Adoption behaviour of sugarcane growers regarding integrated pest and disease management practices in Nandurbar district

P. L. PATEL AND S. V. SUPE

See end of the article for authors' affiliations

Correspondence to :
P.L. PATEL
Department of Agriculture Extension, College of Agriculture, Shahada, NANDURBAR (M.S.) INDIA

ABSTRACT

The present study was undertaken in Nandurbar district with the specific objectives to know the adoption behaviour of sugarcane grower regarding IPDM practices. It was observed that regarding practice wise adoption of IPDM, most of respondents followed cultural operations followed by mechanical practices. In distributional analysis, it was concluded that majority of the respondents (60 per cent) had medium level of adoption of IPDM practices. In relational analysis it was observed that education , land holding, area under sugarcane, annual income, socio-economic status and sources of information were positively and significantly correlated with adoption level.

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INTRODUCTION

Sugarcane (*Saccharam officinarum*) is a second largest commercial agro industrial crop of the country with heavy investment in agricultural economy. Among the sugarcane growing countries in the world, India leads in area and production.

In India, among the important sugarcane growing states, the three namely, Uttar Pradesh, Maharashtra and Tamil Nadu are contributing nearly 60 per cent of the total area of the country. Uttar Pradesh has the highest acreage under sugarcane crop. However, Tamil Nadu has highest production per hectare in India.

Maharashtra has highest sugar recovery in India. In Maharashtra area under sugarcane was 770 thousand hectares with production of 23157 thousand tonnes and yield per hectare was 61.7 tonnes during year 2009 (Anonymous, 2010), comparatively low going on continuous decreasing due to incidence of pests and diseases.

According to an estimate of food and agriculture organization of the United Nations, the world sugarcane production is only 45 per cent of the potential production. Whereas 55 per cent is lost chiefly due to diseases and pests alone 19.2 per cent loss was because of diseases. Continuously decreasing yield due to incidence of the same. So this point of view to control of pest and disease save money and time of farmer, to check chemical pollution is essential with help of Integrated pest and disease management (IPDM).

Integrated pest and disease management:

Integrated pest and disease management (IPDM) aims at combining all available methods or tools of pest and disease control in a judicious manner that minimizes pesticide, insecticide and fungicides use and disturbance to the ecosystem.

Nandurbar district is one of the major sugarcane growing district having 8594 hac. Area under sugarcane, while average yield is 74 m.tonnes pre hectare, which is comparatively very low. The lower yield can be attributed to heavy attack of insect and severe damage due to diseases and their improper management. Plant protection is an important factor of successful crop production. Because of high incidence of pest and disease for this point of view integrated pest and disease management is need of today.

With a view the present investigation was conducted with specific objectives to study the

extent of adoption of integrated pest and disease management practices by sugarcane growers and to study the relationship of selected characteristics of sugarcane growers with their extent of adoption practices of Integrated pest and disease management.

METHODOLOGY

The study was conducted in Shahada and Taloda Panchayat Samitees of Nandurbar district in Maharashtra state, where the sugarcane production was comparatively on large area. From this Panchayat Samiti, 15 villages were selected on the basis of more area under sugarcane crop.

The village wise list of sugarcane growers cultivating sugarcane since, last three years was prepared with help of Shahada and Taloda Panchayat Samitees officers and talathi. Out of these list 150 sugarcane growers were selected by proportionate random sampling. Data were collected by personally interviewing the respondents with the help of pre-tested structured interview schedule. The collected data were tabulated and analysed through correlation and multiple regression analysis and findings obtained after analysis were interpreted.

Measurement of adoption index:

For measurement the degree of adoption is practices of integrated pest and disease management for sugarcane were decided and responses of the sugarcane growers were received on three point scale showing complete, partial and no adoption. Score assigned to these responses were 2, 1 and 0 respectively. The total score obtained were summed up and converted into adoption index by using following formula.

$$\text{Adoption index} = \frac{\text{Adoption score obtained by a respondents}}{\text{Maximum obtainble adoption score}} \text{x100}$$

The respondents were categorized on the basis of adoption index by using mean and standard deviation (x + SD).

Sr. No.	Adoption level	Index range
1.	Low	Up to 23
2.	Medium	24 to 39
3.	High	Above 40
	Mean ($\overline{x}$)= 31.75	SD (σ) = 9.120

OBSERVATION AND ANALYSIS

Adoption shows the present state of use of integrated pest and disease management (IPDM) practices for pest and disease management by the sugarcane growers.

