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ARC-Vegetable and Ornamental Plants Newsletter

Newsletter of Vegetable and Ornamental Plants, a campus in the Crop Sciences Programme of the Agricultural Research Council (ARC)

False chinch bugs use crops as alternative hosts

Compiled by Diedrich Visser (ARC-VOP) and Michael Stiller (ARC-PHP)

During the latter parts of 2018, several enquiries were received from vegetable farmers who experienced invasions of a small greyish bug into their crops. The bug was reported to be troublesome on peppers, strawberries, potatoes, and sunflower, from farmers in Pretoria, Thabazimbi and Middelburg (Mpumalanga). Both open fields and crops in tunnels were affected. The bug was identified as the false chinch bug, *Nysius* ericae (Schilling), a sucking bug in the family Orsillidae, previously in a subfamily under Lygaeidae.

False chinch bugs are small (5 mm), greyish bugs that normally feed on grass seeds.

Description

The false chinch bug is a small, light to dark grey, elongated insect, 4–5 mm in length. Eggs are laid on plant debris or on plants. They may be laid singly or in small clusters. The bugs are well adapted to weather fluctuations, but the optimal ambient temperatures for reproduction are 25–28° C. One generation is completed in approximately one month.

Taxonomy

Numerous *Nysius* species occur worldwide, but the taxonomy and distribution of these "false chinch bugs" worldwide has not been completely resolved. Identifications to species level are difficult, usually done by comparing specimens under magnification. At least four *Nysius* species occur in South Africa, of which two have been reported to feed on vegetables previously, i.e. *N. ericae* and *N. binotatus*. Reasons for uncertainty about species in this genus is that no recent world or regional study has been undertaken. *Nysius ericae* was originally known from the Northern Hemisphere but now includes two species from Africa, although this synonymisation is not accepted unanimously. Voucher specimens collected at the Roodeplaat research station have been deposited in the National Collection of Insects, reference PENT00001.

