Original Research Article

Knowledge and Adoption of Fall Armyworm Management Practices by the Maize growers

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A B S T R A C T

The fall armyworm (FAW) (*Spodoptera frugiperda*), has high capacity of biological and ecological adaptation. FAW can survive more than 80 crop species including maize crop. A study was undertaken to assess the knowledge and adoption of fall armyworm management practices by maize growers in Warangal district of Telangana state. The findings of the study revealed that majority of the maize growers were middle aged, educated, economically sound and usage of mass media to good extent. Besides this there were some gaps between recommended and actual knowledge and adoption of FAW management practices by the maize growers.

Introduction

Maize is the third-most significant cereal crop in the world after rice and wheat. Currently, nearly 1162.35 million MT of maize is being produced together by over 170 countries from an area of 201.98 million ha with average productivity of 5.75 tons per hectare. Among the maize growing countries, India rank 4th in area and 7th in production, representing around 4% of the world maize area and 2% of total production. (https://iimr.icar.gov.in/world-maze-scenario/).

Maize is a significant cereal crop in Telangana. With a productivity of roughly 4080 kg/ha, it is grown on an average area of 6.67 lakh ha and produces 28 lakh tons annually. In Telangana, the area planted with maize in *kharif* 2020–2021 was 3.81 lakh hectares, down from 4.62 lakh ha in kharif 2019–2020. However, it was noted that the maize crop was heavily attacked by the fall army worm during the previous year.

The fall army worm attacks the maize crop early and damages the entire plant. It then destroys the plant by infecting the whorl. In this manner, the maize crop's productivity and output are hindered and the farmer obtains a low output. The university's recommended management measures can help farmers prevent fall army worm infestations and other pest harm to a significant extent. The specific objectives of the research are: to study the personal, socio-economic, communicational and psychological characteristics of the maize growers,

to study the knowledge and adoption of fall armyworm management practices by the maize growers, to study the relationship between selected characteristics of the maize growers with the knowledge and adoption of fall armyworm management practices by the maize growers, to identify the constraints faced by the maize growers in adoption of fall armyworm management practices in maize crop.

Materials and Methods

The present study was conducted in Warangal district of Telangana state during 2022-2023. Three mandals were selected from the Warangal district namely Warangal, Nekkonda and Chennaraopet because of maximum area under Maize crop. The exploratory design of social research was used for the study.

From this Panchayat Samiti 12 villages were selected based on large area under maize cultivation. From the list 10 farmers were selected purposively from each village. Thus, 120 farmers constituted the sample for the study.

Data from the maize growers were collected by personally interviewing with the help of pre-tested and well-structured interview schedule. The data collected were tabulated and analysed for interpretation of the findings.

Results and Discussion

Personal, socio-economic, communicational and psychological characteristics of the selected maize growers

The profile characteristics of the respondent maize growers like age, education, land holding, occupation, farming experience, annual income, cropping pattern, area under maize, sources of information, economic motivation, scientific orientation were studied and grouped under the profile characteristics and are presented as table below.

Age

From table 1, it is observed that majority (50.84%) of the respondents were middle age followed by old age (33.33%) and young age (15.83%).

Education

It is observed from table 1 that all most all are literate. Majority (34.17%) of the respondents were educated up to secondary school followed by middle school education (21.67%), college and above (13.33%), primary education (10.83%) and nobody was illiterate.

Land holding

It is observed from the table 1 that majority (43.33%) of the respondents had semi-medium category (2.01 to 4.00 ha) followed by 27.50 per cent of respondents had small land holding category (1.01 to 2.00 ha), 14.17 per cent respondents had medium land holding category (4.01 to 10.00 ha), 11.67 per cent had marginal land holding category (up to 1.00 ha) and very few per cent of respondents (03.33%) had large land holding category.

Occupation

From the above table it is found that majority (48.33%) of the respondents were involved in the agriculture as the main occupation. Whereas 15.00 per cent of the respondents had agriculture and labour as their subsidiary occupation it followed by agriculture and business main occupation (14.17%), agriculture and allied occupation (11.67%) and agriculture and services (10.83%).

