



Incidence and distribution of fall armyworm, *Spodoptera frugiperda* Smith (Lepidoptera: Noctuidae) in different geographical regions of Odisha, Andhra Pradesh and Telangana

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ABSTRACT: Fall armyworm *Spodoptera frugiperda* Smith (Lepidoptera: Noctuidae) is an invasive pest of maize, threatening the global food security. An attempt has been made on the occurrence and intensity of *S. frugiperda* in commercially grown maize fields of different geographical regions in Odisha, Andhra Pradesh and Telangana during 2019-2021. Results revealed that the infestation of fall armyworm ranged from 14.33 ± 2.33 to 45.66 ± 1.45 per cent. Simultaneously, highest per cent incidence was observed in Telangana (35.72 ± 2.66) followed by in Andhra Pradesh (26.51 ± 1.62 per cent) and Odisha (23.16 ± 1.97). The mean numbers of larvae recorded per fifty plants were 15.60 ± 1.21 , 15.89 ± 0.83 and 20.91 ± 1.47 in Odisha, Andhra Pradesh and Telangana, respectively. From the above study, it was evident that fall armyworm, *S. frugiperda* has spread over the Odisha, Andhra Pradesh and Telangana and can inflict potential damage to the maize crop in these southern India states.

Keywords: Fall armyworm, maize, *Spodoptera frugiperda*, distribution, Odisha, Andhra Pradesh, Telangana

INTRODUCTION

Fall armyworm, *Spodoptera frugiperda* (J. E. Smith) (Lepidoptera: Noctuidae) is an invasive and noxious pest of maize (*Zea mays* L.), which is indigenous to the Americas (Abrahams *et al.*, 2017 and Day *et al.*, 2017). It can cause huge yield loss in maize ranging from 57.60% to 58.00% (Cruz *et al.*, 1999 and Chimweta *et al.*, 2019). The Fall armyworm (FAW hereafter) invaded West and Central Africa in 2016 (Goergen *et al.*, 2016) and then it spread to all the countries of sub-Saharan Africa within short span of time (Prasanna *et al.*, 2018) indicating its rapid invasive ability in the African continent, threatening the food security of millions of people. It is now an invasive pest of Indian Sub-continent, first reported from Shivamogga district of Karnataka on maize during May-June, 2018 (Sharanbassappa *et al.*, 2018; Gainger *et al.*, 2018 and Shylesha *et al.*, 2018). Later, its presence was confirmed in few other states, such as Maharashtra, Gujarat, Chhattisgarh, Andhra Pradesh, Telangana, Tamil Nadu and Odisha (Chormule *et al.*, 2019; Padhee and Prasanna, 2019; Sisodiya *et al.*, 2018 and Deole *et al.*, 2018).

Fall army worm is a highly polyphagous pest infesting 186 plant species belonging to 42 different families among which Poaceae, Fabaceae, Solanaceae,

Asteraceae, Rosaceae, Chenopodiaceae, Brassicaceae and Cyperaceae are important (Casmuz *et al.*, 2010). In India, its incidence was first reported from maize, sugarcane and sorghum (Sharanbassappa *et al.*, 2018) and it has become a devastating pest due to its polyphagous nature, rapidly dispersing habit across wide geographical areas and persistence throughout the year. The larvae attack the maize plant at all stages of its development. They voraciously feed on the foliage and also can cause direct injury to the cob. According to the recent studies, fall armyworm can cause huge yield losses in maize ranging from 8.3 m to 20.6 million tonnes per year in absence of management practices (Day *et al.*, 2017). Therefore, an attempt has been made to generate the preliminary base line data on the occurrence and intensity of *S. frugiperda* in commercially grown maize fields of different geographical regions in Odisha, Andhra Pradesh and Telanganaduring 2019 to 2021.

MATERIALS AND METHODS

Roving surveys were conducted in commercial maize growing areas of different geographical regions in the states of Odisha, Andhra Pradesh and Telangana during 2019 to 2021. During the roving survey, 40 villages from thirteen districts of Odisha, Andhra Pradesh and Telangana were studied for the incidence of fall

Table 1. Incidence and distribution of fall armyworm, *Spodoptera frugiperda* in different maize growing regions of Odisha, Andhra Pradesh and Telangana