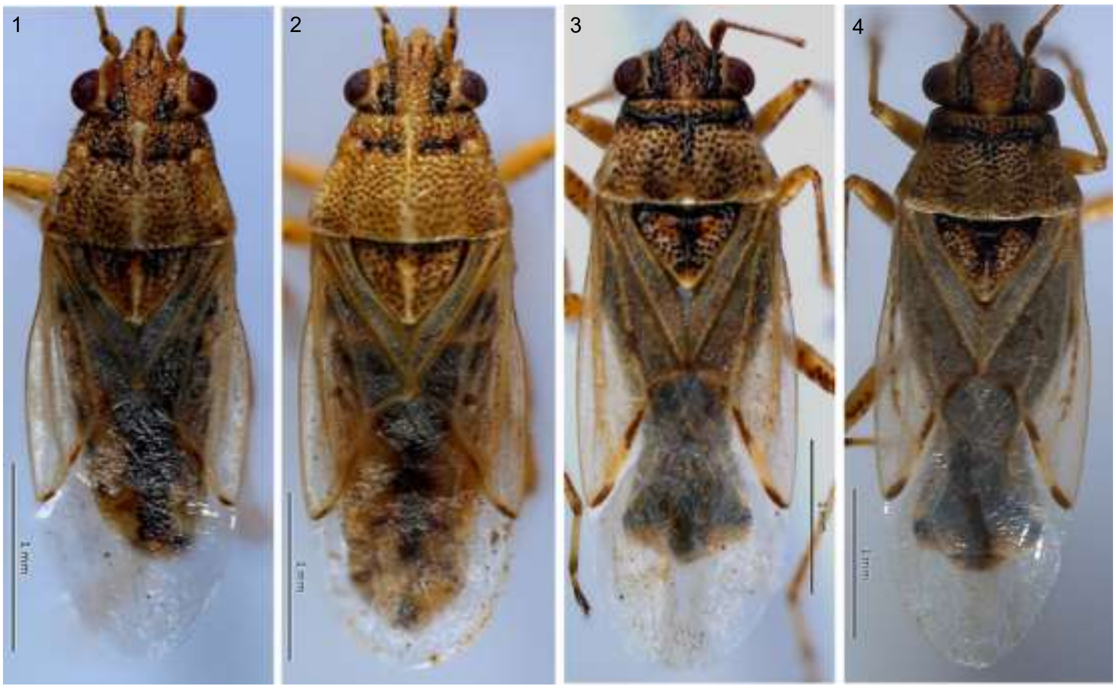
Host plants

False chinch bugs are mainly known as seed pests and are also commonly known as a "seed bug". They are known to feed on seeds of onion, leek, garlic, turnips, wheat, fodder crops, and cultivated pastures, as well as sunflower seeds. Many other crops sometimes serve as alternative hosts when their usual hosts are absent. Their natural hosts are grass weeds that are often found growing adjacent to crops. However, under certain conditions, they may invade crops that do not produce seed, and then may cause wilting of leaves due to the piercing-sucking manner of feeding. This usually happens when their host plants, e.g. nearby grasses, were destroyed, or when the seeds or these plants were removed by other animals, e.g. birds and rodents.

Wilting of terminal leaves is usually observed when false chinch bugs feed on potato foliage.

Damage potential

The false chinch bug is most often only a visual pest that is more alarming than destructive. Because they occur in swarms, they are easily noted on foliage and perceived as pests that need immediate control actions. However, they are rarely responsible for economic damage and rarely need to be controlled. They inflict limited damage to crops by sucking sap from foliage and seeds. Their damage potential is attributed to their gregarious habits. They swarm in large numbers from adjacent weeds to feed on seeds of plants like onions and related crops, resulting in poor seed set. However, they often invade vegetables and other crops that are not in seed. They feed on the tips/shoots or terminal leaves, thereby causing wilt. The wilting leaves tend to curl up, and numerous bugs may be found hiding within the curl itself. Very young plants may be killed and infested leaves may die off. However, symp-



Nysius species, images of identified museum specimens. 1. *Nysius binotatus* male, with pale longitudinal raised ridge across pronotum and scutellum. 2. *Nysius binotatus* female, with pale longitudinal raised ridge across pronotum and scutellum. 3. *Nysius* sp., female, with costal vein unmarked. 4. *Nysius ericae*, female, with costal vein with brown markings. Scale = 1mm.

toms are always localised at the feeding sites, and when plants are larger and healthy, serious damage is seldom experienced. Some reports were also received of high numbers of bugs on flowers of strawberries, interfering with pollination by other insects and causing poor fruit formation or deformed fruits. However, most observations of the false chinch bug on crops are usually an exception rather than the rule, and invasions of crops are usually linked to the destruction of their normal grass hosts.

Control
Removal of weeds may not be a control option for these insects because they can migrate in large numbers. Control on weeds with insecticides, however, may be an option when the bugs are present in large numbers near crops. Regular inspection of surrounding areas is therefore important. For a list of insecticides on crops, consult www.croplife.co.za.

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Great potential of organic waste recycling using black soldier fly larvae: a technology to consider!

Compiled by Keletso Seetseng, Crop Sciences Division

The production of food crops has a considerable impact on the environment because it may lead to soil erosion, desertification, and reduction in plant biodiversity and water pollution. Moreover, a constant increase in the global population's mean income is expected. Some of the limitations in food production are inadequate irrigation facilities, decreasing water resources, climate change, and low quality yields, notwithstanding the high cost of agricultural inputs, particularly fertilizer. High levels in the decline of soil fertility and consistent reduction in crop yields compel the use of more fertilizers for food production. The need for alternative soil amelioration to chemical fertilizers, therefore becomes very necessary. In this regard, black soldier flies are useful in reducing the amount of organic waste that exist, resulting in good raw materials for compost.

Adult black soldier fly (*Hermetia illucens*).

Solid waste management
Due to rapid urbanization and changes in consumers' behavior, municipalities and decision makers are confronted with new challenges in solid waste management. Over some time now, numerous cities have increased their efforts in finding sustainable solid waste management solutions; especially in developing integrated solid waste management strategies, including construction and operation of sanitary landfills.

