

IMPACT OF FLD CONDUCTED ON PLANT PROTECTION SCHEDULE AND USE OF CERTIFIED SEED IN THE YIELD OF POTATO

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Abstract: In Surguja district of Northern Hilly zone of Chhattisgarh, potato is grown as *rabi* and *kharif* also. The use of seed treatment and recommended plant protection schedule like 3 sprays of recommended pesticides for management of major diseases (i.e. –blight *Phytophthora* wilt etc) and insect pest, (i.e. Potato tuber moth aphids & sucking pest) will achieve the expected yield of potato. The present study was carried out during the year 2012-15 in Surguja district of Chhattisgarh state. Findings of the study showed the data significantly indicated that before Front line demonstration (FLD), the majority of respondents were (57.14 to 74.28 per cent) in the category of low level of knowledge for various aspects of study. With respect to knowledge level in medium category in each aspect of plant protection, remaining respondents were included and the share of respondents ranged between 25.72 per cent to 42.86 per cent. There was a rise in the number of respondents in middle level of knowledge from low level and the respondents belonging to this category after FLDs ranged between 49.00 to 51.42 per cent as against 25.71 to 42.86 per cent before FLDs. 22.85 to 43.29 per cent respondents become successful in acquiring high level of knowledge pertaining to the various aspects of plant protection in potato production. There was increase in the number of respondents in middle level of adoption and the respondents belonging to this category after FLDs ranged between 37.14 to 54.28 per cent as against 22.86 to 37.14 per cent before FLDs. 22.86 to 37.14 per cent respondents become successful in acquiring high level of adoption pertaining to the various aspects of plant protection in potato production after FLDs. With respect to various aspects of certified seed of potato, the FLDs helped the respondents to improve their knowledge. There was increase in no of respondents in high knowledge level and medium knowledge level category and reduction of respondents in low knowledge level category. With respect to adoption level in medium category in each aspect of use of certified seed of potato remaining respondents were included and the share of respondents ranged between 17.14 to 54.28 per cent. Data further revealed that average yield before FLD were 70q/ha⁻¹. However it increased to 110q/ha⁻¹ and increase in yield was 57% after FLDs. Problems faced by respondents regarding use of plant protection schedule indicated that maximum number of respondents had problems about uncertain weather condition like frost, rainfall and hailstorm (97.14%) followed by Disease infestation especially early and late blight of potato (88.57%) respectively. Problems faced by respondents regarding use of certified seed maximum respondents having problems of more demand of local red variety of potato by consumer (100.00%) and more cost of seed potato (100.00%) both followed by non availability of certified seed of potato in market and lack of facility of cold storage (94.28%) both.

Keyword: FLDs, Potato, Surguja districts (C.G.)

INTRODUCTION

Potato (*Solanum tuberosum* L.), family Solanaceae, is one of the most popular vegetables grown in India because of its higher nutritive and higher production. It is the cheapest source of dietary carbohydrates (20.6%), protein (2.1%), fat (0.3%), crude fiber (1.1%), ash (0.9%), starch and vitamins especially C and B₁ and minerals. Potato is a good source of energy as they are rich in carbohydrates and therefore, is the fourth most important food crop after rice, wheat and maize. India is the second largest producer of potato in the world. Uttar Pradesh is the largest potato producing state in the country and accounts for 32% of total production. Potato is a very popular and important cash crop in district Surguja of C.G. but due to improper adoption of improved technology, its productivity is far below the average productivity of the state.

