Seminar entitled "Sustainable nanotechnologies for plant protection and food safety"; Balestra G. M., Fortunati E., Francesconi S., Schiavi D. ; National day of the bioeconomy, UNITUS Viterbo, 23 May 2019.</p> <p>Seminar entitled "Basic research, technology transfer and sustainability for food security and the protection of agricultural crops"; Balestra G. M., Fortunati E., Francesconi S., Schiavi D.; Sustainability and circular economy; UNITUS Viterbo, 3 June 2019.</p> <p>Seminar entitled "Eco-sustainable strategies for the enhancement of the wheat supply chain"; Francesconi S., Felici L., Sestili F., Balestra G. M.; Sustainability and Bioeconomy Day; UNITUS, Viterbo, 24 September 2020</p>
<p>Pubblicazioni scientifiche/ Scientific publications (Indicare tutte le informazioni bibliografiche dei lavori pubblicati e sottomessi/Indicate all references of published and submitted papers)</p>	<p>Mandalà G., Tundo S., Francesconi S., Gevi F., Zolla L., ceoloni C., D'Ovidio R; 2019, Deoxynivalenol detoxification in transgenic wheat confers resistance to <i>Fusarium</i> head blight and crown rot diseases; <i>Molecular Plant Microbe Interaction</i>; 32(5):583-592; doi.org/10.1094/mpmi-06-18-0155-R.</p> <p>Francesconi S., Mazzaglia A., Balestra G. M.; 2019; Different inoculation methods affect components of <i>Fusarium</i> head blight resistance in wheat; <i>Phytopathologia Mediterranea</i>; 58(3):679-691; doi:10.13128/Phyto-10942.</p> <p>Francesconi S. and Balestra G. M.; 2020; The modulation of stomatal conductance and photosynthetic parameters is involved in <i>Fusarium</i> head blight resistance in wheat; <i>PLoS ONE</i>; 15(6):e0235482; doi.org/10.1371/journal.pone.0235482.</p> <p>Francesconi S., Steiner B., Buerstmayr H., Lemmens M., Sulyok M., Balestra G. M.; 2020; Chitosan hydrochloride decreases <i>Fusarium graminearum</i> growth and virulence and boosts growth, development and Systemic Acquired Resistance in two durum wheat genotypes; <i>Molecules MDPI</i>; 25, 4752, doi:10.3390/molecules25204752.</p> <p>Canzoniere P., Francesconi S., Giovando S., Balestra G. M.; 2020; The antibacterial activity of tannins towards <i>Pseudomonas syringae</i> pv. <i>tomato</i> (Pst) and their potential biostimulant activities on tomato plants; <i>Phytopathologia Mediterranea</i>; In Press (Accepted on 10 October 2020);</p> <p>Bischetti G., Francesconi S., Schiavi D., Fortunati E., Balestra G. M.; Coumarin compound as a green strategy for organic control of tomato bacterial spot; 2020; <i>Journal of Plant Diseases and Protection</i>; under peer review, submission ID JPDP-D-20-00337.</p>

	<p>Belete T., Bastas K. K., Francesconi S., Balestra G. M.; 2020; Biological effectiveness of <i>Bacillus subtilis</i> on common bean bacterial blight; Journal of Plant Pathology; doi.org/10.1007/s42161-020-00727-8</p> <p>Francesconi S., Harfouche A., Maesano M., Balestra G. M.; 2020; UAV-based thermal and RGB imaging combined with molecular diagnostics allowed early detection of Fusarium head blight and gave new insights into the physiological responses to the disease in durum wheat; Frontiers in Plant Science; under peer review, submission ID: 628575.</p> <p>Francesconi S., Di Lorenzo V., Schiavi D., Balestra G. M.; 2021; Inorganic nanomaterials usable in plant protection strategies. In: Nanotechnology-based sustainable alternatives for the management of plant diseases. (Book chapter), Elsevier.</p>
<p>Comunicazioni a congressi/ Conferences communications (Specificare se comunicazioni poster o comunicazioni orali/Specify if poster or oral communications)</p>	<p>Francesconi S., Mazzaglia A., Balestra G. M.; 2018; Evaluation of Fusarium head blight resistances on Italian wheat cvs. by phenotyping and molecular analyses; II Mediterranean Forum for PhD students and young researchers; CIHEAM BARI, September 18-20 2018. (Oral presentation)</p> <p>Francesconi S., Mazzaglia A., Balestra G. M.; 2018; Phenotypic and genotypic studies to evaluate Fusarium head blight type I and type II resistances in Italian wheat cvs.; Journal of Plant Pathology 100:613-653. XXIV Sipav Congress; Ancona, September 5-7 2018. (Poster presentation)</p> <p>Canzoniere P., Francesconi S., Bischetti G., Balestra G. M.; 2019; Evaluation of tannins respect to their biostimulant and antibacterial activity on tomato plants; Journal of Plant Pathology 101:849-883. 4° International symposium on biological control of plant bacterial diseases BIOCONTROL 2019, UNITUS Viterbo, July 9-11 2019. (Oral presentation)</p> <p>Francesconi S., Schiavi D., Fortunati E., Balestra G. M.; 2019 Screening on natural active compounds as an eco-sustainable weapon against different bacterial and fungal plant pathogens; Journal of Plant Pathology 101:849-883. 4° International symposium on biological control of plant bacterial diseases BIOCONTROL2019, UNITS, Viterbo, July 9-11 2019. (Poster presentation)</p> <p>Euticchio G., Fortunati E., Camaioni E., Francesconi S., Schiavi D., Balestra G. M.; 2019; Development of new delivery systems based on derivatized cellulose nanocrystals; Journal of Plant Pathology 101:849-883. 4th International symposium on biological control of plant bacterial diseases BIOCONTROL2019, UNITUS, Viterbo, July 9-11 2019. (Poster presentation)</p>

