

Agro-Chemicals Use Pattern of Pointed Gourd Growers' in Controlling Insect-Pests and Diseases in Nadia District of West Bengal

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ABSTRACT

Indiscriminate use of chemicals in agriculture during post green revolution period and their adverse effect on soil health and environment has created an alarming situation. A situation has resulted which urgently demands an environmentally safe, sustainable and simultaneously, economically viable production system. This indeed is essential for optimizing production and at the same time to minimize threat to environment. Considering the importance of the study, the objective, to portray the agro-chemicals use pattern of pointed gourd growers in controlling insect-pests and diseases was undertaken. The study was conducted in Nadia district of West Bengal. For the selection of area and respondents of the present study, multi-stage random sampling technique and universe method were adopted. The study reveals that (1) the most harmful insect-pest of pointed gourd crop was green caterpillar (2) fruit rot disease was the most damaging disease (3) pointed gourd growers were using various brands of various technical grade of agro-chemicals for controlling insect-pests and diseases with several doses (4) infestation of insect-pests and diseases was mainly seen on mature stage of the crop (5) main source of information on agro-chemicals use was agricultural input retailers (6) the pointed gourd growers used 80-100 litres of water per bigha of land (1 acre=3 bighas) for spraying at mature stage of the crop (7) their interval of spraying of chemicals was mainly 4-7 days (8) spraying was most popular method of application of pesticides. Therefore, on the basis of the present investigation, the various extension agencies those are working in the study area should reorient their extension strategies accordingly.

Keywords : Agro-chemicals, Trade name, Use pattern, Pointed gourd growers, Insect-pests, Diseases

INTRODUCTION

Our country has made progress in agriculture but productivity of our major agricultural and horticultural crops is very low in comparison to other countries. Our agriculture is still technology deficit, Yields per hectare of foodgrain, fruits and vegetables in our country are below global averages. India's population is expected to reach 1.5 billion by 2025, making food security most important social issue and food production will have to be increased considerably, to meet needs of growing population. According to the FAO, India is still home to some 217 million undernourished people, or a quarter of all undernourished people globally (Gautam and Kumar, 2014). Vegetables are so common in human diet that a meal without vegetable is supposed to be incomplete in any part of the world. Vegetables provide proteins, carbohydrates, minerals, vitamins and roughages which constitute the essential of balanced diet (Ram et al., 2012). The lower

yields are attributed to infestation of the crops by insect-pests and diseases and non-adoption of plant protection measures by farmers (Bhalekar et al.; 2013). Among the all measures to raise the productivity level, plant protection is in central position. Plant protection is a basic exercise in any crop for control of insect-pests, diseases, weeds etc. to avoid economic losses. Reports indicate these losses ranging from 20-30 percent by each of the insect-pests, diseases and weeds, but on a holistic basis about 30 percent average cumulative loss by them appears a fair estimate. This implies that suitable control measures must be followed to keep these losses to the minimum (Muthuraman and Kumar, 2013). The harmful impact of chemical pesticides and fertilizers may be explained as large scale arbitrary use of chemical pesticides, not only endangers human civilization but also pollutes the environment to a great extent. Only a small amount of the pesticides (less than 1%) applied to a crop reaches to the target

pests and the remaining more than 99% contaminates soil, air, water, food, feed etc. On the other hand, excessive use of chemical fertilizers steadily deteriorates the soil health. In view of preventing the forthcoming danger for human being and other creatures and restoring environmental balance, it is needed to divert attention towards judicious and need based pesticides and fertilizers application so far as concern of sustainability. Farmers' use behaviour of agro-chemicals in vegetables is so dynamic which requires regular research.