Practice wise extent of adoption of IPDM:

Information regarding practice wise adoption of IPDM practices by the sugarcane growers has been presented in Table 1. In respect of adoption of cultural practices, the results in revealed that as much as (100 per cent) respondents adopting deep ploughing, (90.66 per cent) grazing by cow, buffalo, goat and other animal in sugarcane field after harvesting, crop rotation (79.34), judicious use of fertilizer and manure (48.67) and pest and disease resistant and tolerant variety (43.34) for pest and disease management.

About 78.00 of the respondents adopted early earthing up operation for pest management and 18.67 per cent of the respondents adopted green manuring crop rotation for disease management.

Thus, it could be concluded that majority of the respondents adopted most of the cultural methods of IPDM either completely or partially as compared to other components of IPDM practices. In case of adoption of mechanical practices of IPDM, majority of the respondents adopted practices like burning and destruction of affected plant parts, weeds and other waste (95.34 per cent) for pest and disease management, but practice of hot water treatment (100 per cent) had not been adopted by a single respondent for diseases management. The picture with regard to adoption of biological practices of IPDM was depicted to be again discouraging as large majority of the respondents ranging from 89.00 to 100 per cent have not adopted practices like releasing parasite (89.34 per cent), setts treatment with *Azotobacter* (85.33 per cent), use of *Trichoderma viride* (95.33 per cent) and spraying of NPV (100 per cent).

It was disappointing to note that, majority of respondents (92.67 per cent) have not used neem seed extract for spraying. As regards to use of pheromone traps, the respondents (96 per cent) had not used pheromone traps. Regarding adopting of chemical practices of IPDM was observed to be again discouraging. The respondents ranging from 75.00 to 100 per cent have not adopted practices like sett treatment with fungicides (75.33 per cent), spraying of dimethoate (100 per cent), spraying of insecticides and pesticides (100 per cent) and spraying of fungicides (100 per cent).

The above findings lead to conclude that the respondents were not found to adopt the biological and chemical control measures for management of pests and diseases in sugarcane, probably it is due to lack of technical knowledge about biological and chemical control measures and unavailability of biocontrol agents.

Table 1: Distribution of respondents according to their extent of adoption of different practices of IPDM

Sr. No.	Practices (IPDM)	Extent of adoption					
		Complete		Partial		Non	
		F	%	F	%	F	%
A.	Cultural practices						
I	Pest and disease management						
1.	Grazing by cow, buffalo, goat and other animals in sugarcane field after harvesting	136	90.66	0	0	14	9.34
2.	Deep ploughing to a depth of 20 to 25 cm	150	100	0	0	0	0
3.	Crop rotation	119	79.34	8	5.33	23	15.33
	Cotton–suru–ratoon						
	Pulses–pre-seasonal–ratoon						
4.	Pest and disease resistant and tolerant variety	65	43.34	45	30.0	40	26.66
	Pest and disease resistant - CO-86032, CO-7219						
	Pest resistant - CO-7302, CO-7303						
	Disease resistant – CO-7527, CO-7125, CO740						
5.	Recommended dose of manure and fertilizers	73	48.67	77	51.33	0	0
	Application of manure – 20-25 tonnes/ha						
	Application of fertilizer – Pre-seasonal and suru-175:100:100 NPK kg/ha						
II	Pest management						
1.	Early earthing up operation – 45 days after germination	117	78.00	33	22.00	0	0
III	Disease management						
1.	Green manuring crop rotation – Green gram, Sunhemp, pulses , Dhaincha	28	18.67	42	28	80	53.33
B.	Mechanical practices						
I	Pest and disease management						
1.	Burning and destruction of affected plant parts, weed and other wastes	143	95.34	0	0	7	4.66
II	Disease management						
1.	Hot water treatment-Dipping setts of sugarcane for 2.5 hours in hot water at 54^0C	0	0	0	0	150	100
C.	Biological practices						
I	Pest management						
1.	Releasing of parasite - *Trichogramma chilonis* @ 50,000 /ha - 4 releases	7	4.66	9	6	134	89.34
2.	Spraying of NPV @ 250 ml /ha 4 sprays	0	0	0	0	150	100
II	Disease management						
1.	Setts treatment with bio-culture *Azotobacter* @ 5 kg/ha	5	3.34	17	11.33	128	85.33
2.	Did you use of *Trichoderma viride* @ 1.5 kg /ha	2	1.33	5	3.34	143	95.33
D.	Use of plant product						
I	Pest management						
1.	Spraying of neem seed extract (5 %)	0	0	11	7.33	139	92.67
E.	Use of pheromone traps – 25 traps/ha						
I	Pest management						
1.	Use of pheromone traps	0	0	6	4	144	96
F.	Chemical practices						
I	Pest management						
1.	Spraying of dimethoate (Rogar)	0	0	0	0	150	100
2.	Spraying of insecticide and pesticides – Malathion, Endosulfan, Monocrotophos, Quinalphos	0	0	0	0	150	100
II	Disease management						
1.	Setts treatment with fungicides Carbendazim (0.1 %) 100 g + 100 lit water (10 min)	16	10.67	21	14	113	75.33
2.	Spraying of fungicides carbendazim, copperoxychloride ferrous sulphate	0	0	0	0	150	100