There is inadequate supply of certified seeds to the extent that farmers almost solely depend on informal seed sources (farm-saved, local markets or

neighbors). Self-supply is the major source of seed for most farmers. The high altitude farms being the sole source of clean basic seed in India, its physical and human capacity is limited, as it struggles with the double mandate of research and commercial basic seed production. It is handicapped by institutional arrangement in which there are very little incentives for increased productivity and efficiency it produces between 25 and 55 tonnes of basic seeds per year. Only about 1% of potato farmers can access quality planting material, since the collapse of the national seed distribution network in the quantities of certified seed potato which is not only inadequate but also highly priced with the implication that majority of farmers resort to using used seed of doubtful quality from various sources. This exacerbates the spread of seed-borne diseases especially bacterial wilt. From one season to the next, farmers select seed at harvest from their own farm but periodically go outside their farms to bring in “new” or “fresh” seed (seed renewal) from the other sources. Farmers renew seed for various reasons including acquiring a new variety, seed degeneration, disease and weather

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calamities (floods, drought etc). The concept of certified seed is not clear to most farmers and most people believe that when productivity of a variety decreases, then the variety is “used to” or “too familiar” to the soil. They, then usually buy seed from another area, exchange their seed with their neighbours or try and change the location of their potato plot. The farmers frequently plant the smallest tubers (chatts) as seeds and either eat or sell the bigger ones. These small seed tubers produce single stems, produce few tubers and are susceptible to diseases such as bacterial wilt and other environmental stresses (Lung’aho pers. Comm.). An economic analysis comparing use of farmers’ seeds with use of certified seeds showed that, under the agronomic practices currently practiced by farmers and current prices of the certified seed and ware potatoes, farmers will incur loss, if they use certified seeds as opposed to their own seeds.

Improper plant protection schedule leads to increased infestation of many insect pests as well as attack of diseases in unfavorable condition. Likewise local variety doesn’t perform better for higher yield. The present system such as seed/soil treatment and recommended plant protection schedule, use of certified seed of suitable variety, 3 sprays of recommended plant protection chemical for control of major insect-pests and diseases enhanced the yield of potato. The proposed study will work out the extent of knowledge and adoption of plant protection practices demonstrated and advocated schedule to farmers under FLD conducted during the year 2012-15 with objectives to study the level of knowledge regarding use of plant protection schedule certified seed, to measure the extent of adoption regarding use of plant protection schedule and certified seed and to find out constraint in adoption of plant protection schedule and use of certified seed.

MATERIAL AND METHOD

The study was carried out in Surguja district of C.G. The FLDs on assessment of use of plant protection schedule and certified seed were conducted in the Village-Pando nagar, block Surajpur, District – Surguja (prior) during the year in *rabi* season 2012-15. Listed beneficiaries of FLDs were selected as respondents for study. For collecting in formations semi structure interview schedule designed on the basis of available literature was used and the data have been collected by personal interview or discussion with all respondents. The data were

analyzed by using appropriate statistical framework such as frequency, mean and percentage, the level of knowledge and adoption measured by knowledge and adoption index.

The thirty five front line demonstrations were conducted at the farmers’ field. These FLDs on potato were purposively conducted in tribal belt village Pandonagar. The soil of the district is mostly sandy loam in texture and suitable for the major crop of the district i.e. potato. Although maximum area of *rabi* and *kharif* both season covered by potato crop, still the average yield of the district is very low i.e. 15t/ha⁻¹. Improper plant protection schedule and lack of use of improved or certified seed of potato account low yield. To assess the performance of seed of improved variety / certified and use of recommended plant protection schedule at proper stage of crop, the front line demonstration were conducted during *rabi* seasons 2012-15. The area under each demonstration was 0.25 hectare. The major problems diagnosed were the early and late blight of potato. Use of certified seed of suitable variety and 3 sprays of recommended plant protection chemicals for control of major diseases i.e. blight, phytophthora wilt etc. and insect pests i.e. borer, potato tuber moth, aphids and sucking pests were demonstrated in FLDs.

To measure the extent of adoption of plant protection schedule and certified seed of potato, questions related with the various aspects of FLDs were identified / prepared in consultation with the experts in this field. The responses obtained from the respondents to these questions were rated on the three point continuum i.e. complete adoption, partial adoption and no adoption with the numerical score of 2, 1 and 0, respectively, before and after the training. The maximum score of an individual could be two and minimum zero.

