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Impact of Yellow Sticky Trap against White Fly in Brinjal Production in Malda under Old Alluvial Zone of West Bengal through Frontline Demonstration

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Impact of yellow sticky trap against brinjal white fly (*Bemesia tabaci*) with recommended dose of fertilizer and seed, soil and micronutrient treatment was investigated through Front Line Demonstration in Malda of West Bengal during *kharif* season of 2019-20 and 2020-21. The

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demonstration yield were 292.44q/ha and 305.54q/ha which were 18.34% and 30.26% higher to control (248.33q/ha and 236.43q/ha) during respective years. The mean little leaf and stunted growth were10.13% and 8.9%in demonstration and 64.73% and 58.49% in control. Net return and benefit-cost ratio from demonstration were Rs. 2,55,329/-ha and 2.75 during 2019-20and Rs. 2,73,020/-ha and 2.84 during 2020-21 and Rs. 1,72,421/-ha and 1.50 in 2019-20and Rs. 1,52,943/-ha and 1.26 in 2020-21 in control. The extension and technology gaps were 44.11q/ha and 57.56q/ha in 2019-20and 69.11q/ha and44.46q/ha in 2020-21.Reduction of technology index from 16.45% (2019-20) to 12.70% (2020-21) exhibited feasibility and acceptability of installation of yellow sticky traps against whitefly in brinjal in these areas.

Keywords: Brinjal; extension gap; frontline demonstration; technology index; technology gap; yellow sticky trap; Bemesia tabaci.

1. INTRODUCTION

According to National Horticulture Board (2019), though vegetable crops occupies 10.35 million ha area, producing about 192.0 million tonnes with an average productivity of 19.2 t/ha (2019-20) of fresh vegetables in India, the productivity is not sufficient to provide diet to our growing national population (Walia & Lalotra, 2021). Brinjal (*Solanum melongena* Linn.), being a native solanaceous vegetable crop to India, is normally self-fertilized. It is worldwide known as aubergine or guinea squash which is the most popular and principle vegetable crop hence regarded as “King of vegetables”. It exerts ayurvedic medicinal properties and white brinjal is beneficial for diabetic patients. It is also a source of vitamins A, C and minerals. The average productivity of brinjal is around 200 to 350 q/ha in India as reported by Jadhav et. al. (2018). As it is cultivated throughout the year in all seasons, it fetches cumulative and continuous source of income to the vegetable farmers. White fly (*Bemisia tabaci* Gennadius) is the key insect hindrance for the successful brinjal production by creating three types of damage viz. direct damage, indirect damage and virus transmission (Sujayanand et al., 2013). Direct damage is occurred through piercing and sucking sap from the foliage part i.e. leaf of plants which causes death of seedling, reduces the plant growth rate and ultimately yield is hampered. Indirect damage is caused by reducing the photosynthetic activity of plant by providing a suitable substrate for the growth of black sooty mould fungus on leaves and fruiting bodies through accumulation of sticky excretory waste product i.e. honeydew, this infestation results in leaf chlorosis, withering and premature dropping of leaves which eventually causes mortality of plant and eventually lessens the value of the plant or yields rendering them unmarketable (Bhowmik et al., 2018). The third type of damage is caused by transmission of plant viruses of seven distinct groups viz. Gemini viruses, oviruses, Carla viruses, poty viruses, nepo viruses, lote oviruses and DNA-containing rod-shaped viruses (Polston & Capobianco, 2013). So, to curb the menace, the crop should be visually inspected for symptoms of whitefly infestation i.e. stunted or chlorotic plants. Adult whiteflies are attracted to yellow/green surfaces (Laekeman et al,.2025). Installation of yellow sticky trap methodOne is one of the most effective approaches to detect the presence of the adult whitefly (Awadalla et al., 2014; Ghulam et al., 2020 and Khuhro et al. 2020). The effectiveness of yellow sticky traps was also reported by Gupta (2010), Prajapati (2010) to evaluate the population levels and dispersal patterns of *B. tabaci*. The reliability of yellow sticky traps, however, has not been proven (Nagaraj et al., 2025). Regularmontoring of *B. tabaci* population should be done by using yellow trap from the early stage of thecrop (Park et al., 2011 and Idris et al., 2012). Keeping all the factors in mind, the present study was formulated to evaluate the effect of yellow sticky traps against white fly on brinjal production in Malda under old alluvial zone of West Bengal.