The black soldier fly (*Hermetia illucens*) is regarded as the insect with the highest potential for waste recycling. The larvae of this fly holds much promise for converting low value manures and many other organic waste into a valuable commodity.

Black soldier fly larvae.

Few studies have been done elsewhere (Switzerland) on the feasibility of establishing and operating the production of urban organic compost. It will be interesting to determine the feasibility of using black soldier fly larvae (BSFL) in converting municipal solid waste into quality organic compost and its use by small holder vegetable farmers in the urban and sub urban areas of South Africa, particularly in the Gauteng Province. This is important because the BSFL composting will provide empirical information on the viability of BSFL composting technology for entrepreneurs to invest in BSFL compost production.

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Compost made from waste by black soldier larvae.

Screening South African sweet potato cultivars for resistance to root-knot nematodes

Compiled by Dr Kgabo Pofu (Crop Protection, ARC-VOP), Dr Sunette Laurie (Plant Breeding, ARC-VOP), and Prof Phatu Mashela (University of Limpopo, Green Biotechnologies Research Centre of Excellence)

Introduction

Plant parasitic nematodes, especially *Meloidogyne* species are considered to be the most important nematodes affecting sweet potato production worldwide. Yield loss attributed to *Meloidogyne* species has been reported as 6% in South Africa, 15% in South America and 24% in West Africa (Kleynhans, 1991). South Africa does not have adequate empirically-based data on damage caused by root-knot nematodes on most popular South African sweet potato cultivars, except for Blesbok, which was found to be highly susceptible to *M. incognita* (Kleynhans, 1991). Various sweet potato cultivars are being targeted for biofortification intended to ameliorate malnutrition diseases in the Southern Africa Development Community countries. These cultivars had to be evaluated for susceptibility to the notorious root-knot nematodes (*Meloidogyne* species) prevalent in South Africa. Therefore, the objective of this project was to screen the most important South African sweet potato cultivars for host-status of three *Meloidogyne* species prevalent in South Africa.

Material used

Plantlets (Fig. 1 A) were established in 20-cm-diameter plastic pots for three parallel greenhouse trials (Fig. 1 B) conducted at the University of Limpopo and the ARC-VOP. Each plantlet was established in soil containing 4:1 (v/v) steam-pasteurised river sand and Hygromix-T growing mixture, inoculated with 6000-second stage juveniles of *Meloidogyne javanica* and *Meloidogyne incognita* races 2 and 4. Cultivars tested included three exotic orange-fleshed ('Beauregard', 'W-119', '199062.1'), two local orange-fleshed ('Impilo', 'Bophelo') and seven local cream-fleshed ('Ndou', 'Monate', 'Letlhabula', 'Ribbok', 'Blesbok', 'Bosbok' and 'Mvuvhelo'). Potential existence of resistance to *Meloidogyne* species and races in local cream-fleshed sweet potato cultivars, 'Mvuvhelo' and 'Bosbok' were reported. Fifty-six days after inoculation, cultivars had highly significant effects on the reproductive potential of the test nematodes.

Potential impact

Cultivars 'Bosbok' (commercial use) and 'Mvuvhelo' (smallholder use), two of the South African cream-fleshed cultivars, were non-hosts to all *Meloidogyne* species and races (Fig. 1 D). 'Blesbok' (most popular commercial cultivar) showed low host-status to *M. javanica* and *M. incognita* race 4. Local orange-fleshed cultivar 'Bophelo' showed significantly lower reproductive potential than other orange-fleshed cultivars for *M. incognita* race 4 and *M. javanica*. All other cultivars were excellent hosts to all *Meloidogyne* species and races (Fig. 1 C). The Sweet Potato Programme of the ARC aims at high β-carotene content, with selections primarily focused on high yield, storability, sweetness and/or dry texture (Laurie et al., 2015). The identification of tolerant/resistant sweet potato cultivars to the three *Meloidogyne* species prevalent in South Africa can increase profitability to both commercial and smallholder farmers. The estimated annual sweet potato loss due to damage caused by root-knot nematodes, together with Reniform nematodes, amounts to 2.6 billion U.S. dollars. These preliminary findings revealed the existence of resistant cream-fleshed sweet potato cultivars; however, additional work is necessary to confirm whether the nematode resistance allows for introgression through hybridization.