OBJECTIVE

To portray the agro-chemicals use pattern of pointed gourd growers in controlling insect-pests and diseases

METHODOLOGY

The study was undertaken in the State of West Bengal. For the selection of area and respondents of the present study, multi-stage random sampling technique and universe method were adopted. At the first stage of sampling, Nadia district was selected among the 19 agricultural districts of the State purposively based on its' higher area coverage in vegetable cultivation. Out of 16 blocks of Nadia district, one block (i.e Chakdah) was randomly selected at the second stage of sampling. In the selected block (Chakdah) a relatively homogenous field cultivated with vegetable crops was chosen on the basis of the opinion of the agricultural input retailers. The farmers who were growing pointed gourd in that field were selected as respondents of the present study through total enumeration. Thus total 100 farmers ultimately considered as respondents of the study. The data were collected by personal interview method by using local language (Bengali) for getting their exact response and simple percentage method was used for analysis of data statistically to reach at meaningful results and conclusion.

RESULTS AND DISCUSSION

Land

At the most 42 percent respondents had upto 10 katha of land under pointed gourd cultivation. Above one-third percent of respondents (34%) had 11-20 kathas of land, 18 percent of respondents had 1.1-2 bighas of land and remaining 6 percent of respondents had 2.1-4 bighas of land under the crop cultivation.

Season

Majority of the respondents (82%) cultivated the crop in kharif season whereas remaining 18 percent of

growers preferred to cultivate the crop in pre-kharif season. In rabi season, there was no cultivation of the crop.

Table 1: Land holding possessed by respondents under pointed gourd cultivation and season of cultivation n=100

Sr. No.	Land Holding under pointed gourd cultivation (Kathas/Big-has)	Percent of Respondents possessed	Season of Cultivation	Percent of Respondents cultivated
1	Upto 10 kathas	42	Prekharif	18
2	11-20 kathas	34	Kharif	82
3	1.1-2 bighas	18	Rabi	00
4	2.1-4 bighas	06	-	-

Experience in pointed gourd cultivation

Respondents of the study area were cultivating pointed gourd for many years. Eight percent of respondents had upto 5 years of experience about cultivation of pointed gourd, 7 percent had 6-10 years, 20 percent had 11-15 years, 20 percent had 16-20 years, at the most 35 percent had 21-30 years, 5 percent had 31-40 years and remaining 5 percent had above 40 years of experience about pointed gourd cultivation.

Experience in applying agro-chemicals in pointed gourd cultivation

Table 2: Years of engagement with pointed gourd cultivation and years of applying pesticides n=100

Years of engagement with pointed gourd cultivation	Percent of respondents	Years of applying agro-chemicals	Percent of respondents
Upto 5	08	Upto 5	07
6-10	07	6-10	18
11-15	20	11-15	20
16-20	20	16-20	20
21-30	35	21-25	15
31-40	05	26-30	20
Above 40	05	Above 30	00

Seven percent of respondents had upto 5 years of experience in applying agro-chemicals in pointed gourd cultivation, 18 percent had 6-10 years, 20 percent had 11-15

years, 20 percent had 16-20years, 15 percent had 21-25 years and remaining 20 percent of respondents had 26-30 years of experience in applying agro-chemicals in pointed gourd cultivation. No respondent had experience above 30 years in applying agro-chemicals in pointed gourd cultivation.

Insect-pests

The major insect-pests attacked the crop, their name and percent of respondents reported are the following; Green caterpillar (100%), Mite (61%), fruit fly (42%) and Green fly (37%).

Diseases

Three major diseases were observed generally in the study area. These were; fruit rot, downy mildew and root rot. Nearly three-fourth percent of respondents (72%) had the problem due to fruit rot disease whereas 59 percent of respondents replied in favour of downy mildew disease and 30 percent of respondents reported about the root rot disease.

