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Assessment of IPM strategy for management of fruit fly in bitter-gourd in Khammam district of Telangana

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Abstract

The present investigation was conducted in different villages during 2018-19 to 2020-21. The main objective was to demonstrate IPM practices in bitter gourd for getting higher yields over control. The average highest yield was 23.79 t/ha in IPM plot over control (19.81 t/ha). The extension gap ranged from 2.08 t/ha to 6.25 t/ha and technology gap ranged between 3.5 to 7.85 t/ha respectively with the technology index of 20.70 percent during demonstration years. IPM plots gave higher gross returns, net returns with higher benefit cost ratio when compared to control. The profile characteristics showed 53.33 per cent of farmers selected under small farm size. The cumulative effects of technological interventions revealed an average fruit yield of 1.68 kg per plant while 1.36 kg in control.

Keywords: Fruit fly, extension gap, technology gap, technology index, technology adoption

Introduction

Cucurbitaceous vegetables are predominately grown in summer months that include bitter gourd, ridge gourd, ivy gourd, spine gourd, bottle gourd and cucumber which are majorly grown in Khammam district of Telangana. Biotic factors limit the production and productivity of cucurbits, of which cucurbit or melon fruit fly (*Bactrocera cucurbitae* Coquillett) has been the most prominent pest over the last several decades in India, especially bitter gourd (*Momordica charantia* Linn). The fly damages the fruit quality thereby affecting its yield (Abro *et al* 2017 and Jain *et al* 2021) [1, 5]. The fruit flies cause more than 50% partial or total damage to cucurbits, making them unsuitable for human consumption.

The control of fruit fly by farmers is done mainly by application of synthetic insecticides, sprayed indiscriminately leading to other problems like insecticide resistance, pest resurgence, harmful pesticide residues and environmental pollution. Since, the maggots damage the fruits internally; it was difficult to control this pest with insecticides. The only option is to manage the adult fruit flies before mating (Hafiz *et al* 2020) [4]. Application of botanical extracts specially neem products, field sanitation, deep summer ploughing, installation of pheromone traps i.e. cue-lure trap, poison baits and spray of chemical insecticides are some of the IPM tools. Cue-lure traps have been used for monitoring and mass trapping of the melon fruit flies in bitter gourd (Sarkar *et al* 2017 and Adhikari *et al* 2020) [, 2]. Therefore, the present study was conducted with the specific objectives to assess adoption of recommended fruit fly management technologies for bitter gourd and to know its impact on yield increase in bitter gourd by effective management of fruit fly.

Materials and Methods

The current study was conducted during 2018-19 to 2020-21 in Khammam district of Telangana. This study was based on primary data collected from bitter gourd farmers. Multistage random sampling method was adopted in scheming sampling frame for the study. In the initial phase, Telangana state is selected purposively. In the second stage, Khammam district was selected, in third stage six villages were chosen randomly based on potentiality and maximum area under bitter gourd. Farmers for conducting the front line demonstrations were selected during 2018-19. The data was composed through pre-tested questionnaire by personal interview method. Total 30 demonstrations were conducted with demonstration package for management of fruit fly in different villages for three continuous years. Each frontline demonstration was laid out on 0.4 ha area which was taken as demo while adjacent 0.4 ha as control for comparison of farmer's practice. The farmers were selected randomly on the basis of survey conducted by KVK, Wyra and trainings imparted on fruit fly management in bitter gourd.

For the demonstration plot bitter gourd crop was raised on pandals along with installation of pheromone traps, spraying of neem products, field sanitation, poison baits and spray of chemical insecticides and others. The traditional practices were taken as a control. Field days were also conducted in each cluster to show the results of front line demonstrations to the farmers of the same village and neighboring villages. In general, soils of the area under study were sandy to sandy loam with low to medium fertility status and the average annual rainfall of this area is 1036 mm and temperature

varied from 24 to 43°C with average temperature of 30°C. In the present study, yield data, yield attributing characters, pest incidence, production costs and gross returns, data on gaps between the potential yield, demonstration yield, extension gap, technology gap and technology index were collected from demonstrated plots and local check plots of bitter gourd for analysis and data interpretation. The statistical tools to estimate the technology gap, extension gap and the technology index, the formulation as mentioned below was used as suggested by Samui *et al* (2000) [9].