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Figure 1: Sweet potato plantlets (A), greenhouse trial (B), galled sweet potato root system (C), and gall-free sweet potato root system (D).

First locality-host report of nematode species associated with potato in the Limpopo Province

Compiled by Michele Cloete (Crop Protection, ARC-VOP), Mariette Marais (Biosystematics, ARC-PHP) and Kgabo Pofu (Crop Protection, ARC-VOP)

Worldwide, root-knot nematodes (*Meloidogyne* spp.), together with the potato cyst nematodes (*Globodera* spp.), are regarded as major pests in all potato-producing regions. In South Africa, *Meloidogyne spp.* (6 species), *Nanidorus minor* (vector of tobacco mosaic virus) and *Pratylenchus spp.* (12 species) are regarded as the major nematode pests in potato production.

During a study to identify the nematode species present in different potato production regions in South Africa, nine nematode species, which are first reports of association with potatoes in the Limpopo Province, were also identified from soil and tuber samples. These included ring nematodes (*Criconema mutabile* and *Criconemoides sphaerocephalus*), spiral nematodes (*Helicotylenchus* sp. and *Scutellonema brachyurus*), stubby root nematode (*Nanidorus minor*), lesion nematode (*Pratylenchus* sp. (j)), stunt nematodes (*Telotylenchus ventralis, Tylenchorhynchus brevilineatus and Tylenchorhynchus mashhoodi*) and a *Rotylenchulus* sp. In addition, root-knot nematodes (*Meloidogyne* spp.) were also retrieved from the soil and tuber samples (Fig. 1).

Figure 1. Potato tubers infested with *Meloidogyne* sp. on surface of potato tubers, and inside cut tubers.

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Medicinal Plant Research at the ARC-VOP – Collection and storage of medicinal plants

Compiled by the Medicinal Plant Research Team, ARC-VOP

It is not uncommon to find expiry dates often indicated as ‘best before’ or abbreviated as ‘BB’ or “E’ on many consumer products, including cosmetic products, food and medications. This is understandable considering that the active constituents are of limited shelf life. After a period, the active constituents undergo chemical changes, including their breakdown into other compounds.

In medicinal plant trade, dried medicinal plant material (especially the scarce materials or those less frequently used) are often stored for a period of time by medicinal plant gatherers, while building stock or traditional medicine practitioners. For how long can medicinal plant materials be stored to retain its biological potency or activity? Previous studies have shown that some medicinal plant material can retain their biological activities and probably be safe for consumption even after prolonged storage (more than 10 years) under specific conditions. Where established, a comparable efficacy between freshly harvested dried plant material and those stored for a long period could reduce or prevent unnecessary harvesting of fresh plant material. In some cases, however, some species demonstrated changes in biological activities (either a decrease or an increase) following their storage for a definite period. Such a report has practical implications for the use of stored medicinal plant material. In situations where there is an increased biological activity, traditional healers or practitioners may have to prescribe a lower dosage when using stored plant material to avoid potential toxicity due to high dosage. Conversely, where there is a decrease in potency, high dosage within the safety limit may have to be prescribed to obtain the desired “therapeutic” effect.

It must be mentioned, however, that a host of other post–harvest handling factors, including variations in the drying process (e.g. sun-drying, oven-drying, air-drying, etc.) and storage conditions (storage temperature, in the dark or light) can largely influence the shelf-life of active compounds present in, and consequentially, the potency of medicinal plant material. While the use of stored medicinal plant material has its advantages, the need for research studies on commonly stored medicinal plant species, with the view of determining their shelf-life vis-à-vis their traditional medicinal value and safety, cannot be over-emphasized. Much like some consumer products in the stores, the storage condition of such medicinal plant material needs to be optimised for maximum benefit. Research activities at the ARC-VOP are designed to address these aspects, amongst others.

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Stored medicinal plant material being sold at a medicinal plant market.

