

A study on extent and level of adoption of pesticides in potato crop

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ABSTRACT

A study on extent and level of adoption of plant protection practices in potato crop by the potato farmers in the sub-tropical zone of Jammu division of Jammu and Kashmir State was conducted during 2011-12. Three districts namely Jammu, Kathua and Samba were selected purposively on the basis of maximum area under potato crop in the sub-tropical zone of Jammu division. A sample size of 225 potato growers was selected randomly from 15: villages selected purposively on the basis of proportionality of area under potato cultivation. The potato farmers have used both recommended and non-recommended pesticides. More than half of the farmers had used recommended insecticides endosulphan 35 EC and 32 per cent of farmers had adopted dimethoate 30 EC to control the insect/pest like cutworm, potato aphids and potato leaf hopper. Fifty six per cent potato farmers had applied recommended fungicide copper oxychloride and 27 per cent farmers had used metalxyl+mancozeb. The level of adoption of recommended dosage of pesticide was about 45.00 per cent of farmers revealed complete adoption of recommended doses of insecticides like; endosulphan 35 EC and 52 per cent farmers had adopted dimethoate 30 EC. Further (48%) of farmers had used recommended dosage of fungicides copper oxychloride and 49 per cent of farmers had adopted metalxyl+mancozeb to control the diseases such as late blight and early blight.

Key words : Plant protection practices and Pesticides

Introduction

Insect pests, diseases and weeds inflict enormous losses to the potential agricultural production. An evidences also indicate rise in the losses, despite increasing use of chemical pesticides. At the same time, there is a rising public concern about the potential adverse effects of chemical pesticides on the human health, environment and biodiversity. These

negative externalities, though, cannot be eliminated altogether; their intensity can be minimized through development, dissemination and promotion of alternative technologies such as bio-pesticides and bio-agents as well as good agronomic practices rather relying solely on chemical pesticide (Vanderman *et al.*, 1994). Pest management in vegetable crops had not received the same level of attention as in cereal crops because of the vast number of vegetable crops,

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diversity in production systems and arthropod complexes (Capinera, 2001). The success of plant protection practices largely depends on the proper adoption of plant protection practices by farmers. Even though in the present scenario, with fast developments in scientific research and evolvement of new technology is flourishing continuously, only 20 per cent of the available technology is reaching farmers to increase the knowledge level and to adopt the improved cultivation practices to control insect pests and diseases. Even after four decades of the Green Revolution with an appreciably improved extension service, the country is yet to attain the goals of sustained economic growth in the agricultural sector. The progress in agriculture depends upon the willingness and ability of farmers to adopt the new technology to increase agriculture production as a whole and keen interest to adopt the important plant protection practices. The enhancement of potato production contributes to the national economy. Potato crop is one of the important crops cultivated in the Jammu division of Jammu and Kashmir State. There are no empirical studies on the status of potato cultivation in the Jammu division and the adoption of technologies in the potato cultivation. Keeping this view, the study was undertaken to know the extent and level of adoption of plant protection practices in the potato crop in the Jammu division.

Materials and Methods

The study was conducted in the sub-tropical zone of Jammu division. Three districts namely Jammu, Kathua and Samba were selected purposively on the basis of maximum area under potato crop. Seven villages from sub-division Marh- namely Pinjore, Dabsudan, Kalyanpur, Gajansoo, Dubditta,

Kanachak and Ganguchak- four villages from sub-division R S Pura; namely Makhanpur, Arnia, Mohanpur and Salahar- three villages from sub-division Dayalachak namely Marheen, Khokhyal and Bhajwal and one village from sub-division Samba namely Prithipur were selected purposively on the basis of proportionality of area under potato cultivation. The villages with highest area under potato crop in each of the three sub-divisions were selected for the present study. Fifteen respondents were selected randomly from each village, thus making a total sample size of 225 from 15 villages. (Table 1)

In this study adoption was studied under extent and level of adoption of recommended crop production technologies by the potato growers in the sub-tropical zone of Jammu division. The recommendations of the plant protection practices of Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu (SKUAST-J) were selected for the study. Extent of adoption was measured with respect to percentage of farmers adopting a recommended practice and level of adoption was measured in case of divisible practices namely dosage of pesticides (Singh and Peshin 2000). Data was collected in person from the farmers by using well-structured interview schedule. The data was analysed by using statistical tools such as frequency, percentage, mean and standard deviation.