Per cent increase in yield	=	Demonstration yield - Farmer's practice yield X 100 /Farmer's practice yield
Technology gap	=	Potential yield - Demonstration yield
Extension gap	=	Demonstration yield - Yield under existing practice
Technology index	=	Potential yield - Demonstration Yield X 100 /Potential yield

Results and Discussion

In the IPM demo plots for management of fruit fly in bitter gourd the following practices were followed i.e. field sanitation (collect, destroy the pupae and bury the infested fruits), deep summer ploughing of the field, raising of the crop on pandals, removal of weeds and host plants recurrently, installation of pheromone traps at the time of flowering, spraying of Azadirachtin 10000 ppm @ 1-2 ml per lit of water, application of insecticidal baits at the time of fruiting, Poison baiting with (Jaggery 100 g + 10 ml toddy/ molasses and appropriate chemical in 10 lit of water), spraying of insecticides at the time of pest below the ETL level. In farmers practice they were applied insecticides after pest observed in the field. The results of the present investigation on the assessment of IPM strategies for management of fruit fly in bitter gourd in Khammam district of Telangana as below.

Profile characteristics of respondents: The 63.34 per cent of the selected respondents were in the middle age group with 26.67 per cent of the respondents being educated up to upper school. Nearly 53.33 per cent of the farmers selected were under small farm size followed with farming experience of more than 10 years for 46.67 per cent of respondents. This family size was 1-4 members in 46.67 per cent and 56.67 per cent respondents depended on personal and hired labour Table 1.

Table 1: Profile characteristics of the selected respondents n =30

S. No	Variables	Category	Frequency	Percentage
1	Age	Young (22-37)	04	13.33
		Middle (38-53)	19	63.34
		Old (54-69)	07	23.33
2.	Education	Illiterate	06	20.00
		Primary school	07	23.33
		Upper school	08	26.67
		High school	02	6.67
		Above matriculation	07	23.33
3.	Farm size (in acres)	Marginal (0-2.5)	08	26.67
		Small (2.5-5)	16	53.33
		Large (5 & above)	06	20.00
4	Farming experience	< 5y (less than 5y)	07	23.33
		5-10y	09	30.00
		>10y (more than 10y)	14	46.67
5.	Family size	1- 4 members	14	46.67
		5-8 members	10	33.33
		More than 8 members	06	20.00
6	Labour source	Personal	07	23.33
		Hired	06	20.00
		Both personal & Hired	17	56.67
7.	Economic status	Low	07	23.33
		Medium	14	46.67
		High	09	30.00
8	Extension contact	Low	15	50.00
		Medium	10	33.33
		High	05	16.67

That the 46.67 percent of the respondents had medium economic status and 50.00 percent of the selected farmers had medium extension contacts with various extension personnel.

Adoption of specific recommended cultivation practices by bitter gourd growers

The 23.33 per cent respondents practiced deep summer ploughing, while 53.33 percent people raised the bitter gourd crop on pandals (Table 2). Majority of bitter gourd growers followed installation of pheromone traps at the time of flowering to final fruit harvest whereas 60.00 percent of the people followed poison baiting at the time of flowering to final harvesting stage.

Only 3.33 percent of the respondents didn't adopt the chemical spraying and 66.67 percent of respondents adopted neem oil spraying at initial stages along with insecticides. Only 20.00 percent of the respondents did not adopt

removal of infected fruits at the time of harvesting. Less than half of the (43.33%) respondents partially adopted the field sanitation while 16.67 and 13.33 per cent of the respondents either partially or did not adopt or plan harvesting at proper maturity stage also mentioned Bhowmik *et al* 2014 [3] and Kuber *et al* 2021 [6].