State	District	Village	Number of larvae/50 plants (Mean±SE)	Number of plants damaged /50 plants (Mean±SE)	Per cent infestation (Mean±SE)	
Odisha	Mayurbhanj	Naikali	12.33	12.00	24.00± 1.15	
		Budhikamali	22.33	18.00	36.00±2.30	
		Singerpur	18.00	11.00	22.00± 3.05	
		Batapondugondi	21.66	10.00	20.00± 2.30	
	Kendujhar	Bhalughar	9.33	8.33	16.00± 1.53	
		Gajapati	13.33	10.66	21.33 ± 2.02	
	Rayagada	Tumbiguda	18.33	16.33	32.66 ± 2.90	
		Sarguli	10.33	7.66	15.33 ± 1.45	
	Nabarangpur	Umerkotae	16.33	13.16	26.33 ± 5.24	
		Durgaguda	18.00	15.00	30.00 ± 1.53	
	Khordha	Bhubaneswar	12.66	8.33	16.66 ± 1.86	
		Khordha	14.66	8.83	17.66 ± 0.88	
Overall Mean (±SE)			15.60 ± 1.21	11.61 ± 0.97	23.16 ± 1.97	
Andhra Pradesh	Krishna	Velpucherla	12.00	8.16	16.33± 0.88	
		Chittapur	17.33	13.16	26.33± 2.85	
		Akirapalli	16.66	13.16	26.33 ± 0.88	
		Digavalli	21.66	17.83	35.67± 1.45	
		Reddygudem	20.33	15.33	30.67± 1.45	
		Naguluru	18.33	16.33	32.67± 0.88	
		Kondaparva	11.00	8.16	16.33± 0.88	
		Vissannapeta	15.33	12.66	25.33± 1.45	
	Guntur	Garikapadu	18.33	16.83	33.67± 2.33	
		Dwarakatirumala	17.00	17.00	34.00± 2.08	
		West Godavari	Dobucherla	13.33	11.83	23.67± 2.19
			V. R. Gudem	19.00	14.16	28.33± 2.03
	East Godavari	Devipatnam	17.00	16.50	33.00± 1.15	
		Chinnaramanayapeta	14.66	12.66	25.33± 5.36	
		Dhandangi	16.66	14.50	29.00± 3.05	
		Thoyeru	8.66	7.16	14.33± 2.33	
		Agraharam	13.00	9.83	19.66 ± 3.53	
Overall Mean (±SE)			15.89 ± 0.83	13.25± 0.81	26.51± 1.62	
Telangana	BhadradriKothagudem	Ganeshpalli	22.33	21.50	43.00 ± 8.66	
		Moddulagudem	20.66	18.50	37.00 ± 2.34	
		Naidupeta	19.33	16.33	32.66 ± 2.03	
		Gattugudem	25.00	19.50	39.00 ± 2.08	
		Nacharam	28.00	22.83	45.66 ± 1.45	
	Khammam	Rudrakshapalli	18.00	13.83	27.66 ± 5.23	
		Buggapadu	24.00	22.33	44.66 ± 3.53	
		Gangaram	19.00	15.83	31.66 ± 6.96	
	Hyderabad	Bethupalli	18.33	16.50	33.00± 2.89	
		Kakarlalalem	25.33	21.33	42.66 ± 0.88	
			Patancheru	10.00	8.00	16.00 ± 1.53
Overall Mean (±SE)			20.91 ± 1.47	17.86 ± 1.34	35.72± 2.66	

armyworm *S. frugiperda* (Table 1). In each region, three to five fields were randomly sampled per village. The consecutive sample fields were separated by at least 20 km, unless constrained by the availability of fields. Each sample field was divided into four equal plots. In each plot, scouting was done by inspecting 10 plants, moving along a W-shape design. The middle of the field was also sampled, making 50 plants surveyed per field (Prasanna *et al.*, 2018).

Spodoptera frugiperda presence was determined using the following indicators:

- (i) Presence of fresh frass in the leaf funnel
- (ii) Presence of larvae on leaves or in the leaf funnel identifiable with the inverted Y-shape mark on the head and the set of four dots forming a square on the dorsum of the last segment of abdomen
- (iii) Irregular damage (cuts) on leaves and
- (iv) Presence of egg masses.
- (v) Other plants known to be *S. frugiperda* hosts were also inspected in and around the maize fields surveyed (Abrahams *et al.*, 2017 and CABI, 2018).

