Original Research Article

An Analytic study to measure the adoption level of recommended practices followed by potato growers in Punjab

Abstract

The study was conducted in Amritsar District of Punjab. Multistage sampling technique was followed for the selection of respondents.In this study, the findings revealed that among the potato growers most of respondents had adopted recommended varieties, Among the potato growers farmers most of the farmers were belonged to medium to high level of adoption of PAU recommended varieties of potato and recommended seed rate and recommended green manure's quantity. Medium number of respondents had adopted recommended doses of fertilizers, herbicides and insecticides for controlling pest/disease and weed control on their crop.(very good)

Keywords: Amritsar, Potato growers, Adoption level, Recommended varieties, Insecticides.

Introduction

Agriculture plays a vital role in the Indian economy. Over 70 per cent of the rural households depend on agriculture. Agriculture is an important sector of Indian economy as it contributes about 17% to the total GDP and provides employment to over 60% of the population. Indian agriculture has registered impressive growth over last few decades. The food grain production has increased from 51 million tonnes (MT) in 1950-51 to 250 MT during 2011-12 highest ever since independence (Kekane, 2013). The agriculture is not only used for providing the food to human beings, as well as fodder to animals, but it also supports the national income of the nation. In the present era of science and technology, so many nations still depend on agriculture to provide jobs as well as supporting the national income (Gayatri and sunkand, 2020).

India is the world's largest producer of vegetable next only to China with an annual production estimated around 50.99 million tonnes from 4.5 million hectares. However, vegetables occupy hardly 2 per cent of the total cropped area of the country which is very low in view of the national need.(sharma, 2021)

In most vegetables,potato is a major food crop, grown more than 100 countries in world. The native South Americans brought potato under cultivation possibly 2000 years before the spanish conquest. In 1537, the Spaniards first came into contact with potato in one of the villages of Andes. In Europe, it was introduced between 1580 .A.D. to 1585 A.D. in Spain, Portugal, Italy, France, Belgium

and Germany. At present, China, Russia, India, Poland and U.S.A. contribute a major share of total world production. It was introduced in India by the portuguese sailors during early 17th century and it's cultivation was spread to north india by the british. potato is one of main commercial crop grown in the country. It is cultivated in 23 states in India. Uttar Pradesh, West Bengal, Bihar, Punjab and Gujarat account a lion's share in total production. Country has achieved a tremendous growth in potato production during last four to five decades. The annual compound growth rate of potato is higher than other major food crops in respect of area, production and productivity. In the year 2002-2003, the production was 25 million tonnes while it was 5 million tonnes during 1970. Hence, owing its significant growth in production, bumper yields has been observed almost in every year. Due to the bumper crop, and lack of post harvest management, glut situations risen in the market for the surplus yield every year which ultimately results in decline the prices drastically (Rana and Pandey, 2009).

Potato is one of the important tuber crops in India. Potato crop plays an important role in the world's food economy. Vegetables are being grown in India in 6.23 million ha, accounting for production of 66.58 Mt. among the major vegetable crops grown. Potato occupied 1.4 million hectares with a net production of 24 Mtand is regarded as the "poor man's food". The potato crop gives more yields per unit area than cereals and that too in a much shorter period.The potato grown in almost of all the states. The major potato growing states in the country are Uttar Pradesh, West Bengal and Bihar (singh and Kumari 2018)

Punjab is one of the major agriculture state of India, with an area of 1.57 percent of the India's total geographical area, the state of Punjab contributes 12 percent to the nation's 234 million tons of food grain, and nearly 40 and 60 percent of the wheat and rice food stock buffer maintained by the nation's central pool and operating of public distribution system for the poor. Punjab stands 6th in total potato production of 2.57 million tones, recording the third highest productivity (26.10 t/ha) from an area of 0.98 lakh ha in 2017-18 (Horticulture Statistics Division, Department of Agri. & Cooperation).(very good)

Research methodology

The study was conducted in Amritsar District during the year 2021-2022. Multistage sampling technique was followed for the selection of respondents. Amritsar district comprises of 8 blocks in which 2 blocks were randomly selected on the basis of availability of potato growers from each block. Four villages from two blocks were randomly selected 25 respondents from each village and total 100 potato growers were selected. Thus the total sample size was of 100 respondents. The data were collected through personal interview with the help of pre structured schedule. The data were analysed and find out the percentage and rank order.(very good)

Results and Discussion

The adoption process is the mental process through which an individual passes from first hearing of an innovation to its final adoption. While adoption is a decision to continue the full use of an innovation. Generally the farmers do not adopt package of practices fully. There is only a partial adoption by them. As a result, the gap always appears between the recommended production technology and their use at farmer's field. With a view to find out the extent of adoption of recommended practices of potato cultivation, the potato growers were asked to give information about package of practices adopted by them. The data regarding socio personal and adoption are given in table 1.