Table 2: Adoption of recommended package of practices followed for management of fruit fly in Bitter-gourd after FLD (n=30)

S. no	Recommended practice	Bitter gourd growers					
		Fully Adopted		Partially Adopted		Not Adopted	
		F	%	F	%	F	%
1	Deep summer ploughing	7	23.33	10	33.34	13	43.33
2	Raising of the crop on pandals	16	53.33	5	16.67	9	30.00
3	Use of pheromone traps	21	70.00	4	13.34	5	16.66
4	Use of poison bait	18	60.00	5	16.67	7	23.33
5	Spraying of insecticides	26	86.67	3	10.00	1	3.33
6	Spraying of Neem oil	20	66.67	7	23.33	3	10.00
7	Removal of infected fruits	14	46.67	10	33.33	6	20.00
8	Field sanitation	9	30.00	13	43.33	8	26.67
9	Harvesting at proper stage	21	70.00	5	16.67	4	13.33
		16.88	56.27	6.89	22.96	6.23	20.77

Overall adoption of recommended cultivation practices by bitter gourd growers

The majority of the bitter gourd growers (56.27%) belonged to fully adopted category of recommended cultivation practices, 22.96 and 20.77 per cent of the respondents were having medium and low overall adoption of recommended practices, respectively. The 79.23% respondents followed the recommended cultivation practices to a greater extent. The frequent contact by KVK scientists and then regular participation in horticulture extension activities were the reasons for more than three-fourth of the respondents adopting the recommended cultivation practices. The results were in conformity with Madhushekar *et al* 2021 [8].

Table 3: Adoption of recommended practices by FLD farmers n=30

S.no	Category	Criteria & Score	Frequency	Percentage
1	Low level of adoption	<x- ½ SD (< 9.0)	6	20.00
2	Medium level of adoption	<x± ½ SD (< 9.0-18.0)	7	23.33
3	High level of adoption	>x+½ SD (> 18.1)	17	56.67

x- no. of observations; S.D. - Standard deviation

The 56.67 per cent of respondents belonged to high adoption category, followed by 23.33 per cent and 20.00 per cent of the respondents belonged to medium and low adoption categories respectively for recommended package of practice in bitter gourd cultivation (Table 3). The farmers faced constraints in crop cultivation especially due to damage of the produce by fruit fly making them eager to opt for the new technologies for getting higher yields.

Infestation percentage of fruit fly, yield and yield attributing characters

The percent fruit fly infestation in bitter gourd was 10.25 percent, 12.68 percent and 9.85 percent compared to 35.62 percent, 38.94 percent and 21.53 percent in control plots during three consecutive years respectively. (Table 4). The cumulative effect of technology interventions over three years revealed an average fruit fly infestation of 10.92 percent compared to 32.03 percent in control with 35.69 percent decrease in demonstrated fields than check plots.

Table 4: Effect of percent infestation, fruit yield and yield attributing characters of bitter Gourd

S. No	Character	2018-19		2019-20		2020-21		Average	
		Check	Demo	Check	Demo	Check	Demo	Check	Demo
1	Fruit fly infestation percentage	35.62	10.25	38.94	12.68	21.53	9.85	32.03	10.92
2	Average fruit weight (g)	49.78	61.60	52.71	67.88	59.63	64.77	54.04	64.75
3	Fruit length (cm)	11	12.14	10.67	13	10.33	12.81	10.5	12.65
4	Fruit diameter (cm)	4.09	4.37	3.89	4.16	3.66	4.01	3.88	4.18
5	Number of fruits per plant	22	29.36	25.75	28.24	23.37	30.16	23.71	29.29
6	Fruit yield per plant (kg)	1.32	1.60	1.45	1.68	1.30	1.75	1.36	1.68
7	Total yield (t/ha)	20.25	26.51	19.12	22.76	20.05	22.15	19.81	23.79

Note: Data collected from 30 plots each and for three consecutive years

The average fruit weight 64.75g in IPM plots compared to fruit weight in farmer's practice. The fruit length of bitter gourd was 12.14 cm, 13 cm, 12.81 cm with an average fruit length of 12.65 cm when compared to 11 cm, 10.67 cm, 10.33 cm with an average of 10.50 cm in control plot. The average fruit diameter was 4.18 in IPM plots compared to 3.88 cm in famers practice.