Table 2. Adoption level of the respondents about plant protection measures in potato crop

Adoption level	Frequency	Percentage
Low (<1.12)	69	31
Medium (1.12-3.0)	100	44
High (>3.0)	56	25
Mean = 2.06	SD = 0.94	

Table 1. Selection of the districts, Sub-divisions, Area, Villages and Respondents.

District	Sub division	Area under potato crop(ha)	No. of potato growing villages	No. of villages selected by proportionate sampling method (proportionate to area)	No. of potato growers were selected by random sampling method
Jammu	Marh	1100	16	7	105
	R S Pura	700	11	4	60
Kathua	Dayalachak	450	7	3	45
Samba	Samba	85	8	1	15

Source: Anonymous (2010)

Results

The farmers were categorized into three categories of low, medium and high adopters. The categorization of respondents was done in to three categories on the basis of formula Mean \pm S.D. (Table 2). About 44 percent of respondents had medium level of adoption about plant protection practices followed by 31 per cent with low level of adoption. Whereas 25 per cent of respondents had high level of adoption about plant protection practices on potato crop.

The data in Table 3 indicates that about 52 per cent and 32 per cent of the respondents used recommended insecticides endosulphan 35 EC and dimethoate 30 EC to control the cut worm, potato aphid and potato leafhopper in potato crop. sub-division-wise distribution of respondents shows that majority of 54 per cent respondents from Marh subdivision, 55 per cent respondents from R S Pura subdivision, 47 per cent respondents from Dayalachak and Samba subdivision each adopted recommended insecticide endosulphan for the control of insect-pest in potato crop. Low dosage insecticide

indoxacarb introduced in India in 2002, but not yet recommended for use by SKUAST-J, was used by only 15 per cent of the respondents from Marh, R S Pura and Dayalachak subdivisions for the control of insect-pest in potato crop.

Data in the Table 3 further reveals that overall 56 per cent and 27 per cent of the respondents used recommended fungicide copper oxychloride and metalxyl+mancozeb for the control of diseases (late blight and early blight) in potato crop. Subdivision-wise distribution of respondents shows that a majority of 58 per cent respondents from Marh subdivision, 58 per cent respondents from R S Pura subdivision, 49 per cent respondents from Dayalachak subdivision and 60 per cent respondents from Samba subdivision had applied recommended fungicides copper oxychloride for the control of fungal diseases in potato crop. The non-recommended fungicide like carbendzim and dimethomorph was used by 11 per cent and 6 per cent of the respondents for the control of disease in potato crop, whereas 32 per cent of the respondents had used non-recommended herbicide materibuzin for the control of

Table 3. Extent of adoption of recommended plant protection measures by potato growers

n=225

Plant protection measures	Sub-Division-wise percentage of respondents				Overall % age of respondents from all sub divisions
	Marh n=105	R.S. Pura n=60	Dayalachak n=45	Samba n=15	
Recommended Insecticides					
Endosulfan 35EC	54	55	47	47	52
Dimethoate 30 EC	29	30	38	53	32
Non-Recommended Insecticide					
Indoxacarb 15.8 EC	17	15	16	00	15
Recommended Fungicide					
Copper Oxychloride	58	58	49	60	56
Metalxyl+Mancozeb	26	27	27	40	27
Non-Recommended Fungicide					
Carbendzim	08	15	16	00	11
Dimethomorph 50 w p	09	00	09	00	06
Non-Recommended Herbicide					
Materibuzin	47	27	18	00	32

Table 4. Extent of adoption timely plant protection measures by potato growers

Chemical control measures	Sub-Division-wise percentage of respondents				Overall %age of respondents from all Sub divisions
	Marh n=105	R S Pura n=60	Dayalachak n=45	Samba n=15	
Insecticide					n=225
At the time of insect appearance	50	45	44	33	46
Fungicide					n=225
At the time of disease appearance	50	50	42	47	48

weeds in potato crop.

On perusal of the data presented in the Table 4 it is evident that, overall 46 per cent of respondents had used insecticides at the time of insect appearance and 48 per cent of respondents had used fungicides at the time of disease appearance. Sub-division-wise distribution of respondents indicates that 50, 45, 44 and 33 per cent of respondents from Marh, R S Pura, Dayalachak and Samba subdivisions, respectively had made timely application of insecticides. The data further shows that 50, 50, 42 and 47 per cent of respondents from Marh, R S Pura, Dayalachak and Samba subdivisions, respectively had applied fungicides timely for disease control.

The results show that cutworm, potato aphids and potato leaf- hopper were the insect pests observed on the potato crop by the potato growers. Majority of the respondents had applied recommended insecticides endosulphan and dimethorath to control the insects pests of potato crop. Only 15 per cent of the respondents had used non- recommended insecticide indoxacarb.

