Original Research Article

Impact of Fall Army Worm (FAW) (*Spodoptera frugiperda*) on the Yield of Maize under Western Agro Climatic Zone of Tamil Nadu

ABSTRACT

The invasive pest, Fall Army Worm (FAW) is a serious one because of its widespread outbreak on maize growing regions. Since its occurrence across the world, the main adoption technique to manage the pest is the spraying of chemical pesticides. This leads to negative environmental impacts. Thus, the present investigation was undergone during Kharif and Rabi seasons of 2019 to study the influence of different dates of sowing and intercropping of legumes on the level of infestation of fall armyworm on maize crop. Three dates of sowing were adopted in each season and intercrops like cowpea, soybean, sunnhemp and tephrosia were included beside sole maize with and without insecticide spray. The results showed that the maize planted during July and October month has reported less infestation of FAW and provided higher yield than the rest of the planting taken. The cowpea and sunnhemp intercropped maize has performed well in terms of yield and the leaf damage was also found to be lower apart from the insecticide applied maize crop.

Keywords: Fall armyworm, Maize yield, Intercropping, Dates of sowing

1. INTRODUCTION

Until 2016, the pest, Fall Army Worm (FAW) has been a major issue in America. In 2016, FAW was reported in the African continent and the reason for the invasion is mysterious. But it is believed that the haplotype that emerged from Florida and the Caribbean existed in Africa (Huesing *et al.,* 2018). Moreover, the other reason for FAW to easily invade the continent is because of its prolific reproducing ability and skill to migrate long distances. The FAW larva caused severe destruction to its host by consuming foliage while the FAW adult takes care of dispersion. The early instar larva causes skeletonized leaves and windowed whorls while the matured larva feeds on maize cob resulting in a fall in yield and quality (Capinera *et al.,* 2017). FAW can cause a yield reduction of about 34 to 38% (Nelly *et al.,* 2021).

The pest FAW has caused serious devastation to the maize crop in India since its outbreak in 2018. After its first report at the College of Agriculture, Shivamogga, Karnataka, it has rapidly spread across the nation. The chief maize cultivating states contribute 79% of the country's maize production and they are Uttar Pradesh, Bihar, Madhya Pradesh, Maharashtra, Rajasthan, Gujarat, Karnataka, Andhra Pradesh, and Tamil Nadu. Most of the maize produced in the country is used for poultry and livestock feed and for industrial purposes. The input of Tamil Nadu to the nation's maize yield is almost 7.25% from the major growing districts like Perambalur, Ariyalur, Cuddalore, Dindigul, and Tirupur. Of the 3.55 lakh acres of maize cultivated, the pest FAW damaged 2.2 lakh acres during 2018 in Tamil Nadu.

The foremost strategy adopted across the globe to manage FAW is the application of chemical insecticides. Though this technique reduces the damage caused and decreases the spread of the pest, its constant use may lead to the development of insecticide resistance in FAW. Further, this method is not useful for FAW management as the excreta of this pest are heavy which blocks the pesticide and may not reach the whorl where the larvae are feeding (Day *et al.,* 2017). Hence, the alternative is to implement an environment-friendly, integrated approach which includes push-pull technology, use of botanical extracts, intercropping, natural enemies and parasitoids, utilizing locally available materials, etc. Keeping this in view, the present investigation has been carried out to find a management option that deliberates ecological values.

2. MATERIAL AND METHODS

The trial was carried out in Eastern Block Farm at Tamil Nadu Agricultural University, Coimbatore from 2019 to 2020. The investigational field is situated at 11°N and 76°57´E longitude and an altitude of 426.7 m above MSL in the Western Agro-Climatic Zone (ACZ) of Tamil Nadu. The soil of the experimental site was sandy clay loam in texture. The climatic condition of the site was hot semi-arid under the Koppen climate classification. The wet season of the site lasts from June to November.