Farming experience

It is found that from table 1most of the respondents (45.83%) had experience of up to 12 years in maize cultivation. It was followed by 35.00 per cent had medium level of experience and 19.17 per cent had above 21 years of experience in maize cultivation.

Annual income

It is revealed from table 1. 44.17 per cent of the respondents had annual income in between Rs.1,00,001 to Rs.2,00,000 and 25.00 per cent of the respondents had annual income up to Rs.1,00,000. It was followed by 14.17 per cent of respondents having annual income between Rs.3,00,001 to Rs.4,00,000 and 12.50 per cent of the respondents had annual income of Rs.2,00,001 to Rs.3,00,000 Very few i.e. 04.16 per cent of the respondents had annual income above Rs.4,00,000.

Cropping pattern

From table 1 it is revealed that, 70.83 per cent of the maize growers represent seasonal cropping pattern, followed by 19.17 per cent respondents with Bi-Seasonal cropping pattern and 07.50 per cent respondents following annual cropping pattern and only 02.50 per cent following perennial cropping pattern.

Area under maize

From the table 1 it is indicated that, maximum percentage of the respondents (51.67%) had 1.01 to 2.00 ha area under maize, followed by 35.00 per cent and 13.33 per cent of the respondents had up to 1.00 ha and above 2.00 ha, respectively.

Sources of information

It is observed that from the table 1 majority (51.67%) of maize growers utilized high level of overall use of sources of information followed by medium (43.33%) and low (05.00%) level sources of information, respectively.

Economic motivation

From the above table Most of the respondents (81.67%) were included in medium category of economic motivation. It was followed by high (11.66%) category and low (06.67%) category of economic motivation.

Scientific orientation

From the table 1 it is observed that majority (66.67%) of the maize growers had medium category of scientific orientation, followed by high (18.33%) and low (15.00%) scientific orientation.

Knowledge of FAW management practices by maize growers

The knowledge refers to the actual awareness of the respondents about fall armyworm management practices of maize crop. The knowledge was measured on the two point continuum as Yes and No by assigning the score of 1 and 0 respectively.

A detail probing about practice wise knowledge possessed by the respondents in table 2. revealed that, most of the respondents (99.17%) respondents had knowledge about sowing time and use of thiamethoxam + Lamda cyhalothrin @0.25ml/lit of water followed by ploughing (98.33%), stages of application of chemicals (94.17%). 90.83 per cent of the respondents had knowledge of poison baiting, 88.33 percent of the respondents had knowledge about intercropping and spraying of 5% NSKE solution followed by biopesticide usage (85.00%) and whorl application of Sand + Lime (81.67%). 78.33 per cent of the respondents had knowledge about erection of bird perches.

In case of 75.00 of the respondents doesn't had any knowledge about use of entomopathogenic fungi. Whereas 71.67 per cent of the respondents had knowledge about use of pheromone traps.

In case of 70.83 per cent of the respondents doesn't have any knowledge about application of *Bacillus thurenginsis* at 5% damage level followed by 60.83 per cent of the respondents doesn't had any knowledge about hand picking and squashing of egg masses and neonates, release of trichogramma and 54.17 per cent of the respondents doesn't had any knowledge about trap crop. More than half per cent (51.67 %) of the respondents had knowledge about seed treatment.