The results also show that majority of the respondents has used recommended fungicide copper oxychloride and metalxyl +mancozeb for the control of late blight and early blight. In sub-division Marh low infestation of late blight was reported during last year during 2010. The reason might be that the majority of the farmers are applying fungicides continuously before appearance of diseases to the potato crop. Only 16 per cent of the respondents had

used non-recommended fungicides like carbenazim and dimethomorph on the potato crop. The probable reason could be lack of knowledge, high cost of chemical and non-availability of recommended chemical at proper time. The findings are not in line with the findings of Thippeswamy *et al.* (2008) and Singh *et al.* (2010) who had reported that less than 50 per cent of the farmers had applied recommended fungicides to control disease.

The results of the study reveal that about 46 per cent of respondents had used insecticides at the time of insect appearance and nearly 50 per cent of respondents had used fungicides at the time of disease appearance. The results were supported by Thippeswamy *et al.* (2008). Who had reported that about 27 per cent of the respondents had adopted application of pesticides at proper time and only 30 per cent of the respondents had adopted application of fungicides at proper time to control pests and disease of coconut crop.

Level of adoption was measured with respect to "correct dosage", "low dosage" and "high dosage" of pesticides applied by the potato growers. Recommended dosage was taken as correct dosage. It is evident from the data presented in Table 5 that overall 45 per cent of respondents had used recommended correct dose of insecticide endosulphan, whereas 35 and 20 per cent of respondents, respectively had used low and high dose of insecticides. Subdivision-wise distribution of respondents indicates that 46, 42, 43, and 57 per cent of the respon-

Table 5. Level of adoption of recommended insecticides dose by potato growers

Level of adoption	Sub-Division-wise percentage of respondents				Overall %age of respondents from all sub divisions
	Marh n=57	R S Pura n=33	Dayalachak n=21	Samba n=7	
Endosulphan 35 EC					n=118
Less than recommended dose	33	33	38	43	35
As per recommended dose 3 liter/ha	46	42	43	57	45
More than recommended dose	21	24	19	00	20
Level of adoption	Sub-Division-wise percentage of respondents				Overall %age of respondents from all sub divisions
	Marh n=30	R S Pura n=18	Dayalachak n=17	Samba n=8	
Dimethoate					n=73
Less than recommended dose	30	33	41	25	33
As per recommended dose 1liter /ha	53	44	47	75	52
More than recommended dose	17	22	12	00	15

dents from Marh, R S Pura, Dayalachak and Samba subdivisions, respectively had used recommended dose of insecticides. Whereas 33, 38 and 43 per cent of respondents from Marh and R S Pura each, Dayalachak and Samba subdivisions, respectively had used lower than recommended dose of insecticides. High dose of insecticides was applied by 21, 24 and 19 per cent respondents from Marh, R S Pura and Dayalachak subdivisions, respectively. None of the respondents from subdivision Samba had used more than the recommended dose of insecticides.

Data in Table 5 further showed that overall 52 per cent respondents had used recommended dose of insecticide dimethoate, whereas 33 and 15 per cent of respondents had used low and high dose of insecticides respectively. Sub-division-wise 53, 44, 47 and 75 per cent of the respondents from Marh, R S Pura, Dayalachak and Samba subdivisions, respectively had used recommended dose of insecticides. Respondents from Marh (30%) R S Pura (33%) Dayalachak (41%) and Samba subdivisions (25%) had used less than recommended dose of insecticides. The data further indicates that 17, 22 and 12 per cent of respondents from Marh, R S Pura and Dayalachak subdivision had used high dose of insecticides. None of the respondents from subdivision Samba had used more than recommended dose of insecticides.

The data in Table 6 reveals that overall 48 per cent of respondents had used recommended dose of fungicide copper oxychloride, followed by 33 per

cent of respondents who had used less dose of fungicides, whereas 19 per cent of respondents had used more than recommended dose. Sub-division-wise distribution of respondents depicts that 52 per cent respondents from Marh subdivision, 46 per cent respondents from R S Pura subdivision, 41 per cent respondents from Dayalachak subdivision and 44 per cent respondents from Samba subdivision had used recommended dose of fungicides. Whereas 31, 34, 36, and 33 per cent of respondents from Marh, R S Pura, Dayalachak and Samba subdivisions, respectively had used less than recommended dose of fungicides and 16, 20, 23 and 22 per cent of respondents from Marh, R S Pura, Dayalachak and Samba subdivisions, respectively had used more than recommended dose of fungicides.

