Study thedifferent level of Nitrogen and Phosphorus on growth, yield of Potato Crop (*Solanumtuberosum* L.)"

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Abstract –

Field investigation was carried out to study the effect of different nitrogen and potash levels on growth and yield parameters in potato var. Kufri Badshah. The experiment was laid out in a randomized block design with treatments consisting of ten nitrogen and phosphorus levels replicated four times. present investigation it can be concluded that application of NPK-150:80:50 kg/ ha-^{1} from the overall experimental finding was proved to be most effective to grow parameters like increased plant height, number of leaves, number of shoots per plant fresh weight and dry weight of shoots , yield attributes and yield of potato *viz.*,maximum number of stolens, fresh weight and dry weight of tuber, number of tuber per plant, grade wisenumber of tuber, number of tuber, grade wise yield of tuber and tuber yield per plot . Therefore, application of NPK-150:80:50 kg/ ha-^{1} can be recommended to potato growers of western Uttar Pradesh for higher yield attributes traits.

Introduction

Potato (*Solanumtuberosum* L.) is one of the most important vegetable crop growing inourdiet, belongs to family Solanaceae. Potato produces more food per unit area and time compared to cereals.In India, it was introduced from Europe in early 19th century. It was originated in Peru-Bolivian in the Andes (South America). India is the second largest producer of potato in the world after China, with cultivation in an area of about 2.02 m ha and production of 46 million metric tons2. Potato is grown almost in all the states of India except Kerala. In Chhattisgarh, it is cultivated in an area of about 37,888 ha with a production of 5.5 lakh metric tons3. Uttar Pradesh is the leading state, which produces 13.45 mt of potato from an area of 0.54 mha (Anonymous, 2009). In India, seed tuber play very important role. iron. About 50-60 per cent of cost comes on seed alone (Somani and Chauhan, 2001). It has been identified as a whole some food and richest source of energy.Nitrogen content of tuber was multiplied by factor 6.25 to get the crude protein. Ascorbic acid of potato tuber was estimated colorimetrically using 2-4 dinitro phenyl hydrazine method (Anonymous, 1990).Potato is not only a rich source of carbohydrates and calories but

also furnishes high quality of amino acids, Vitamin B, Vitamin C and minerals. One hundred grams of potato tuber contains 80% moisture, 20% dry matter, 14% starch, 20% sugar, 2% protein, 1% mineral salts, 0.61% fiber and 0.1% fat (Anonymous, 2002). It is used in the preparation of chips, puffs and raw material to produce alcohol.

. Sufficient use of nitrogen fertilizers in early growth season will expand leaf area and increase photo assimilates. Deficiency of nitrogen will decrease tuber yield via affecting the tuber production. Nitrogen is one of the essential elements for plant growth and is one of main components of proteins. When plant is in abnormal conditions like over use of nitrogen fertilizer, protein production will decrease and nitrogen will be stored as non-protein form. In his study, effect of four pure nitrogen levels (0, 50,100 and 150 kg/ha) on three cultivars (Danva, Matilda and Bit) was evaluated and for Bit cultivar, increase in nitrogen raised the tuber yield but Danva and Matilda cultivars produced their highest yield in 100 kg/ha nitrogen. High amounts of nitrogen produced large tubers in that study.

MATERIALS AND METHODS

The present investigation was carried out at the School of Agriculture and Environmental Sciences, Shobhit University Gangoh Saharanpur during the *rabi*season of 2015-16. Gangoh, Saharanpur the place of investigation, is situated in central part of Uttar Pradesh. Saharanpur is situated in the alluvial belt of gang etic plain in West U.P. The experiment was laid out in randomized block design with ten treatments consisting of different levels of nitrogen phosphorus and potash viz., 0 (control), 50,100,150, kg N and 40, 40, 80 kg P_2O_5 and 50 kg K_2O/ha which were replicated four times. Nitrogen phosphorus and potash was applied in the form of Urea, S.S.P. and M.O.P, respectively. Recommended dose of potash i.e. 50 kg/ha of each was applied. The test variety used was Kufri Badshahplanted on ridges of 60 cm apart with a spacing of 20 cm. The soil of experimental field was clayey loam with low level of NPK. Full dose of potash @ 50 kg/ha wasapplied through single super phosphate respectively as basal dose at the time of planting, whereas nitrogen and potash was applied in each plot in split doses as per the treatments. Half dose of the nitrogen and phosphorus of each treatment was applied through urea and SSP as basal dressing and remaining half dose was applied at 30 days after planting. All the three fertilizers used for basal dressing were mixed before application and was applied in the middle of ridges before planting the tubers. Thirty days after planting the remaining dose of

