A study on adoption of integrated pest management practices for red hairy caterpillar, *Amsacta moorei* Butler in groundnut in Rajasthan

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SUMMARY : A study was carried out in Bikaner district of Rajasthan with 180 sample sizes to find out adoption level of farmers about integrated pest management Practices against red hairy caterpillar (*Amsacta moorei* Butler) infesting groundnut and to ascertain the relationship between socio-psychological characteristic of farmers with their adoption level. The study revealed that about half of the respondents had medium level of adoption however, majority of farmers adopted the cultural practices such as summer deep ploughing, sanitation of fields, manual weeding, inter cropping and inter row earthing up. With regards to the practices through mechanical control reveals that majority of respondents had low level of adoption *viz.*, use of pheromone / light traps, destruction of alternative host plants and setting up of light traps, whereas a high majority of respondent were adopting of low level of practices *i.e.* concentration of neem seed kernel extract, frequency of their spray preparation of neem seed extraction and with regard to insecticides of plant origin control. Similarly, in case of biological control such as use of *Trichogramma* sp. identifies supplementary activity fungal and Bt Formulations while about half of respondents were adopted chemical control practices of insect. The study further reveals that 17 independent variables were included in the study, out of which 11 variables were found positively and significantly related with the adoption level of IPM in groundnut that all the independent variables with could explain variation in the dependent variables adoption level of IPM in groundnut.

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BACKGROUND AND OBJECTIVES

Groundnut is an important oilseed crop of India playing pivotal role in edible oilseed production. As much 90 per cent of the total edible oil production in the country comes from two oil seed crops namely groundnut and rapeseed mustard. Rajasthan is one of the top of five oilseed producing states in the country,

contributing 9.27 per cent of the oilseed production. Groundnut is the major oilseed crop after rapeseed and mustard accounting 2.65 per cent of the total cropped area in the state. However, the productivity of groundnut is 1952 kg/ha as compare to national average of 1764 kg/ha. The low productivity of groundnut may be due to many factors. Among

them integrated pest management (IPM) practices to control major pest red hairy caterpillar by the farmers is one of the important limiting factor in boosting up the groundnut productivity. Therefore, there is an urgent need of increasing the productivity of these oil seed crops in the country through adoption of recommended technology by the farmers, the present study was conducted with the following objectives:

– To study the extent of adoption level of the farmers about integrated pest management practices for red hairy caterpillar.

– To determine the association between the socio-eco-psychological characteristics of farmers in their adoption of integrated pest management practices for red hairy caterpillar.

– To ascertain the association between socio-eco-psychological characteristics of farmer with their adoption of IPM for Red hairy caterpillar.

RESOURCES AND METHODS

The study was conducted in hyper arid partially irrigated western plain (Zone-1C) of Rajasthan during the year 2011-12. This zone comprises three districts namely, Bikaner, Churu, and Jaisalmer. Out of which Bikaner district was selected purposively on the basis of having maximum area and production under groundnut crop and sometimes affected by a severe attack of red hairy caterpillar. Out of six Panchayat Samities in the Bikaner district, three Panchayat Samities *viz.*, Bikaner, Loonkaransar and Sridungargarh were purposively selected based on the similar criteria. From each Panchayat Samities 6 villages were selected randomly and from each village 10 farmers who were growing groundnut crop since last five years were selected randomly thus making a total sample of 180. The data were collected through personal interview schedule. The procedure followed by Sen Gupta (1967) was utilized to measure adoption level of the respondents. The partial

adoption technique suggested by Supe (1973) was followed with necessary modification for scoring the practices followed by respondents. Mean and standard deviation were used to categorization of respondents on the basis of low, medium and high category, correlation co-efficient was used to see the association and multiple regression was used to measure the effect of respondent variable towards the adoption level of IPM practices for red hairy caterpillar in groundnut and results were interpreted accordingly.

OBSERVATIONS AND ANALYSIS

The data presented in Table 1 revealed that 47.22 per cent of groundnut growers had medium level of adoption. Whereas 21.66 per cent of them had higher adoption level while 31.12 per cent of the groundnut growers had low level of adoption category with regards to integrated pest management practices in groundnut crop. The findings are conformity with those of Hanchinal *et al*. (1991); Chandranna *et al*. (2009); Singh *et al*. (2012); Singh *et al*. (2014) and Bagenia *et al*. (2017).

Observation of Table 2 reveals that majority of farmers had completed adoption of cultural practices such as weeding (90.0%), sanitation of field (75.0%), summer deep ploughing (70.0%), inter row earthing up between groundnut (65.0%) and growing cow pea/cluster bean/lady finger/sesame as inter crop (60.0) in IPM practices on groundnut crop. The results are quite obvious due to the fact these cultural practices part and partial of groundnut cultivation practices and generally known to the groundnut growers are regularly being practiced.

