ADOPTION OF BIO-PESTICIDES AND BIO-CONTROL AGENTS

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Abstract : Bio-pesticides (also known as Biological Pesticides) are certain types of pesticides derived from such natural materials as animals, plants, bacteria and certain minerals, for example at the end of 1998 there were approximately 175 registered Bio-pesticide active ingredients and 700 products of bio-pesticides.
The Chemical Pesticide consumption is increasing @ 20% per annum. The pest and disease cause over Rs. 29,000 cores crop losses per annum. This situation has been caused by indiscriminate use of chemical pesticides resulting in development of resistance in pests and resurgence of minor pests. Rejection of Indian argil exports are more than Rs. 4000 cores per annum, because of very high pesticide residue contents. WHO estimates 1 million pesticide-poisoning cases and 20,000 death every year globally. This is due to high pesticide residues in food chain. Chemical pesticides cause significant health hazards like Vomiting, Paralysis, Blindness, Coma, Death, damage to respiratory tract, allergies, anemia etc.

INTRODUCTION

Success Stories of Bio-pesticides in India

The use of Bio-pesticides and bio-control agents in India is on the increase but not up to the desired levels of growth. All though presently a decrease or decline in chemical pesticide consumption is indicated, only 1% of 143 Million ha, cropped area and only 2500 villages out of over 6 lakh villages in the country have been covered so far under IPM. They are many encouraging success stories of Bio-pesticides and bio-control agents in Indian agriculture : (Table 1).

1) Control of Diamond back moth by B.t. in Delhi and Ajmeer,
2) Control of Mango hoppers and mealy bugs by *Beauveria* in Malihabad (Luk),
3) Control of white fly on cotton by 1500 neem products in Haryana, Punjab, Gujarat and West Bengal.
4) Control of *Helicoverpa* on Cotton, Pigeon pea, tomato, by B.t. in Haryana, Punjab, Gujarat and West Bengal.
5) Control of Rots in various Vegetable by *Trichoderma* based bio-control agents in Haryana, Rajasthan, Maharashtra.

Some common bio-pesticides and control agents

1) ***Predators*** **:** *Chrysoperla Carnea* is a general entomorphagous predator which is commercially produced in many countries including India for use as a biological control agent against aphides similarly *Malada astur* is a another predators mainly predates on white fly.
Orius tantilus is a common predaceous anthocorid in India, which attacks the aphid nymph mites and thrips. *Orius indicus* exclusively predates on thrips, aphids, leaf hoppers.

2) ***Trichogramma*** **:** *Trichogramma* is one of the most popular biological control agents used against many lepidopteron insects. It is a egg parasitoids of stem borer of paddy, maize, sorghum, and sugar cane. This is sensitive to chemical pesticides.

3) ***Bacillus Thruingiensis*** **(Bt) :** It is one of the most important bacterial bio-pesticides used worldwide. It was first produced in USA in 1957 and was registered as bio-pesticide in 1961. It is commonly called "Bt" which contains a protein called *Bacillus thruingiensis*, toxin. It is primarily a pathogen of Lepidopteron pests. This Bt gene also has been introduced into
plants like cotton, potato, corn and soybean. Commonly available commercial Bt products are Delfin, Spicturin, Agree etc.

4) ***Trichoderma*** **:** *Trichoderma* is a well known potent biological control agent for some soil born plant fungal pathogens. It was first used in 1930, and is effective against root pathogens and used for seed treatment. It is particularly effective in the case of Ground nut, Sunflower, Beans, Grams and Chick Pea particularly against *Pythium, fusarium Rhizoctonia* and *Sclerotium.*
Several species of *Tcichederma* are available *T. viridae* and *T. harzianum* are widely used as bio control agents against many diseases.
Trichoderma spp is used for seed treatment (dry) @ 4 g/kg seed. It can be directly applied to soil, it is compatible with fertilizers like *Rhizobium* and *Azospirillum*.

5) **N. P. V. (Nuclear Polyhedrosis Virus) :** It has been found to be effective in the control of many pests, it can be applied individually or in combination with many chemical insecticides or neem. Two types are available one is NPV (Ha) and NPV (S). NPV (Ha) has been found to control *Helicoverpa armigera* where as NPV (S) controls *Spodoptera litura.*

6) Pheromones : These are used for light traps and sexlures / Pheromonals to monitor the activity of fruit sucking moths and other Lepidopteron pests.

Plant Bio-pesticides

Neem :- The neem tree *Azadirachta indica* produces a variety of substances with antifeedent property. It was first isolated by Buffer-worth and Morgan in 1908. Neem is reported to be effective against over 300 pest species. Neem formulation have a commercial potentiality in south and south east Asia, USA, and Australia. The Govt. of India has approved registration of a no. of neem formulations only in 1992. The different types of insect pests controlled by various neem compounds including mites, aphides, jassides, whitefly, fruit & shoot borers, caterpillars, weevils, nematodes, as well as plant pathogenic fungi and bacteria. Now the registration committee has divided to approve the formulation with azadirachtin content ranging from 300 – 50,00 ppm. Research has shown that neem extracts can influence nearly 200 species of insects, neem EC is the general purpose botanical pesticide of choice for organic agriculture. (Table 2).