Table.1 Profile characteristics of the selected maize growers

Sl. no.	Variables	Categories	No of Respondents (n=120)	
			Frequency	Percentage
1	Age	Young	19	15.83
		Middle	61	50.84
		Old	40	33.33
2	Education	Illiterate	0	00.00
		Primary school	13	10.33
		Middle school	26	21.67
		Secondary	41	34.17
		Junior collage	24	20.00
		College and above	16	13.33
3	Land holding	Marginal	14	11.67
		Small	33	27.50
		Semi-medium	52	43.33
		Medium	17	14.17
		Large	04	03.33
4	Occupation	Agriculture + labour	18	15.00
		Agriculture	58	48.33
		Agriculture + allied occupation	14	10.83
		Agriculture + Business	17	14.17
		Agriculture + Service	13	11.67
5	Farming experience	Low (Up to 12)	55	45.83
		Medium (13 to 21)	42	35.00
		High (Above 21)	23	19.17
6	Annual income	Up to Rs.1,00,000	30	25.00
		Rs.1,00,001 to 2,00,000/-	53	44.17
		Rs.2,00,001 to 3,00,000/-	15	12.50
		Rs.3,00,001 to 400000/-	17	14.17
		Above Rs. 4,00,000	05	04.16
7	Cropping pattern	Seasonal	85	70.83
		Bi seasonal	23	19.17
		Annual	09	07.50
		Perennial	03	02.50
8	Area under maize crop	Small (Up to 1 ha)	42	35.00
		Medium (1.01 to 2.00 ha)	62	51.67
		High (Above 2.00ha)	16	13.33
9	Source of information	Low	06	05.00
		Medium	52	43.33
		High	62	51.67
10	Economic motivation	Low	08	06.67
		Medium	98	81.67
		High	14	11.66
11	Scientific orientation	Low	18	15.00
		Medium	80	66.67
		High	22	18.33

Table.2 Distribution of maize growers to their practice wise knowledge of fall armyworm management practices of maize crop.

Sl. No	Statements	Knowledge n=120	
		Yes	**No**
		Frequency (%)	**Frequency (%)**
A.	**Cultural measures**		
a.	**Ploughing** Deep ploughing 15-20cm in the month of May	118 (98.33)	02 (01.67)
b.	**Seed treatment** Cyantraniliprole 19.8% + Thaimethaxam19.8% FS @ 6ml/kg of seed	62 (51.67)	58 (48.33)
c.	**Sowing time** **Kharif** - 2nd fortnight of June to first fortnight of July **Rabi** - 1st fortnight of October	119 (99.17)	01 (00.83)
d.	**Intercropping** –Pulse crops	106 (88.33)	14 (11.67)
e.	**Trap crop**- Desmodium and Napier grass	55 (45.83)	65 (54.17)
f.	**Erection of bird perches** (@ 25/ha during early stage of crop – Up to 30 days)	94 (78.33)	26 (21.67)
B.	**Mechanical measures**		
a.	Whorl application of Sand + Lime (9:1)	98 (81.67)	22 (18.33)
b.	Hand picking and squashing of Egg masses and Neonates.	47 (39.17)	73 (60.83)
c.	Spraying of 5%NSKE or Azadirachtin1500ppm at 5% infestation level	106 (88.33)	14 (11.67)
d.	Mass trapping of male moths using pheromone traps (@15/acre)	86 (71.67)	34 (28.33)
C.	**Biological measures**		
a.	Augmentative release of Trichogramma and Telenomus remus 5000/ha	47 (39.17)	73 (60.83)
b.	Application of Bacillus thurenginsis @20g/lit at the initiation of infestation	35 (29.17)	85 (70.83)
c.	Biopesticides used at 5% damage in seedling to early whorl stage.	102 (85.00)	18 (15.00)
d.	At 10%ETL use of Entomopathogenic fungi (Nomuralia rileyi @3gr/lit) whorl application	30 (25.00)	90 (75.00)
D.	**Chemical measures**		
a.	Use of **Emamectin benzoate** 5SG @ 0.4gr/lit or Chloramtraniliprole 18.5 SC @ 0.4 ml/lit or **Thiamethoxam + Lamda cyhalothrin** @ 0.25 ml/lit of water. The spray should be directed to the plant whorls & top leaves	119 (99.17)	01 (0.83)
b.	**Poison baiting** 10 kg rice bran + 2kg jaggery with 2-3 lit of water for 24 hrs to ferment add 100 gm Thiodicarb just half an hour before application to the field. The bait should be into the whorl of the plant	109 (90.83)	11 (9.17)
c.	Stages applied for chemical measures (seedling to early whorl stage, mid whorl stage to late whorl stage)	113 (94.17)	07 (5.83)

