



Department of Agriculture & Rural Development

2019/2020 Multi-Planting Season

UNDERSTANDING FALL ARMYWORM AND ITS MANAGEMENT

THE fall armyworm (FAW), *Spodoptera frugiperda* Smith (Lepidoptera: Noctuidae), is a well-known sporadic, long-distance, migratory insect pest with adult moths capable of flying distances of over a 100 kilometres in a single night aided by wind.

The larvae/caterpillars of this species feed on more than 80 plant species, but primarily prefer maize and sorghum. This pest has a voracious appetite, and reproduces and spreads quickly, given optimal environmental conditions.

The species is indigenous to the tropical regions of the western hemisphere, from Argentina to the United States of America. In South Africa, the pest was first reported during the 2016/2017 growing season, but was positively identified in 2017 and has since been recorded in all nine provinces of the country.

IDENTIFICATION AND LIFE CYCLE

Adult female moths lay eggs in clusters of up to 200 eggs or more. Egg clusters are covered with greyish scales or bristles. Egg clusters are generally laid on the undersides of leaves. In two to three days, the eggs hatch into tiny larvae. Their feeding results in semi-transparent patches on the leaves (Figure 1a), later developing into ragged torn holes (Figure 1b).

One batch of eggs has more larvae than the plant can handle, so many larvae move to neighbouring plants. The larvae grow quickly to become caterpillars. If not managed early, they can enter the whorl and become extremely difficult to manage.

Caterpillars can be greenish or brownish, with stripes along the lengths of their bodies. Larger adults (ca 1-3cm) often have a visible inverted "Y" shape on their heads and four distinct dots towards the end of their body (Figure 2). When the caterpillar is fully grown, it drops to the ground and forms a pupa (resting stage). An adult moth emerges about eight days later to begin the cycle again.

The exact duration for the egg and pupal stages is dependent on temperature.

The duration of the pest destructive stage (ie larval/caterpillar stage) is also largely dependent on temperature, but also diet (ie availability of host plants).

It should be clearly noted that KwaZulu-Natal has a particularly favourable climate and therefore, one should not be surprised when the pest is identified during growing seasons in the province.

CURRENT STATUS OF FAW IN KZN

For 2017, a total of 18 reports were received, mostly from the Uthukela district, followed by Umkhanyakude and Zululand districts, with one isolated report in the Umgungundlovu district. Overall, most reports originated from the central and northern regions of the province.

For the 2018/2019 growing season, a total of 13 reports were received. Most reports came from the Umkhanyakude district, followed by Umgungundlovu, Ugu and only one report from the Uthukela and Ilembe districts, respectively. Most reports for the 2018/2019 season now originate from the south and northern regions respectively, with the central region recording the lowest number of reports. Given the reports,

it is clear that this pest has spread in the province and is building up higher numbers, which is making people more aware of its presence. An alien invasive species doesn't just arrive in a new range and take off in numbers; there is a lag phase before infestations become problematic and this is likely to be why there are more reports from different districts and areas for 2018/2019.

The drop in the number of reports for the 2018/2019 season compared to 2017 is most likely due to farmers becoming more familiar with the pest and how to deal with it. (Reports for 2017 were from emerging and commercial farmers, whereas, reports for 2018/2019 were predominantly household farmers, smallholder farmers and from departmental plantings). Secondly, farmers in the other districts are probably now becoming more aware of the pest and asking questions.

Up to now, no reports originating from the Amajuba, Unthungulo, Ethekweni, Umzinyathi and Harry Gwala districts were received. This could be due to low pest numbers and that the pest is therefore not yet problematic in those districts.

Alternatively, farmers in these regions may not be well acquainted with identifying and dealing with the pest. It is likely that they are focusing on stalk borer damage (ie shot hole symptoms) (see Figure 3).

What is clear in the province is that maize plants are attacked by FAW and stalk borer at the same time (Figure 3). This has been the case throughout the KZN province when scouting for FAW. Overall, the reporting of occurrences remains crucial as it helps to build a framework for the province. In this regard, it is very much likely that this pest is present in those districts, given the current distribution we are witnessing in the province based on reports.

Reports to date have noted this pest targeting maize plants, with only one report pertaining to sorghum in 2017. Reports were for standard maize cultivars and not Bt maize. Overall, from these reports we see that in the province, maize is particularly preferred.

For the 2018/2019 season, reports increased from November, with January recording the highest number of reports. These reports mainly pertained to late planted maize grown under no-till conditions, generally in the V6-V10 leaf stage. Also worth noting is that FAW was first detected in November 2017 on Cedara. Reports for the winter growing regions (ie Makhathini Research Station) are generally received from July onwards.

From monitoring using pheromone traps on Cedara, it was clear that adult male moth numbers were highest during January and February, where the species reached pest status and then declined from March to April, with no moths recorded for June to July as the pest status of this species depends on optimal climatic conditions. Outbreaks often occur during hot spells followed by periods of rain, which create favourable conditions for eggs and small larvae to survive. Irrigated fields, with regard to the Makhathini Research Station, are highly attractive to female moths for egg laying, especially during drought conditions.

