



Use of Pesticides in Agriculture by Different Categories of Farmer in Punjab

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ABSTRACT

A study was conducted to know about the use, pattern of pesticide application, reasons for using non recommended pesticides at higher doses and the suggestions to tackle this issue. It was found that the average consumption of pesticides in Punjab agriculture was 0.53 kg/ha in 1974-75 which increased to 0.94 kg/ha of gross cropped area in 1994-95. It might have occurred due to severe pest attack on cotton crop in the state during that period but it declined to 0.73 kg/ha in the year 2010-11. Thereafter, no increase in pesticide consumption in the state was noticed up to the year 2015-16 rather it remained stagnant. Among the various crops, the per cent area being treated by pesticides was calculated to be high in cotton (98.4%) followed by sugarcane (96.3%), paddy (93.6%) and wheat (91.7%) while per cent area was calculated to be lowest in case of maize crop (71.1%). The expenditure on pesticides usage was more or less same in three zones of Punjab during rabi season but was different in kharif season with maximum in zone II (Rs. 5728/-ha) followed by zone III (Rs. 5163/-ha) and zone I (Rs. 4000/-ha). Thirty four per cent of the total sampled farmers were found to be using the recommended doses of pesticides. Amongst the various reasons cited by the farmers for using higher doses of pesticides, spurious quality of pesticides has emerged as the main reason, 100 per cent of the farmers were of the view that pesticide usage should decline in the state because of the ill effects of pesticides on the human and animal health. Fifty per cent of the total sampled farmers suggested that quality of the pesticides must be ensured for effective control of pests/diseases while 26 per cent were in favour of developing new formulations of better quality than existing ones.

Key Words: Agriculture, Crops, Expenditure, Farmers, Paddy, Pesticides, Sugarcane, Wheat.

INTRODUCTION

There are various methods to control pests in different pest management systems, yet use of pesticides continue to be the major component of most of the pest control programmes and will probably remain so in the near future. However, several reports have highlighted the indiscriminate and excessive use of insecticides by the farmers. The probable reason may be that pesticides are easily available and they can be used in any combinations by the farmers. The dose, combinations and spraying intervals are left to the fancy of farmers and anyone can get any quantity of these lethal chemicals at any time.

This large scale use of pesticides has caused many environmental problems like pesticide poisoning, insecticide resistance, resurgence of pests and effect on non target organisms besides accidents involving human deaths and injury. India lacks accountability on the front of pesticide usage especially when misbranded or spurious pesticides are involved. The conviction in cases of pesticide accidents is very low. One probable solution to combat these problems is to use recommended pesticide at the right time with the recommended dose and not to make use of banned or restricted pesticides at all. The reason is that the recommended pesticides are good, less persistent and more toxic to

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the target species, thus provide required control of insect pest or disease. It is pertinent to mention that before making any recommendation within a state, the state agricultural universities conduct a large number of experiments to test the brand developed by a pesticide firm in the laboratory as well as at the farmers' field. Later on, these recommendations are passed on to farmers through various extension agencies including the Krishi Vigyan Kendra (KVK) working at the district headquarter in a district.

The availability, efficacy and suitability of pesticides for the control of insects and disease are major factors considered while providing solution to the problems of farmers. Farmers are advised to use only the recommended dosages of insecticides or fungicides. However, during several interactions with the farmers, it was observed that despite the efforts of various extension agencies in educating the farmers about the right use of pesticides, farmers are still using non recommended insecticides and that too at higher doses. Thus, a study was conducted to know about the use, pattern of pesticide application, reasons for using non recommended pesticides at higher doses and the suggestions to tackle this issue.

MATERIALS AND METHODS

The study is based mainly on primary data collected from farm households of different categories in Punjab. The study was devised on randomly selected 10 blocks from three agro-economic zones viz. sub- mountainous zone, central plain zone and south western zone of the state. At second stage of sampling, two villages were selected from each selected block and 25 farm households were selected from each village based on size of their operational holding and were divided into three categories i.e. small, medium and large. Thus, the ultimate sample consisted of 495 farm households in proportion to the size of holding structure existing in that particular village.