nitrogen and Phosphorus was applied through urea and SSP as top dressing just before earthling up. Earthling up was done at 30 days after planting (DAP). Weeding was done at the time of earthling to remove the weeds. Seven were provided during the entire crop growth period. Although, irrigation was given by flood irrigation method, . All the recommended package and practices were followed to raise a healthy crop. After harvesting the potato, tubers were graded into four groups for each plot in all the replication on the basis of tuber weight as <25g, 25-50g, 51-75g and >75g and weighed separately to record yield.

RESULTS AND DISCUSSION

(A) Growth Parameters

Data presented on growth parameters in Table 1 revealsthat the treatment effect was found to be significantlydifferent for plant height. Increasing trend in case ofplant height was observed with the increase in nitrogen and Phosphoruslevels. At 35, 50 and 65 DAP, similar trend was observedfor plant height with maximum plant height (36.7, 42.72, and45.93 cm, respectively) recordedless than 150 kg N, 80 kg phosphorus, and 50 kg potash /hectare. In general, an increase in nitrogen and phosphorus influencedthe number of leaves per plant. Significantly maximumnumber of leaves was found on application of 150 kg N, 80 kg phosphorus, 50 kg potash / hectare. Maximum number of leaves recorded at 35, 50 and 65 DAP were41.28, 43.87 and 46.89 respectively. Maximum number of shoot per plant, at 35 and50and 65 DAP, significant difference among the treatmentswas found. At 65 DAP, significantly maximum numberof shoot per plant (5.87) was recorded with nitrogen, phosphorus and potash was having at par effect with treatments150 kg N/ha, 80 kg P/ha and 50 kg K. The increase in plant height, number of leaves and shoot with increase in nitrogen phosphorus and potash. Enhancing the fresh weight of shoot with maximum being recorded under 150 kg N/ha 80 kg P/ha and 50 kg K/ha (284.32g). Maximum dry weight of shoot per plant (27.38 g) was noted in thetreatment 150:80:50 NPK/ha.

Table 1. Effect of nitrogen and phosphorus and potash levels on vegetative parameters of potato

NPK Levale	Plant height (cm			Number of leaves per plant			Number of shoot per plant			Freshwt. of shoot (g)	Dry wt of shoot
	35 DAP	50 DAP	65 DAP	35 DAP	50 DAP	65 DAP	35 DAP	50 DAP	65 DAP		

											(g
NPK@0:0:50	22.8	26.75	30.38	31.21	35.23	38.42	3.19	3.63	4.15	142.75	10.02
NPK@50:0:50	30.7	35.29	39.41	36.84	40.45	43.69	3.57	4.02	4.46	174.86	14.83
NPK@100:0:50	31.2	36.16	40.32	37.54	41.25	42.43	3.87	4.53	4.83	175.10	15.12
NPK@150:0:50	32.1	36.34	41.23	38.21	41.96	43.15	4.11	4.71	4.95	186.21	20.26
NPK@0:40:50	26.4	31.84	36.21	35.28	38.47	40.30	3.58	3.25	3.84	188.32	18.02
NPK@0:40:50	27.1	32.52	37.87	36.94	39.41	41.02	3.80	4.21	3.89	195.12	19.35
NPK@0:80:50	29.5	33.45	37.98	38.24	40.64	42.98	3.98	4.31	4.61	199.25	20.54
NPK@50:40:50	34.4	38.21	43.58	39.87	41.96	43.69	4.12	4.58	4.88	221.88	21.25
NPK@100:40:50	35.6	41.27	44.73	40.37	42.54	45.25	4.22	4.58	5.04	265.99	22.87
NPK@150:80:50	36.7	42.72	45.93	41.28	43.87	46.89	4.98	5.11	5.87	284.32	27.38