Data in the Table 6 further indicates that 49 per cent of respondents had used recommended dose of fungicide as metalxyl+mancozeb followed by 41 per cent of respondents who had used less than recommended dose of fungicides, whereas 10 per cent of respondents had used more than recommended dose. Sub-division-wise, 59 per cent respondents from Marh subdivision, 56 per cent respondents from R S Pura subdivision, 42 per cent respondents from Dayalachak subdivision and 33 per cent respondents from Samba subdivision had used recommended dose of fungicides. Whereas 37, 44, 42, and 67 per cent of respondents from Marh, R S Pura, Dayalachak and Samba subdivisions, respectively had used less than recommended dose of fungicides

Table 6. Level of adoption of recommended fungicide by potato growers

Level of adoption	Sub-Division-wise percentage of respondents				Overall %age of respondents from all sub divisions
	Marh n=61	R S Pura n=35	Dayalachak n=22	Samba n=9	
Copper Oxychloride					n=127
Less than recommended dose	31	34	36	33	33
As per recommended dose 3 liter/ha	52	46	41	44	48
More than recommended-dose	16	20	23	22	19
Level of adoption	Sub-Division-wise percentage of respondents				Overall %age of respondents from all sub divisions
	Marh n=27	R S Pura n=16	Dayalachak n=22	Samba n=6	
Metalxyl+Mancozeb					n=61
Less than recommended dose	37	44	41	67	41
As per recommended dose 1kg/ha	59	56	42	33	49
More than recommended dose	22	00	00	00	10

and only 22 per cent of respondents from Marh Sub-division had used more than recommended dose of fungicides. None of the respondents from R S Pura, Dayalachak and Samba subdivisions, had used more than recommended dose of fungicides.

The recommended doses of insecticides is endosulphan @ 3 liter/ha and dimethoate @ 1liter/ha for potato crop. Among the adoption of different insecticides, about 45 per cent of respondents had applied recommended doses of endosulphan and nearly 52 per cent of respondents had applied recommended doses of dimethoate .

Discussion

The farmers reported that the insects pests did not pose a severe problem in potato crop for last 2 years during 2009 to 2010 but all of the farmers used insecticides as precautionary measures for control of insects. The findings are in agreement with the findings of Badodiya *et al.* (2009) who had reported that majority of the farmers had applied recommended insecticides to their crops.

It can be concluded from the above findings that nearly one-half of the respondents had applied recommended doses of insecticides to the potato crop. The reason might be that the respondents had lack of knowledge regarding recommended doses of insecticides and apply the pesticides on the recommendation of pesticide shopkeepers. These findings are in conformity with those of Sharma (1996a), Hakeem (1998), Shivalingaiah and Nagabhushanam (2004) and Singh *et al.* (2010) who had reported that majority of respondents do not follow recommendation regarding insect control. The recommended doses of fungicide copper oxychloride @ 2.5 kg/ha and metalxyl+mancozeb @ 1kg/ha for potato crop. About 50 per cent of overall respondents had used recommended fungicide is copper oxychloride and metalxyl+mancozeb as per recommended dose. Majority of the respondents had not applied recommended doses of fungicide. The probable reason may be that lack of knowledge regarding recommended doses of fungicide. Since majority of the farmers were localites. They follow the advices given by the fellow farmers and input dealers. These findings are in conformity with those of Sharma (1996a), Hakeem (1998) Shivalingaiah and Nagabhushanam (2004) and Singh *et al.* (2010) who had reported that farmers do not follow the recommendation for control of diseases.

Conclusions

Under plant protection measures, the results showed that cutworm, potato aphids and potato leaf hopper were the major insect pests encountered by the potato growers. Majority of the respondents had applied recommended insecticides endosulphan and dimethorate to control the insect pests of potato crop. Whereas non-recommended insecticide indoxacarb was used by only 15 per cent of the respondents for the control of insect-pest in potato crop. The results of the study reveals that about 46 per cent of respondents had used insecticides at the time of insect appearance and 48 per cent of respondents had used fungicides at the time of disease appearance. The results also shows that majority of the respondents has used recommended fungicide copper oxychloride and metalxyl+mancozeb for the control of late blight and early blight. In subdivision Marh low percentage of disease like late blight was reported during the year 2010. The non-recommended fungicide like carbendzim and dimethomorph was used by 11 per cent and 6 per cent of the respondents for the control of disease in potato crop, whereas 32 per cent of the respondents had used non-recommended herbicide materibuzin for the control of weeds in potato crop.

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