Department of
Primary Industries and Regional Development

GOVERNMENT OF WESTERN AUSTRALIA

Fall armyworm in Western Australia webinar Questions and answers

6 May 2020

Biosecurity

Question: Is containment of fall armyworm being considered?

Answer: The fall armyworm, *Spodoptera frugiperda*, has been declared at a national level to be non-eradicable. Given this insect has the natural capacity to disperse over large distances in a short period of time, containment is not possible.

Lifecycle

Question: What causes large numbers?

Answer: Fall armyworm is naturally prolific, highly mobile as moths and larvae feed on a wide array of plants to survive. A single female can lay as many as 1000 eggs throughout her life span as a moth. If all these eggs were to survive to adult stage, we would see massive outbreaks of fall armyworm, all the time. But, outbreaks are sporadic in other parts of the world.

Various factors can influence the chance of survival for fall armyworm:

- Eggs and larvae can be parasitised or eaten by natural enemies such as spiders, beetles, and wasps.
- Birds, other vertebrates and invertebrates may eat adult moths.
- Various fungi, bacteria and viruses kill fall armyworm.
- There is also evidence of cannibalism in fall armyworm when conditions are crowded.
- Host plant quality and availability can influence the health and survival of fall armyworm larvae, pupae and the number of eggs an adult female moth can lay.
- Weather events, and high and low temperatures can lead to mortality.

Thus, changes in population numbers for fall armyworm are driven by temperature, weather events, food quality and natural enemies. While these factors can reduce fall armyworm numbers, adverse changes in any of these factors can lead to an increased population of fall armyworm.

Question: Is the life cycle from the time the egg is laid until the moth emerges and can lay eggs, or from the time the egg is laid until the caterpillar finishes eating and goes into a pupa?

Answer: We usually start counting the days for development from the time the egg is laid by the female to the time it emerges as an adult moth.

Question: How can adult fall armyworm moths be identified in the field if the scales are missing or damaged?

Answer: It is not possible to visually determine the species if the wings of the moth do not have a good covering of scales. Adult fall armyworms look very similar to adults of other species, like the cluster caterpillar, *Spodoptera litura*, which are found in some of the same crops. Fall armyworm larvae have more distinguishing features and growers should focus on collecting and monitoring the larvae.

Question: What's considered a "cool" temperature for development? And I'm seeking confirmation that fall armyworm won't survive below 10º Celcius?

Answer: The fall armyworm is adapted to live in tropical and subtropical climates and its rate of development is tied to temperature. The optimal temperature for fall armyworm development from egg to adult stage is 28ºC and at this temperature, it takes about 30 days. The ideal temperature range for the development of the insect is between about 20ºC and 30ºC. Fall armyworm complete its lifecycle faster at warmer temperatures within this range and slower at cooler temperatures.

Fall armyworm can continue to develop at temperatures above 30ºC but it doesn't develop as well, and adults may be deformed. Likewise, it can continue to develop at temperatures below 20ºC, but it does not survive prolonged periods of cold temperature below 10ºC.

Feeding and damage

Question: Does fall armyworm affect fruit also?

Answer: Fall armyworm can affect and feed on the fruits and grains in addition to the vegetative or leafy parts of plants.

Question: Do you think fall armyworm will lop cereal heads like southern armyworm do in early summer?

Answer: There is no specific evidence that larvae will chew heads off cereals.

Question: You mentioned fall armyworm feeds on many crops, including wheat. Does the same apply to barley, oats and canola?

Answer: Fall armyworm has a wide host range of over 350 plant species. However, some of those host plants are identified as main hosts and are preferred by fall armyworm. Others are secondary or occasional host plants. In general, fall armyworm prefer grasses and among these, maize, sweet corn, and sorghum are favoured.

In a recent review of the host plants fed on by fall armyworm, barley (*Hordeum vulgare*) and oats (*Avena sativa*) were noted as host plants. Both barley and oats are considered secondary host plants and may not be consumed if a preferred host plant is available.