Medicinal Plant Research at the ARC-VOP: Agro-processing of African ginger

Compiled by Ms P.H Maphothoma, Dr S. Mokgehle, Dr H.T Araya and Dr S. Amoo, Medicinal Plant Research Team

African ginger (*Siphonochilus aethiopicus*) is one of the commercially important and highly sought medicinal plant species in southern Africa. Its rhizomes and roots are known to possess healing properties for a variety of ailments, including coughs, colds, asthma, headaches and infections. African ginger has a restricted distribution in South Africa, mainly in the Mpumalanga and Limpopo Provinces, while it has become extinct in the wild in the KwaZulu-Natal Province.

A nursery for large-scale production of African ginger was established at the ARC's Brits experimental farm, through funding received from the Department of Science and Technology (DST). Approximately 10 ha of African ginger were cultivated using propagules obtained from collections kept in the ARC medicinal genebank at the ARC-VOP, Roodeplaat campus. About 5000 m^2 shade net-nursery area was also established for growing the mother material. Propagation technologies to ensure sustainable supply of this plant material have been developed on African ginger. Harvesting of African ginger rhizomes for agro-processing is often done during the winter season, when the plants are dormant. The harvested material go through cleaning, chipping and drying on-site before entering the value chain of products.

The agro-processing facility at the Brits experimental farm will serve as a multi-service facility to provide training and technical assistance for the creation and expansion of small and medium-sized agro-processing enterprises. The agro-processing unit will focus on product research and development for the transformation of local produce into value added agricultural products, as well as the transfer of technologies to improve income generation and food security. The ARC can thus contribute more significantly towards technologies that can assist local communities to access commercial markets with their produce. Cultivation and basic processing will pave the way for growth in the sector with the availability of material from local growers.

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Crates of cleaned African ginger rhizomes and roots ready to be sliced.

Sliced African ginger rhizomes in a slicing pot.

Sliced African ginger rhizomes spread out on a drying rack.

Racks of sliced African ginger rhizomes ready to be dried.

Packaged dried material ready for use in products.

Two ARC-VOP researchers attend the prestigious UC Davis African Plant Breeding Academy in Nairobi, Kenya

Compiled by Dr Inge Gazendam, Plant Breeding

Dr Inge Gazendam and Dr Amelework Assefa from the ARC-VOP were among the 36 participants, selected from over 600 African applicants, to attend the fourth session of the prestigious UC Davis African Plant Breeding Academy. The training program is organized in collaboration with the African Union New Partnership for Africa's Development (NEPAD) Agency and the African Orphan Crops Consortium to fill a critical need for trained plant breeders in Africa.

The first of three 2-week training sessions were held in Nairobi, Kenya, from November 25 – December 8, 2018. Over the duration of the thirteen month program, around 300 hours will be spent in classes, workshops and the field, to receive training to complete this premium professional certification program.

The lectures were hosted by the World International Centre for Research in Agroforestry (ICRAF), also known as World Agroforestry, in Nairobi, Kenya. Their conference facilities and catering services were excellent.

Dr Rita Mumm is the director and primary instructor of the African Plant Breeding Academy. She is an expert in maize quantitative genetics, applications of genomic information to the development of improved crop cultivars, and deployment of traits created through genetic engineering, including efficient breeding strategies and stewardship of governmentally regulated materials.

During the first session, valuable training was acquired in statistical and practical applications of plant breeding, that equipped ARC plant breeders to improve their current breeding programs, with the potential to expand to other vegetable crops.

Dr Assefa is in the process of establishing new research programs on cassava and onion and the training came at the right time to improve the technical aspects of new research proposals in both crops by incorporating the ideas newly acquired from the training. Dr Gazendam will similarly incorporate aspects acquired from the training into research proposals that will be developed for improving sweet potato through breeding. Participation also allowed the ARC researchers to identify potential regional and international collaborators on proposals for donor funding.

The two participants from ARC-VOP selected for the prestigious UC Davis African Plant Breeding Academy (AfPBA) class IV, Dr Inge Gazendam (left) and Dr Amelework Assefa (right).