The knowledge test composed of items called questions for constructing the knowledge test of all the conducted FLDs. The questions developed were discussed with the subject matter specialist, in the disciplines and were finalized. Answers to these questions were non-structured. The correctness of the answer was judged against the predetermined answers and was categorized as complete, partial and no knowledge and scored as 2, 1 and 0. The sum of scores of all the items of test for a particular individual was taken as the knowledge of that individual before and after the training. The knowledge index and adoption index were worked out with the help of following formula:

$$\text{Knowledge index} = \frac{\text{Knowledge score actually obtained by the respondents}}{\text{Maximum obtainable knowledge score by the respondents}} \times 100$$

The respondents were grouped into three categories on the basis of knowledge level by using following formula:

$$\text{KI} = \text{Mean} (\bar{X}) \pm \text{S.D. (Standard Deviation)}$$

Categories Low level of knowledge	Computed by $(< \bar{X} - \text{SD})$
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Medium level of knowledge (in between $\bar{X} \pm SD$)

High level of knowledge ($> \bar{X} + SD$)

$$\text{Adoption index} = \frac{\text{Adoption score actually obtained by the respondents}}{\text{Maximum obtainable adoption score by the respondents}} \times 100$$

The extent of adoption was ascertained in terms of selected aspects of the use of plant protection schedule home science practices adopted by the trainees. The respondents were grouped into the following categories on the basis of using following formula:

	AI =	Mean (\bar{X}) \pm S.D. (Standard Deviation)	Computed by
Categories			($< \bar{X} - SD$)
Low level of adoption			
Medium level of adoption		(in between $\bar{X} \pm SD$)	
High level of adoption		($> \bar{X} + SD$)	

RESULT AND DISCUSSION

Level of knowledge regarding various aspects of plant protection in potato production.

The data contained in table 1 clearly revealed the positive impact of Front line demonstration (FLD) pertaining to the various aspects of plant protection in potato right from the seed treatment.

The data significantly indicated that before FLDs, the majority of respondents were in the category of low level of knowledge. In this low level of category, the highest per cent of respondents (74.25 %) were found with regards to time or schedule of use of insecticide/pesticide for storage pest, followed by seed treatment (71.43%), use of insecticide/pesticide for storage pests (86.75%), time or schedule of use of insecticide/pesticide (65.72) and time or schedule of use of fungicide or other chemicals for disease control (62.86). In other aspects of plant protection, the low level of knowledge was possessed by less than 60% respondents but not below 57 per cent.

With respect to knowledge level in medium category in each aspect of plant protection, remaining respondents were included and the share of respondents ranged between 25.72 per cent to 42.86 per cent as indicated by the data in table 1.

It was surprising that none of the respondents belonged to high level of knowledge before FLDs.

The data given in table 1 regarding the knowledge level of FLDs clearly revealed the positive impact of FLDs and there was substantial increase in the knowledge of the respondents. This resulted in drastic reduction of respondents in low knowledge level category, increase in medium knowledge level category and shifting of some farmers into high level of knowledge category. 20.00 to 28.57 per cent respondents belonged to low level of knowledge after FLDs as against 57.14 to 74.28 per cent before FLDs with regards to various aspects of plant protection in potato crop.

There was a rise in the no. of respondents in middle level of knowledge and the respondents belonging to this category after FLDs ranged between 49.00 and 51.42 per cent as against 25.71 to 42.86 per cent before FLDs. 22.85 to 43.29 per cent respondents become successful in acquiring high level of knowledge pertaining to the various aspects of plant protection in potato production.

The data further indicated that there is a need to have successful FLDs in potato production so that none of the respondents will be found Saikh *et.al.*(1993),Sarda and Khurana (1994), reported that farmers did not apply chemicals at proper time, because they had information about time of application of chemicals low level of knowledge category.

Level of adoption regarding various aspects of plant protection in potato production.