Brassicas are noted as hosts but canola (*Brassica napus var napus)* is considered a secondary host plant and may not be fed on, particularly if a preferred host plant is available.

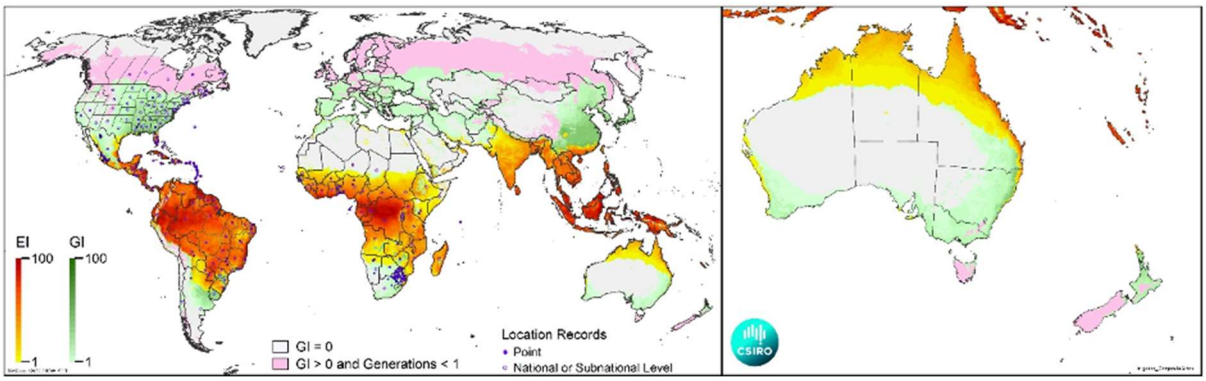
Dispersal and range

Question: Is fall armyworm likely to be a warm northern climate pest? If so, why is it a potential pest around Perth to Albany? Why does it like Mediterranean environment when it is a tropical pest?

Answer: Fall armyworm is considered a tropical or subtropical pest as it does not have a diapause or resting stage that can endure cold temperatures. This means it cannot persist year-round in places where temperatures drop below the lower threshold of about 10ºC. There is some variation in this lower threshold as fall armyworm has adapted to different climates around the world.

The temperature ranges at which fall armyworm can survive year-round is consistent with temperatures in the north of Western Australia. However, there are times of the year in the south when temperatures are acceptable for fall armyworm survival and reproduction. The would have to migrate to these areas every year and re-establish in the crops from areas in the north where it exists year-round. Please refer to the CLIMEX map below.

Fall armyworm follows this pattern in the Unites States, where it exists year-round in southern Florida and Texas. The pest populations build up as the temperatures warm and then it migrates north as far as Canada and causes damage to crops grown across this range.



Caption: *The potential distribution of fall armyworm (Spodoptera frugiperda) globally and in Australia is modelled using CLIMEX. The yellow-red-shaded areas indicate relative climatic suitability for establishment of persistent populations. The green-shaded areas indicate climatic suitability for seasonal migration during warmer months. Pink areas cannot support a full generation of the moth. Image source: du Plessis, H., van den Berg, J., Kriticos, D.J. & Ota, N. (2017) Spodoptera frugiperda (fall armyworm). Pest Geography. CSIRO-InSTePP, Canberra.*

Question: What is the likelihood of natural spread to the South West region, considering there is an unsuitable area between?

Answer: This insect is capable of migrating long distances on its own in a single generation, particularly if aided by wind currents and weather events. Potential pockets of suitable habitat exist in areas such as the Pilbara, where acceptable host plants are grown under pivot irrigation. Weather events such as cyclones could aid long distance movement from the Kimberley down to the Pilbara and Gascoyne regions during the wet season.

Question: Are Victoria and South Australia also at risk from fall armyworm?

