Studies on the influence of agro-ecological interventions for fall armyworm management in maize

AP SIVAMURUGAN and R RAVIKESAVAN

Department of Millets, Tamil Nadu Agricultural University, Coimbatore 641003 Tamil Nadu, India
Email for correspondence: apacsivamurugan@gmail.com

 Received: 05.01.2022/Accepted: 16.01.2022

ABSTRACT

Field experiment was carried out at the Department of Millets, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu during kharif 2020 to study the influence of agro-ecological interventions for fall armyworm (FAW) management involving different intercrops in maize. The experiment was laid out in a randomized complete block design with the five treatments viz T_1- Maize + *Tephrosia*, T_2 - Maize + fenugreek, T_3- Maize + coriander, T_4- Maize + marigold and T_5- Maize alone, replicated thrice. A row of C:N hybrid grass was planted in the brim of the field. It was found that among the intercropping systems in maize, maize + marigold was found to be superior for the management of FAW in maize which recorded higher maize equivalent yield of 6,215 kg/ha, net return of Rs 47,181.00/ha and B-C ratio of 1.87.

Keywords: Maize; intercrops; FAW; infestation; yield

INTRODUCTION

Maize (*Zea mays* L) is one of the most important cereal crops in India after rice and wheat with respect to area and production. It is cultivated round the year in almost all parts of India due to its wide ecological adaptability. The productivity of maize is very low owing to aberrant weather situations, improper application of organic manures and fertilizers, weed infestation, widespread occurrence of pests and diseases etc. Among the pests, fall armyworm (FAW), *Spodoptera frugiperda*, an invasive pest damages more than 80 host species (Goergen et al 2016, Witt et al 2017). Maize is one among the crops in which the incidence of FAW is higher (Hassanali et al 2008) compared to other crops thus leading to severe decline in productivity. Intercropping systems are found to reduce the incidence of FAW in maize thus favouring the productivity (Seran and Brintha 2010). Hence a study was conducted to find out the influence of agro-ecological interventions for FAW management involving different intercrops in maize.

MATERIAL and METHODS

Field experiment was carried out at the Department of Millets, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu during kharif 2020. The soil was sandy clay loam and low in available N (173 kg/ha), medium in available P (16.2 kg/ha) and high in available K (501 kg/ha) with a pH of 8.21. The experiment was laid out in a randomized complete block design with five treatments viz T_1- Maize + *Tephrosia*, T_2 - Maize + fenugreek, T_3- Maize + coriander, T_4- Maize + marigold and T_5- Maize alone, replicated thrice. A row of C:N hybrid grass was planted in the brim of the field. Sowing of maize hybrid CO H(M) 6 and intercrops viz *Tephrosia*, fenugreek, coriander and marigold was done. The cultural operations were carried out as per Anon (2020). Observations on per cent plant infestation were recorded at 20, 30 and 40 DAS and tassel damage and yield were recorded. The data were statistically analyzed as per Gomez and Gomez (1984).

RESULTS and DISCUSSION

Effect of various intercroppings on incidence of FAW in maize

The data given in Table 1 show that plant infestation at 20, 30 and 40 days ranged from 57.8 to 70.0, 55.5 to 78.9 and 80.0 to 90.0 per cent respectively. The tassel damage was from 50.0 to 67.8 per cent. Davies scale value at 20, 30 and 40 days ranged from

4.6 to 5.9, 4.0 to 5.8 and 5.4 to 6.6 respectively. The range of cob damage score at harvest was 1.8 to 2.8. However there were no significant differences among the various treatments for these traits.

Influence of intercropping on yield and economics of maize

The data on influence of intercropping on yield and economics of maize are given in Table 2. The maize grain yield was maximum in T_4 (Maize + marigold) (4,578 kg /ha) and T_1 (Maize + *Tephrosia*) (4,206 kg/ha) the two being at par. The yield of intercrop was maximum in T_4 (4,913 kg/ha). Equivalent yield of intercrop and equivalent yield of maize + intercrop was again maximum in T_4 (1,637 and 6,215 kg/ha respectively). Equivalent yield of maize + intercrop was lowest in T_5 (Maize alone) (3,671 kg/ha) and T_2 (Maize + fenugreek) (4,166 kg/ha) the two being at par. Maximum maize stover yield was recorded in T_4 (7,921 kg/ha) and T_1 (7,324 kg/ha) which were at par and significantly superior to other three treatments. There were no significant differences among the treatments for 100-seed weight. Maximum net return and B-C ratio were recorded in T_4 (Rs 47,181.00 and 1.87 respectively) as compared to minimum in T_5 (Rs 21,097.00 and 1.52 respectively).