Several constituents of neem seed or neem oil have been found to possess pest control properties. These include Solanin, Salanol, 3-deacenty 1 Salanin, azadirachtin, nimbin, epinimbin, epinimbocinol etc. Different kinds of Azodirachtins (A – K) have been isolated, the most abundant of which is Azadirachtin – A. This component acts as feeding deterrent when the leaf is treated with neem product because of presence of Azadirachtin Salanin and meleandriol there is an anti peristaltic wave in the elementary canal and this produces Vomiting Sensation in the insect as a result of which the insect does not feed. Another mode of deterrence is through oviposition blockade i.e. not allowing the female insects to lay eggs. Besides, essential oils obtained from cedar, eucalyptus, lavender, and citronella are extensively used to ward of pest through repletion by odour a mission. Bioactive natural compounds have been isolated complants possessing insecticidal, antifeedent and insect growth regulatory properties.

E.g. Plumbagin from plumbago species.

Rotenone from the roots of *Lonchoarpus* sp. *Pyrethrum* from Chrysanthemum, Nicotine from tobacco etc.

What are the Advantgages of Using Bio-pesticides?

1. Bio-pesticides are inherently less harmful than conventional pesticides.
2. These are designed to effect only one specific pest in some cases a few target organisms.
3. When used in IPM programme Bio-pesticides can greatly decrease the use of conventional pesticides, while crop yield remain high.
4. Usually do not destroy beneficial organisms besides being easily bio-degradable in nature.

CONCLUSION

The population pressure, water loss, soil erosion, floods, saline and alkaline soils, weed and pest damage are considered to be the main indicators of unsustainability. Hence, supply and judicious use of production factors play a decisive role in the sustainable growth of agricultural production. We have discussed on almost all aspects of organic farming and can conclude that it is an economic, ecofriendly system, which attempts to provide a balanced environment, maintains soil fertility, control insect pest and diseases and produce safer and qualitative food stuff. However technologies like organic farming or integrated management systems need to be assessed to their location, specific applicability and adaptability to bring about better sustainability. Over all organically grown food may not put more nutrients into once body but will surely optimize the health and production of inter-dependent communities of soil life, plants, animals and people. When one buys certified organic food and products, the money you spent cast a vote for a healthier planet.

Table 1. Bio - Products

Active Ingredient	Recommended Usages	Dose of Application
Trichoderma Viridi	Seed treatment, Nursery	5-10 g/kg seed treat.
	Drenching, Soil Application	3 g/lt for nursery
	Foliar Spray for Control of	drenching 2 kg/ac
	Fungal diseases like wilt,	in compost.
	Root rot, Sheath rot etc.	
Beauveria bassiana	Wide spectrum insecticide	5 – 10 g/lt. of
	for control of Helicoverpa	Water.
	Spodoptera and other suck-	
	ing and chewing pests.	
Verticillium Lecanii	For Control of Mealy bugs,	5 – 10 g/lt. of

	Scales, Thrips and other	Water.
	Sucking pests.	
Metarhizium anisoplae	For Control of Soil pests like	5 – 10 g/lt. of
	Root Grubs, Termites.	Water.
Bacillus Thuringiensis	For Control of DBM and	400 – 500 g/acre.
		Other Caterpillar pests.
N. P. V.	For Control of Spodoptera	250 ml/acre.
	Litura.	
Paecilomyces spp.	For Control of Nematodes	2 kg/acre with
	In Banana, Potato, Flowers	Compost.
		And Fruit Crops.
Azadiarchtin 0.15%	Wide Spectrum in	750 ml/acre &
EC & 0.03% EC	Secticides.	1 lt/acre.
Nitrogen Fixing	Atmospheric Nitrogen	2 kg/acre.
Bacteria.		Fixation.
Phosphorus Solubili- zing bacteria.	Solubilises Phosphorus in Soil.	2 kg/acre.
Amono Acid	For Protein assimilation,	500 ml/acre
	better fruiting.	
Humic Acid	Complete Plant Food and	500 ml/acre
	Imparts Stress tolerance.	
Neem Cake	Bio Fertilizer, Nematicide.	200 kg/acre.

Table 2. Effect of Neem Formulation (ACHOOK) on infestation and yield of Brinjal and Lady's finger.
[Location : Institute of Agriculture, Sriniketan]

Treatment	Brinjal		Lady finger	
	% of Fruit infestat due to *Leucinoi orbonalis*	Fruit yield Tons/ha.	% of Fruit infestat due to *Eariasvitella*	Fruit yield Tons/ha.
Achook wp 0.5%	29.42	21.41	25.38	20.12
at 15, 30 Dp*				
Achook wp 0.5%	28.11	25.84	18.45	23.48
at 15, 30, 45 Dp				
Achook wp 0.5%	23.99	24.29	18.68	25.09
at 15,30,45,60 Dp				
Achook wp 0.5%	28.76	22.27	16.51	23.39
at 15, 30 Dp				
Achook wp 0.5%	24.06	20.00	15.01	26.48
at 15, 30, 45 Dp				
Achook wp 0.5%	20.54	24.34	11.70	27.16
at 15,30,45,60 Dp				
Control	38.13	18.54	38.45	17.56

Dp* = Days after planting.

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