2. MATERIALS AND METHOD

2.1 Site Description

Impact of Yellow sticky trap against white fly in brinjal (Pusa Kranti)were carried out through frontline demonstration with 10 farmers of Bahirkap, Rukundipur, Mirkamary and Gopalpur villages of Ratua-I Block of Malda district in West Bengal, India during *kharif* season of 2019-20 and 2020-21.

2.2 Soil and Climatic Conditions

The soil texture of the experimental site was sandy loam in nature with good water holding capacity, drainage facility with moderate fertility status. The experimental area is situated under subtropical humid climate. The soil properties of the demonstrated areas are as follows:

Table 1. Soil Fertility Parameters of Different Villages

Village name	Available N (kg/ha)	Available P (kg/ha)	Available K (kg/ha)	pH	EC (dS m^{-1})	OC (%)
Mirkamary	654.12	69.77	342.12	7.39	0.25	0.69
Bahirkap	675.54	43.76	287.86	7.3	0.13	0.12
Gopalpur	365.85	85.43	196.46	6.55	0.12	0.14
Rukundipur	480.32	98.07	213.6	6.98	0.42	0.43

**N=Nitrogen, P=Phosphorous, K=Potash, EC=Electrical Conductivity, OC= Organic Carbon*

Description of Technology

The frontline demonstration technology in brinjal was comprised of yellow sticky traps, balance dose of FYM @ 25 ton/ha and NPK(100:150:100 kg/ha as basal and 100 kg/ha nitrogen as top dressing), treatment of seed with carbendazim 50% WP @ 1 gm/kg of seed, treatment of soil with well rotten cow dung manure @ 375kg/ha and *Trichoderma viride* @ of 1.5 ton/ha and *Pseudomonas fluorescens* @ of 1.5 ton/ha, proper irrigation, weed management with glyphosate @ 2.5 kg/ha and micronutrient treatments with boron 20% @ 450 g/haand zinc @ 900 g/ha. The yellow sticky traps were made of yellow coloured rectangular shaped (11.5 inch x7.5 inch) board with sticky substance on either side of the board. In demonstration plots, 10 yellow traps were installed per acre randomly in the open field with the help of the bamboo stick starting from the 30 days up to 120 days after transplanting. The pointed end of stick which was 5 ft in height was penetrated in the soil in field and another end was fixed on the board. On the other hand, regular sprays of Imidacloprid 17.8% SL, Profenophos 50% EC, Lamda-cyhalothrin 5% EC and Cypermethrin 10% EC were done at 3-4 days interval starting before flowering to final harvesting of fruits (i.e. farmer's practice or control).

2.3 Observations

The primary data on white fly infestation were collected from the individual farmer through interview and interpreted and presented in terms of percentage and the qualitative data were converted into quantitative form and expressed in terms of per cent increased yield over farmers' practice i.e. control. The percentage of infested plant was calculated on the basis of total number of healthy plants and whitefly infested ones from each demonstration plot i.e. 0.13 ha area per farmer out of 1.3 ha area at 7 days interval by observing the symptoms of little leaf or stunted growth of the plant. The board was replaced at 2 weeks interval. Data of yield and cost of cultivation was also recorded for economic interpretation in terms of net profit earned and benefit cost ratio. Yield attributes were collected after every harvesting (starting from 45 days to 140 days after transplanting). The data were analyzed by using the following formulae:

$$Per\ cent\ yield\ over\ control = \frac{Yield\ of\ Demonstration - Yield\ of\ Farmers'\ Practice\ i.e. Control}{Yield\ of\ Demonstration} x\ \ 100$$