Maize was sown at three dates of sowing in four seasons viz., Kharif, 2019 (D_1 - June 15th, D_2 - July 15th, and D_3 - August 15th), Rabi, 2019 (D_1 - September 15th, D_2 - October 15th and D_3 - November 15th), Late Rabi, 2020-2021 (D_1 - December 15th, D_2 - January 15th and D_3 - February 15th) and Summer, 2021 (D_1 - March 15th, D_2 - April 15th and D_3 - May 15th) and were taken in the main plot. Along with sole maize without insecticide spray (S_1) and sole maize with recommended insecticidal spray (S_2), the intercrops were taken in subplot *viz.,* maize + cowpea (S_3), maize + soybean (S_4), maize + sunn hemp (S_5), and maize + tephrosia (S_6). The split-plot design was adopted and replicated thrice.

The fields were ploughed with a cultivator and rotovator to get a fine, clod-free tilth. After forming ridges and furrows, the area was delineated into plots, and treatments were allocated. Neem cake was applied two weeks before the sowing and fertilizers were applied as per recommendation given by TNAU (135: 62.5: 50 kg NPK/ha). Maize was planted at a spacing of 60 x 25 cm while the intercrops were sown in between the maize rows. The after cultivation for maize was done as per the recommended practices while the intercrops were not undergone any such operations like maize. The intercrops were brown manured at 50 days after sowing by spraying 2, 4-D herbicide. The chemical pesticides for treatment S_2 (Sole maize with recommended insecticide spray) were sprayed at 20 and 40 DAS using Azadirachtin and Emamectin Benzoate, respectively.

The damage caused by FAW on maize foliage was noted down before tasseling stage by using Davis *et al.* (1992) scoring scale and the yield of maize was recorded for different dates of sowing.

3. RESULTS AND DISCUSSION

The influence of fall armyworm leaf damage on yield of maize at different dates of sowing and intercropping is presented in Figure 1 to 6.

Among the various treatments adopted, the sole maize with recommended insecticide spray (S_2) has produced better yield than the others irrespective of the dates of sowing. This is due to the quick action and higher toxicity of insecticides that are sprayed at the whorls of maize where the larvae reside and this was in accordance with the findings of Pitre (1986). The next greatest yield was found in maize intercropped with cowpea (S_3) followed by sunnhemp (S_5) in all three plantings of Kharif and Rabi season. This is because the cowpea and sunnhemp intercrops possess the ability to minimize the masses of FAW which also delays it's time of infestation in succeeding maize growing season. This was similar to the results of Meagher *et al.* (2004) who reported that the FAW larvae took more time to develop in cowpea and sunnhemp crops and also the pupae weight was found to be 20 to 25% lower than the other treatments implemented.

Of the three sowings taken in Kharif and Rabi season, the maize planting done during July (7200 kg/ha) and October (7015 kg/ha) month has produced better yield compared to other two plantings in both seasons which is because of the less leaf damage of FAW in July (1.47) and October (1.18) month. The minimal leaf damage during these two plantings might be due to the copious amount of rainfall received during its initial stages of vegetative growth. This effective rain might have provided better growing condition for the maize crop during its initial stages and have reduced the spread and damage of FAW. This result was similar to the outcomes of Harrison *et al.* (2019) which stated that the first effective rains provide better growing conditions for maize, making use of more heat units at the beginning of the cropping season.