The data were collected from selected sample of farm households across the state through structured and pre-tested questionnaire to find out the extent

of agro-chemicals use as well as the constraints faced by the farmers in its management through personal interview method. Suggestions were also sought from the respondents to deal with the issue. The primary data were supplemented with latest available secondary data on some parameters. Statistical techniques like percentage, average etc. were worked out for the variables.

RESULTS AND DISCUSSION

Consumption of pesticides in Punjab

The data (Table 1) showed that the average per hectare consumption of pesticides in Punjab agriculture was 0.53 kg/ha in 1974-75 which increased to 0.94 kg/ha of gross cropped area in 1994-95. It might have occurred due to severe pest attack on cotton crop in the state during that period but it declined to 0.73 kg/ha in the year 2010-11. Thereafter, no increase in pesticide consumption in the state was noticed up to the year 2015-16 rather it remained stagnant (Table 1).

Table1. Pesticides consumption in Punjab.

Year	Quantity (MT of Technical Grade)	Kilogram / hectare
1974-75	3300	0.53
1980-81	3000	0.44
1984-85	4800	0.67
1990-91	6100	0.80
1994-95	7300	0.94
2000-01	7005	0.93
2010-11	5745	0.73
2013-14	5725	0.73
2014-15	5699	0.73
2015-16	5721	0.73

Source: Directorate of Plant Protection and Quarantine, Government of India.

Crop wise consumption of pesticides

The data (Table 2) showed that per cent consumption of pesticides in Punjab was high due to the fact that about 91% of the total cropped area is being treated by pesticides in Punjab. The per

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cent area being treated by pesticides was calculated to be high in cotton (98.4%) followed by sugarcane (96.3), paddy (93.6) and wheat (91.7) while per cent area was calculated to be lowest in case of maize crop (71.1). In Maharashtra, the farmers had resorted to heavy pesticide spraying due to the persistent attack of pink bollworm on cotton crop (Annon, 2018). Singh *et al* (2016) also reported that out of a total of 606 farmers from different villages and blocks of Kapurthala district during the years 2013 to 2015, 212 farmers (35%) visited the Plant Disease Diagnostic Laboratory related to the problems of insect pests and diseases in paddy and basmati only. This high level of footfall of farmers in the KVK regarding solution of their problems related to insect pest and diseases in paddy and basmati showed that this crop is heavily sprayed with pesticides.

Expenditure incurred on pesticides

The average expenses on pesticides were less on small, medium and large farmers' fields in zone I as compared to zone II and III in kharif season. On an average, expenditure of pesticides used was Rs 4200/-ha in zone I which was Rs 5728/-ha and Rs. 5163/-ha in zone II and III, respectively in Kharif season. In Rabi season, the use of pesticides was comparatively more among medium and large farmers in zone III which constituted about

Rs 6100/-and Rs. 6108/-ha, respectively (Table 3). While on an average per hectare expenditure incurred on pesticides during rabi season was more or less same across the zones but in kharif season it was less in zone I due to maize crop being the main kharif crop in zone I.

A significant difference was found in the pesticides consumption among three categories of farmers. The pesticide consumption was found to be directly related to the size of holding of the farmer. The pesticides usage was more or less same in three zones during rabi season but was different in kharif season with maximum in zone II (5728/-ha) followed by zone III (5163/-ha) and zone I (4200/-ha). The reason was due to the difference in cropping sequence being followed in the three zones of the state. Wheat- maize is the main cropping sequence in zone I while wheat-paddy in zone II and wheat-paddy and wheat-cotton cropping sequence is followed in zone III.

Use of recommended doses of pesticides

About 48 per cent small farms, 25 per cent medium farms and 21 per cent large farms were found to be using recommended doses of pesticides (Table 4). In all, 34 per cent of the total sampled farmers were found to be using the recommended doses of pesticides.

Table 2. Gross cropped area and area under major crops treated with pesticides in Punjab.