(B) Yield and Yield Attributing Parameters

On the perusal of yield attributing data presented in is evident that the maximum number of stolon per plant (15.23) was recorded under the treatment 150:80:50 kg NPK/ha. The minimum number of stolon per plant (10.87) was counted in the treatment 0 kg N/ha, 0 kg P and 50 kg potash. At harvest, fresh weight of tuber per plant ranged from minimum of 175 g to maximum of 284 g. The maximum dry weight of tuber per plant (19.23 g) was noted on application of 150:80:50 kg NPK/ha. The highest number of tuber per plant (7) was recorded with 150:80: kg NPK/ha which was having statistically equal effect with rest of the treatments but significantly superior over control. The observed tuber number increase in response to NPK fertilization could be attributed to an increase in stolon findings. The highest number of tuber per plot30,53,66,95 g tuber was obtained under150:80:50 kg NPK/ha followed by 100 kg N/ha, 40 kg P/ha, 50 kg K/ha and, all significantly superior to control. that highest tuber yield per plot (0.39 kg and3.63 kg) in the grade 0-25 g and 25-50g was obtained under 150:80:50 kg NPK/ha, whereas in case of 50-75 g and >75 g grade tuber, the highest yield per plot (6.85 kg and 10.24 kg, respectively) was obtained under 150:80:50 kg NPK/ha which had at par effect with all the other treatments, but significantly superior over control.

Table . Effect of nitrogen and phosphorus levels on yield parameters of potato

NPK Levale	Grade-wise number of tuber per plot				Tuber yield (kg/plot)			Tuber yield (q/ha)		
	0-25g	25-50 g	50-75g	>75g	M*	U*	Total	M*	U*	Total
NPK@0:0:50	0.24	2.82	4.01	5.37	14.18	.65	14.83	142.32	9.24	151.56
NPK@50:0:50	0.29	3.28	5.12	7.25	17.25	.68	17.96	184.26	8.26	192.52
NPK@100:0:50	0.30	3.31	5.12	8.41	17.52	.71	18.23	189.45	8.14	197.59
NPK@150:0:50	0.33	3.45	5.70	8.27	18.34	.51	18.85	199.38	5.25	204.63
NPK@0:40:50	0.30	3.21	5.68	8.67	17.25	.55	17.80	195.38	5.87	201.25
NPK@0:40:50	0.31	3.22	5.32	8.87	18.64	.53	19.17	198.37	4.12	202.49
NPK@0:80:50	0.33	3.34	5.89	9.28	18.84	.35	19.19	201.54	4.01	205.55
NPK@50:40:50	0.33	3.35	5.93	9.87	19.54	.27	19.81	211.87	4.21	216.08
NPK@100:40:50	0.38	3.58	6.24	9.98	20.14	.22	20.36	215.47	3.15	218.62
NPK@150:80:50	0.39	3.63	6.85	10.24	20.86	.19	21.05	218.78	2.28	221.06

The highest yield of marketable tuber (20.86 kg/plot) was recorded on the application of 150, 80, 50 kg NPK/ha whereas, Highest unmarketable yield of tuber (.65 kg/plot) was recorded with 0, 0, 50 kg NPK/ha which was observed to have at par effect with 150, 80, 50 kg NPK/ha. The highest total tuber yield (21.05 kg/plot) was recorded in 150, 80, 50 kg NPK/ha. However, no significant difference was observed between the treatments 150, 80, 50 kg NPK/ha and other treatments viz., 100, 40, 50 kg NPK/ha for this attribute. The highest yield of marketable tuber (218.78 q/ha) as Well as total tuber yield (221.06 q/ha) was recorded under 150, 80, 50 kg NPK/ha. The highest unmarketable tuber yield was recorded with the lowest nitrogen level 0,0,50 kg NPK/ha,. A decrease in unmarketable yield was observed with higher levels of NPK. Higher yield obtained with application of higher dose of NPK would have helped in increase in Tuberization as well as increased duration of tuber bulking which would have resulted in higher production.

4. Conclusion

It can be inferred from the present findings that, optimum NPK application is essential to improve potato tuber yield. Although with the increase in NPK levels, vegetative parameters of crop growth increasedwith maximum values achieved on application of 100, 40, 50 kg NPK/ha but application of 150, 80, 50 kg NPK/ha proved to be superior for obtaining higher yield and yield attributing characters. Thus, application of optimum dose of 150, 80 and 50 kg NPK/ha was observed to be superior in terms of yield, as well as more profitable and can, therefore, be economically recommended for cultivation of potato variety Kufri Badshah under Uttar Pradesh plains agro-climatic zone.

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