With regards to IPM practices through mechanical control method reveals that majority of respondents had low level of adoption practices such as using pheromone trap's (80.55%), destruction of alternate host plants (67.77%) and setting up of light traps (62.23%). Only 55.0 per cent of the groundnut growers had high adoption

Table 1 : Distribution of respondents accordingly to their adoption level about integrated pest management (IPM) practices for red hairy caterpillar (n=180)			
Sr. No.	Adoption category	No. of respondents	Percentage
1.	Low (Score below 23.70)	56	31.12
2.	Medium (Score from 23.70 to 45.60)	85	47.22
3.	High (Score above 54.60)	39	21.66
	Mean	29.63	-
	SD	6.76	-

of hand picking of egg masses or larvae or pupae. The possible reason may be due to the fact that lack of information on availability of pheromone trap and skill to use it, destruction of alternate host plants, light traps and its method of installation, including the difficulty in identification of larval stages and pupal stage.

In case of insecticide on plant origin table also reveals that majority of groundnut growers were found in low level of adoption of practices such as concentration of neem seed kernel extract (81.67%), frequency of neem seed extract (79.45%) and preparation of neem seed kernel extraction (70.55%), respectively. The practice like use of neem oil was

adopted by 67.78 per cent of respondents. The probable reason might be due to the fact that groundnut growers are not aware about the insecticide of plant origin.

With regards to IPM practices through biological control table further reveals that the great majority of the groundnut growers had adopted in low level of adoption practices such as using of *Trichogramma* sp. (85.56%), whether the farmer identifies and their supplement activity (89.45%), however a high majority of respondent farmers were adopting up tolow level of practice *i.e.* use of fungal formulation (*Metarrhizium ansopliae* and *Beauveria bassiana*) (83.89%), Bt Formulation (73.89%) and use of bio-pesticides

Sr. No	Adoption practices	Groundnut growers					
		Full adoption		Partial adoption		Low adoption	
		No.	%	No.	%	No.	%
	Cultural control						
1.	Summer deep ploughing	126	70.0	36	20.0	18	10.0
2.	Sanitation of field	135	75.0	27	15.0	18	10.0
3.	Crop rotation	36	20.0	54	30.0	90	50.0
4.	Growing intercropping (cow pea/cluster bean/lady finger/sesame)	108	60.0	45	25.0	27	15.0
5.	Inter-row earthing up between groundnut and cow pea/cluster bean/lady finger, sesame	117	65.0	45	25.0	18	10
6.	Critical stages for protecting the crop from the pest	45	25.0	81	45.0	54	30.0
7.	Dig the trench around the field to avoid the pest	27	15.0	54	30.0	99	55.0
8.	Manual weeding	162	90.0	9	5.0	9	5.0
	Mechanical control						
1.	Hand picking of egg masses/larvae/pupae	99	55.0	63	35.0	18	10.0
2.	Destruction of alternate host plant	27	15.0	31	17.23	122	67.77
3.	Setting up light traps	32	17.77	36	20.0	112	62.23
4.	Using pheromone traps	15	8.33	20	11.12	145	80.55
	Insecticide plant origin control						
1.	Use of neem oil	8	4.44	50	27.78	122	67.78
2.	Preparation of neem seed kernel extract	41	22.78	12	6.67	127	70.55
3.	Concentration of neem seed kernel extract	10	5.55	23	12.78	147	81.67
4.	Frequency of spraing of neem see extract	12	6.67	25	13.88	143	79.45
	Biological control						
1.	Use of *Trichogramma* sp.	8	4.44	18	10.0	154	85.56
2.	Use of bio-pesticides	33	18.33	11	6.12	136	75.55
3.	Whether the farmers identifies and their supplementary activity	6	3.33	13	7.22	161	89.45
4.	Bt Formulation	17	9.44	30	16.67	133	73.89
5.	Fungal formulations	15	8.33	14	7.78	151	83.89
	Chemical control						
1.	Insecticide applied to control major pest	93	51.66	65	36.12	22	12.22
2.	Concentration/composition of pesticides	78	43.33	56	31.12	46	25.55
3.	Frequency of application	83	46.12	52	28.88	45	25.00

Table 2 : Extent of adoption of integrated pest management practices for red hairy caterpillar in groundnut (n=180)

(75.55%). The probable reason might be due to fact that complexity of these practices and non-availability of the said material. The table further indicated that IPM practices through chemical control evident that 51.66 per cent of the groundnut growers had complete level of adoption of insecticides to control major pest followed

by frequency of application and concentration/ composition of pesticide with 46.12 and 43.33 per cent, respectively. The probable reason for complete level of adoption of these specific chemical control practices by farmers might be that effective management of the pest within economic injury level. The other reasons that the

Table 3 : Association between selected socio-economic-psychological characteristics of groundnut growers with their overall adoption level of IPM practices in groundnut