Socio economic characteristics of the respondents.

A little less than half of the respondents were in middle age group i.e 43% while 15 per cent were in young age group and 42 per cent of the respondents fell in old age group. The younger generation is comparatively less occupied in agriculture.The findings are in line with the findings of Kharlukhi (2021) that majority of the respondents belonged to middle age group.As majority of respondents had received education upto the middle level, the possible reason might be due to financial crisis and their families were unaware of importance of education, results into less encouragement and moral support to get educated. The findings are in line with the findings of Devi and Dubey (2016) that majority of farmers belonged to medium level of educationFamily size refers to the number of members in the family of potato growers. Family size of the potato growers was classified into three categories i.e small, medium and large and the data regarding the size of family is placed in table1 which reveal that 66 per cent of the respondents were belonged to medium family size with five to nine members. About 29 per cent of the respondents families were belonged to small family size and 5 per cent of the respondents were belonged to large family size.An operational land holding is a techno-economic land unit used wholly or partly for agricultural production and operated. The figures set in table1 depicts that 18 percent of the respondents were having marginal land holdings which is ranged 0 - 2.5 acres land, 39 per cent of the respondents were having small operational land holdings which is ranged between 2.5 – 5 acres land, 36 per cent of the respondents were having medium operational land holdings, which is ranged between 5- 12.5 acres land, whereas only 7 per cent of respondents were belonging to large land holdings which is ranged above of 12.5 acres land.

Table1 ; Distribution of socio-personal profile of Respondents

Parameter	**Mean**±(S.D)	**Frequency(%)**
Avg. Age (in years)	**49.51(±7.58)**	
Age	30-40 years	15
	40-50 years	43

	50-60 years	42
Avg Education	**9.57(± 2.08)**	
Education	Primary	4
	Middle	40
	Matric	27
	High school	23
	Graduate	4
	Post-graduate	2
Family type	Nuclear	68
	Joint	32
Avg Family Size	**6.17 (± 2.67)**	
Family size	Small (<5)	29
	Medium (5-9)	66
	Large (above 9)	5
Avg Land holding	**5.63 (± 5.30)**	
Land holding	Marginal (0-2.5)	18
	Small (2.5-5)	39
	Medium (5-12.5)	36
	Large (>12.5)	7

Varieties sown by potato farmers.

Majority of respondents had adopted kufrijyoti, kufriashoka and kufrisurya recommended varieties was due to the fact that these varieties were suitable for early and mid planting and also good tolerant of heat stress conditions and diseases early blight and late blight, which were highly occurring in their fields. Respondents also reported that they were facing difficulty for purchasing new recommendations and resistant variety seeds in their nearby markets.

The findings are in line with the findings of Khalil (2014) that most of the respondents had high adoption of recommended varieties.

Table 2 ; Distribution of respondents according to the varieties sown by potato farmers.

Varieties	**Percentage**
Kufriashoka	83
Kufrichandarmukhi	8

Kufrijyoti	93
Kufri Surya	59
Kufribadshah	10
Kufripushkar	1

Sowing time of potato farmers.

It is the act of scattering seeds on land so that they may grow, the sowing of seeds in specific the sowing season. The best time for sowing of potato seeds is last week of September to mid-october for autumn crop and second fortnight of January for spring crop. As Data placed in table 3 reveals that the seventy eight per cent of respondents were following recommended sowing time of potato as per package of practices oct-nov and twenty two per cent of the respondents were following nov-jan.

The season followed by most of the potato farmers as oct-nov was due to early season as the get higher yield of the crop. The findings are in line with Khalil (2014) that majority of the respondents were following recommended sowing time.

Table 3 ; Distribution of respondents according to the sowing time of potato farmers.