The level of infestation per unit (0.13 ha) was evaluated by this formula:

$$Damage\ percentage = \frac{Number\ of\ damaged\ plants}{Number\ of\ total\ plants} x\ \ 100$$

Extension gap, technology gap and technology index were calculated by using the formulae (Morwal et al., 2018):

Extension gap = Demonstration yield - Local check or control yield

Technology gap = Potential yield - Demonstration yield

$$\text{Technology index} = \frac{\text{Potential yield} - \text{Demonstration yield}}{\text{Potential Yield}} \times 100$$

3. RESULTS AND DISCUSSION

3.1 Effect of Yellow Trap on Yield of Brinjal

The Average yield performance and economics of ten 'Frontline Demonstrations' of yellow sticky trap based technology and farmers' practices were assessed (Table 2 and Figs. 1 and 2) during 2019-20 and 2020-21. The recommended practice i.e. installation of yellow sticky traps @ 10/acre was evaluated and assessed over farmers' practice i.e. control**.** The yield performance of demonstrated practice was 292.44 and 305.54 q/ha during 2019-20 and 2020-21, respectively and similar studies was done by Abubakar et al., (2022). These yields of demonstrated plots were 18.34% and 30.26%higher to farmer's practice or control (248.33 and 236.43 q/ha) during respective year. The average yield and per cent yield increase over control during both the years were observed 298.99 q/ha and 24.3 per cent, respectively in demonstration plots, whereas in control plots the average yield was 242.38 q/ha and Bhowmik, (2016) also done the same research work on yellow trap against whitefly.

Table 2. Impact of yellow sticky traps on yield and economics of brinjal during *kharif* season of 2019-20 and 2020-21

Technology	Year	Yield (q/ha)	% yield increase	Infestation per cent/ha LL	SG	Cost of cultivation (Rs./ha)	Gross Return (Rs./ha)	Net Return (Rs/ha)	BC Ratio
DT	2019-20	292.44	18.34	10.28	9.04	93105	348434	255329	2.75
	2020-21	305.54	30.26	9.98	8.75	96170	369190	273020	2.84
	Average	298.99	24.3	10.13	8.9	94638	358812	264175	2.8
FP	2019-20	248.33	--	62.52	54.00	115416	287837	172421	1.50
or control	2020-21	236.43	--	66.93	62.98	121481	274423	152943	1.26
	Average	242.38	--	64.73	58.49	118449	281130	162682	1.38

DT = Demonstration Technology; FP = Farmers' Practice; LL = Little Leaf; SG = Stunted Growth; BC = Benefit Cost ratio