Barring Makhathini, as mentioned, most reports were for young tender late-planted maize grown under no-till conditions. Therefore, climatic conditions were most likely optimal during January and February where these months are generally characterised by hot conditions followed by periods of rain. Furthermore, as stated in the literature, this pest comes in later in the growing season, where infestations build up (given optimal conditions) and targets young late-planted maize. Currently in the province, we can see that this is line with what is stated in the scientific literature.

Furthermore, the literature states that when conditions are not optimal, this species cannot reach pest status. As temperatures start to drop and rainfall declines (March to May), numbers drop drastically. When winter arrives, characterised by cold temperatures and frost as is the case for Cedara (June/July), we see zero moths. This may also be why no reports were received from the Harry Gwala district, in particular the Kokstad Research Station, where temperatures are generally cooler throughout the summer months and extremely cold during the winter months. Again, it is worth noting that the species may be present, but possibly cannot reach pest status – rendering it insignificant.

MANAGEMENT Crop Management

Avoid planting late in the season. This is because FAW is more threatening to late-planted maize (as noted in the scientific literature and reports received to date). Moreover, avoid staggered planting, as this will continue to provide the favoured food for FAW locally (ie young plants). This will ensure that plants have enough vigour and will be able to better withstand infestation and feeding damage by FAW larvae. Currently, this is the most important recommendation for smallholder farmers and rural household families.

Moreover, ensure good soil health. Finally, management of crop residues and volunteer plants is crucial before planting and after harvest.

Detection

There is no preventative measure for FAW. Scouting becomes imperative and is applicable to both early and late-planted maize. This is because the leaf whorl is preferred in young plants, whereas leaves around the cob silks are attractive in older plants.

When scouting, if 10% or more plants reveal FAW damage symptoms, then control measures, currently in the form of insecticides, will have to be undertaken. Scouting remains imperative post-spraying in order to monitor the situation and pick off any larvae that remain. Pay attention to the newest two to three leaves, tassels and cobs.

Another detection method is the use of pheromone traps to detect adult FAW male moths early in growing seasons. Trap catches can be recorded weekly, preferably on the same day every week. The moths should be removed from the traps after counting. The catches of FAW male moths are an indicator of the infestation and should be used to determine the threshold for insecticide



Figure 1: (a) Fall armyworm larval feeding damage resulting in semi-transparent patches and (b) ragged torn holes (Photos: H. Ramanand KZN DARD).

spraying programmes. It is therefore essential to follow label recommendations and guidelines. With that being said, pheromone traps are not a substitute for scouting, particularly for smallholder farmers and rural farm families.

Practise Conservation Agriculture (CA) where possible. Research has shown that insect pests are more prevalent in conventionally tilled crop fields compared to CA crop fields. As mentioned, conventionally tilled crop fields provide a highly conducive environment for insect pest development and reproduction.

Chemical

Firstly, make sure the product is registered. Read the label thoroughly and follow label recommendations. Apply the correct dosage, water volume, with the correct size hollow cone nozzle. Determine the best time for optimal control. Spray early in the morning or in late evening when larvae are active on leaves and there is little or no wind to avoid pesticide drift.

Be sure to target the leaf whorl. If more than one application is required – rotate chemicals from different chemistries (ie mode of action group). Application windows are recommended where multiple insecticide applications are required. Fall armyworm has an approximately 30-day generation period – establish application windows that are about 30 days apart. Multiple applications of the same mode of action group in a single window period must be avoided.

Control varies from very poor to adequate with the use of carbamates and organophosphates; therefore, it is vital to test before using extensively. It is also important to note that this pest is resistant to pyrethroids, hence one will not find a registration for a pyrethroid alone.

Given the residual periods of insecticidal sprays for stalk borers, a follow-up spray is required two weeks after the initial application. Now, as stated in this document, insecticides need to be rotated for FAW given that the species builds up resistance very quickly. Therefore, it is recommended that insecticides only registered for stalk borer species be used for follow-up sprays.

Integrated Pest Management (IPM) is the answer. Keep up to date with all relevant information, conduct regular scouting of fields for infestation and apply

pesticides with care and only when needed.

There is no single control measure to manage FAW and control practices should be integrated. In a recent scientific publication, which used survey data from Zambia and Ghana, it was found that the combination of pesticide application and hand-picking of larvae produced the highest yield gain of 125%. The authors concluded that the current interventions utilised by farmers to manage FAW infestations are providing positive outcomes. However, successful management of the pest will require more action, which includes raising awareness to enhance the adoption of control interventions, as well as exploring other control options.

WHAT IS KZN DARD DOING?

- Research into the efficacy of pheromone lures in trapping male fall armyworm moths.

An efficient lure has been identified based on work conducted on the Cedara Research Station. Data emanating from this work will contribute to the permanent registration of this lure in South Africa.