RESULTS AND DISCUSSION

The incidence of FAW recorded during the roving survey in thirteen districts of Odisha, Andhra Pradesh and Telangana was presented in Table 1. Among three states surveyed, the infestation of fall armyworm ranged from 14.33 ± 2.33 to 45.66 ± 1.45 per cent. However, overall high incidence was observed in Telangana (35.72 ± 2.66) followed by Andhra Pradesh (26.51 ± 1.62 percent) and Odisha (23.16 ± 1.97). Similarly, average number of larvae recorded per fifty plants was 15.60 ± 1.21 , 15.89 ± 0.83 and 20.91 ± 1.47 in Odisha, Andhra Pradesh and Telangana, respectively.

In Odisha, twelve villages from six districts were surveyed for the distribution and incidence of fall armyworm, *S. frugiperda*. Results revealed that infestation of fall army worm was ranged from 15.33 ± 1.45 to 36.00 ± 2.30 per cent and the highest incidence was observed in the Budhikamali village of Mayurbhanj district (36.00 ± 2.30 %) followed by Tumbiguda village of Rayagada district (32.66 ± 2.90 %). Whereas the least per cent of incidence was noticed in the Sarguli village of Nabarangpur district (15.33 ± 1.45). The overall mean number of larvae recorded per fifty plants was 15.60 ± 1.21 (Range: 9.33 to 22.33 larvae).

Similarly in Andhra Pradesh, seventeen villages from

four districts were surveyed for the distribution and incidence of fall armyworm *S. frugiperda*. The survey revealed that the infestation of FAW ranged from 14.33 ± 2.33 to 35.67 ± 1.45 per cent and the maximum incidence was observed in the Digavalli village of Krishna district (35.67 ± 1.45 %) followed by Dwarakatirumala village of West Godavari district (34.00 ± 2.08 %).

Whereas, the lowest incidence was noticed in the Thoyeru village of East Godavari district (14.33 ± 2.33 %). The overall mean number of larvae recorded per fifty plants was 15.89 ± 0.83 (Range: 8.66 to 21.66 larvae).

Survey conducted in eleven villages from three districts of Telangana state revealed an incidence of fall armyworm *S. frugiperda* that ranged from 16.00 ± 1.53 to 45.66 ± 1.45 per cent. The maximum per cent of incidence was observed in the Nacharam village of Bhadradi Kothagudem district (45.66 ± 1.45) followed by Buggapadu village of Khammam district (44.66 ± 3.53). Whereas, the minimum per cent of incidence was noticed in the Patancheru village of Hyderabad (16.00 ± 1.53) and Rudrakshapalli village of Khammam district (27.66 ± 5.23). The overall mean number of larvae recorded per fifty plants was found to be 20.91 ± 1.47 (Range: 10.00 to 25.00 larvae).

The current study showed the incidence and spread of fall armyworm on maize in all the study areas surveyed as reported earlier (Chormule *et al.*, 2019; Padhee and Prasanna, 2019; Sisodiya *et al.*, 2018 and Deole *et al.*, 2018). The varying degrees of fall armyworm *S. frugiperda* incidence on maize was observed in all the districts studied and it was observed that the pest chosen young plants relatively than old and matured ones. During the survey, it was also observed that the pest not only fed on leaves and central whorls but also on young, immature cobs and grains. These findings were in concurrence to other workers (Deole *et al.*, 2018 and Goergen *et al.*, 2016), where it was observed that fall armyworm, *S. frugiperda* was found damaging the all-growth stages of maize. However, the FAW damage is more severe in vegetative stage when compared to other stages.

Literature on FAW incidence indicated higher infestation of *S. frugiperda* in summer maize (Dhar *et al.*, 2019 and Chormule *et al.*, 2019) and the same was observed in the present study also during farmers interaction. Different degrees of FAW incidences were reported by several workers globally as well as in India (Deole *et al.*, 2018; Chimweta *et al.*, 2019; Baudron *et*

al., 2019; Fotso Kuate *et al.*, 2019 and Dhar *et al.*, 2019) which is in line with the current findings. This might be due to the diverse weather conditions prevailing in different geographical regions.

The present study highlights that the fall armyworm, *S. frugiperda* has spread all over the Odisha, Andhra Pradesh and Telangana and can cause potential damage to the maize crop in these regions. Further, the existing tropical conditions of surveyed areas may aid this polyphagous pest to switchover to other commercial crops in respective regions. Further studies should be directed towards assessing the FAW damage and dispersal in different standard weeks of cropping season in diverse geographical regions and its relationship with various climatic factors. Such data sets might help in mitigating this notorious pest through designing sustainable pest management strategies.

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