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The fourth class of the UC Davis African Plant Breeding Academy (AfPBA class IV) participants consisted of 36 breeders, half of whom are women, representing 23 African nations.

AfPBA class IV participants receiving a lecture at ICRAF by one of the primary instructors, Dr Iago Hale. He is an assistant professor of specialty crop improvement at the University of New Hampshire, USA.

Dr Rita Mumm, director and primary instructor of the African Plant Breeding Academy, addressing the AfPBA class IV participants.

The AfPBA class IV participants during a tour to ILRI's forage grass demonstration plots. Dr Sita Ghimire is explaining the climate smart Brachiaria program conducted in East Africa.

The conference facility at the World International Centre for Research in Agroforestry (ICRAF) in Nairobi, Kenya, with its exquisitely stained glass window panel.

Sweet potato cultivation practices and field demonstration at the Elembe project in Rethabiseni

Compiled by Whelma Mphela, Plant Breeding and Nomsa Tshele, Gauteng Department of Agriculture and Rural Development (GDARD)

The ARC-VOP provided training in sweet potato production to 34 beneficiaries from the Elembe vegetable project, Sibusisiwe project, Siyathoma project, Thokozani elderly project, Rethabiseni food garden, Sinethemba project, Ezolimi project, Qedidlhala project, Happy kiddio project and Strauss project. These are community vegetable projects located in the Rethabiseni and Ekangala area, Bronkhorstspruit, mainly producing cash vegetables such as carrots, Swiss chard, tomatoes, and onions. Most of these projects gained interest after the collaborative Gauteng Department of Agriculture and Rural Development (GDARD) and ARC -VOP project during 2010-2011 on demonstration trials with new ARC sweet potato cultivars. These projects have been purchasing vines from the ARC-VOP every year since 2012 and their agricultural advisor, Ms Nomsa Tshele, organised training for them on sweet potato cultivation practices and a field demonstration on 13 November 2018. Currently, the projects are under the GDARD Food Security Programmes: Community Food Gardens. The main objective of the sub-programme is to establish community food production units to increase food production at household level. Project beneficiaries re-

Fig. 1. Land demarcation demonstration

ceived support on infrastructure and technical advice, training and production inputs. Projects will receive management assistance for at least a period of three to five years, after which beneficiaries are expected to be independent. The aim of the presentations were to support the community project members through oral presentations, planting demonstrations and technical advice on sweet potato production. This will enable the community members to establish self-sufficiency towards food security, achieve better management of diseases and increased yields to generate income. Cultivation practices discussed included land preparation, fertilizer application, cuttings preparations, planting and maintenance, and harvesting. Additional descriptions of different cultivars was provided based on their morphological characters, agronomical performance and market use. The field demonstration was done on farm (Fig. 1) and a total of 92 cuttings of Ndou were planted at a spacing of 30 cm apart (Fig. 2). An additional 100 Monate and 30 Bophelo cuttings were given to the Elembe project to be planted.

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Fig.2. Planting of sweet potato cuttings in the soil at 30cm spacing

ARC-VOP donated orange fleshed sweet potato cuttings

Compiled by Tsholo Tselapedi, Public Relations Officer

The Agricultural Research Council (ARC), through its Vegetable and Ornamental Plants (VOP) campus recently visited Kgantsho Primary school in Kwa-Mhlanga, Mpumalanga to donate orange fleshed sweet potato cuttings for the school garden. The visit is part of a series of interventions scheduled to ensure that food security is addressed at schools and to help those who are in need. More than 1 000 learners will benefit from this initiative.

The orange fleshed sweet potato cultivar Bophelo is an ARC cultivar that is rich in provitamin A and is one of the most preferred because of its improved dry texture and sweet taste. Bophelo is important in reducing malnutrition, addressing food security, and for income generation.

The ARC remains committed to provide excellent services in agriculture and strives to improve production systems through continued research in the improvement of production technologies and efficiencies.

The ARC-VOP welcomes all farmers to place their orders for sweet potato cuttings.

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Technology Transfer

Scientific publications

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