Sowing time	**Percentage**
Oct- Nov (recommended)	78
Nov- jan	22

Crop sown as green manure.

Data placed in table 4 reveals that medium number of respondents fifty eight per cent of them were following dhaincha as recommended green manure crop as per package of practices and ten per cent of respondents were following sunhemp as recommended green manure crop and thirty two per cent were following barseem as green manure crop.

Berseem was used as green manure crop by little less than half of respondents as they think that it was useful for both milch and draught animals. It can also be used for green manuring in irrigated areas.

Table 4 ; Distribution of respondents on the basis of crop sown as green manure.

Crop as green manure	Percentage

Dhaincha (recommended)	58
Sunhemp (recommended)	10
Barseem	32

Number of tillage operations applied in the potato fields.

Most of the farmers were following recommended tillage operations in their fields as ninety five per cent respondents were following 0-2 number of tillage operations and five per cent of respondents were following 2-3 number of tillage operations in potato fields. As respondents were following tillage operations in their fields according to their field's soil health.

As year after year number of tillage operations vary in their fields according to soil type and for different crops. The findings were contradicted with the findings of chaudhry (2000) that majority of the respondents were following recommended tillage operations.

Table 5 ; Distribution of respondents according to the number of tillage operations applied in the potato fields.

Tillage operations	**frequency**	**percentage**
Recommended (0-2)	95	95
More than recommended (>2)	5	5

Distribution of respondents according to the seed rate show in Table 6.

Medium number of respondents have high adoption of recommended seed rate. Respondents were dissatisfied due to non-availability of resistant variety seeds in their nearby areas, lack of disease, insects pest free seeds and good quality seeds. Respondents who were aware of new recommendations and want to adopt them were facing the unavailability of seeds in their areas

The findings were contradicted with the findings of chaudhry (2000) that medium level of respondents were following recommended seed rate.

Method of planting ;Majority of respondents had very low adoption rate. They were following planting method as kerapora method, it was might be due to the fact that the respondents were more comfortable and this method was cheaper than other methods. They also reported that the un-availability of ridger, and lack of knowledge.

Table 7 : The findings were contradicted with findings of chaudhry (2000)

Parameter	Category	Percentage
Seed rate	Less than recommended	37
	Recommended (13-18 q/acre)	48
	More than recommended	15
Method of planting	Ridger (recommended)	20
	Kera-pora	80

Chemical fertilizers applied

I. **Urea ;** The recommended dose of urea was 165 kg/acre and fifty five per cent of respondents were following recommended dose of urea , twenty six per cent of the respondents were following less than recommended dose of urea and nineteen per cent of them were applying urea fertilizer at very high rates. Recommended Splits of urea was 3 splits and ninety five respondents were following recommended splits and five per cent respondents were following more than recommended.

II. **SSP ;** The recommended dose for SSP is 155kg/acre and forty eight per cent of the respondents were applying recommended dose of SSP and twenty three per cent of the respondents were applying less than recommended dose and twenty nine per cent of the respondents were applying SSP fertilizer at very higher rates. Recommended splits of SSP was 2 splits and eighty eight per cent of the respondents were following recommended splits of SSP and twelve per cent of the respondents were following less than recommended splits of SSP.

III. **MOP ;** table no.5 shows that recommended dose of MOP was 40kg/acre and sixty per cent of respondents were Applying recommended dose of MOP and thirty one per cent of respondents were Applying less than recommended dose of Mop and nine per cent of respondents were Applying Mop at very higher rates. Recommended splits of Mop was 2 splits and ninety three per cent of the respondents were following recommended splits and seven per cent of the respondents were following less than recommended splits of MOP.

Table 8 ; Distribution of respondents on the basis of chemical fertilizers applied per acre.