Table 3: Insect-pests and Diseases of pointed gourd
n=100

Insect-pests	Percentage of respondents reported	Diseases	Percentage of respondents reported
Green caterpillar	100	Fruit rot	72
Mite	61	Downy mildew	59
Fruit fly	42	Root rot	30
Green fly	37		

Insect-pests

Table 4: Insect-pests and diseases of pointed gourd and the chemicals used to control
n=100

Pest problem	Chemicals used	% of respondents used
Insect-pests		
Green caterpillar	Ustad	32
	Challenger	28
	Tarjan	26
	Marshall	21
	Thiodan	18
	Rogor	14
	Monocil	13
	Superkiller	11
	Baserthrin	09
	Sevin	08

Mite	Thiovit	20	
	Metacid	17	
		Confidor	16
		Lannate+Thiodan	14
		Chlorocron	13
		Furadon	10
Met505		08	
Fruit fly	Challenger+Thiodan	32	
	Challenger+Hostathion	27	
	Sevin	12	
Greenfly	Challenger+Thiodan	29	
	Lannate+Thiodan	14	
Diseases			
Fruit rot	Dithane-M 45	61	
	Fytolan	12	
	Blitox	08	
Downy mildew	Dithane-M 45	42	
	Miraculan	27	
	Blitox	18	
Root rot	Bavistin	39	
	Indofil M-45	25	
	Blue copper	16	

Table 5 : Various pesticides and their doses

Pesticides used	Dose: ml or gm/litre of water
Insecticides	
Thiodan	2.00ml
Marshall	2.00ml
Monocil	1.50ml
Superkiller	2.00ml
Sevin	1.00gm
Rogor	2.00ml
Tarjan	2.50ml
Challenger	1.00ml
Baserthrin	1.00ml
Ustad	1.00ml
Confidor	0.50ml
Chlorocron	2.00ml
Thiovit	2.00gm
Furadon	3.00kg/bigha
Met505	1.50ml
Lannate+Thiodan	1.50ml
Metacid	1.00ml
Challenger+ Hostathion	2.00ml
Challenger+Thiodan	2.00ml
Sevin	5.00gm

Fungicides	
Dithane-M 45	2.00gm
Fytolan	2.00gm
Blitox	5.00gm
Dithane-M 45	2.50gm
Blitox	2.00gm
Miraculan	1.00ml
Bavistin	2.5gm/kg of seed
Indofil M-45	2.5gm
Blue copper	4.0gm

(a) Green caterpillar (*Palpita indica*)

It was seen all stages of the crop. The larvae feed on the lower surface of the leaves and they bind them together with the help of silken threads exuding from the mouth of larvae. They also attack the ovaries of flowers and bore the young developing fruits which become unfit for human consumption. The moths have white wings with dark brown marginal patches. Caterpillars are bright green. The pesticides used, their doses and the percentage of respondents reported are the following (Table-4&5)- Ustad @ 1ml/litre of water (32%), Challenger @ 1ml/litre of water (28%), Tarjan @ 2.5 ml/litre of water (26%), Marshall @ 2 ml/litre of water (21%), Thiodan @ 2 ml/litre of water (18%), Rogor @ 2 ml/litre of water (14%), Monocil @ 1.5 ml/litre of water (13%), Superkiller @ 2 ml/litre of water (11%), Baserthrin @ 1 ml/litre of water (9%), and Sevin @ 1 gm/litre of water (8%). The amount of water used for spraying the chemicals was 80-100litres/bigha.

(b) Mite (*Tetranychus cucurbitae*)

It was seen mainly in mature stage of the crop. These are small insects and appear in large colonies. They feed on the under surface of the leaves by sucking cell sap. They remain protected by fine shinning webs. The affected leaves develop greyish patches and finally curl and dry up. This is a minor pest. The chemicals used for controlling the pest, their doses and percent of respondents reported are the following (table-4&5)- Thiovit @ 2gm /litre of water (20%), Metacid @ 1 ml/litre of water (17%), Confidor @ 0.5 ml/litre of water (16%), Lannate+Thiodan @ 1.5 ml/litre of water (14%), Chlorocron @ 2 ml/litre of water (13%), Furadon @ 3 kg/bigha (10%) and Met-505 @ 1.5 ml/litre of water (8%). The amount of water used for spraying the chemicals was 80-100 litres per bigha of land.