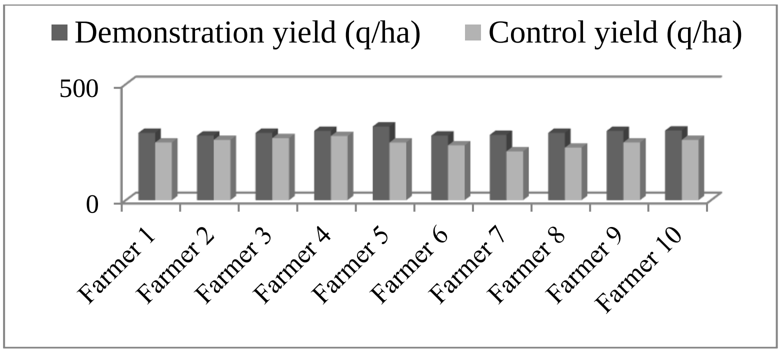

Fig. 1. Yield in Technology Demonstrated plots and Farmer's plots during 2019-20

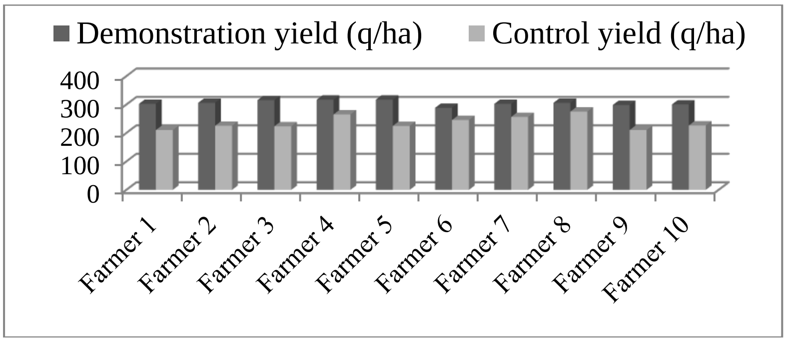

Fig. 2. Yield in Technology Demonstrated plots and Farmer's plots during 2020-21

3.2 Effect of Yellow Trap on Infestation Level by White Fly in Brinjal

The infestation on brinjal plant by white fly was recorded by observing little leaf and stunted growth symptoms. The percent infestation of little leaf symptom was found 10.28% and 9.98%, whereas the percent infestation of stunted growth symptoms was 9.04% and 8.75% in case of demonstrated practice during 2019-20 and 2020-21, respectively. It was found 62.52% and 66.93% infestation by little leaf and 54.00% and 62.98% by stunted growth in farmers' practice during respective years (as depicted in Table 1 and Figs. 3, 4, 5 and 6). The average per cent of little leaf infestation and stunted growth during both the years were 10.13% and 8.9%, respectively in demonstrated plots. But in control plots the average per cent of little leaf and stunted growth were 64.73% and 58.49%, respectively.

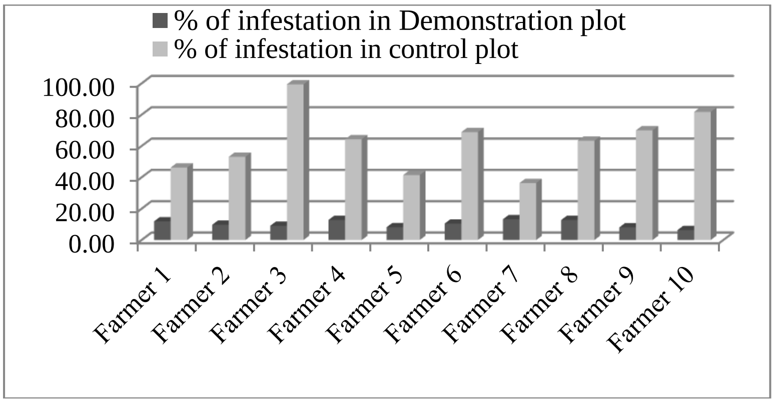

Fig. 3. Percentage of Little leaf of brinjal infestation in Technology Demonstrated plots and Farmer's plots during 2019-20

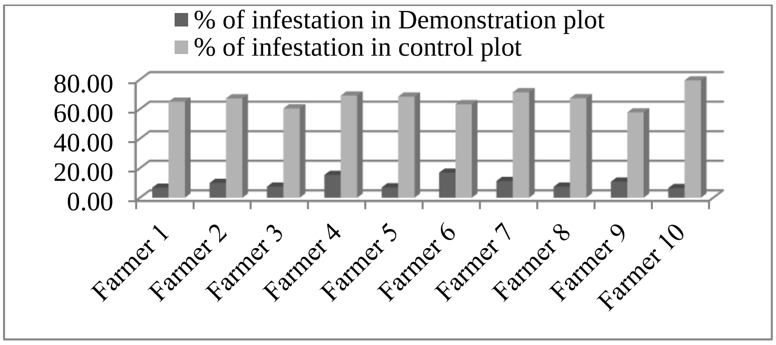

Fig. 4. Percentage of Little leaf of brinjal infestation in Technology Demonstrated plots and Farmer's plots during 2020-21