Answer: As with southern Western Australia, Victoria and South Australia may also be at risk of the seasonal migration of fall armyworm southward from areas where it establishes year-round in the north, such as in Queensland or the Northern Territory. Refer to the image above.

Question: Is all of Western Australia's South West agricultural area suitable or highly suitable for fall armyworm?

Answer: There are areas in the State's South West that are considered suitable and highly suitable. The climate prediction also suggests areas of the South West that are considered marginally suitable for fall armyworm. We should also continue to monitor these areas, which include a number of favoured crops and pastures. However, it is unlikely the pest will establish year-round in these areas given the colder winter temperatures.

Trapping and surveillance

Question: Will we be putting traps across the wheat/grainbelt in the south?

Answer: At this point, DPIRD has not placed pheromone traps in the grain growing areas of Western Australia or the Wheatbelt region. As crops start to go in, there is consideration for the strategic placement of traps. Growers and agronomists can work with DPIRD to place traps in these areas to expand the range of WA's early warning surveillance system.

Question: Will DPIRD be placing traps in Manjimup Food Bowl?

Answer: At this point, no pheromone traps have been placed in Manjimup area as part of the formal surveillance program for this pest. However, growers and agronomists can work with DPIRD to place traps in these areas to expand the early warning system.

Question: Are the surveillance results being displayed on the web or other platforms? Are the results available to growers?

Answer: DPIRD is developing a map that will display the general location of detections to date. This map will soon be available on the department's website. Individuals who submit pest samples will receive results for their submissions.

Question: How specific to fall armyworm is the lure?
Answer: The pheromone lure is highly specific to fall armyworm, however, some other moths and insects occasionally get caught in the traps as they may be attracted to certain elements of the lure.

Question: Are traps available for purchase?

Answer: Traps are available for purchase. There are Australian suppliers of the bucket or funnel traps. DPIRD and other government agencies sourced traps from Costa Rica. The lure and toxicant are needed as part the trap system and are available for purchase but their use requires collaboration with DPIRD. See below for more detail on this.

Question: Where can traps be access or ordered from?

Answer: A number of suppliers can provide the traps, which are often referred to as unitraps or bucket traps. These have been used for many years for a range of pests and are freely available in Australia and overseas. Australian suppliers of pheromone lures are limited because fall armyworm is a new pest to Australia, but this is an evolving situation with increasing demand.

Question: Is the purchase of pheromone lures and pesticides possible?

Answer: It is allowable to purchase the pheromone lure and the pesticide. However, the relevant Australian Pesticides and Veterinary Medicines Authority (APVMA) permit (PER89169) states that use of the lure and pesticide is currently only allowable by "Commonwealth or state biosecurity officers, their contractors or persons under their direction trained in the handling and use of the products to be used". Please contact DPIRD if you would like to deploy a fall armyworm trap with lure.

Management

Question: What are the recommended treatment and control methods?

Answer: Recommended treatments will vary depending on the crop. In general, we recommend you manage fall armyworm the same way you approach the management of other *lepidopteran* pests in your crops. At this time, the most predictable tool for fall armyworm management in the toolbox is chemical control. However, we know from overseas experience that sole reliance on chemical management options will lead to the evolution of resistance in fall armyworm and disrupt natural enemies in the system.

This is a challenging time for growers and agronomists across industry, as there is much we don't know about how this insect will behave in Western Australia. We recommend remaining vigilant and using chemical control options judiciously, keeping in mind natural enemies of fall armyworm, other pests in the system and the possibility for resistance.

Question: Are any seed treatments registered for the control of fall armyworm in broadacre crops in Australia?

Answer: Insecticide seed treatments such as *chlorantraniliprole* have been effective against fall armyworm in seedling maize. However, no seed treatments are currently registered or under permit for field crops in Australia. The seed treatments for broadacre crops are aimed at controlling sucking insects such as aphids, beetles such as wireworm and red-legged earth mite (RLEM). The only pre-plant systemic for fall armyworm control is available as a seedling treatment in leafy vegetables, including leafy brassicas.