The number of fruits per plant was 29.36, 28.24, 30.16 in IPM Plots in control plots with an average of 29.29 when compared to 22, 25.75, 23.37 an average of 23.71.

The fruit yield per plant was 1.60, 1.68 and 1.75 kg in IPM plots compared to 1.32, 1.45 and 1.30 kg in control plots during 2018-19, 2019-20 and 2020-21 respectively with an average fruit yield of 1.68 kg per plant equated to 1.36 kg in control.

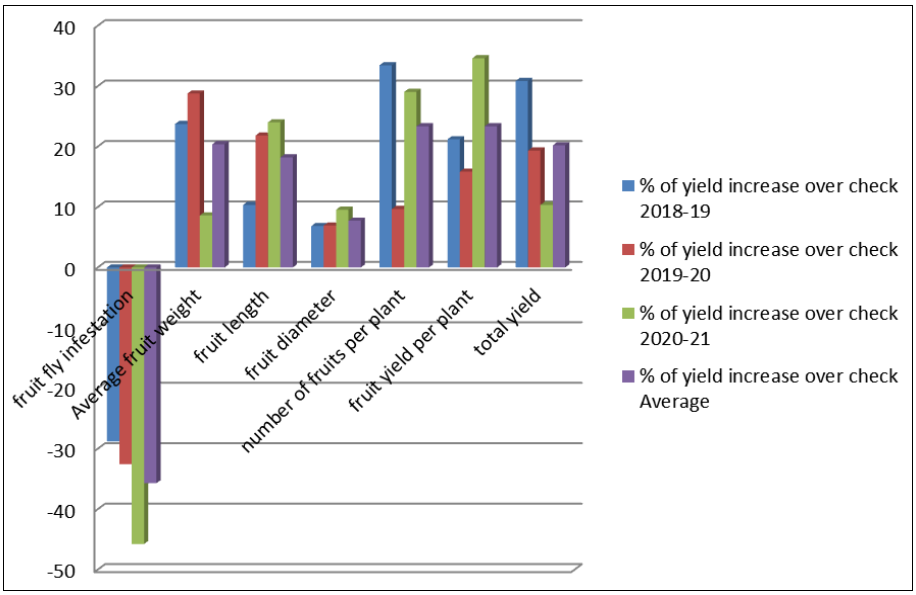

Fig 1: Percentage yield increase of yield and yield attributing parameters

The total fruit yield per ha under were 26.51 t, 22.76 t and 22.15 t in IPM plots compared to 20.25 t, 19.12 t and 20.05 t in control plots. The cumulative effects of technological intervention over three years revealed an average total fruit yield per ha as 23.79 t in demo compared to 19.81 t in control plots. The year-to-year fluctuations in yield and cost of cultivation can be explained on the basis of variations in prevailing social, economic and microclimatic condition of that particular location. The above findings are in similarity with the findings of Singh *et al* (2020) [11] in bitter gourd.

Economic parameters

The net returns from IPM plots was substantially higher than control plot *i.e*. farmers practice during the years of demonstration. The average net returns from demonstration plot were Rs. 1.87 lakhs /ha compared to Rs 1.59 lakhs /ha in control (Table 5).

The average gross expenditure in IPM plot was recorded as Rs. 1.45 lakhs per ha compared to Rs. 1.34 lakhs per ha in control plots with average gross returns of Rs. 3.33 lakhs /ha as compared to Rs. 2.94 lakhs /ha in control plots. The B.C ratio in IPM plots was recorded as 2.30: 1 compared to 2.13:1 in farmer's plot.