Sr. No.	Characteristics	Co-efficient correlation (r)
1.	Age	0.0717 NS
2.	Education	0.3726*
3.	Family type	0.0525 NS
4.	Family size	0.0695 NS
5.	Annual income	0.2855*
6.	Size of holding	0.3527*
7.	Farm power	0.2983*
8.	Social participation	0.0235 NS
9.	Socio-economic status	0.2389*
10.	Mass media exposure	0.2589*
11.	Cosmo politeness	0.0993 NS
12.	Extension participation	0.2339*
13.	Economic motivation	0.2770*
14.	Market orientation	0.2768*
15.	Agriculture infrastructure	0.3256*
16.	Innovative proneness	0.3321*
17.	Management orientation	0.0252 NS

* indicates significance of value at P=0.05   NS=Non-significant

Table 4 : Multiple regression analysis between selected socio-economic and psychological characteristics of groundnut growers with their overall adoption level of IPM practices in groundnut

Sr. No.	Characteristics	Co-efficient	Standard error	(t-value)
1.	Age	0.309	0.0203	2.9320**
2.	Education	-0.0505	01630	0.3250
3.	Family type	0.2589	0.3820	-0.7225
4.	Family size	0.0204	0.0365	0.5583
5.	Annual income	0.0020	0.0001	0.1249
6.	Farm power	0.1421	0.1728	2.3550**
7.	Social participation	0.1225	0.1725	2.2250**
8.	Socio-economic status	0.0410	0.1602	0.2562
9.	Mass media exposure	0.0850	0.927	0.9133
10.	Cosmo politeness	0.0306	0.0205	2.9560**
11.	Extension participation	0.1570	0.0815	1.9072
12.	Economic motivation	0.139	0.0573	-0.2423
13.	Market orientation	0.0322	0.0840	0.3806
14.	Agriculture Infrastructure	0.1870	0.0960	1.8574
15.	Innovative proneness	0.0425	0.1102	0.3808
16.	Management orientation	0.0554	0.1070	0.3750
17.	Size of holding	0.1421	0.1728	2.369**

R^2 =0.6908   **indicates significance of value at P= 0.01 level of probability.

farmers getting pesticides from the dealer on credit basis and repay after the sale of the produce. Similar results were observed by Sunderswamy and Bavalatti (1991); Chandranna *et al.* (2009); Singh *et al.* (2012 a & b) and Bagenia and Lakhera (2017).

Association between socio-economic and psychological characteristics of groundnut growers with their adoption level of IPM practices in groundnut cultivation.

Data presented in Table 3 shows that out of 17 socio-economic-psychological characteristics, 11 characteristics *viz.,* Education, Annual income, Farm power, socio-economic status, Mass media exposure, size of land holding, Extension participation, Economic motivation, Marketing orientation, agriculture infrastructure, Innovative proneness were positively and significantly associated with adoption level of IPM practices of Red Hairy Caterpillar in groundnut crop, whenever, other remaining characteristics namely; Age, Family type, Family size, Social participation, Cosmo politeness, Management orientation had positive and non-significant relationship with adoption level of IPM practices of Red Hairy Caterpillar in groundnut crop.

Similar findings were also reported by Chandranna *et al.* (2009); Singh *et al.* (2012 a&b); Subhash *et al.* (2012); Singh *et al.* (2014) and Bagenia and Lakhera (2017).

Multiple regression analysis was carried out (Table 4) to predict the contribution of independent variables towards adoption level of IPM practices and results were furnished in Table 4. Out of 17 independent variables fitted in regression equation, the variable *viz.,* age, family type, social participation, cosmo politeness, economic motivation and management orientation were found negatively and significantly associated to the variation in adoption, however remaining 11 variables *viz.,* education, family size, annual income, farm power, socio-economic ststus, mass media exposure, extension participation, market orientation, agriculture infrastructure, innovative proneness and size of holding were significantly associated with the adoption level of IPM practices in groundnut. The value of co-efficient of multiple determination (R^2) is 0.6908, implying that all the 17 independent variables could explain variation in the dependent variables of adoption level of IPM practices in groundnut crop to the extent of 69.0 per cent.

Conclusion :

It could be concluded that most of the groundnut growers had medium level of adoption of IPM practices for red hairy caterpillar in groundnut cultivation. With reference to the extent of adoption IPM practices. Whereas, majority of the farmers were not adopted insecticide of plant origin and biological control practices. It appears that farmers were not fully aware about IPM practices.

All these 17 independent variables jointly explain significant amount of variation to the extent of 69.08 per cent in adoption in IPM practices in groundnut. Thus it can be recommended that the groundnut grower's knowledge must be updated about IPM practices of red hairy caterpillar. More specifically how to do aspect of specific technologies on biological control practices to increase the adoption of IPM practices among groundnut growers. It is to organize the training, discussion and group meeting, field days, field visit by considering the characteristics having significant relationship with adoption level. This will certainly help to increase the desired level of adoption of IPM practices in groundnut.

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