(Per cent)

Category	Gross cropped area (%)	Paddy (%)	Wheat (%)	Cotton (%)	Sugarcane (%)	Maize (%)
Marginal	84.0	90.6	86.2	95.8	100	69.9
Small	86.6	92.0	88.0	98.3	100	72.1
Semi-medium	89.3	93.5	90.4	98.0	96.2	67.3
Medium	91.6	93.3	92.2	99.9	97.0	72.1
Large	93.3	94.7	93.6	97.0	94.3	74.2
All Groups	90.9	93.6	91.7	98.4	96.3	71.1

Source: All India Report on Input Survey 2011-12. (Latest available information)

Table 3. Expenditure incurred on Pesticides during Rabi and Kharif seasons (Rs/ ha).

Particular		Rabi	Kharif
Zone I	Small	5360	4163
	Medium	5765	4098
	Large	5786	4400
Zone II	Small	5418	5433
	Medium	5780	5788
	Large	5795	6110
Zone III	Small	5068	4768
	Medium	6100	5645
	Large	6108	5288
Punjab	Zone 1st	5533	4200
	Zone 2nd	5623	5728
	Zone 3rd	5673	5163

Table 4. Use of recommended doses of pesticides by sampled farmers (Number).

Zone	Small	Medium	Large	Total
I	25 (92.6)	8 (88.9)	6 (60.6)	39 (84.78)
II	40 (30.3)	9 (11.8)	5 (5.5)	54 (18.12)
III	41 (65.08)	14 (18.4)	21 (42.8)	76 50.33
Total	106 (47.74)	31 (25)	32 (21.47)	169 (34.14)

Figures in parenthesis indicate the percentage to total.

Eighty five per cent farmers in zone I responded that only need based application of pesticides is done by them. However, in zone II, only 18 per cent were found to be using recommended doses of pesticides while rest of the farmers was using higher levels of agro-chemicals. In zone III, 50 per cent of the respondents used the pesticides as per the recommended application. However, majority of the small farmers were using recommended doses (65%) followed by large farmers (43%) and medium farmers (18%) in zone III. Singh *et al* (2013) have reported that in the market, only 17.3 per cent insecticides and 22.8 per cent recommended fungicides were available and therefore, due to non availability of the recommended pesticides, farmers opted for higher doses as well as non recommended brands as per the advice of the dealer.

Reasons for using higher doses of pesticides

A number of reasons were cited by the

farmers for using higher doses of pesticides than recommended, use of non recommended brands of pesticides and application not based on economic threshold level. Of the various reasons cited by the farmers for using higher doses of pesticides, spurious quality of pesticides has emerged as the main reason as 32.32 per cent of sampled farmers said about spurious quality of pesticides as shown in Table 5. The incidence of more pest/disease attacks was also cited as a reason by 30.50 per cent of farmers, 16.5 per cent of the respondents used pesticides as a measure to prevent the disease and not to cure it. They also added that they do not want any kind of disease to appear in their field and hence they go for spray of pesticides without bothering for economic threshold level of the pest. They were also of the opinion that disease can be managed easily at the initial stage of infestation otherwise it would spread at a faster rate and would not be controlled easily. Similarly, 16 per cent of the sampled farmers

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Table 5. Reasons for using higher dose of pesticides by sampled farmers (Multiple responses).

Sr. No.	Particular	Small	Medium	Large	Total
1.	Lack of proper knowledge	0 (0)	2 (1.61)	0 (0)	2 (0.40)
2.	Spurious quality	18 (8.1)	11(8.87)	12 (8.0)	40 (32.32)
3.	To get higher yield	1 (0.4)	0 (0)	0 (0)	1 (0.20)
4.	More pest, diseases	55 (24.7)	39 (31.45)	57 (38.25)	151 (30.50)
5.	Ineffective previous application	30 (13.5)	20 (16.12)	31 (20.80)	81 (16.36)
6.	To cope with less rain/water	8 (3.60)	4 (3.22)	5 (3.35)	17 (3.43)
7.	To cope with more rain/water	1 (0.45)	2 (1.60)	5 (3.35)	8 (1.61)
8.	Unfavorable weather	17 (7.65)	19 (15.32)	20 (13.42)	56 (11.31)
9.	Quick spread of diseases	29 (13.06)	19 (13.70)	34 (22.81)	82 (16.56)