	<p><u>Francesconi S., Maesano M., Moresi F. V., Harfouche A., Balestra G. M.; 2019; Phenomics analysis and risk prediction of FHB; Journal of Plant Pathology 101:811-848. XXV Sipav Congress, Milan, September 16-18 2019. (Poster presentation)</u></p> <p><u>Francesconi S., and Balestra G. M.; 2019; Natural compounds assessments for eco-sustainable FHB control strategies; Journal of Plant Pathology 101:811-848. XXV Sipav Congress, Milan, September 16-18 2019. (Poster presentation)</u></p> <p><u>Canzoniere P., Francesconi S., Balestra G. M.; 2019; Antibacterial activity of hydrolysable tannins against Pst and their potential biostimulant activities on tomato plants Journal of Plant Pathology 101:811-848. XXV Sipav Congress, Milan, September 16-18 2019. (Poster presentation)</u></p> <p><u>Francesconi S. and Balestra G. M.; 2019; Natural compounds assessments for eco-sustainable Fusarium head blight control strategies; 70th plant breeder's meeting in Gumpenstein, Saatgut, Austria, November 25-27 2019. (Oral presentation)</u></p> <p><u>Francesconi S., Maesano M., Moresi F. V., Harfouche A., Balestra G. M.; 2019; Phenomics analysis and risk prediction of FHB; 70th plant breeder's meeting in Gumpenstein, Saatgut, Austria, November 25-27 2019. (Poster presentation)</u></p> <p><u>Francesconi S., Steiner B., Lemmens M., Buerstmayr H., Balestra G. M.; 2020; Effectiveness of chitosan hydrochloride on organic control of Fusarium head blight of wheat; GPZ symposium digital breeding, Tulln and der Donau, Austria, February 11-13 2020. (Poster presentation)</u></p> <p><u>Francesconi S., Maesano M., Moresi F. V., Harfouche A., Balestra G. M.; 2020; FHB early detection by in-field phenomics; GPZ symposium digital breeding, Tulln and der Donau, Austria, February 11-13 2020. (Poster presentation)</u></p> <p><u>Balestra G. M. and Francesconi S.; 2020; Biological protection and technological innovation; Organic farming for the green new deal, Bologna, October 10 2020. (Oral presentation)</u></p> <p><u>Francesconi S., Steiner B., Buerstmayr H., Lemmens M., Sulyok M., Balestra G. M.; 2020; Chitosan hydrochloride decreases <i>Fusarium graminearum</i> growth and virulence and boosts growth, development and Systemic Acquired Resistance in two durum wheat genotypes; Young Scientists for Plant Health, web workshop, December 16 2020. (Oral presentation)</u></p>
Altre tipologie di pubblicazioni/	

<p>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>	
<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>Internship at University of Natural Resources and Life Sciences Vienna (BOKU), Department of Agrobiotechnology TULLN (IFA-TULLN), Tulln an der Donau, Austria. Title of the research project: "Fusarium head blight resistance in bread and durum wheat, identification and validation for wheat genes involved in the Fusarium head blight resistance response and phenotyping of wheat plant for Fusarium resistance, and the role of Chitosan in induced resistance". 1 October 2019 - 12 March 2020.</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>	<p>"Young Researchers" Award during the SIPAV 2018 conference for the presentation of a poster entitled "phenotypic and genotypic studies to evaluate Fusarium Head Blight type I and type II resistances in Italian wheat cvs." Ancona, 5-7 September 2018.</p> <p>Participation in the European Researchers' Night with a poster entitled "Genetics and natural compounds: the new weapons to fight wheat diseases"; Francesconi S., Mazzaglia A., Balestra G. M., Viterbo, 28 September 2018.</p> <p>Registered in the Plant Pathology Society (SIPaV), February 2018</p> <p>Participation in the European Researchers' Night with a poster entitled "Eco-sustainable and high-tech strategies for the control of agricultural crops"; Francesconi S., Harfouche A., Balestra G. M., Viterbo, 27 September 2019.</p> <p>Member of the organizing committee of the 4th International symposium on biological control of plant bacterial diseases BIOCONTROL2019, UNITUS, Viterbo, 9-11 July 2019.</p>

Data/Date

08/02/2021

Firma/Signature