The data (Table 2) revealed the significant impact of front line demonstration; data positively showed that before FLDs, the majority of respondents were in the category of low level of adoption. In this low level of category, the highest per cent of respondents (77.14%) were found with regards to seed treatment and time or schedule of use of insecticide/pesticide for storage pests both, followed by time or schedule of use of insecticide/pesticide and use of insecticide/pesticide for storage pests (71.43 %) both, use of insecticide/pesticide (65.71%), use of fungicide or other chemical for diseases control (63.86%) and time or schedule of use of fungicide or other chemical for diseases control (60.00%). In other aspects of plant protection, the low level of adoption was possessed by 60 % respondents.

With respect to adoption level in medium category in each aspect of plant protection, remaining respondents were included and the share of respondents ranged, between 22.86 per cent and 37.14 per cent as showed in table 2.

With regards to the adoption level in high category in various aspects of plant protection respondents were

included in range between 0.00 per cent and 28.75 per cent. Quadri et al. (2013) reported that high cost as a reason for not using plant protection measures by about 47.88 per cent respondents.

The data given in table 2 regarding the adoption level after FLDs revealed the positive impact of FLDs and there was substantial increase in the adoption of the respondents. This resulted into drastic reduction of respondents in low adoption level category, increase in medium adoption level category and shifting of some farmers into high level adoption category. 14.20 to 77.14 per cent respondents belonged to low level of adoption after FLDs as compared to 60.00 to 77.14 per cent before FLDs with regards to various aspects of plant protection in potato crop.

There was increase in the no. of respondents in middle level of adoption and the respondents belonging to this category after FLDs ranged between 37.14 to 54.28 per cent as against 22.86 to 37.14 per cent before FLDs. 22.86 to 37.14 per cent respondents become successful in acquiring high level of adoption pertaining to the various aspects of plant protection in potato production.

The result further showed that there is a need to have successful FLDs in potato production so that none of the respondents will be found in low level of adoption category. Ibrahim, et.al. (2014), observed that in Munshiganj Sadar, highest proportion of the respondents was observed in high adoption categories in case of recommended potato variety (72.6%) after FLDs.

Level of knowledge regarding use of certified seed of potato

Data presented in table 3 revealed the level of knowledge regarding use of certified seed of potato before FLDs. Majority of the respondents belonged medium level of knowledge with regarding time of sowing (54.28%) followed by earthing up (48.57%), time of harvesting (45.71 %), seed rate (37.14), application of fertilizer (34.28%) respectively. However low level of knowledge were possessed by majority of the respondents in respect of source of availability of certified seed of potato and variety (82.86%), spacing (65.71%), seed rate (60.00 %), application of fertilizer (57.14 %) respectively. While high level of knowledge was about time of harvesting (25.71%), earthing up (22.86%) and time of sowing (14.28 %) . A very few respondents possessed high level of knowledge and maximum respondents (25.7 %) had high level of knowledge for time of harvesting followed by earthing up.

With respect to various aspects of certified seed of potato, the FLDs helped the respondents to improve their knowledge. There was increase in number of respondents in high knowledge level and medium knowledge level category and reduction of respondents in low knowledge level category.

Table 3 clearly revealed the positive impact of Front line demonstrations (FLDs) pertaining the knowledge

regarding use of certified seed of potato right from the Source of availability of certified seed of potato.

Data significantly indicated that after FLDs the majority of respondents were included medium category. The share of respondents declined between 0.00 to 20.00 per cent as compared to 28.57 to 82.86 per cent in knowledge level before FLDs in low level of category. In medium category, share of respondents ranged between 37.14 to 54.28 per cent as compared to 17.1 to 54.28 per cent before FLDs. In high level category, after FLDs there was rise in respondents to 31.42 to 57.14 per cent as compared to 0.00 to 25.71 per cent before FLDs.

Level of Adoption regarding use of certified seed of potato

The data significantly indicated (Table 2) that before FLDs, the majority of respondents were in the category of low level of adoption. In this low level of category, the highest per cent of respondents (85.71%) were found with regards to seed rate followed by source of availability of certified seed of potato and use of variety (82.86%) both, spacing (54.29 %), use of time of sowing (48.57%) and application of fertilizer, earthing up time of harvesting (28.57%) respectively.