(c) Fruit fly (*Dacus cucurbitae*)

The insect-pest infestation was seen in mature stage

of the crop. The maggots bore into the fruits and feed on the pulpy tissues inside, forming galleries. The attacked fruits are polluted and destroyed. The affected fruits start rotting. The fly attack is severe after summer rains when the humidity is high. The flies are reddish brown with lemon yellow curved verticle markings on the thorax. The female has conical abdomen ending in a ovipositor while male has spherical abdomen. Wings are transparent with brown bands and grey spots at the apex between the joint of thorax and abdomen. The maggots are legless and appear headless, dirty white wriggling creatures, thicker at one end and tapering to a point at the other. The female fly punctures the fruit and deposits the eggs inside the pulp. The chemicals used by the respondents for controlling the pest, their doses and percent of respondents reported were the following- Challenger +Thiodan @ 2 ml/litre of water (32%); Challenger+ Hostathion @ 2 ml/litre of water (27%) and Sevin @ 5 gm/litre of water (12%). The amount of water used for spraying the chemicals was 80-100 litres per bigha of land.

(d) Green fly

It was seen in mature stage of the crop. Respondents of the study area reported that a very small green coloured fly are there those affected the crop upto a considerable level. For controlling the pest 29 percent of respondents used Challenger +Thiodan @ 2 ml/litre of water whereas 14 percent of them used Lannate +Thiodan @ 1.5 ml/litre of water. The amount of water used for spraying the chemicals was 80-100 litres per bigha of land.

Diseases

(a) Fruit Rot (*Pythium aphanidermatum*)

The fruits in contact with the soil suffer from the disease. The skin of the fruit shows soft, dark green, water soaked lesions which develop into a watery soft rot. On this rotting portion the cottony mycelia growth develops abundantly during humid atmosphere. The affected fruits look as if wrapped in absorbent cotton. On the margin of the cottony growth the skin of the fruit looks dark green and water soaked. The fungi are present in the soil living in a saprophytic manner on dead organic matter.

It was observed in fruiting stage to whole mature stage of the crop. More than half of respondents (61%) sprayed Dithane M-45 @ 2gm/litre of water (table-4&5) whereas 12 percent of them sprayed Fytolan @ 2gm/litre of water and only 8 percent of respondents sprayed Blitox @

5gm/litre of water for controlling the specified disease. All most all the respondents needed 80-100 litres of water for spraying the chemicals per bigha of land.

Downy mildew of cucurbits (*Pseudoperenospora cubensis*)

The spots are yellow, angular, and often restricted by the veins on the upper surface of the leaves. On the lower surface of these spots, the purplish downy growth appears during periods of high humidity. Sometimes the purplish colour is lacking and the lower side of the spots looks white to almost black. The entire leaf dies quickly. The fruits are few and smaller than the healthy ones with poor tests. The fungus survives as mycelium and spores on some hosts.

It was mainly visible in mature stage of the crop. For effective control of the disease at the most 42 per cent of respondents sprayed Dithane M-45 @2.5 gm/litre of water whereas 27 percent of them used Miraculan @1 ml/litre of water (the agro-chemical is not a pesticide but, a growth regulator. Farmers considered it as pesticide which obviously indicates that farmers have lack of knowledge to distinct between pesticides and growth regulators) and only 18 percent of respondents sprayed Blitox @2 gm/litre of water. Almost all the respondents in the present study reported that they applied 80-100 litres of water for spraying the chemicals per bigha of land.

Root rot : (*Fusarium solani*)

The infected plants show sudden wilting during the mid season. The disease can be distinguished from the vascular wilt by the dark brown cortical soft decay at the base of the stem. The underground parts are found disintegrated. In humid weather the stem base may be seen covered with fungal growth. The fungus is seed borne and also survives in the form of perithecia. It is clear from the table-4&5 that to control the disease thirty nine percent of respondents applied Bavistin @2.5gm per kg of seed for seed treatment, Indofil-M-45 was used by 25 percent of respondents @ 2.50gm/litre of water whereas 16 percent of respondents used Blue copper @ 4.00gm/litre of water.