Table.3 Distribution of the respondents according to the overall knowledge about the recommended fall armyworm management practices

Sl. no	Category	Respondents (n=120)	
		Frequency	**Percentage**
1.	Low (Up to 33.33)	05	04.17
2.	Medium (33.34 to 66.66)	62	51.67
3.	High (Above 66.66)	53	44.16
	Total	**120**	**100.00**

Table.4 Distribution of respondents according to their practice wise adoption of recommended Fall armyworm management practices of maize.

Sl. No	Statements	Adoption n=120		
		Complete adoption	**Partial adoption**	**Non adoption**
		Freq (%)	**Freq (%)**	**Freq (%)**
A.	**Cultural measures**			
a.	**Ploughing** Deep ploughing 15-20cm in the month of May	103 (85.83)	15 (12.50)	02 (1.67)
b.	**Seed treatment** Cyantraniliprole 19.8% + Thaimethaxam <u>19.8% FS @6ml/kg</u> of seed	05 (04.17)	49 (40.83)	66 (55.00)
c.	**Sowing time** Kharif - 2nd fortnight of June to first fortnight of July Rabi - 1st fortnight of October	99 (82.50)	19 (15.83)	02 (01.67)
d.	**Intercropping** –Pulse crops	56 (46.67)	50 (41.67)	14 (11.66)
e.	**Trap crop** - Desmodium and Napier grass	10 (8.33)	44 (36.67)	66 (55.00)
f.	Erection of bird perches (@25/ha during early stage of crop - Up to 30 days)	70 (58.33)	24 (20.00)	26 (21.67)
B.	**Mechanical measures**			
a.	Whorl application of Sand + Lime (9:1)	39 (32.50)	57 (47.50)	24 (20.00)
b.	Hand picking and squashing of Egg masses and Neonates.	12 (10.00)	41 (34.17)	67 (55.83)
c.	Spraying of 5% NSKE or Azadirachtin 1500 ppm at 5% infestation level	64 (53.33)	42 (35.00)	14 (11.66)
d.	Mass trapping of male moths using pheromone traps(@15/acre)	53 (44.17)	31 (25.83)	36 (30.00)
C.	**Biological measures**			
a.	Augmentative release of Trichogramma and Telenomus remus 5000/ha	06 (05.00)	40 (33.33)	74 (61.67)
b.	Application of Bacillus thurenginsis @ 20g/lit at the initiation of infestation	08 (06.67)	33 (27.50)	79 (65.83)
c.	Biopesticides used at 5% damage in seedling to early whorl stage	43 (35.83)	53 (44.17)	24 (20.00)
d.	At 10%ETL use of entomopathogenic fungi (Nomuralia rileyi @3gr/lit) whorl application	00 (00.00)	24 (20.00)	96 (80.00)
D.	**Chemical measures**			
a.	Use of **Emamectin benzoate** <u>5SG@0.4gr/lit or</u> <u>Chloramtraniliprole 18.5</u> SC @0.4 ml/lit or	84 (70.00)	33 (27.50)	03 (02.50)

	Thiamethoxam + Lamda cyhalothrin @0.25ml/lit of water. The spray should be directed to the plant whorls & top leaves			
b.	**Poison baiting** 10kg rice bran+2kg jiggery with 2-3 lit of water for 24 hrs to ferment add 100 gm thiodicarb just half an hour before application to the field. The bait should be into the whorl of the plant	50 (41.67)	58 (48.33)	12 (10.00)
c.	Stages applied for chemical measures (seedling to early whorl stage, mid whorl stage to late whorl stage)	95 (79.17)	18 (15.00)	07 (05.83)

Table.5 Distribution of the respondents according to the overall adoption about the recommended fall armyworm management practices of maize.