Parameter	Category	Percentage

1.Urea (n = 100)		
I. dose	Less than recommended (<165kg/acre)	26
	Recommended (165kg/acre)	55
	More than recommended (>165kg/acre)	19
II. Splits	Less than recommended (<3 splits)	0
	Recommended (3 splits)	95
	More than recommended (>3splits)	5
2.SSP (n = 100)		
I. Dose	Less than recommended (<155kg/acre)	23
	Recommended (155kg/acre)	48
	More than recommended (>155kg/acre)	29
II. Splits	Less than recommended (<2 splits)	12
	Recommended (2 splits)	88
	More than recommended (2 splits)	0
3.MOP (n = 100)		
I. Dose	Less than recommended (<40kg/acre)	31
	Recommended (40kg/acre)	60
	More than recommended (>40kg/acre)	9
II. Splits	Less than recommended (<2 splits)	7
	Recommended (2 splits)	93
	More than recommended (2 splits)	0

Quantity of farmyard manure

It is the decomposed mixture of dung and urine of farm animals along with litter and left over material from roughages or fodder fed to the cattle. As Data placed in table 9 recorded that the recommended quantity of farmyard manure applied by the potato farmers to their crop. The recommended quantity of farmyard manure was 20 tonnes per acre and most of the eighty four per cent of the respondents were applying recommended quantity of farmyard manure and six per cent of respondents were Applying less than recommended and 10 per cent of the respondents were Applying more than

recommended quantity of farmyard manure. Majority of the respondents were following recommended farmyard manure.

Table 9 ; Distribution of respondents according to the quantity of farmyard manure

Qty. of farmyard manure	**percentage**
Less than recommended (20 tonnes/acre)	6
Recommended (20 tonnes/acre)	84
More recommended (20 tonnes/acre)	10

Quantity of biozyme.

As little more than half or we can say that the medium number of the respondents were following recommended adoption of biozyme application and rest of the all were applying biozyme in lesser or more quantities. It was due to some of the respondents were following their own perceptions or belief that has existed for a long time.

Table 10; Distribution of respondents according to quantity of biozyme.

Qty of Biozyme	**Percentage**
Less than recommended (200ml/acre)	23
Recommended (200ml/acre)	59
More than recommended (200ml/acre)	18

Quantity of herbicide used by potato growers

As all of the respondents had high adoption of recommended herbicides and doses. As majority of respondents were aware of recommended herbicides and their doses. The reason was they were highly engaged in information activities and cyber sources such as whatsapp groups, youtube and PAU website.

The findings of my study are in line with Khalil (2014).

Table 11. Distribution of respondents according to quantity of herbicide used by potato growers.

Parameter	**Herbicides used**	**Percentage**

Recommended Herbicides Used	Gramaxone	79
	Sencor	21
Dose of gramaxone (n = 79)	Recommended (500-750ml/acre) In 250-350 litres of water	79
Dose of sencor (n = 21)	Recommended (200g/acre) in 250-350 litres of water	21

Number of irrigations

As all of the respondents had optimum adoption of recommended irrigation schedule. Majority of respondents have reported that shortage of electricity and water erosion may creates problems in scheduling irrigation which may results into fluctuations in scheduling as potato crop done with five irrigations the reason might be due to large farm size or lack of trainings, shortage of electricity etc.

The findings of my study are in line with Khalil (2014)

Table 12. Distribution of respondents according to number of irrigations given by potato growers to potato fields

Parameter	**Irrigation schedule**	**Percentage**
Irrigation at time of sowing or planting	1-5 (DAS)	100
Irrigation at planting to pre emergence	5-12 (DAS)	100
Irrigation at Emergence to tuber initiation	12-30 (DAS)	100
Tuber initiation to full bloom	30-35 (DAS)	100
Full bloom to plant senescence	35-40 (DAS)	100

Type of insect pest are attacking their crop and their control measures.

Insects pests attacking in potato fields were Aphids, jassids, and cutworms and their recommended control measures were 300ml/acre used by the respondents. Data in table recorded multiple responses as all of the respondent's potato fields were suffering from Aphids attack and 43 per cent of respondent's fields were suffering from jassids and 65 per cent of respondents were suffering from cutworm.

As all of respondents had high adoption of recommended control measures they were using insecticide metasystox as per recommended dose 300ml/acre in their potato fields to control the insect pests attack. The Probable reason might be the respondents have great contact with sources of information.The findings of my study are in line with Khalil (2014).(should be restricted to 2-3 paragraphs) Not up to the mark of an international paper.

Table 13. Distribution of respondents according to type of insect pest are attacking their crop and their control measures.

Parameter	**Category**	**Percentage**
Insect pest	Aphids	100
	jassids	43
	cutworm	65
Insecticide (metasystox)	300ml/acre recommended	100

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