The increase in grain yield was ascribed to lower incidence of FAW in maize owing to different intercropping systems. The results are in accordance with the findings of Hailu et al (2018) and Midega et al (2015).

CONCLUSION

Based on the results it is concluded that among the intercropping systems in maize, maize + marigold was found to be superior for the management of FAW in maize which recorded higher maize equivalent yield (6,215 kg/ha), net return (Rs 47,181/ha) and B-C ratio (1.87).

REFERENCES

Anonymous 2020. Crop production guide. Directorate of Agriculture, Chennai, India and Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India.

Table 1. Effect of various intercroppings on incidence of FAW in maize

Treatment	Plant infestation after (DAS) (%)			Tassel damage (%)	Davis scale after (DAS)			Cob damage score at harvest
	20	30	40		20	30	40	
T_1	57.8	55.5	85.6	53.3	4.6	4.0	6.6	2.1
T_2	65.5	62.2	80.0	61.1	4.8	4.0	5.4	2.3
T_3	60.0	62.2	88.9	60.0	4.6	5.4	6.3	2.2
T_4	61.1	64.4	80.0	50.0	5.3	5.1	5.5	1.8
T_5	70.0	78.9	90.0	67.8	5.9	5.8	6.5	2.8
CD	NS	NS	NS	NS	NS	NS	NS	NS

T_1- Maize + *Tephrosia*,T_2 - Maize + fenugreek, T_3- Maize + coriander, T_4- Maize + marigold, T_5- Maize alone

Table 2. Influence of various intercroppings on yield and economics of maize

Treatment	Maize grain yield (kg/ha)	Yield of intercrop (kg/ha)	Equivalent yield of intercrop (kg/ha)	Equivalent yield of maize + intercrop (kg/ha)	Maize stover yield (kg/ha)	100-seed weight (g)	Net return (Rs/ha)	B-C ratio
T_1	4,206	74	740	4,946	7,324	38.7	37,348.00	1.85
T_2	3,852	118	314	4,166	6,552	38.8	25,721.00	1.60
T_3	3,961	173	346	4,307	6,774	38.4	27,635.00	1.63
T_4	4,578	4,913	1,637	6,215	7,921	38.6	47,181.00	1.87
T_5	3,671	0	0	3,671	6,158	39.2	21,097.00	1.52
$CD_{0.05}$	581	229	111	553	1,001	NS	-	-

T_1- Maize + *Tephrosia*, T_2- Maize + fenugreek, T_3- Maize + coriander, T_4- Maize + marigold, T_5- Maize alone

Goergen G, Kumar PL, Sankung SB, Togola A and Tamo M 2016. First report of outbreaks of the fall armyworm *Spodoptera frugiperda* (JE Smith) (Lepidoptera, Noctuidae), a new alien invasive pest in west and central Africa. PLoS ONE **11(10):** e0165632. https://doi.org/10.1371/journal.pone.0165632.

Gomez KA and Gomez AA 1984. Statistical procedures for agricultural research. John Wiley and Sons.

Hailu G, Niassy S, Khan ZR, Ochatum N and Subramanian S 2018. Maize-legume intercropping and push-pull for management of fall armyworm, stemborers, and *Striga* in Uganda. Agronomy Journal **110(6):** 2513-2522.

Hassanali A, Herren H, Khan ZR, Pickett JA and Woodcock CM 2008. Integrated pest management: the push-pull approach for controlling insect pests and weeds of cereals and its potential for other agricultural systems including animal husbandry. Philosophical Transactions of the Royal Society of London Series B: Biological Sciences **363(1491):** 611-621.

Midega CAO, Bruce TJA, Pickett JA, Pittchar JO, Murage A and Khan ZR 2015. Climate-adapted companion cropping increases agricultural productivity in east Africa. Field Crops Research **180:** 118-125.

Seran TH and Brintha I 2010. Review on maize-based intercropping. Journal of Agronomy **9(3):** 135-145.

Witt A, Oppong-Mensah B, Pratt C, Gómez J, Lamontagne-Godwin J, Cock M, Bateman M, Corniani N, Phiri N, Gonzalez-Moreno P, Abrahams P, Early R, Day R, Murphy ST, Silvestri S, Beale T, Clottey V and Colmenarez Y 2017. Fall armyworm: impacts and implications for Africa. Outlooks on Pest Management **28(5):** 196-201.