Sl.no	Category	Respondents (n=120)	
		Frequency	**Percentage**
1.	Low (up to 33.33)	05	04.17
2.	Medium (33.34 to 66.66)	88	73.33
3.	High (Above 66.66)	27	22.50
	Total	**120**	**100.00**

Table.6 Distribution of the selected maize growers according to their constraints

Sl. No	Constraints	Respondents (n=120)	
		Frequency	**Percentage**
1.	Lack of information about biological control of pests	109	90.83
2.	Lack of technical knowledge and skill involved in Seed treatment	107	89.17
3.	Lack of knowledge about Trap cropping in maize	104	86.67
4.	Lack of guidance from extension person about use of recommended management practices of maize crop	103	85.83
5.	Financial problem to purchasing of pesticides and weedicides	101	84.17
6.	Shortage of improved seed during sowing time	98	81.67
7.	Lack of knowledge about identification of pests and diseases	93	77.50
8.	High wage rates at the time of intercultural operations	89	74.17
9.	Lack of availability of plant protection equipment	85	70.83

It was observed from Table 3. that, majority (51.67%) of the respondents had medium level of knowledge about recommended FAW management practices of maize followed by 44.16 per cent of the respondents had high level of knowledge and 04.17 per cent were had low level of knowledge about recommended FAW management practices of maize.

Adoption of FAW management practices by maize growers

Adoption shows the present state of use of recommended fall armyworm practices of maize by the farmers. It was measured on three point continuum as complete adoption, partial adoption and non-adoption by assessing the score of 2, 1 and

0 respectively. From the table 4 it was observed that majority (85.83%) of the respondents had complete adoption about ploughing and 82.50 per cent of the respondents had complete adoption about sowing time.

In case of 10% ETL use of Entemopathogenic fungi, maximum number (80.00%) of respondents were observed in non-adoption. Majority i.e., 79.17 per cent of the respondents had complete adoption of stages of applied chemical measures and 70.00 per cent of the respondents had complete adoption of Thiamethoxam + Lamda cyhalothrin @ 0.25 ml/lit of water. In case of application of Bt @ 20 gr/lit 65.83 per cent of the respondents were found in non-adoption and 61.17 per cent of the respondents non adopting augumentative release of Trichogramma and *Telenomus remus,* 58.33 per cent of the respondents had complete adoption about erection of bird perches. In case of hand picking and squashing of egg masses and neonates 55.83 per cent of the respondents were observed in non-adoption, 55.00 per cent of the respondents found in non-adopting trap crop and seed treatment. 53.33 per cent of the respondents had complete adoption about spraying of NSKE.

In case of partial adoption 48.33 per cent of respondents found in Poison baiting, 47.50 per cent of respondents found in whorl application of Sand + Lime. 46.67 per cent of the respondents found in complete adoption about inter cropping followed by 44.17 per cent of the respondents found in complete adoption about use of pheromone traps and partial adoption of biopesticides usage.

It was observed from Table 5. that, majority (73.33%) of the respondents possessed medium level of adoption of recommended FAW management practices in maize crop followed by 22.50 per cent of the respondents had high level of adoption and 04.17 per cent were had low level of adoption of recommended fall armyworm management practices in maize crop. These findings are like the findings of Morey (2020).

Constraints faced by maize growers about FAW management practices

In the present study constraints referred to problems or difficulties faced by the maize growers in adoption of recommended fall armyworm management practices in maize crop were studied.

Majority of the respondents were middle aged, educated, economically sound, good extent of mass media exposure, medium level of economic motivation and majority of the respondents were faced constraints regarding biocontrol measures, seed treatment etc., so, it is implied that extension personnel, concerned agencies should conduct kisan melas, field days and exhibitions for enhancing their knowledge about FAW management practices it will help for more adoption of fall armyworm management practices in maize crop. Some of them are facing financial problem for purchasing of pesticides and unavailability of plant protection equipment so, the government or concerned agencies should provide credit facility, subsidy provision and timely availability of plant protection equipment.

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