Table 5: Economics of FLD on Fruit fly management in bitter-gourd

Year	Cost of cultivation (In lakhs of Rs)		Gross returns (In Lakhs of Rs)		Net returns (In Lakhs of Rs)		B:C ratio	
	Check	Demo	Check	Demo	Check	Demo	Check	Demo
2018-19	1.29	1.35	2.73	3.18	1.44	1.80	2.12:1	2.35:1
2019-20	1.20	1.32	2.69	3.06	1.49	1.74	2.08:1	2.32:1
2020-21	1.55	1.68	3.39	3.74	1.84	2.07	2.19:1	2.23:1
Average	1.34	1.45	2.94	3.33	1.59	1.87	2.13:1	2.30:1

Technology gap: The difference between potential yield and yield of demonstration plots was 3.5, 7.24 and 7.85 tons/ha during 2018-19, 2019-20 and 2020-21 respectively (Table 6) with average of 6.21 tons/ha. This may be due to the soil fertility, managerial skills of individual farmer's and climatic conditions of the selected area. Hence, location specific recommendations were necessary to bridge these gaps. These findings are similar to the findings of Madhushekar *et al* 2021 [8] and Shankar *et al* 2022 [10].

Extension gap: Extension gap of 6.25, 3.69 and 2.08 tons/ha was observed during 2018-19, 2019-20 and 2020-21 respectively. With average of 4 tons/ha. This emphasized the need to educate the farmers through various appropriate techniques for the adoption of improved agricultural production technologies to reverse this trend of wide extension gap. The more and more use of latest production technologies along with high yielding varieties /hybrids will subsequently change this alarming trend of galloping extension gap.

Technology Index: The technology index shows the feasibility of the demonstrated technology at the farmer's field. The technology index varied from 11.66 to 26.16% (Table 6) with of 20.70 per cent which shows the effectiveness of technical interventions. This accelerated the adoption of demonstrated technical interventions to increase the yield performance of bitter gourd.

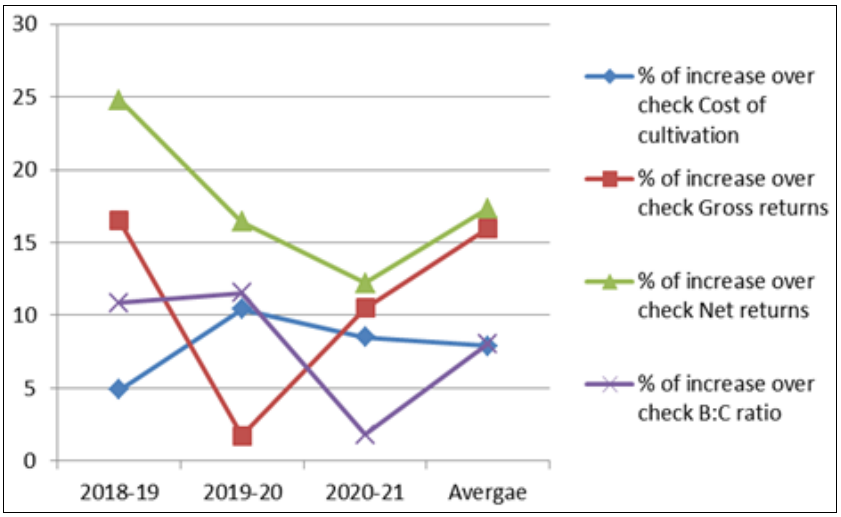

Fig 2: Percentage increase over check in three consecutive years

Table 6: Fruit yield, extension gap, technology gap and technology index on Fruit-fly management in Bitter-gourd

