SURVEY OF FALL ARMYWORM, *Spodoptera frugiperda* INCIDENCE IN MAIZE IN TELANGANA, INDIA

ABSTRACT

A roving survey was conducted in maize during the Rabi season of 2023-24, covering three agroclimatic zones aimed to assess the extent of damage inflicted by fall armyworm (FAW), *Spodoptera frugiperda*. The survey assessed FAW infestation levels and leaf injury ratings at both vegetative and reproductive stages of maize growth. The findings revealed varying degrees of infestation and damage across different villages and zones, with the highest infestation rates observed in the South Telangana Zone. Notably, the study identified Lingasanipally village in Nagarkurnool district as experiencing the highest infestation at 80% during the vegetative stage. Leaf injury ratings ranged from 2.1 to 6.12, with the highest rating recorded in Latpally village of Nagarkurnool district.

Key word: FALL ARMYWORM, Lepidoptera, Spodoptera frugiperda, nematodes

1. INTRODUCTION

Maize, *Zea mays* L. (Poaceae) is the third most important cereal crop after wheat and rice in Telangana. It is popularly called as "Queen of cereals" because of its high genetic yield potential (Parihar *et al*., 2011). With an energy density of 365 kcal/100 g, maize is primarily composed of roughly 72% carbohydrate, 10% protein, and 4% fat (Ranum *et al.*, 2014). Numerous pests, including nematodes, mites, birds, and rats, attack the crop. From seeding to harvest, up to 141 insect pests harm maize crops (Reddy *et al*., 2008). *Spodoptera frugiperda* remains a prominent one among them causing major yield loss.This polyphagous lepidopteran pest is native to tropical and subtropical regions of America. However, a serious outbreak of FAW was recorded in African countries such as Sao Tome, Nigeria, Benin, and Togo in 2016 (Goergen *et al*., 2016) and later in 2017, it was reported in Ghana. It is the primary insect pest of maize in these regions, but it also targets over 80 different plant species, including alfalfa, sorghum, rice, millet, peanuts, and other wild and cultivated plant species (Sisay et al., 2019). It was reported that FAW caused up to 34.11 per cent yield loss in maize (Overton *et al*., 2021). In India, the incidence of FAW was first reported in Karnataka in 2018 by Sharanabasappa *et al*. (2018) subsequently the infestation was reported in Maharastra, Gujarat, Chattisgarh, Andhra Pradesh, Telangana, Tamil Nadu, and Odisha (Chormule *et al.*, 2019; Padhee and Prasanna, 2019; Sisodiya *et al.*, 2018 and Deole *et al.*, 2018).

FAW in Telangana has spread to almost all the maize-growing areas in the past few years. Maize is the second most important cereal next to paddy in Telangana and FAW can become a major threat to the crop yield and economy. So, the survey was undertaken to record the extent of damage caused by FAW across three agroclimatic zones *viz*., North Telangana Zone (NTZ), South Telangana Zone (STZ), and Central Telangana Zone (CTZ). Survey during various cropping stages in agriculturally important crops is requisite to comprehend the per cent incidence and to make timely decisions to prevent more economic yield loss in crop. This article is a step towards it.

2. MATERIAL AND METHODS

A roving survey was conducted in Rabi 2023-24 covering all three agroclimatic zones of Telangana. Prominent maize-growing villages were selected in each zone from major maize-growing mandals. In each village, 3 farmer fields were selected for survey. The survey was carried out at two crop stages, i.e., during the vegetative stage – from 7 days after sowing to 50 days after sowing and the reproductive stage – 60 days after sowing to 110 days after sowing the crop.

The roving survey was carried out by a leisure walking in "W" pattern in the field after leaving 3-4 outer rows. While walking in the first straight line, 5 plants on the way were selected before reaching the first stopping point. Like-wise 20 plants were selected while covering the 5 stopping points representing the corners of "W". The per cent infestation was calculated using the below mentioned formula

$$\text{Percent Infestation} = \frac{\text{No. of plants damaged}}{\text{Total no. of plants observed}} \times 100$$

The leaf injury rating was recorded by using modified Davis and Williams 1-9 rating scale.