Various pesticide brands and their chemical names

Agro-chemicals have two names-one chemical names or technical names and commercial names or trade names. The table indicates that among the several insecticides Cypermethrin was most popular chemical with brand names Challenger, Baserthrin and Ustad whereas among the several fungicides, Copper Oxychloride was most popular chemicals

with brand names Fytolan, Blitox and Blue copper.

Table 6: Various pesticide brands and their chemical names

Pesticide brands	Chemical/Technical names
Insecticides	
Thiodan	Endosulfan
Marshall	Carbosulfan
Monocil	Monocrotophos
Superkiller	Cypermethrin
Sevin	Carbaryl
Rogor	Dimethoate
Tarjan	Triazophos
Challenger	Cypermethrin
Baserthrin	Cypermethrin
Ustad	Cypermethrin
Confidor	Imidachlorprid
Chlorocron	Chlorpyriphos
Thiovit	Sulphur
Furadon	Carbofuran
Met505	Ethion
Lannate+Thiodan	Methomyl + Endosulfan
Metacid	Methyl Parathion
Challenger+ Hostathion	Cypermethrin + Triazophos
Challenger+Thiodan	Cypermethrin + Endosulfan
Sevin	Carbaryl
Challenger+Thiodan	Cypermethrin + Endosulfan
Lannate+Thiodan	Methomyl+ Endosulfan
Fungicides	
Dithane-M 45	Mancozeb
Fytolan	Copper Oxychloride
Blitox	Copper Oxychloride
Dithane-M 45	Mancozeb
Miraculan	Entriacontanol
Blue copper	Copper Oxychloride

Insect-pests and diseases, their attacking stage and amount of water used for spraying

Insect-pests and diseases mainly attacked at mature stage of the crop. At matur stage of the crop, the amount of water applied by the respondents for spraying chemicals was 80-100 litre/ bigha of land.

Table-7: Insect-pests and diseases, their attacking stage and amount of water used for spraying

Pests	Attacking stage of crop	Water used for spraying/bigha of land
Insect-pests		Mature stage
Green caterpillar	All stages	80-100 litre
Mite	Mature stage	80-100 litre
Fruit fly	Mature stage	80-100 litre
Greenfly	Mature stage	80-100 litre
Diseases		
Fruit rot	Fruiting to whole mature stage	80-100 litre
Downy mildew	Mainly mature stage	80-100 litre
Root rot	Seedling to mature stage	80-100 litre

Table-8: Interval of applying and method of application of agro-chemicals

Days of Interval	Percentage of respondents followed	Methods of application of pesticides	Percentage of respondents followed (Cumulative)
1-3	21	Spraying	100
4-7	53	Dibbling	35
8-15	17	Dusting	9
Above 15	9		

Interval of applying agro-chemicals

Respondents in the study area preferred to apply pesticides in the following days' interval-1-3 days (21%), 4-7 days (53%), 8-15 days (17%) and more than 15 days (9%).

Methods of applying agro-chemicals

All the respondents in the study area (100%) applied pesticides mainly through spraying whereas 35 percent of pointed gourd growers followed dibbling method (dug the soil and the pesticides were inserted and filled the hole by soil again especially application of granular pesticides) and only 9 percent of selected farmers also applied the chemicals by following dusting method.

Source of information in using agro-chemicals

All the respondents (100%) reported that they mainly got information in using agro-chemicals from agricultural input retailers at the time of purchasing. About one-third of respondents (32%) collected information from fellow farmers and it was very traditional way of getting information. In the study area, it was seen that a crop doctor had a frequent contact with the farmers and supplied valuable information pertaining to agricultural problems. Twenty two percent of respondents replied that they got information from crop doctor whereas 16 percent of farmers

collected information from neighbour (farming community) and 20 percent of respondents collected it from big farmers (opinion leaders). Only 7 percent of respondents' source of information was relatives whereas 11 percent of respondents collected that information from Agricultural Development Officers (ADOs), Krishi Prayukti Sahayaks (KPSs) when any demonstration organized by them, experts of agricultural university (when farmers came to participate any agricultural training programme or personally contacted from experts), company personnel or other agricultural field functionaries. After collecting the information from various sources, each respondent evaluated it in their level best and finally applied the suitable one.