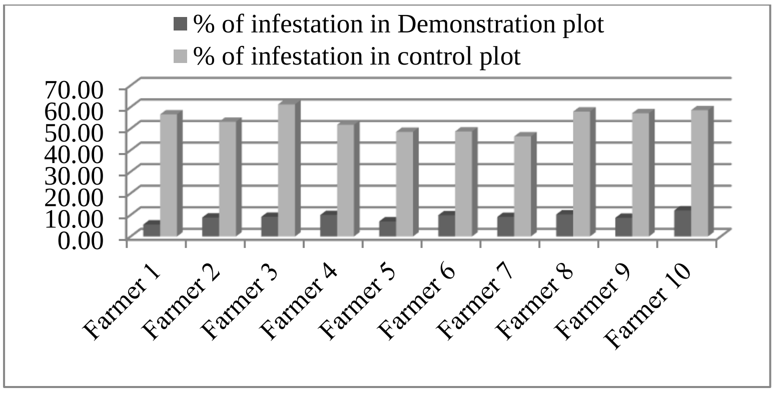

Fig. 5. Percentage of Stunted growth of brinjal infestation in Technology Demonstrated plots and Farmer's plots during 2019-20

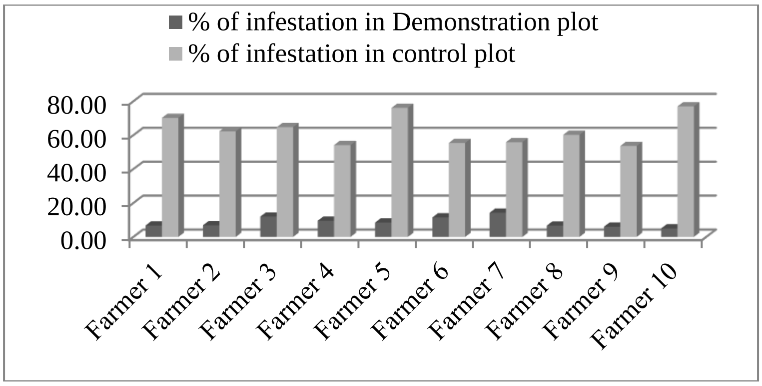

Fig. 6. Percentage of Stunted growth of brinjal infestation in Technology Demonstrated plots and Farmer's plots during 2020-21

Table 3. Production performance of Brinjal with demonstration technology under FLD programme during 2019-20 and 2020-21

Year	Average yield (q/ha)		% increase over farmer's practice	Extension gap (q/ha)	Technology gap (q/ha)	Technology index (%)
	Demonstration	Farmer's practice				
2019-20	292.44	248.33	18.34	44.11	57.56	16.45
2020-21	305.54	236.43	30.26	69.11	44.46	12.70
Average	298.99	242.38	24.30	56.61	51.01	14.57

- *Potential yield = 350 q/ha*

3.3 Effect of Yellow Trap on Economics of Demonstration

Table 2 clearly revealed that the net returns and benefit cost ratio obtained from the demonstrated plots were substantially higher than farmers practice during both the years. Net returns from demonstrated plots were observed to be Rs. 2,55,329/-ha and Rs. 2,73,020/-ha whereas these were Rs.1,72,421/-ha and Rs. 1,52,943/-ha in farmers' practice, hence income was increased by Rs 82,908/-ha and Rs. 1,20,077/-ha during 2019-20 and 2020-21, respectively (Table 2). These benefits can be attained by the technological intervention i.e. installation of yellow sticky traps through frontline demonstrations. The benefit cost ratio of demonstrated practice were also elevated (2.75 and 2.84) than farmers practice (1.50 and 1.26) during respective years. The pooled cost of cultivation, gross return, net return and BC ratio were 94638/-ha, 358812/-ha, 264175/-ha and 2.8, respectively during both the years in demonstration plots. In control plots, these were 118449/-ha, 281130/-ha, 162682/-ha and 1.38, respectively. Thus, encouraging cost-benefit ratios and increased net returns proved the economic feasibility of the demonstrated technology and influenced the farmers regarding the efficacy of the technology demonstrated at their farming situation. Similar results were also reported by Mishra et al (2007 and 2012) in onion and cauliflower. Effect of the frontline demonstration evidently reveals that the dissemination of demonstrated technology is feasible, economically viable and environmentally safe for controlling white fly in brinjal.

