



Use of pheromone trap and vermicompost

for the success of vegetable growers of Bundelkhand, Uttar Pradesh

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Food security has long been linked with a vision of abundance of cereals — the staple crops that provide affordable sources of dietary energy. However, the concept of nutritional security has now moved to the fore and has become embedded in food security. Owing to growing health concerns among common people, consumers are questing for safer and quality diets. The recent COVID-19 pandemic has markedly changed people's consumption behavior and preferences towards healthier foods. Vegetables are an important source of various essential nutrients. They have high demand and are thus cultivated in large quantities. Vegetable production faces challenges like insect pest attack and diseases. Pheromone traps are one of the important components of pest management practices which have been reported to reduce the rates of chemical pesticides. Similarly, enriching soil with vermicompost is a widely suggested measure to minimize the use of chemical fertilizer. Under the Farmer FIRST (Farm, Innovations, Resources, Science and Technology) programme (FFP), the successful effect of vermicompost, bio-pesticide and pheromone traps on cost of production of vegetables and also on use of chemicals in vegetable have been captured here.

Keywords: Insect pest, Pheromone trap, Vermicompost

VEGETABLES are the human's most reasonable source of vitamins and minerals needed for a healthier life. They are an essential constituent of the human daily diet as they are rich sources of minerals, carbohydrates, vitamins, and proteins. Vegetables are also a chief source of income to farmers because of their high yielding and short cultivation duration features. India is bestowed with a wide range of topographical and agro-climatic conditions suitable for growing various vegetable crops. The increasing trend in area and production under vegetable crops shows the vast potential of the country in meeting the nutritional security needs of global population. Major biotic stress in vegetable production is due to insect pest attacks. There is a total yield loss due to direct (feeding on plants) and indirect (vectors of viral disease) damages.

Farmers use indiscriminate doses of pesticides that increase the pesticide load on vegetable crops and cause environmental pollution and health hazards. However, this production growth is largely attributed to heavy reliance on agrochemical interventions for bolstering

productivity and controlling pests and diseases. A galore of literature evidenced that chemical pesticides have created many other serious problems like ecological backlashes in pest species and loss of beneficial fauna and therefore, eco-friendly production practices have attracted policy attention in recent years.

The use of pheromone traps is one of the important components of pest management practices which have been reported to reduce the rates of chemical pesticides and prevent, or at least delay the development of resistance in target pests to both chemical pesticides and bio-pesticide toxins. Similarly, enriching soil with vermicompost is a widely suggested measure to minimize the use of chemical fertilizer, improving plant resistance to pest and prevent soil degradation. Studies indicating the effect of pheromone traps and vermicompost on yield potential of vegetables are many, but field level evidences of its impact on curtailing chemical use application and cost of pest management is very limited. Needless to mention that cost of farming assumes a significant importance in the present Indian

Table 1. Effect of vermicompost on fertilizer used and yield of vegetables

Vegetables	Use of DAP (kg/acre)			Use of Urea (kg/acre)			Yield (q/ha)		
	Adopter	Non-adopter	t-stat	Adopter	Non-adopter	t-stat	Adopter	Non-adopter	t-stat
Bottle gourd	32.37	21.00	17.63*	31.38	20.75	19.57*	55.1625	52.875	15.06*
Ridge gourd	33.28	21.71	15.79*	32.57	21.14	12.60*	17.81	16.11	10.27*
Brinjal	38.06	23.89	11.46*	36.11	22.08	12.29*	70.60	67.64	9.55*
Tomato	38.65	24.62	11.31*	35.76	22.88	12.33*	74.98	72.11	8.33*
Chilli	32.38	21.66	9.24*	31.66	20.47	16.41*	19.35	17.54	14.84*
Cucumber	29.68	20.00	31.00*	29.37	20.00	21.95*	19.87	17.75	10.50*
Cauliflower	50.00	32.33	8.33*	44.33	26.66	10.98*	83.80	80.15	10.82*