Table 1. Leaf injury rating chart

Score	Damage symptoms/ Description	Response
1	No visible leaf feeding damage	Highly resistant
2	Few pinholes on 1-2 older leaves	Resistant
3	Several shot-hole injuries on a few leaves (<5 leaves) and small circular hole damage to leaves	Resistant
4	Several shot-hole injuries on several leaves (6–8 leaves) or small lesions/pinholes, small circular lesions, and a few small elongated (rectangular-shaped) lesions of up to 1.3 cm in length present on whorl and furl leaves	Moderately Resistant
5	Elongated lesions (>2.5 cm long) on 8-10 leaves, plus a few small- to mid-sized uniform to irregular-shaped holes (basement membrane consumed) eaten from the whorl and/or furl leaves	Moderately Resistant

6	Several large elongated lesions present on several whorl and furl leaves and/or several large uniform to irregular-shaped holes eaten from furl and whorl Leaves	Susceptible
7	Many elongated lesions of all sizes present on several whorl and furl leaves plus several large uniform to irregular-shaped holes eaten from the whorl and furl leaves	Susceptible
8	Many elongated lesions of all sizes present on most whorl and furl leaves plus many mid- to large-sized uniform to irregular-shaped holes eaten from the whorl and furl leaves	Highly Susceptible
9	Whorl and furl leaves almost totally destroyed and plant dying as a result of extensive foliar damage	Highly Susceptible

(Modified from Davis and Williams, 1992)

3. RESULTS AND DISCUSSION

The survey results in terms of per cent infestation and leaf injury rating during vegetative and reproductive stages recorded from various villages across three agroclimatic zones of Telangana are presented in Tables 2 and 3. The per cent infestation ranged from 20-80 percent in Telangana. 80 per cent infestation was noticed in Lingasanipally village of Nagarkurnool district in STZ during the vegetative stage. The lowest per cent infestation which is 20 per cent was recorded in Venkepally village of Saidapur and New Pochampad of Nirmal district in NTZ.

The lowest leaf injury rating (LIR) of 2.1 was recorded in New Pochampad village of Nirmal district in the North Telangana zone and Ramachandrapuram village of Khammam district in the Central Telangana zone. 6.12 was recorded as highest leaf injury rating in Latpally village of Nagarkurnool district in STZ.

The mean per cent infestation and LIR for both the vegetative and reproductive stages are recorded high in the south Telangana zone. The highest mean per cent infestation (50.27) was recorded in South Telengana Zone (STZ) followed by 42.5 in the North Telangana Zone and 41.7 in the Central Telangana Zone. The highest mean leaf injury rating (4.3) was recorded in the South Telangana Zone, followed by 3.57 in the North Telangana Zone and 3.22 in the Central Telangana Zone.

Getu *et al.* (2024) reported up to 91.67 per cent incidence of the pest Zara kebele of Ethiopia which is similar to the results obtained in the present study. Balakrishnan and Srinivasan (2020) reported that the percentage of FAW infestation ranged between 1.67 and 66.67 per cent. Ravindren *et al.* (2020) reported that the per cent incidence of fall armyworm ranged from 13.44 to 87.99 per cent in Andhra Pradesh. The findings pertaining to per cent infestation and leaf injury rating in present study are also similar to studies conducted by Sisay *et al.* (2019) where it is reported that the per cent of FAW infestation is up to 95.7 per cent in Tanzania and up to 100 per cent infestation in Kenya. The leaf damage rating was recorded in the range of 1.9 to 6.8 in Ethiopia and Kenya. Painkra *et al.* (2019) reported an

overall FAW incidence of 71 perc ent in Rabi in the Kondagoan district of Chhattisgarh which is similar to the present study.

Table 2. Percent infestation of fall armyworm, *S. frugiperda* on maize in various villages across various zones

Zone	District	Village	Percent infestation	
			Vegetative Stage	Reproductive Stage
STZ	Nagarkurnool	Gangaram	50	40
		Latpally	70	60
		Khanapur	55	40
		Lingasanipally	80	60
		Pothireddipally	40	40
	Rangareddi	Tangutoor	60	45
		Maheswaram	50	45
		Chevella	45	30
NTZ	Nirmal	Kallur	55	30
		New Pochampad	40	20
		Lolam	50	45
	Jagtial	Jaggsagar	60	50
		Bandalingapur	45	25
		Vellula	55	50
	Kothapally	Nagulamallial	45	40
	Saidapur	Perkapally	60	50
		Gollagudem	40	35
		Venkepally	35	20
CTZ	Khammam	Mallaram	55	40
		Brahmanapalli	40	25
		Tatigudem	60	35
		Buchireddy palem	45	30
		Ramachandrapuram	45	30
		Rudrakshapalli	50	35
		Kakarlapalli	55	40

Table 3. Leaf injury rating recorded by fall armyworm damage in various villages

Zone	District	Village	LIR	
			Vegetative Stage	Reproductive Stage
STZ	Nagarkurnool	Gangaram	4.61	3.44