3.4 Extension Gap

Extension gap defines as the differences between yield of demonstration plot and farmers' plot. The extension gaps were 44.11 q/ha and 69.11 q/ha during 2019-20 and 2020-21, respectively (Table 3). The average extension gap during the two years of FLD programme was 56.61q/ha which highlighted the need to train the farmers through various extension programmes like trainings in different areas for adoption of improved protection technology, to regress the trend of large extension gap. More application of this new innovative technology will subsequently change this distressing trend of galloping extension gap.

3.5 Technology Gap

The technology gap defines as the differences between potential yield and yield of demonstration plot. The potential yield of brinjal var. Pusa Kranti is 350 q/ha. The technology gaps were observed 57.56 q/ha and 44.46 q/ha during 2019-20 and 2020-21, respectively (Table 3). The average technology gap during the two years FLD programme was 51.01 q/ha. The technology gap observed may be caused due to the dissimilarity in the soil fertility status of the villages, crop production practices of the farmers and prevailing climatic situation of the locality.

3.6 Technology Index

Technology index points out the practicability of the improved technology in the farmers' fields. The feasibility of the technology demonstrated depends on the lower value of technology index (Sagar and Chandra, 2004; Arunachalam, 2011 and Kumar et al., 2014). So, the reduction of technology index from 16.45% (2019-20) to 12.70% (2020-21) revealed the feasibility of the demonstrated technology (Table 3). Yield improvement in different crops through frontline demonstration has abundantly been documented by Beigh et al., (2015); Mishra et al., (2009) and Kumar et al., (2010). The average technology index was observed 14.57% during the two years of FLD programme, which proved the effectiveness of the good performance of technical interventions. This will hasten the adoption of demonstrated technical intervention to increase the yield performance of Brinjal.

4. CONCLUSION

The Integrated Pest Management or component of Integrated Pest Management based practices were found fruitful in comparison to traditional methods, so, the demonstrated management practice must be adopted by the brinjal growers. The magnitude of the knowledge and adoption of technology by the farmers in four adopted villages with ten farmers were improved after imparting training and conducting FLD by KVK scientists in Malda district of West Bengal. The productivity achieved under FLD over farmers' practices created awareness and motivated the other farmers of neighbouring villages to accept this new technology for the control of white fly infestation in brinjal in this district. It can be concluded that the yield gap between demonstration and farmers' practice can be reduced through the extensive publicity of the new technology through various extensions activities organized in FLD programmes in the farmer's fields. So, for quick and large scale spreading of technology demonstrated by KVK, a large number of FLD should be conducted and the scientific visits to the fields should be amplified with the training to the farmers by Krishi Vigyan Kendras who are working at grass root level with the farmers.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

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COMPETING INTERESTS

Authors have declared that they have no known competing financial interests or non-financial interests or personal relationships that could have appeared to influence the work reported in this paper.

REFERENCES

Abubakar, M., Koul, B., Chandrashekar, K., Raut, A., & Yadav, D. (2022). Whitefly (*Bemisia tabaci*) management (WFM) strategies for sustainable agriculture: A review. *Agriculture, 12*, 1317. https://doi.org/10.3390/agriculture12091317

Arunachalam, R. (2011). Spread and acceptance of recommended production technologies in green gram and black gram: A comparative analysis. *Legume Research, 34*(1), 8–13. https://arccjournals.com/journal/legume-research/LR-34-1/ARCC832