Year	Fruit yield per ha (t/ha)		Technology gap (t/ha)	Extension gap (t/ha)	Technology index
	Demo	Check			
2018-19	26.50	20.25	3.5	6.25	11.66
2019-20	22.76	19.07	7.24	3.69	24.13
2020-21	22.15	20.07	7.85	2.08	26.16
Average	23.79	19.79	6.21	4.00	20.70

* Potential yield -30 t/ha

Conclusion

The IPM technologies for management of fruit fly in bitter gourd before implementation of the FLD were very less but after conducting the FLD in farmer's field, awareness was created. The package of practices showed significant effect on adoption levels of use of pandals, spraying of neem oil and harvesting at appropriate stage after implementation of FLD compared to farmer's practice. In demonstrated plots, the fruit fly incidence percentage was less; yield and gross returns were high compared to farmer practice. The productivity gain under FLD over existing practices of bitter gourd fruit fly management has created greater awareness and motivated other farmers to adopt the demonstrated technologies for bitter gourd production in the district which helps in enhancing the vegetable production, consumption, nutritional security to farmers of Khammam district in Telangana.

References

1. Abro ZA, Baloch N, Khuhro NH, Akbar W. Efficacy of protein bait sprays in controlling melon fruit fly *Bactrocera cucurbitae* (Coquillett) in vegetable agroecosystems. Proc Pak Acad Sci. 2017;54(2):111-115.
2. Adhikari D, Joshi SL, Tapa RB, Pandit V, Sharma DR. Fruit fly management in Nepal: A case from plant clinic. J Biol Control. 2020;34(1):8-14.
3. Bhowmik P, Mandal D, Chatterjee ML. Chemical management of melon fruit fly, *Bactrocera cucurbitae* Coquillett (Diptera: Tephritidae) on bitter gourd (*Momordica charantia* Linn.). Pesticide Res J. 2014;26(1):68-73.
4. Hafiz S, Nasir MF, Mohsin A, Qureshi MS, Hamzah AM, Ghuffar S, *et al*. Effect of plant extracts on egg deposition of fruit fly *Bactrocera cucurbitae* on bitter gourd. J Entomol Res. 2020;5(3):116-119.
5. Jain D, Kumar H, Singh B, Chouhan BS, Soni P. Evaluation of pheromone traps for management of fruit fly (*Bactrocera cucurbitae* Coq.) infesting bitter gourd - A success story. Int J Curr Microbiol Appl Sci. 2021;10(8):396-401.
6. Kubar IM, Khoso FN, Khatri I, Khuhro NH, Gilal AA. Effect of different management strategies on melon fruit fly, *Bactrocera cucurbitae* (Coquillett), infestation in cucurbit vegetables. Sarhad J Agric. 2021;37(3):915-920.
7. Kumari DA, Suresh V, Nayak MH, Lavanya AVN, Mamatha A. Evaluation of different pest management modules in bitter gourd. Int J Chem Stud. 2021;9(11):587-590.
8. Madhushekar BR, Narendar G, Kumar AA. Impact of front-line demonstrations on extent of adoption and horizontal spread of direct seeding in rice with drum seeder in Nalgonda district of Telangana. Pharm Innov J. 2021;SP 10(9):784-788.
9. Samui SK, Mitra S, Roy DK, Mandel AK, Saha D. Evaluation of front line demonstration on groundnut. J Indian Soc Coastal Agric Res. 2000;18(2):180-183.
10. Shankar A, Reddy TP, Reddy JM, Jhan A, Rajashekar M, Rajashekar B, *et al.* Impact of front line demonstration on integrated management of brinjal shoot and fruit borer (*Leucinodes orbonalis* Guenee) in Nagar Kurnool district, Telangana State. Int J Bio-Res Stress Manag. 2022;13(3):292-298.
11. Singh RK, Singh RP, Singh AK, Upadhyay SP. Impact of KVK on adoption of improved bitter gourd cultivation technology in Ghorakhpur district of Uttar Pradesh. Indian J Ext Educ. 2020;56(2):164-169.