Extent of adoption level:

The data presented in Table 2 indicate that majority of the respondents (60 per cent) had medium level of adoption of IPDM practices.

As much as 23.34 per cent respondents had low level of adoption, while comparatively less respondents (16.66 per cent) had high level of IPDM practices. Thus, the adoption of IPDM practices for sugarcane by the sugarcane growers was of medium level and needs the improvement.

Table 2: Distribution of respondents according to their extent of adoption level

Sr. No.	Category	Frequency (n=150)	Percentage
1.	Low	35	23.34
2.	Medium	90	60.00
3.	High	25	16.66
	Total	150	100.00

Relational analysis:

The correlation between adoption level of respondents and various characteristics like personal, socio-economic and communication about IPDM practices innovation attributes have been presented in Table 3.

It was observed that education (0.7697), land holding (0.4289), area under sugarcane (0.2353), annual income (0.6404), socio-economic status (0.5909) and sources of information (0.6546) were positively and significantly correlated with adoption level. The relationship was significant at 0.01 level of probability. Age (– 0.4027) was found to be negatively significant with adoption level.

Table 3 : Correlation coefficients of characteristics of the respondents with their adoption

Sr. No.	Variables	'r' values
1	Age	– 0.4027**
2	Education	0.7697**
3	Land holding	0.4289**
4	Area under sugarcane crop	0.2353**
5	Annual income	0.6404**
6	Farming experience	-0.0445^{NS}
7	Socio-economic status	0.5909**
8	Sources of information	0.6546**

** indicate significance of value at p=0.01, respectively
NS = Non significant

The observation of Table 3 indicated that education, land holding, area under sugarcane, annual income, socio-economic status and sources of information helped the respondents to adopt IPDM practices.

Multiple regression analysis:

Multiple regression analysis of independent variables with adoption:

The results furnished in Table 4 indicate that out of eight variables, the regression coefficient of education, area under sugarcane and annual income were positively significant.

Table 4: Multiple regression analysis of independent variables with adoption

Sr. No.	Variables	Regression coefficient	SE (B)	't' value
1.	Age	– 0.0196	0.0779	0.2523
2.	Education	1.2217	0.2740	4.4574**
3.	Land holding	0.1721	0.2268	0.7587
4.	Area under sugarcane crop	– 2.1787	0.8873	2.4554*
5.	Annual income	0.0000	0.0000	2.9178**
6.	Farming experience	0.4677	0.3833	1.2203
7.	Socio-economic status	0.0355	0.2006	0.1672
8.	Sources of information	0.1796	0.2598	0.6913

$R^2 = 0.6649$ 'F' value = 34.9737
** and * indicates significance of value at p=0.05 and p=0.01, Respectively, NS: Non significant.

It was further observed that out of eight variables, education and annual income was significant at 0.01 level of probability, area under sugarcane, were significant at 0.05 level of probability.

The other variables did not contribute to the variation in adoption of IPDM practices of sugarcane. All these variables jointly could explain a variation of 66.49 per cent in adoption of IPDM practices as indicated by R^2 value (0.6649) its 'F' value (34.973) R^2 was also found to be significant at 0.01 level of probability.

It may thus be inferred that there were other important factors responsible for causing the variation in adoption of IPDM practices of sugarcane. These important factors need to be ascertained with a view to take necessary steps to speed up the adoption of IPDM practices of sugarcane. Bhatkar *et al*. (1997), Kharde and Nimbalkar (1997) and Chapke (2000) have also made some contributions on adoption behaviour of sugarcane growers and adoption of farmers about bio-control measures.

Authors' affiliations:
S.V. SUPE, Department of Agriculture Extension, Post Graduate Institute, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, AKOLA (M.S.) INDIA

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