Awadalla, S. S., Bayoumy, M. H., Khattab, M. A., & Abd El-Wahab, A. H. (2014). Yellow sticky trap catches as indicator for the cotton whitefly, *Bemisia tabaci* (Genn.) population and its parasitoids. *Journal of Plant Protection and Pathology, 5*(4), 455–471. https://doi.org/10.21608/jppp.2014.87936

Beigh, M. A., Rufaida Mir, S. Z. A., Matoo, J. M., & Sibat, F. K. (2015). Impact analysis of front line demonstration of rice (*Oryza sativa*) on the yield, economics and farmer's knowledge in temperate region of India. *Scientific Research and Essays, 10*(14), 449–455. https://doi.org/10.5897/SRE2015.6284

Bhowmik, P. (2016). Studies on seasonal fluctuation of whitefly population on different crops in rabi season and monitoring through yellow sticky traps (M.Sc. thesis). Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur. http://krishikosh.egranth.ac.in/handle/1/5810043022

Bhowmik, P., Bhowmick, A. K., Das, S. B., & Pandey, A. K. (2018). Monitoring of whitefly populations through yellow sticky traps installed at different heights. *International Journal of Chemical Studies, 6*(5), 3072–3076. https://www.chemijournal.com/archives/2018/vol6issue5/PartBB/6-4-884-910.pdf

Bhowmik, P., Bhowmick, A. K., Das, S. B., & Pandey, A. K. (2018). Seasonal incidence of whitefly on different crops in Rabi season. *Journal of Entomology and Zoology Studies, 6*(6), 68–74. https://www.entomoljournal.com/archives/2018/vol6issue6/PartB/6-4-415-290.pdf

Ghulam, Q. J., Muhammad, H. H., Junaid, A. S., Abdul, S. S., Asad, R., Ali, S., & Shah, S. A. (2020). The color attraction of white fly (*Bemisia tabaci*) through sticky cards in brinjal crop. *International Journal of Entomology Research*, 5(1):111–112. https://www.entomologyjournals.com/assets/archives/2020/vol5issue1/4-6-38-281.pdf

Gupta, K. K. (2010). Studies on the major insects trapped in different traps associated with some winter vegetable crops at Jabalpur (M.Sc. thesis). JNKVV, Jabalpur. http://krishikosh.egranth.ac.in/handle/1/5810018987

Idris, A. B., Khalid, S. A. N., & Mohamad Roff, M. N. (2012). Effectiveness of sticky trap designs and colours in trapping alate whitefly, *Bemisia tabaci* (Gennadius) (Hemiptera: Aleyrodidae). *Pertanika Journal of Tropical Agricultural Science, 35*(1), 127–134. https://www.cabi.org/isc/abstract/20123300090

Jadhav, R. D., Kadam, D. R., Jadhao, P. B., & Kangale, G. K. (2018). Bioefficacy of newer insecticides against brinjal white fly and their natural enemies. *Journal of Entomology and Zoology Studies, 6*(6), 1187–1191. https://www.entomoljournal.com/archives/2018/vol6issue6/PartT/6-6-158-269.pdf

Khuhro, S. N., Junejo, I. A., Hullio, M. H., Maitlo, S. A., Daar, J. S., & Rajput, S. (2020). Evaluation of colored sticky traps for monitoring the population of whitefly *Bemisia tabaci* (Gennadius) on brinjal crop. *Pakistan Journal of Agricultural Research, 33*(2), 327–330. http://dx.doi.org/10.17582/journal.pjar/2020/33.2.327.330

Kumar, A., Kumar, R., Yadav, V. P. S., & Kumar, R. (2010). Impact assessment of frontline demonstrations of Bajra in Haryana State. *Indian Research Journal of Extension Education, 10*(1), 105–108. https://seea.org.in/upload/IRJEE%20Vol%2010%20(1)%20Jan%202010.pdf

Kumar, S., Singh, R., & Singh, A. (2014). Assessment of gaps in pulse production in Hamipur district of Himachal Pradesh. *Indian Research Journal of Extension Education, 14*(2), 20–24. https://api.seea.org.in/uploads/pdf/2014-40-20-24.pdf