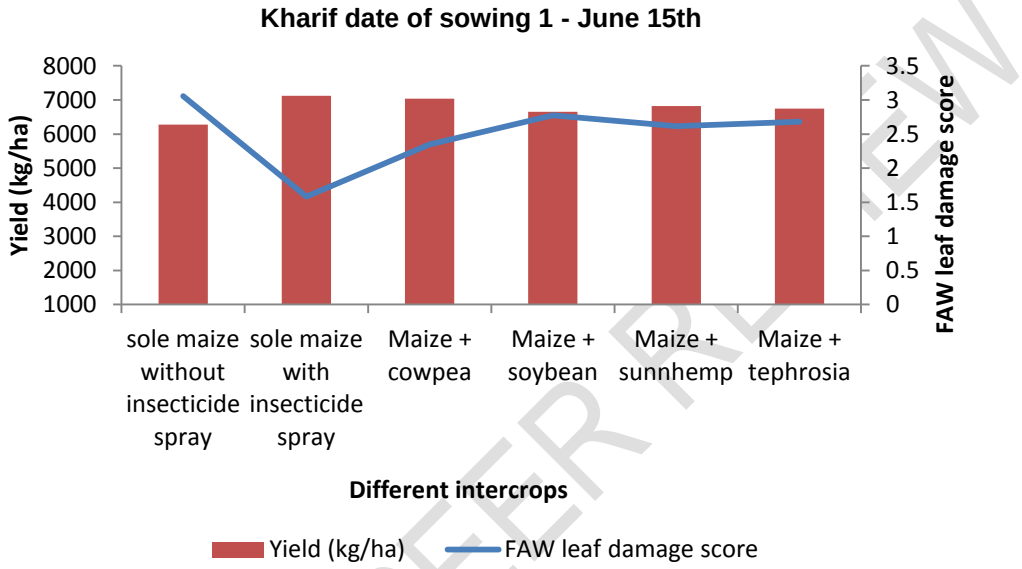

Fig 1. Influence of FAW leaf damage on the yield of maize at first date of sowing (June 15th) during Kharif, 2019

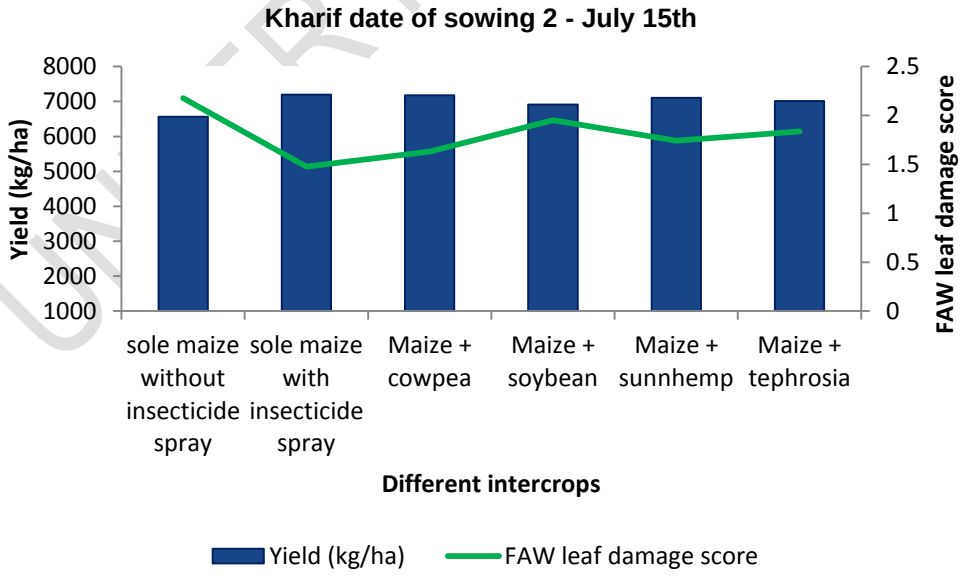

Fig 2. Influence of FAW leaf damage on the yield of maize at second date of sowing (July 15th) during Kharif, 2019

