LIÈGE université
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Agro-Bio Tech

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 BAYENDI LOUDIT Sandrine Mariella,

Titulaire d'un diplôme d'ingénieur agronome, option production végétale,
Titulaire d'un diplôme de master complémentaire en protection des cultures tropicales et subtropicales,

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

DOCTEUR EN SCIENCES AGRONOMIQUES ET INGENIERIE BIOLOGIQUE,

le 29 novembre 2017, à 11h15 précises (personne ne sera admis après cette heure),

en l'auditorium Zl (Zoologie, bât. 9),

Passage des Déportés, 2, à 5030 GEMBLOUX.

Cette dissertation originale a pour titre :

« Study of plant-aphid interactions in Gabonese vegetable crops and biological control perspectives ».

Le jury est composé comme suit :

Présidente : Prof. M.-L. FAUCONNIER, Présidente du Département AGROBIOCHEM,
Membres : Prof. F. FRANCIS (Promoteur), Prof. A. NDOUTOUME NDONG (Copromoteur, IRAF Libreville, Gabon), Prof. B. SCHIFFERS, Prof. F. VERHEGGEN, Prof. G. MERGEAI, Dr S. BOUKRAA (ENSA Alger, Algérie).

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Summary

Periurban agriculture increased vegetables production in the cities. A survey was conducted in three market gardening in Libreville and Owendo cities to register crop and pesticides diversity uses by farmers. The most abundant cultivated species throughout the year appeared to be amaranth (*Amaranthus hybridus* L. Amaranthaceae). The most important pests were aphids (Hemiptera: Aphididae) and some beetles (Coleoptera). To control the pests, conventional neurotoxic insecticides were used with effect on environment and human health. In order to identify the occurring insects in the selected areas, a monitoring of insects was carried out during two years on amaranth, roselle, tomato (*Lycopersicon esculentum* M., Solanaceae) and cabbage (*Brassica oleracea* L., Brassicaceae). Entomological abundance and diversity were assessed through weekly trapping and visual observations from July to August each year. Insects were collected, identified at the taxonomic level of the family, and classified into three categories: pests, beneficials and associated insects to agriculture. Eighty four families belonging to height orders were recorded with 7910 and 3148 sampled individuals in 2012 and 2013 respectively. The predominant insect families were in both years Aphididae, Cecidomyiidae (Diptera) and Chrysomelidae (Coleoptera) for pests, Dolichopodidae (Diptera), Staphylinidae (Coleoptera) and Coccinellidae (Coleoptera) for beneficials, and Muscidae (Diptera), Psychodidae (Diptera) and Formicidae (Hymenoptera) for associated insects. As aphids are the most important pests, further study at species level and in relation to predatory beneficials were assessed on vegetable crops in 2013 in two peri-urban gardening sites. The *Aphis craccivora* Koch aphid was the most abundant aphid species observed infesting amaranth in both sites. The other aphid species were *Lipaphis erysimi* Kaltenbach, *Myzus persicae* Sulzer, *Aphis fabae* Scopoli and *Aphis gossypii* Glover. Moreover, seven species of natural enemies were trapped, mainly predatory hoverflies (Diptera: Syrphidae) and ladybirds (Coleoptera; Coccinellidae). *A. craccivora* Koch is known to be a vegetable pest. Its recent identification as pest in amaranth motivated us to study their multitrophic interactions. Since relationships between aphids and host plants could be related to symbiont and feeding behaviour. *A. craccivora* endosymbiont bacteria and saliva protein diversity were analysed to explain plant–aphid interactions. Indeed, *Buchnera aphidicola* was found. Some proteins were only identified in solid and soluble saliva, while others originated from *Serratia* sp. endosymbiont. Two of the identified proteins are involved in plant-pathogen interactions: calmodulin and elongation factor Tu. To control *A. craccivora* which causes several crop damages, volatile organic compounds (VOC) have been studied. Only aphid alarm pheromone (E)-β-farnesene (EβF) was identified and quantified. Its effect on escape behaviour in aphids has been demonstrated on three species. *A. craccivora* responded more strongly than the two other Aphidinae (*M. persicae* and *A. fabae*) species with 78% of the individuals initiated dispersal behavior at 500 ng dose of EβF. In another laboratory study, the repellency effect of (E)-β-farnesene, methyl salicylate and two essential oils of basil species (*Ocimum gratissimum* L. and *Ocimum basilicum* L. Lamiaceae) were determined, while no repellent effect was observed. Also, aphid populations were reduced by exposure to EβF and *O. gratissimum* essential oil. This study is one of the few to explore the description of insects in the market gardens of Libreville. This could contribute to the elaboration of the sustainable development strategies of pest control in the zones.