Question: Has pesticide resistance been found in other countries?

Answer: Fall armyworm has a reputation for developing resistance and cross-resistance to insecticides and has done so for different classes of compounds in different parts of the world.

Question: What are the thresholds in non-GM maize?

Answer: The action thresholds recommended for applying control measures for fall armyworm vary depending on the growth stage:

- At the seedling stage, if more than 5% of plants are cut.
- At the early whorl stage (knee high), if more than 20% of plants are infested.
- At the late whorl stage (shoulder high), if more than 40% of plants are damaged, and live larvae are present, and
- At the tasselling/early silking stage:
    - in sweet corn, if more than 5% of plants are infested, and
    - in maize, if more than 20% of plants are infested.

Question: What are the management options for growers if they suspect fall armyworm in the crop and are waiting on test results?

Answer: The current APVMA permits specific to fall armyworm, require a confirmed identification of this insect. However, in WA use of any insecticides registered for use on crops for control of other insects is permitted if those products are considered effective on fall armyworm, and provided they are applied according to label details. See section 87 'Use in accordance with label', page 53 of Western Australia's Health (Pesticides) Regulations 2011. Where required, APVMA permits should be read in conjunction with the relevant product label for information on withholding periods and other critical comments.

Question: Has modelling been undertaken to determine whether fall armyworm could be contained in northern WA for a period of six months to protect the 2020 cereal crop?

Answer: It is not possible to contain fall armyworm in any of the northern areas. This insect disperses readily on its own, particularly on wind currents.

Question: At what point is fall armyworm intervention more effective than control or management?

Answer: Based on the experience of growers overseas, the use of chemical intervention on younger larvae of about 1.5mm has more impact, as larger larvae consume more and cause extra damage. Thresholds for larvae at this size vary with the commodity/crop grown.

Question: Does pupae busting help reduce risks for the following season? Will pupae busting reduce the risk of damage in following crops?

Answer: This will need to be studied specifically for fall armyworm. However, a study of till and no-till systems overseas found no difference of either treatment on fall armyworm numbers, suggesting that pupae busting may not be an effective tactic for this pest.

Question: Are recommended economic thresholds available for various crops to help growers decide when to spray?

Answer: With further study we can develop economic threshold relevant to Australian production systems. At this time, we will need to rely on thresholds developed overseas. These are being reviewed and will soon be published on the DPIRD website.

Question: Does fall armyworm have any known natural predators, such as wasps, in the WA environment?

Answer: Natural enemy species that attack fall armyworm overseas are also present in Australia and Western Australia, including at least one parasitic wasp which has already attempted to use fall armyworm larvae as a host, in Kununurra. Generalist predators, egg parasitoids and pathogens are all expected to use fall armyworm as food and hosts as they do with other *lepidopteran* pests in WA.

Question: Is it possible to get a resistance profile on fall armyworm in Kununurra?

Answer: Once a research colony is established it will be possible to conduct some resistance profiling. This is the aim of several research organisations.

Question: Spinetoram has a permit and cost $100/ha. There are a number of $10/ha insecticides that could be used (if not resistant) under WA regulations. Can these be listed or tested?

Answer: APVMA permits have been issued for fall armyworm control on various commodities. Other applications for permits are being reviewed. If there is a particular product that you would like to see permitted, work with your industry body to submit an application. Where required, APVMA permits should be read in conjunction with the relevant product label for information on withholding periods and other critical comments.

Question: Can frost-mitigation strategies for orchards in Manjimup aid fall armyworm survival?

Answer: Further research will be required to answer this question.

Question: Where can we get more information about fall armyworm?

Answer: A number of government and industry bodies are providing information and recommendations on their websites, including DPIRD, and researchers are available to assist in answering your questions. Work with your agronomist for specific pesticide or management recommendations for your crop.

Contact

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