Table-9: Sources of information on agro-chemicals' use

Sr. No.	Source	Percentage of respondents collected
1	Agricultural input retailers	100
2	Fellow farmers	32
3	Crop Doctor	22
4	Neighbour	16
5	Big farmers	20
6	Relatives	7
7	ADOs, KPSs, Experts of Agril. University, company personnel, other agricultural field functionaries	11

CONCLUSION

Cultivation of high yielding varieties and hybrids of cereals have put a great pressure on soil and water resources. Vegetable cultivation has aggravated this problem because intensive cultivation of these crops require heavy doses of fertilizers and various kind of chemicals to protect the crops from insect-pests, diseases, weeds, nematodes and other pests. Therefore, to reduce the detrimental effects of these

chemicals on environment, it is urgent to know the pesticides use pattern of farmers for each crop. Considering these the present investigation was carried out. It can be concluded from the study that pointed gourd growers should give more emphasis on controlling insect-pest of green caterpillar and fruit rot disease, those damage the crop mostly. pointed gourd growers were using various brands of various technical grades of agro-chemicals for controlling insect-pests and diseases with several doses where it is generally seen that the farmers used chemicals and their doses varied from recommendations. Therefore, they must try to follow recommendations those are well tested for various situations as well as provide optimum results. Farmers must also follow various precautions in using agro-chemicals. Precautions are so integratedly related with agro-chemicals application that we can say, agro-chemicals application and following various precautions are two sides of a coin. Following precautions are essential in respect of sustainability concern.

The pointed gourd growers main source of information in using pesticides were agricultural input retailers, because the growers purchase the chemicals from them, at the time of purchasing, growers get advice and instructions to use the purchased chemicals as well as retailers are mainly local people in rural areas, therefore, they are believable to them. On the other hand, agricultural input retailers consider the farmers who purchase chemicals from them as customers of their business; therefore, survival of customers (farmers) means survival of their business means their betterment. Therefore, agricultural input retailers always try to co-operate the farmers in farming upto a maximum extent though they are business minded. Since, time has come to consider agricultural input retailers as one of stakeholders of agricultural development of our country. Therefore the Govt. extension agencies should have a special attention on

this section of society. In the study area, spraying was the mostly followed method of application of agro-chemicals compare to dibbling method and dusting method, therefore pesticides manufacturers should have more emphasis on liquid chemicals production. The growers interval of applying agro-chemicals was mainly 4-7 days. More than half of respondents (53%) applied chemicals following the 4-7 days interval as a routine work. Farmers should refrain from this use behaviour and pesticides only be applied to the crop when insect-pests attack crosses the economic threshold level (ETL), otherwise it is harmful to sustainability concern as well as reduces the profit margin.

Therefore, on the basis of the findings of the present investigation, the govt. extension agencies, pesticides companies and private extension agencies should reorient their extension programmes accordingly.

REFERENCES

- Bhalekar, M.D.; Sidam, V.N.; Bondarwad, S.P. and Lad, A.S. (2013); Constraints in Adoption of Biological Pest Management Practices in Cotton in Vidarbha Region; *Agriculture Update*: 8 (1&2):70-72.
- Gautam, H.R. and Kumar, R (2014) Agricultural Development-The Road Ahead; *Kurukshetra*: 62(8): 3-6
- Muthuraman, P. and Kumar, S. A. (2013); Crop Growth Stage-wise IPM Practices in Rice; *Kisan World*; 40 (4): 57-59.
- Ram, D.; Prasad, A.; Sahu, R.P. and Chanu, T. M. (2012) Comparative Profile of Entrepreneurial Behaviour of Vegetable Growers in Manipur; *Journal of Interacademia*: 16 (4a): 1015-1022.

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