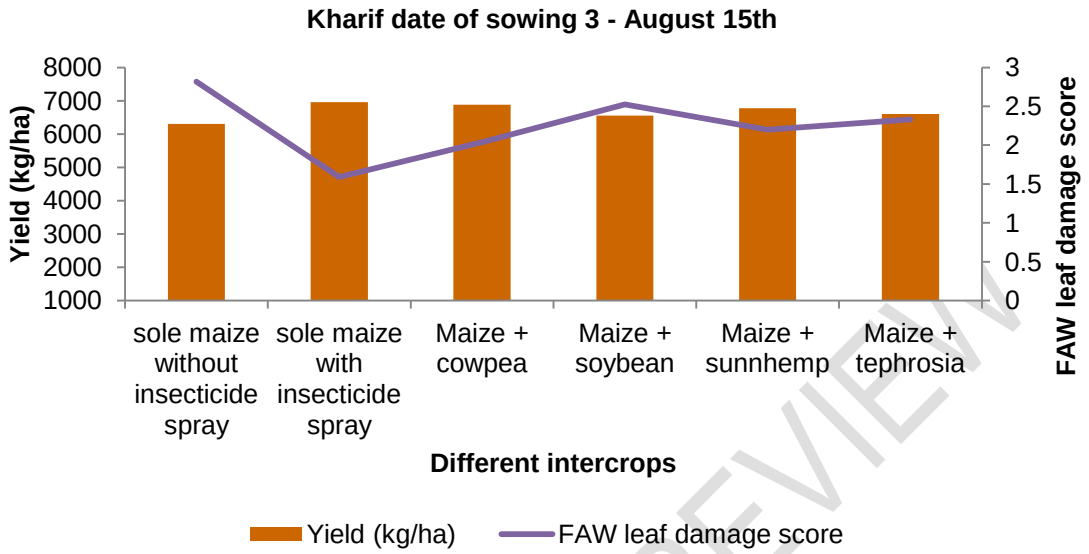

Fig 3. Influence of FAW leaf damage on the yield of maize at third date of sowing (August 15th) during Kharif, 2019

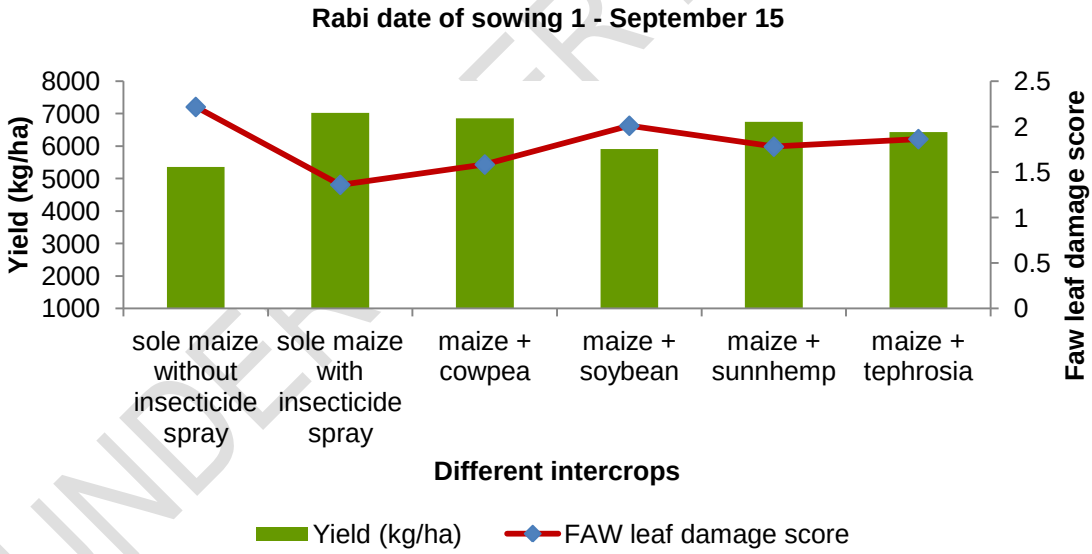

Fig 4. Influence of FAW leaf damage on the yield of maize at first date of sowing (September 15th) during Rabi, 2019