Laekeman, B., Bonte, J., Dermauw, W., Christiaens, A., Gobin, B., Van Huylenbroeck, J., Dhooghe, E., & Lootens, P. (2025). Species-level detection of thrips and whiteflies on yellow sticky traps using YOLO-based deep learning detection models. *Frontiers in Plant Science, 16*, 1668795. https://doi.org/10.3389/fpls.2025.1668795

Mishra, D. K., Paliwal, D. K., Tailor, R. S., & Deshwal, A. K. (2009). Impact of frontline demonstrations on yield enhancement of potato. *Indian Research Journal of Extension Education, 9*(3), 26–28. https://api.seea.org.in/uploads/pdf/v09307.pdf

Mishra, D. K., Pathak, G., Tailor, R. S., & Deshwal, A. K. (2007). On farm trial: An approach for management of thrips in onion. *Indian Research Journal of Extension Education, 7*(1), 66–67. https://www.researchgate.net/publication/265570291_On_Farm_Trial_An_Approach_for_Management_of_Thrips_in_Onion

Mishra, D. K., Tailor, R. S., Paliwal, D. K., & Deshwal, A. K. (2012). Assessment and impact of bio-management of diamondback moth in cauliflower. *Indian Research Journal of Extension Education, 12*(2), 87–90. https://api.seea.org.in/uploads/pdf/v12218.pdf

Morwal, B. R., Pagaria, P., Kantwa, S. L., & Das, S. (2018). Performance of frontline demonstration on yield enhancement of cumin in Barmer district of Rajasthan. *Journal of Krishi Vigyan, 6*(2), 176–178. https://doi.org/10.5958/2349-4433.2018.00078.8

Nagaraj, S., Namachivayam, V., & Nagarajan, M. (2025). Advances and limitation of yellow sticky traps in integrated pest management. *Uttar Pradesh Journal of Zoology, 46*(12), 274–284. https://doi.org/10.56557/upjoz/2025/v46i125064

National Horticulture Board (NHB). (2019). *Horticulture crops for 2019-20 (Second advance estimates)*. Government of India. https://nhb.gov.in/StatisticsViewer.aspx?enc=MWoUJibk35dW2g36TUJWAoZqESmAYFi7h2irlsmjlINTcFl1rG/kLbq8ZQbWUvuM

Park, J. J., Park, K. W., Shin, K. I., & Cho, K. (2011). Evaluation and comparison of effects of air and tomato leaf temperatures on the population dynamics of greenhouse whitefly (*Trialeurodes vaporariorum*) in cherry tomato grown in greenhouses. *Korean Journal of Horticultural Science and Technology, 29*, 420–432. https://koreascience.or.kr/journal/HorticulturalScienceandTechnology.page

Polston, J. E., & Capobianco, H. (2013). Transmitting plant viruses using whiteflies. *Journal of Visualized Experiment, 81*, e4332. https://doi.org/10.3791/4332

Prajapati, M. (2010). Studies on the major insects trapped in different traps associated with some rabi vegetable crops at Jabalpur (M.Sc. thesis). JNKVV, Jabalpur. http://krishikosh.egranth.ac.in/handle/1/5810018987

Sagar, R. L., & Chandra, G. (2004). Frontline demonstration on sesame in West Bengal. *Agricultural Extension Review, 16*(2), 7–10. https://www.researchgate.net/publication/251323263_Frontline_Demonstration_on_Sesame_in_West_Bengal

Sujayanand, G. K., Sharma, R. K., & Shankarganesh, K. (2013). Efficacy of newer insecticides against leaf hopper and whitefly infesting brinjal and its effect on coccinellids. *Pesticide Research Journal, 25*(1), 6–11.

Walia, A., & Lalotra, A. (2021). Aspects of the Indian vegetable seed industry. *Just Agriculture, 1*(11). (e-ISSN: 2582-8223). https://justagriculture.in/files/newsletter/2021/july/90.pdf

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