With respect to adoption level in medium category in each aspect of use of certified seed of potato remaining respondents were included and the share of respondents ranged between 17.14 to 54.28 per cent as indicated by the data in table 4. None of the respondents belonged is high level of adoption before FLDs.

The data given in table 1 regarding level of adoption regarding use of certified seed of potato revealed the positive impact of FLDs and there was substantial increase in adoption of the respondents. This resulted in to drastic reduction of respondents in low adoption level category, increase in medium adoption level category and shifting of some farmers into high level of adoption category. 0.00 to 20.00 per cent respondents belonged to low level of adoption after FLDs as against 28.57 to 85.71 per cent before FLDs with regards to various aspect of use of certified seed of potato.

There was a rise in the no of respondents in middle level of adoption and the respondents belonging to this category after FLDs ranged between 31.43 to 60.00 per cent as against 14.29 to 65.71 per cent before FLDs.

The data further indicated that there is a need to have successful FLDs in potato production so that none of the respondents will be found in low level of adoption category. Huque *et.al.* 1996 Findings revealed that majority of the potato growers (63 per cent) had moderate level of adoption, 32 per cent low and only 5 per cent had high adoption. Singh *et.al* 2010 concluded that about 82 per cent of the vegetable growers had low or medium adoption of Commercial potato cultivation practices

Impact of FLD on plant protection schedule and certified seed of potato on yield of potato

Data showed in table 5 revealed that average yield before FLD were 70q/ha⁻¹ however it increased to 110q/ha⁻¹ with increased in yield by 57%.

Problems faced by respondents regarding use of plant protection schedule

Data presented in table 6 revealed problems faced by respondents regarding use of plant protection schedule. Maximum number of respondents had problems about uncertain weather condition like frost, rainfall and hailstorm (97.14%) followed by

disease infestation especially early and late blight of potato (88.57%) respectively.

Problems faced by respondents regarding use of certified seed

In case of problems faced by respondents (table 7) regarding use of certified seed, maximum respondents faced problems of more demand of local red variety of potato by consumer (100.00%) and more cost of seed potato(100.00%) both followed by non availability of certified seed of potato in market and lack of facility of cold storage(94.28%) both.

Table 1. Level of Knowledge regarding plant protection schedule of potato n=35

S N	Particular	Knowledge level Before FLD						Knowledge level After FLD					
		Low		Medium		High		Low		Medium		High	
		F	%	F	%	F	%	F	%	F	%	F	%
1	Seed Treatment	25	71.43	10	28.57	0	0.00	7	20.00	18	51.42	10	28.57
2	Use of insecticide / pesticide	21	60.00	11	31.42	3	8.58	10	28.57	17	48.58	8	22.85
3	Time or schedule of use of insecticide/ pesticide	23	65.72	8	22.85	4	11.42	10	28.57	16	45.71	9	25.71
4	Use of fungicide or other chemicals for diseases control	20	57.14	15	42.86	0	0.00	9	25.71	14	40.00	12	34.29
5	Time or schedule of use of fungicide or other chemical for diseases control	22	62.86	11	31.42	2	5.71	7	20.00	18	51.42	10	28.57
6	Use of insecticide /pesticide for storage pests	24	68.57	10	28.57	1	2.86	9	25.72	18	51.42	8	22.85
7	Time or schedule of use of insecticide /pesticide for storage pest	26	74.28	9	25.71	0	0.00	7	20.00	16	45.71	12	34.29