		Latpally	6.12	5.81
		Khanapur	5.62	4.35
		Lingasanipally	6.08	4.81
		Pothireddipally	3.34	3.23
	Rangareddi	Tangutoor	3.2	2.9
		Maheswaram	4.4	3.6
		Chevella	3.12	2.8
NTZ	Nirmal	Kallur	4.6	2.8
		New Pochampad	3.41	2.1
		Lolam	3.94	3.11
	Jagtial	Jaggsagar	4.9	4.32
		Bandalingapur	3.6	2.4
		Vellula	4.81	3.8
	Kothapally	Nagulamallial	3.3	3.4
	Saidapur	Perkapally	5.1	4.7
		Gollagudem	3.4	2.9
		Venkepally	2.8	2.2
CTZ	Khammam	Mallaram	4.1	3.3
		Brahmanapalli	3.1	2.2
		Tatigudem	5.2	2.6
		Buchireddy palem	3.1	2.4
		Ramachandrapuram	3.4	2.1
		Rudrakshapalli	3.8	2.6
		Kakarlapalli	3.3	3.1

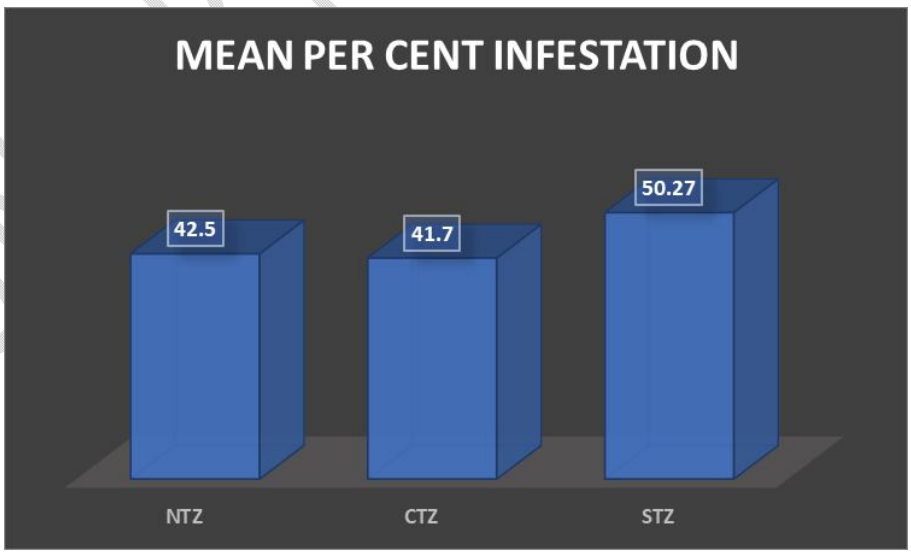

Fig. 1. Mean per cent infestation of fall armyworm across various Agro-climatic zones of Telangana

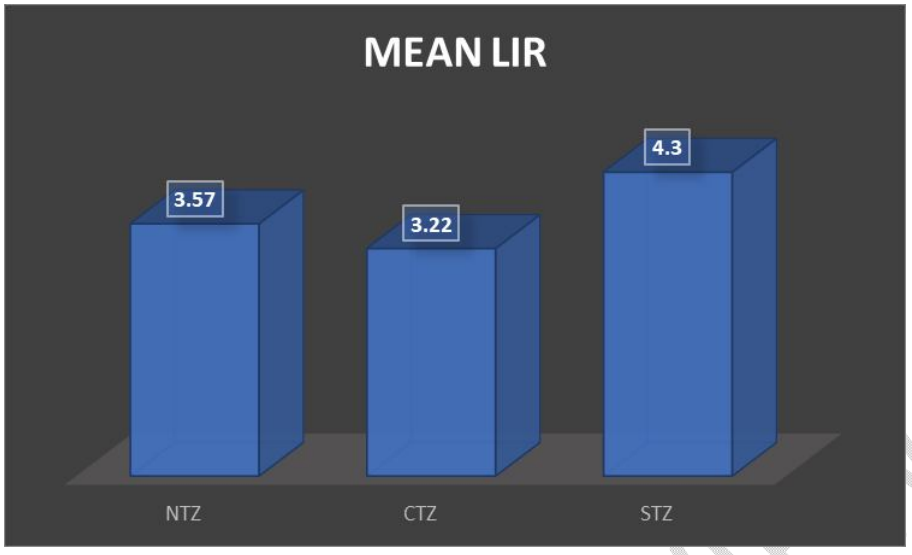

Fig. 2. Mean LIR of fall armyworm across various Agro-climatic zones of Telangana

4. SUMMARY AND CONCLUSION

The damage and yield loss caused by fall armyworms are increasing across various crops including maize. Surveys during various crop stages in maize is requisite to comprehend the per cent incidence and to make timely decisions to prevent more economic yield loss in crop. The present survey shows that the infestation is comparatively higher during the vegetative stage in all three Agro-climatic zones and there is thus a need to control the pest at earlier stages of the crop. Further studies are required on the damage pattern based on climate to predict the incidence of pests across various agroclimatic zones and to design the management strategies.

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