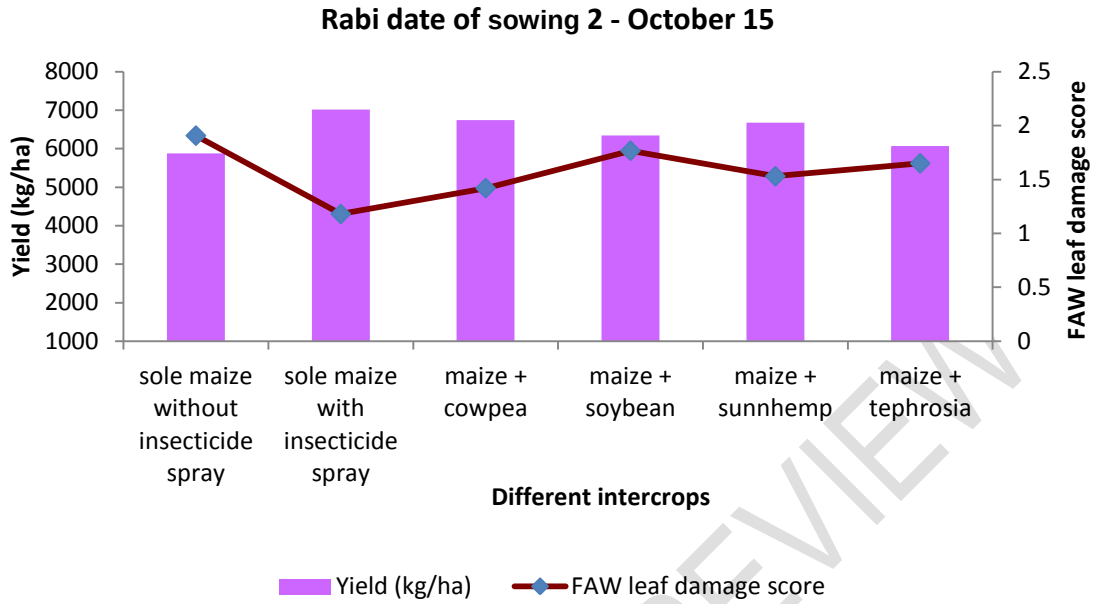

Fig 5. Influence of FAW leaf damage on the yield of maize at second date of sowing (October 15th) during Rabi, 2019

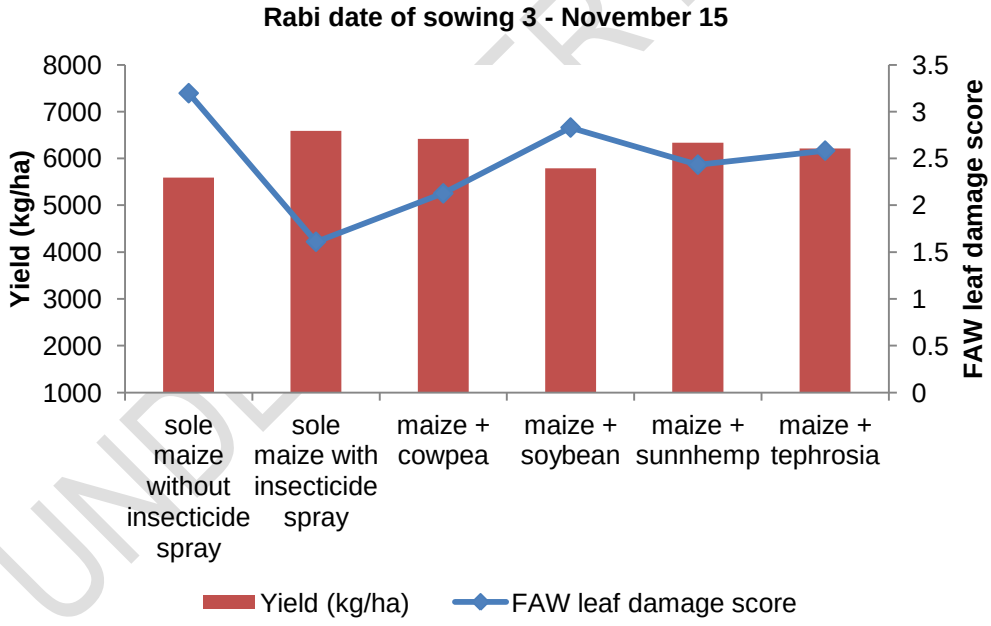

Fig 6. Influence of FAW leaf damage on the yield of maize at third date of sowing (November 15th) during Rabi, 2019

4. CONCLUSION

It is obvious from the above results that the maize crop which received better growing condition can withstand the damage caused by FAW pest and those with cowpea and sunnhemp intercropping performed well next to the chemical treatment.

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