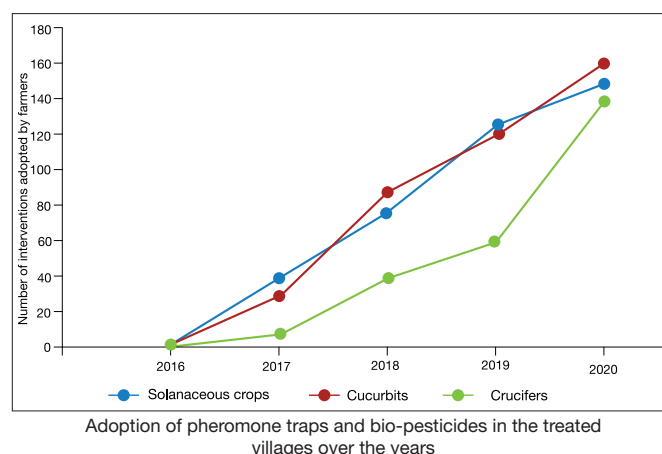
*P<0.01

agricultural scenario because rising production cost has become one of the underlying reasons of farm distress, particularly in largely cultivated rainfed areas.

Effect of vermicompost application on chemical fertilizer use and vegetable yield

Vermicompost is organic material in which virtually any organic waste is converted into a useful manure and effective soil conditioner. Vermicompost products confer higher plant nutrients, various plant growth promotion hormones, enzymes and humic substances as compared to farm yard manure. Thus, it improves the physical, chemical and biological properties of the soil, which provides a suitable environment for plant growth as well.

The results (Table 1) indicated that the use of vermicompost by the farmers have significantly reduced the use of DAP and urea in the vegetable cultivation, and has accentuated the yield of all selected vegetables. Several other experiences of use of vermicompost in vegetables in past have also established that plants treated with chemical fertilizer had higher growth and yield related parameters compared to those treated with vermicompost, but maximum chlorophyll content and reduced pest and disease incidence was noticed in vermicompost treated plants as compared to chemical fertilizer treated plants. It has been also estimated that nearly about 25–50% of the recommended dose of chemical fertilizer can be supplemented by vermicompost.



Effect of pheromone traps and bio-pesticides on pesticide application and cost of production

Farmers were unaware regarding use and benefits of pheromone traps in vegetable farming in the selected villages. On farm demonstration were carried out by the team of scientists and realizing the potential benefits of pheromone traps, its adoption by the farmers for controlling insect pests in vegetables increased over the time. The results from a sample of 86 vegetable growers from the project area showed that the target pest including *Helicoverpa armigera*, *Plutellaxy lostella*, *Bactrocera* spp. and *Leucinodes orbonalis* when monitored using pheromone traps, the frequency of chemical pesticide's application reduced from 14 to 10 and also the usage of chemical pesticides declined by 28.6% per acre.

Use of bio-pesticides as an alternative to chemical pesticides significantly reduced the cost involved in the management of pests by around ₹951 per acre i.e. by 13.8% as compared to non-adopters. Use of sex pheromone trap along with neem based bio-pesticides reduced the shoot and fruit damage to the extent of 71.72% and 39.06%, respectively.

Similarly, cucurbitaceous vegetable growing farmers (n=104) were selected from each adopter category and impact of fruit fly traps and bio-pesticides in IPM was determined per acre basis. Monitoring of pests by fruit fly traps reduced the frequency of chemical pesticide's spray from 06 to 04 and reduced usage of chemical pesticides by 33.33% per acre. Use of bio-pesticides as an alternative pesticide to chemical pesticide by farmers reduced the cost involved in the management pests by 11.61% per acre as compared to non-adopters.

Cauliflower growing farmers (n=17) were also given pheromones and bio-pesticides in IPM. Monitoring of pests by pheromone traps/lures, reduced the frequency of chemical pesticide's spray from 17 to 11 and reduced usage of chemical pesticides by 35.29% per acre. Use of bio-pesticides as an alternative to chemical pesticides by adopters reduced the cost involved in the management pests by 24.87% per acre as compared to non-adopters.