Figures in parentheses indicate the percentage to total.

in the state mentioned that the recommended dose of pesticide sprays were not effective, hence they applied higher doses. Likewise, 11 per cent of the respondents used pesticides to help the crop to cope with variation in climate and water requirement. The lack of proper knowledge about adequate levels or to get more yields did not emerge as a prominent reason for higher use of agro-chemicals. It is worth to mention that the farmers in the state were well aware about recommended doses of pesticide use for various crop but using higher levels of these due to some reasons as mentioned above.

Suggestions given by farmers to decrease pesticide usage

As we have already discussed the expenditure incurred and constraints of the sampled farmers regarding higher use of agro chemicals as well as the hazards it is creating for health, pest resistance, environment etc. So, suggestions were sought from sampled farmers, to tackle the issue, as Punjab was consuming 13 per cent of the total pesticides used in India. The suggestions given by sampled farmers have been discussed in the table 6.

All the participating farmers were of the view that pesticide usage should decline in the state because they were well aware of the ill effects of pesticides on the human and animal health. Fifty per cent of the total sampled farmers suggested

that quality of the pesticides must be ensured for effective control of pests/diseases, 26 per cent were in favour of developing new formulations of better quality than existing ones. A stringent quality control was suggested by 21 per cent of the farmers to check duplicity in the available spurious pesticides, 6 per cent of the respondents in the state felt the need to encourage organic farming, which will abolish the need of agro-chemicals. The cheaper substitutes of existing pesticides in the form of herbal compositions were suggested by 3 per cent of the sampled farmers. Two per cent of the respondents were in favour of distribution of pesticides through cooperative societies so as to maintain the quality.

CONCLUSION

The quantity (0.73 kg/ha) of pesticides used in Punjab is much higher as compared to other states. The use of pesticides was calculated to be high in cotton (98.4%) followed by sugarcane (96.3%), paddy (93.6%) and wheat (91.7%) while per cent area was calculated to be lowest in case of maize crop (71.1%). The reason might be their more susceptibility to the attack of insect pests and diseases due to more favourable climatic conditions. The expenditure on pesticides usage was more or less same in three zones of Punjab during rabi season

Table 6. Suggestions by sampled farmers zone wise and category wise (Multiple responses) .

Sr. No.	Particular	Small	Medium	Large	Total
1.	Should be used less	222 (100)	124 (100)	149 (100)	495 (100)
2.	Substitute should be cheaper	6 (2.70)	5 (4.03)	6 (4.02)	17 (3.43)
3.	Organic farming needs to be followed	10 (4.50)	11 (8.87)	9 (6.04)	30 (6.06)
4.	Better composition	105 (47.29)	64 (51.61)	78 (52.34)	247 (49.89)
5.	Quality control	50 (22.25)	26 (20.96)	28 (18.79)	104 (21.01)
6.	Invention of less harmful	63 (28.37)	28 (22.58)	39 (26.17)	130 (26.26)
7.	Resistant varieties	1 (0.45)	1 (0.80)	2 (1.34)	4 (0.80)
8.	Distribution only through society	3 (1.35)	4 (3.22)	5 (3.35)	12 (2.42)

Figures in parenthesis indicate the percentage to total.

but was different in kharif season with maximum in zone II (Rs. 5728/-ha) followed by zone III (Rs. 5163/-ha) and zone I (Rs.4200/-ha). Thirty four per cent of the total sampled farmers were found to be using the recommended doses of pesticides. Of the various reasons cited by the farmers for using higher doses of pesticides, spurious quality of pesticides has emerged as the main reason. All the sampled farmers were of the view that pesticide usage should decline in the state because of the ill effects of pesticides on the human and animal health, 50 per cent of the total sampled farmers suggested that quality of the pesticides must be ensured for effective control of pests/diseases while 26 per cent were in favour of developing new formulations of better quality than existing ones.

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