Table 2. Level of Adoption regarding plant protection schedule of potato n=35

SN	Particular	Adoption level Before FLD						Adoption level After FLD					
		Low		Medium		High		Low		Medium		High	
		F	%	F	%	F	%	F	%	F	%	F	%
1	Seed Treatment	27	77.14	8	22.86	0	0.00	5	14.28	18	51.43	12	34.29
2	Use of insecticide / pesticide	23	65.71	11	31.43	1	2.86	9	25.71	18	51.43	8	22.86
3	Time or schedule of use of insecticide/ pesticide	25	71.43	8	22.86	2	5.71	10	28.57	13	37.14	12	34.29
4	Use of fungicide or other chemical for diseases control	22	62.86	13	37.14	0	0.0	7	20.00	15	42.86	13	37.14
5	Time or schedule of use of fungicide or other chemical for diseases control	21	60.00	10	28.57	4	11.43	5	14.28	18	51.43	12	34.29
6	Use of insecticide/ pesticide for storage pests	25	71.43	10	28.57	0	0.00	5	14.28	19	54.28	11	31.43
7	Time or schedule of use of insecticide/pesticide for storage pests	27	77.14	8	22.86	0	0.00	6	17.14	17	48.57	12	34.29

Table 3. Level of Knowledge regarding use of certified seed of potato n=35

S N	Particular	Knowledge level before FLD						Knowledge level after FLD					
		Low		Medium		High		Low		Medium		High	
		F	%	F	%	F	%	F	%	F	%	F	%
1	Source of availability of certified seed of potato	29	82.86	6	17.14	0	0.00	3	8.57	17	48.58	12	34.28
2	Variety	29	82.86	6	17.14	0	0.0	2	5.71	19	54.28	14	40.00
3	Seed rate	21	60.00	13	37.14	1	2.85	5	14.28	15	42.86	15	42.86
4	Spacing	23	65.71	11	31.43	1	2.85	3	8.57	14	40.00	18	51.43
5	Time of sowing	11	31.43	19	54.28	5	14.28	2	5.71	22	62.85	11	31.42
6	Application of fertilizer	20	57.14	12	34.28	3	8.57	7	20.00	11	31.42	17	48.57
7	Earthing up	10	28.57	17	48.57	8	22.86	0	0.00	21	60.00	14	40.00
8	Time of harvesting	10	28.57	16	45.71	9	25.71	1	2.86	14	40.00	20	57.14

Table 4. Level of Adoption regarding use of certified seed of potato

n=35

S N	Particular	Adoption Before FLD						Adoption After FLD					
		Low		Medium		High		Low		Medium		High	
		F	%	F	%	F	%	F	%	F	%	F	%
1	Source of availability of certified seed of potato	29	82.86	6	17.14	0	0.00	7	20.00	19	54.28	9	25.71
2	Variety	29	82.86	6	17.14	0	0.00	7	20.00	18	51.42	10	28.57
3	Seed rate	30	85.71	5	14.29	0	0.00	5	14.28	17	48.57	13	37.14
4	Spacing	19	54.29	11	31.43	5	14.28	1	2.86	20	57.14	14	40.00
5	Time of sowing	17	48.57	13	37.14	5	14.28	3	8.57	11	31.43	21	60.00
6	Application of fertilizer	10	28.57	23	65.71	2	5.71	2	5.71	15	42.85	18	51.42
7	Earthing up	10	28.57	17	48.57	8	22.86	0	0.00	21	60.00	14	40.00
8	Time of harvesting	10	28.57	19	54.28	6	17.14	0	0.00	19	54.28	16	45.71

Table 5. Impact of FLD on plant protection schedule & certified seed of potato on yield of potato

Crop	Yield before FLD	Yield after FLD	% Increase in yield
Potato	70q/ha	110q/ha	57

Table 6. Problems faced by respondents regarding use of plant protection schedule

S.No.	Problems	F	Yes	F	No
1	Uncertain weather condition like frost, rainfall and hailstorm.	34	97.14	1	2.86
2	Uncertain disease infestation specially early and late blight of potato.	31	88.57	4	11.43

Table 7. Problems faced by respondents regarding use of certified seed

Sr. No	Problems	Yes		No	
		F	%	F	%
1	Non availability of certified seed of potato in market	33	94.28	2	5.72
2	More demand of local red variety of potato by consumer (due to taste).	35	100.00	-	-
3	Lack of facility of cold storage	35	94.28	2	5.72
4	More cost of seed potato	35	100.00	-	-

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