

# Brassica stunting disorder: a real threat to sustainable cabbage production in South Africa

Over the last three years, cabbage farmers across large sections of South Africa have observed a new disease called 'Brassica stunting disorder'. This anomaly has been observed since 2012, mainly in the Brits area, but has spread throughout the country and now occurs in most of the cabbage producing regions (Fig. 1). The disease is characterized by stunted plants, flattening and occasional purpling of the leaves, side shoot development, vascular discoloration in the stem and the midrib of leaves, poor root development, low yield and quality of the final product. This reduces market value of the crop (Fig. 2). Disease incidence varies with season and variety. In some cases up to 90% incidence has been seen. The disease has also been recorded on broccoli and cauliflower crops, but incidence on these crops is much lower.

**F**rom the high disease incidence reported and the rapid spread of infection across the country over the last 3 years, it is evident that effective control measures are

needed to ensure continued sustainable production of Brassica crops by both commercial and subsistence farmers. To this end, six industry members (Bayer, Klein Karoo Seed Marketing, Sakata, STARKE AYRES, Syngenta and the Seedling Growers Association of

SA NEW & Dr Lindie Esterhuizen, University of Johannesburg

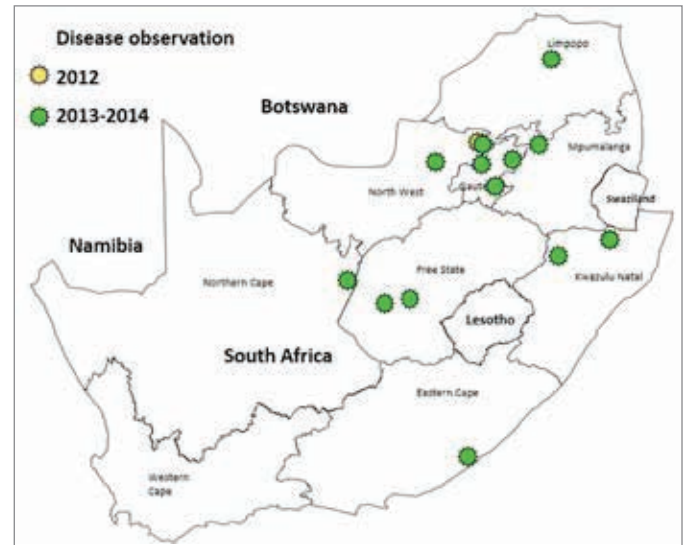


Fig 1

South Africa) have partnered with researchers from the University of Johannesburg to investigate Brassica stunting disorder. The most important questions that the study will aim to answer are the identity of the disease-causing pathogen and its mode of transmis -

sion, followed by the development of a molecular detection technique. This information will then be made available to the industry as well as directly to farmers so that effective disease management practices can be developed.

To learn more about the problem, a field trial was set up in Brits area over a period of four months (March-June) in 2014. This region was chosen due to high disease incidence of the problem. The disease progression was monitored throughout the season on a susceptible cabbage variety, grown in the open field and within cages covered with insect proof netting. The predominant insect species were monitored with the use of blue and yellow sticky traps that were placed in the field and cages. The first symptoms were observed in the uncaged plants four to six weeks after transplanting. It was seen that plants could be infected at different stages, with the disease severity being greater following early infection. Plants infected at early stages (between 4-6 weeks) displayed severe symptoms, including stunting, flattening, purpling of leaves, increased side shoot formation and no head formation. Those plants infected later in the season did produce heads but these showed clearly reduced size when compared to heads from uninfected plants (Fig 3)

A comparison of open field plants and those from inside the cages showed that the disease causing pathogen is not seed, soil or waterborne. Little or no infection was seen inside the cages, whereas 90% of the plants grown in the field were infected.

The most likely vector of the disease therefore seems to be a flying insect. The most predominant flying insects observed during the trial were various species of leafhoppers (*Aconurella*, *Austroagallia*, *Delphacid*, *Exitia*, *Circulifer/Nesoclutha*) and whiteflies (*Trialeurodes vaporariorum*). The information generated in the field trial served to narrow down the possible list of insect vector species. The study will now aim to identify the specific vector species in a similar field trial that is planned for the 2015 growing season.

The key remaining question is the identity of the disease causing pathogen and this has proven to be a more difficult question to answer. One of the main challenges in identifying the pathogen responsible is the presence of numerous different potentially pathogenic microorganisms on the diseased cabbages collected from the field. The study is currently attempting to isolate the specific pathogen by transmission of the infectious agent from diseased cabbages to healthy cabbage seedlings under pathogen and insect free conditions by sap and graft inoculation and dodder transmission. To date, successful transmission



Fig 2

of the infectious agent has been achieved by sap inoculation (Fig 4). Currently attempts are being made to identify the disease causing pathogen by two different methods. Firstly, visual comparison of sap inoculated and non-inoculated control plants by electron microscopy, a technique capable of revealing microorganisms inside diseased tissue. Secondly, the genetic material isolated from the inoculated and non-inoculated control plants are compared by a technique called Next Generation Sequencing, in an attempt to pinpoint the genetic material of the pathogen present only in symptomatic cabbages. Upon identification of the infectious agent, the study aims to develop a molecular detection technique that will be used to further monitor its spread. This will assist with identification of the insect species responsible for disease transmission and also with the identification of weeds that may be reservoirs for this pathogen.



Fig 3



Fig 4

Taken together, the information generated in this study will provide both farmers and the broader agro-industry with the tools to de-

velop and implement various management strategies, such as improved cropping practices, producing effective barriers against the vectors or the use of appropriate pesticides to control the specific vector populations, or possibly the development of more resistant cultivars. 🌱