This particular lure currently has an emergency registration to enable certain users and to conduct efficacy trials, where data needs to be submitted by February 2020. Utilisation of an efficient pheromone will result in better surveillance of this pest during crop growing seasons, particularly within the maize/green mealie fields of smallholder farmers and rural farm families.

In turn, this will allow officials of relevant government departments to act accordingly in controlling the pest, while helping farmers to understand its severity. The benefits of such work is evident in the case of *Busseola fusca* Fuller (Lepidoptera: Noctuidae), where pheromone trap captures have greatly enhanced timeous spraying against this pest in South Africa.

• Creating awareness

Farmers' day events pertaining to this pest have continued since its arrival. Such events include presentations by experts and scouting sessions in the field. Extension and advisory officials have also been included in such events, as well as workshops, in order for them to familiarise themselves with this pest - thereby putting them in a better position to advise farmers in their

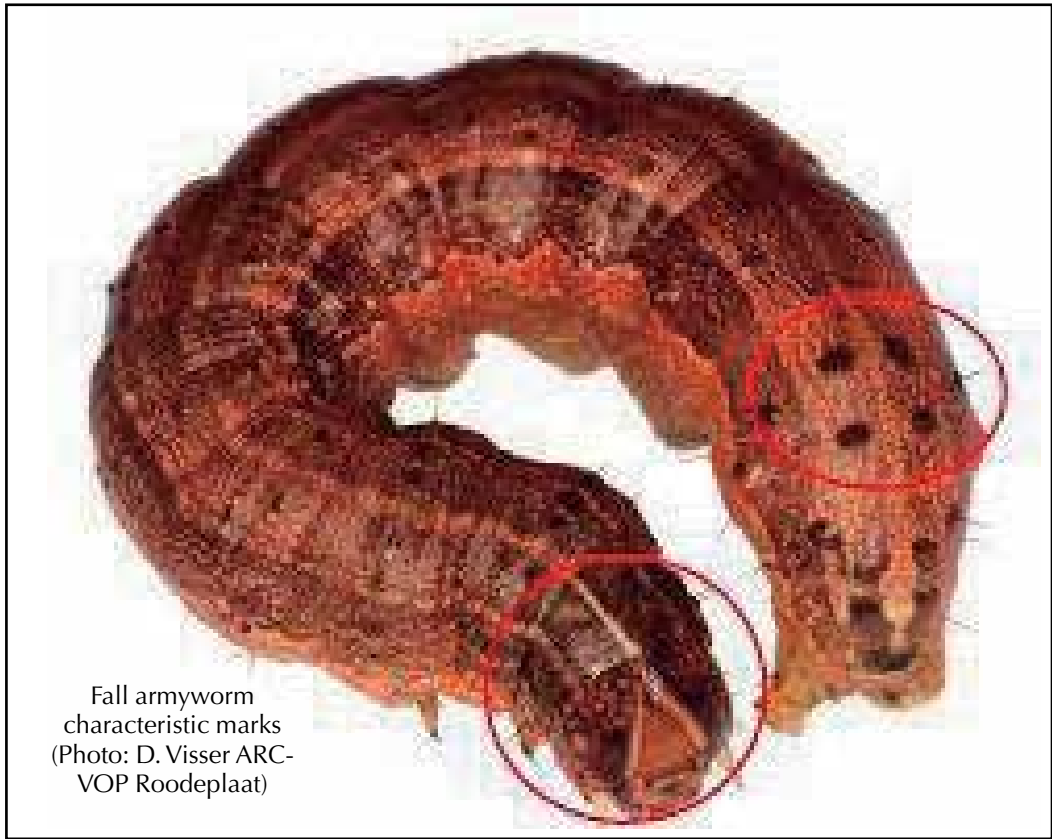


Figure 3: Fall armyworm and stalk borer (i.e. B. fusca) attacking the same maize plant.

relevant regions. Finally, a research bulletin pertaining to this pest has been published on the KZN DARD website. More bulletins will follow soon.

• Monitoring using pheromone traps

FAW is being monitored on the Makhathini Research Station, as well as the Cedara Research Station. Monitoring will commence this growing season on the other two research stations.

This will include the Dundee and Kokstad Stations, respectively. This essentially

provides good surveillance coverage in the province. Such data will help in prioritising high risk regions where government assistance is required.

CONCLUSION

In KwaZulu-Natal, no economic losses resulting from FAW were recorded or reported. Stalk borer still remains particularly problematic in the province, where economic losses and substantial damage were recorded.

Therefore, one cannot only focus on FAW. It is therefore crucial to understand the pest situation in a certain region and base control methods around this. Remember, no two regions are the same.

FAW is here to stay and is not going away. In light of this, it is crucial for farmers, in particular, to plan accordingly before the start of growing seasons.

Based on the experiences in KZN to date, it appears that the FAW is not as destructive as previously thought.



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