The impact of pheromones and bio-pesticides in IPM of all vegetables crops was also analyzed and the findings are shown in the Table 2. The data obtained from the 207 vegetable growing farmers of each group showed that monitoring of pests by pheromone traps, reduced the

Table 2. Impact of pheromone traps and bio-pesticides in IPM of all vegetable crops

Particulars	Adopter (n=207)	Non-adopter (n=207)
Total area covered (acre)	106	106
Average number of chemical pesticides sprays (per acre)	11	15.3
Average number sprays of bio-pesticides	3.0	0.0
Average reduction of chemical pesticide application (%)		-28.10
Average cost involved in chemical spray (per acre)	5467.2	7600
Average cost of pheromone traps (10 traps per acre)+bio-pesticides	840.0	0.0
Average cost involved in pest management	6307.2	7600
Average cost reduction per acre		1293.31*

*P<0.01

frequency of chemical pesticide's spray from 15.3 to 11 and reduced usage of chemical pesticides by 28.10% per acre. Use of bio-pesticides as an alternative to chemical pesticides by farmers reduced total cost involved in the management pests by 17.0% per acre as compared to non-adopters (Table 2).

SUMMARY

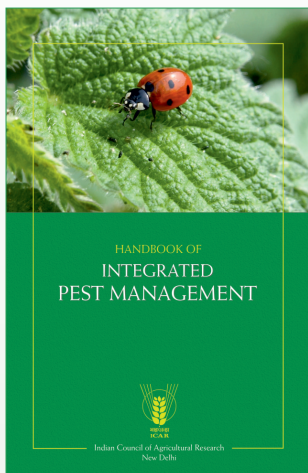
It is clearly indicated that pheromone traps along with bio-pesticides and vermicompost offer considerable level of protection against targeted pest and reduces

the production cost and increases the net returns to the farmers. Besides, it reduces the pesticide dumping in the vegetable production. This eco-friendly method has many advantages over chemical pesticides including low cost, safe to non-target organisms and environment, less labour intensive, easy to operate and residue free products.

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HANDBOOK OF INTEGRATED PEST MANAGEMENT

To reverse the loss of environmental resources and also to reduce biodiversity loss, the Government of India has Integrated Pest Management (IPM) as part of the National Agricultural Policy. Integrated Pest Management emphasizes the growth of a health crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms. IPM is not new – mechanical, cultural and biological tactics were used by farmers for hundreds of years before chemical pesticides became available. Besides, there are IPM techniques that have been developed more recently and are effective in suppressing pests without adversely affecting the environment.



The task of spreading the message of IPM across is tough due to poor awareness about the subject among people in line-departments as also among the farmers. The information on integrated pest management as a whole is scattered. This *Handbook* comprehensively deals with all the aspects of integrated pest management in field crops, horticultural crops under traditional, protected systems. Information on basic strategies and tactics of different methods of management including mass production of biocontrol agents, IPM policy and pesticide registration is provided in comprehensive form.

The *Handbook of Integrated Pest Management* comprises 82 chapters which are well written in lucid language with crispy sentences by the renowned scientists. The role of IPM is elucidated with different pests like *Trichogramma*, *Bacillus thuringiensis*, *Nomuraea rileyi* etc. and agricultural crops like rice, wheat, maize, sorghum, pearl millet, pulses, soybean, rapeseed mustard, groundnut, minor-oilseed crops, sugarcane, cotton, jute and mesta, potato, vegetable crops, fruits, grapes, citrus, banana, pomegranate, coconut etc. This *Handbook* will provide information of available useful technologies to educate on how to reduce or judiciously use chemical pesticides, safeguard ourselves from chronic poisoning, save the National environment while also reducing input costs and raise farmers' income. This compilation will be useful to teachers, students, trainers, line-department personnel and policy makers.

TECHNICAL SPECIFICATIONS

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