RESPONSE OF POTATO CULTIVARS TO VARYING LEVELS OF NITROGEN UNDER CHHATTISGARH PLAINS IN DORSA SOIL

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Abstract: The field experiment was conducted during *Rabi* 2009-10 at the Research cum Instructional Farm, Department of Horticulture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) to study the response of potato cultivars to varying levels of nitrogen under Chhattisgarh plains in dorsa soil. The experiment consisted of nine treatments comprising three varieties viz. Kufri Pukhraj, Kufri Jawahar and Kufri Khyati with three nitrogen levels 150 ,187 and 225 kg N/ha. Variety Kufri Pukhraj was found significantly superior from the other two varieties for growth parameters and yield parameters. The interaction between Kufri Pukhraj combined with 225 kg/ha N was found remarkably superior to all the other treatment combinations as regards to number of leaves per plant.

Keywords: Fertilizers, potato cultivars, yield

INTRODUCTION

Potato (*Solanum tuberosum* L.) is one of the most important vegetable cum starch supplying crop. Potato having high production per unit area per unit time. It can substitute the cereals for human consumption to a greater extent. It is a rich source of carbohydrates, contains protein and has many industrial uses. In Chhattisgarh state, it is cultivated in almost all the district of the state mainly in Sarguja, Raigarh, Jashpur, Bilaspur and Bastar. Presently this crop is being grown in an area of 32126 hectares with annuals production of 358526 metric tonnes and productivity of 11.16 t/ha in Chhattisgarh state. Nutrient requirement of potato crop is quite high and the application of fertilizer and organic manures are considered essential to obtain high economic yield. Nitrogen is the first limiting factor for potato crop; it improves the vegetative growth and increases the tubers per plant as well as tuber size. Nitrogen response varies with the soil type, varieties, length of growing season, organic manures, kind of fertilizers; time and method of application, moisture supply and nutrient interaction affect nitrogen needs of the crop. Long duration potato varieties producing large sized tubers are more responsive to nitrogen than short duration ones producing small and medium sized tubers.

MATERIAL AND METHODS

The experiment was conducted at the Horticultural Research Farm, Department of Horticulture, College of Agriculture, Indira Gandhi Krishi Vishwavidylaya, Raipur (C.G.), in winter season of 2009-10 to study the response of potato cultivars to varying levels of nitrogen under Chhattisgarh plains in dorsa soil. Nitrogen was applied in the form of urea 150, 187 and 225 kg/ha N, half at planting and the remaining half 30 days after planting the first earthing up. Phosphorus in the form of single super phosphate and potassium in the form of muriate of potash were applied as basal dose @ 100 and 100 kg/ha each. The experiment was laid out in a factorial randomized block design with 4 replication having nine treatments. Data were taken on the plant height, number of shoots, number of leaves, leaf area index, number of stolons and tubers per plant and on the fresh and dry weight of shoots, tubers per plant, total tuber yield.

RESULTS AND DISCUSSION

Data pertaining to different levels of nitrogen on various traits in potato presented in Table 1. The results revealed that among cultivars, Kufri Pukhraj recorded the better performance with respect of growth parameters such as plant height, fresh weight of shoots, tubers per plant, number of leaves and shoots per plant and yield parameter like total tuber yield per hectare.

The maximum plant height (50.83 cm) was recorded at 225 kg/ha N while the minimum (43.16 cm) at 150 kg/ha N. This increase in plant height might be due to the fact that higher nitrogen concentration stimulated the assimilation of carbohydrates and protein, which in turn enhanced cell division and formation of more tissues that resulted in enhanced vegetative growth of the plant. The higher number of leaves per plant (434.83) (Table 2.) was recorded at 225 kg/ha N whiles the minimum (328.75) at 150 kg/ha N. Significantly higher number of leaves per plant was recorded with higher dose of N. This increase may be due to increased uptake of nutrients which resulted in increased synthesis of carbohydrates, which are utilized in building up of new cells. The results are in conformity with the finding of Kushwaha (1989), Hussain *et al.* (1995) and Chaurasia and Singh (1996). The highest number of shoots per plant was recorded by the nitrogen level 225 kg/ha which was an at par with 187 kg/ha . The maximum leaf area index per plant was recorded by

the nitrogen level 225 kg/ha N and lowest leaf area per plant was found in 150 kg/ha N. The significantly higher fresh and dry weight of shoots per plant was recorded with highest N level (225 kg/ha N). The finding of the present investigation indicate the increase in fresh weight of shoots per plant was maximum with the application of 225 kg/ha N than the lower levels resulted to the luxurious growth of the crop in terms of more height, number of leaves and over all higher top growth. The results are in agreement with the finding of Kumar and Singh (1979) and Krishnappa and Shrivashankara (1981).

