Le Corps professoral de Gembloux Agro-Bio Tech - Université de Liège vous prie de lui faire l'honneur d'assister à la défense publique de la dissertation originale que

Madame LI Lin,

Titulaire d’un diplôme de *master of agriculture*,

présentera en vue de l’obtention du grade et du diplôme de

**DOCTEUR EN SCIENCES AGRONOMIQUES ET INGENIERIE BIOLOGIQUE,**

le 20 novembre 2019, à 15h00 précises (personne ne sera admis après cette heure),

en l’auditorium ZI (Zoologie, Bât. 9),

Passage des Déportés, 2, à 5030 GEMBLOUX.

Cette dissertation originale a pour titre :

« Integrated management of wheat aphid and virus by protein elicitor ».

**Le jury est composé comme suit :**

Président : Prof. B. BODSON, Professeur ordinaire,
Membres : Prof. F. FRANCIS (Promoteur), Prof. D. QIU (Copromoteur - CAAS, Chine), Prof. M. ONGENA, Prof. F. VERHEGGGEN, Prof. J. CHEN (CAAS, Chine).
Summary

*Sitobion avenae* is one of destructive aphids on wheat, causing huge loss in agriculture by plant sap consumption and virus transmission. Barley yellow dwarf virus (BYDV) is persistently and circulatively transmitted by aphid and hosted mostly in phloem of Poaceae plants. The wheat aphid, BYDV and wheat compose the system with vector, pathogen virus and host, among which, wheat aphid is the control target. Nowadays, induced resistance has been a hot topic as an alternative of chemical pesticide, which is environmentally friendly and safe to human beings. Protein elicitor is a kind of inducer of plant defense response. In this study, we applied PeaT1 and Hrip1, two compositions of commercial pesticide Atailing, on wheat to detect the control efficiencies on *S. avenae* and BYDV, unveil the mechanism of the protein elicitor induced resistance in wheat.

The main content and results are as follows:

(1) **Determination of protein elicitor induced resistance in wheat against *Sitobion avenae***

Intrinsic rates of increase in 2nd and 3rd generations of *S. avenae* were declined in PeaT1 (2nd generation 0.28±0.01, 3rd generation 0.26±0.01) and Hrip1 (2nd generation 0.28±0.03, 3rd generation 0.25±0.01) treatments compared with control (2nd generation 0.31±0.01, 3rd generation 0.28±0.01). *S. avenae* preferred to colonize on control other than PeaT1 or Hrip1 treated wheat seedlings in host selection test. PeaT1 and Hrip1 treated wheat leaves possessed more trichomes and wax that formed a disadvantageous surface environment for *S. avenae*. Some defense related metabolites were accumulated in protein elicitor treated wheat seedlings. Both salicylic acid (SA) and jasmonic acid (JA) were significantly accumulated in PeaT1 and Hrip1 treated wheat seedlings.

(2) **Determination of protein elicitor induced resistance in wheat against BYDV***

The control efficiencies of both PeaT1 and Hrip1 were over 30% at 14th and 21th day after BYDV inoculation. Q-RT-PCR test showed that mRNA of BYDV coat protein gained less quantity and lower increase rate in PeaT1 and Hrip1 treated wheat seedlings. EPG test showed that virus transmission vector *Schizaphis graminum* performed longer time in finding probe and feeding site in PeaT1 and Hrip1 treated wheat seedlings. Additionally, PeaT1 and Hrip1 treated wheat seedlings gained higher plant height and more chlorophyll a&b.

As a conclusion, both PeaT1 and Hrip1 triggered SA and JA pathways to regulate the defense response in wheat. The surface structure and metabolites of wheat were significantly modified by protein elicitors to reduce reproduction and deter colonization of *S. avenae*. The two protein elicitors inhibited proliferation of BYDV and reduce BYDV transmission ability by *S. graminum*. Additionally, they promoted wheat growth to make up for the biomass loss caused by wheat aphid and BYDV. We can conclude that Atailing, mainly composed by PeaT1 and Hrip1, can be applied in integrated management of wheat aphid and BYDV in the field.