The fresh weight of tubers per plant increased with the increase in nitrogen level up to 225 kg/ha N. Thus the finding of the present investigation are close to the reports of Roy and Jaiswal (1998) who was found significantly higher fresh weight of tubers per plant with higher N levels up to 240 kg N/ha. The results are almost similar with the results of Patel and Patel (2001). The dry weight of tubers per plant was recorded higher in variety Kufri Pukhraj. The dry weight of tubers progressively increased with an increase in the levels of N 225 kg/ha recorded significantly higher dry weight of tubers per plant which was statistically at par with Kufri Khyati. The highest number of stolons per plant was recorded under 225 kg/ha N. The number of tubers per plant was recorded significantly higher at 225 kg/ha N and 187 kg/ha N were statistically at par. Bhowmik and Dandapat (1991) reported the highest number of tubers per plant with 150 kg N/ha.The highest (292.01 q/ha) yield of total tuber (q/ha) was recorded with the application of 225 kg/ha N which was significantly better than 150 kg/ha N and 187 kg/ha N. Similar results were also reported by Sharma *et al*. (1995) and Bhat *et al.* (2005).

The interaction effects of varieties and nitrogen levels were found non-significant for plant height, number of shoots per plant, leaf area index, fresh and dry weight of shoots and tubers per plant, number of stolons, number of tubers and total tuber yield. While as interaction effect of varieties x nitrogen levels were found significant for number of leaves per plant. Variety Kufri Pukhraj in combination with 225 kg/ha N showed a remarkable increase in number of leaves per plant.

Table 1. Effect of different levels of nitrogen on various traits in potato varieties.

Treatments	Plant height (cm)	Number of shoots per plant	Number of leaves per plant	Leaf area index per plant	Fresh weight of shoots per plant (g)	Dry weight of shoots per plant (g)	Fresh weight of tubers per plant (g)	Dry weight of tubers per plant (g)	Number of stolons per plant	Number of tubers per plant	Total tuber yield (q/ha)
Varieties											
Kufri Pukhraj	49.50	7.50	428.16	24.39	174.33	22.20	356.75	64.83	24.99	12.25	305.21
Kufri Jawahar	43.31	5.83	338.33	15.75	155.66	19.95	328.50	53.50	19.40	9.24	235.88
Kufri Khyati	46.00	7.00	379.25	21.64	168.16	20.83	335.25	60.83	24.85	11.21	268.62
SEM±	**0.96**	**0.38**	**2.28**	**0.29**	**8.89**	**0.65**	**16.78**	**0.68**	**0.57**	**0.44**	**5.75**
CD	**2.80**	**1.11**	**6.66**	**0.85**	**25.94**	**1.91**	**NS**	**1.99**	**1.67**	**1.28**	**16.77**
Nitrogen levels (Kg/ha)											
150 kg/ha	43.16	6.08	328.75	16.01	143.25	18.75	329.16	58.00	21.59	9.80	253.90
187 kg/ha	44.81	6.58	382.16	20.53	149.66	20.79	335.58	59.91	21.91	10.82	263.79
225 kg/ha	50.83	7.66	434.83	25.23	205.25	23.45	355.75	61.25	25.74	12.08	292.01
SEM±	**0.96**	**0.38**	**2.28**	**0.29**	**8.89**	**0.65**	**16.78**	**0.68**	**0.57**	**0.44**	**5.75**
CD	**2.80**	**1.11**	**6.66**	**0.85**	**25.94**	**1.91**	**NS**	**1.99**	**1.67**	**1.28**	**16.77**

CD at 5% level of significance

Table 2. Number of leaves per plant as affected by interaction between varieties and nitrogen levels of potato.

Varieties / **Nitrogen Levels**	**Number of leaves per plant**		
	V1(KufriPukhraj)	**V2(Kufri Jawahar)**	**V3 (Kufri Khyati)**
150 kg/ha	307.50	287.50	311.25
187 kg/ha	422.00	318.75	405.75
225 kg/ha	475.00	408.75	420.75
SEM±	**3.95**		
CD	**11.54**		

CD at 5% level of significance

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