



PERFORMANCE OF POTATO cv. KUFRI ASOKA AS INFLUNCED BY GRADED LEVELS OF N, P AND K

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Abstract

An investigation was carried out in AICRP on potato during *rabi* season of 2014-15 to study the response of different doses of plant nutrient *viz.*, NPK under eastern coastal plain agro climatic condition with an objective to study on growth, yield and yield attributing characters. In this investigation, higher dose of fertiliser (150% RDF) recorded Highest yield *i.e.* 22.52t ha⁻¹ along with the number of tubers per plant (5.99), average tuber weight (39.87g), plant height (50.31 cm), number of compound leaves per plant (95.35), leaf area (91.65 cm²) compared to RDF (N₁₅₀ P₈₀ K₁₀₀). But under the treatment RDF, which recorded a yield of 22.26 t ha⁻¹ produced the highest B:C ratio (2.02) during *rabi* season under coastal agro climatic condition of Odisha.

Key words : RDF, N, P, K, yield, economics.

Introduction

Potato is third important food crop after rice and wheat because of its great yield potential and high nutritive value (Kumar *et al.*, 2012). It is considered as ‘food of future’ considering it as a major food contributing towards poverty eradication as well as to food security. It can meet vegetable demand as well as provide necessary nutrients for the people of the low income group (Islam *et al.*, 2013). The average yield of Odisha (11.07 t ha⁻¹) is much below the potential productivity. The main reasons of such low yield of potato in India especially in Odisha are due to use of poor quality planting materials, application of improper doses of fertilizers and manures and use of traditional method of cultivation. Among the above stated reason non judicious application of fertilizers is considered as one of the main factor for the poor yield of potato. NPK fertilizers improve yield and quality of potato tubers and response of potato to NPK fertilisers varies depending upon the variety, soil characteristics and geographical condition (Naz *et al.*, 2011). Yield can be increased upto 50%, if due attention is paid to proper nutrient management.

Materials and Methods

The experiment was carried out at AICRP on potato, Orissa University of Agriculture & Technology, (OUAT),

Bhubaneswar (Odisha), India during *rabi* season of the year 2014-15. It comes under eastern coastal plain and is termed as sub-humid characterized by warm moist climate with mild winter. The soil of the site was sandy in texture and slightly acidic (pH 6.03), being high in organic carbon (0.41%), low in available nitrogen (120kg/ha) high in available phosphorous (63.67 kg/ha) and low in available potassium (133.67 kg/ha) potassium. The experiment was laid out in Randomised Block Design (RBD) with four replications and seven treatments *viz.* T₁ 50% RDF of NPK, T₂ 100% RDF of NPK, T₃ 150% RDF of NPK, T₄ without N fertiliser(recommended P and K), T₅ without P fertilisers (recommended N and K), T₆ without K fertiliser (recommended N and P), T₇ without NPK fertiliser (absolute control). Certified seeds of potato variety “Kufri Ashoka” collected from All India Coordinated research Project on Potato, OUAT, Bhubaneswar and used as planting material. An uniform doses of FYM@10 t/ha was applied to all the treatments and seed tubers were treated with 3% boric acid and panted at a distance of 60 X 20 cm. Nitrogen, phosphorous and potassium were applied in the form of urea, DAP and MOP.

During the crop growth period regular and normal intercultural operations and insect pest and disease control measures were also carried out as per requirement to

maintain healthy crop. The potato crop was harvested at 84 days of planting and yield was recorded. Observations were recorded on growth parameters like plant stand, plant height, number of shoots per plant, number of compound leaves per plant, leaf length, leaf breadth, leaf area, compound leaf length, fresh weight of compound leaf, yield attributes like fresh weight of haulm per plant, fresh weight of haulm per plot, fresh weight of tuber per plant, number of tubers per plant, number of tubers per plot, average weight of tubers, weight of tuber per plant, number of tubers per hectare and yield of tubers and finally the B:C ratio calculated.

Results and Discussion

The data presented in table 1 revealed that there was no significant effect of different doses of fertilizers reflected on plant stand. Highest plant stands of 98.33% was recorded in control as compared to other chemical fertilizer application. It was found that different doses of chemical fertilizers did not produce significant changes in plant stand. However, in control the increase in plant stand may be due to no effect of chemical fertilizers directly on the sprouted tubers. This finding corroborates with the findings of Kumar *et al.* (2013), Barman *et al.* (2014).

The highest plant height 50.31 cm were recorded on 60th days after planting showing. The highest plant heights revealed that application of higher doses of fertilizers have significant impact on potato for increase in plant height. This finding is in accordance with the findings of Kumar *et al.* (2013), Baishya *et al.* (2013), Barman *et al.* (2014).

Obersevations (table 1) critically explained that highest number of shoots per plant (4.65) was recorded in T₁ and the lowest number of shoots (3.30) was recorded in control. In potato application of varied doses of chemical fertilizers did not produced significant changes in number of shoots per plant. This type of findings was also reported by Singh and Gupta (2005) and Kumar *et al.* (2008).

The number of compound leaves increases the total canopy area, solar harvesting, photosynthesis and overall growth and yield of plant observed during the experiment. The number of compound leaves were highest with T₃ (86.30) due to effect of higher doses of fertilizers. The present findings were in accordance with the findings of Singh and Gupta (2005), Kumar *et al.* (2013), Barman *et al.* (2014). The maximum average petiole length (2.22 cm), maximum length of standard compound leaf (9.32cm) and the highest leaf area of compound leaf (91.65 cm²) was observed in T₃ with application of highest

doses of NPK (225:120:150). The relative performance of above characters as noted from the table number1 indicates that nutrition plays an important role in deciding the growth of above morphological characters in potato. Increase in characters like leaf area, length of leaves and petiole length in a compound leaf were found to be interrelated deciding the better performance of potato. This type of findings was observed and explained Kumar *et al.* (2013) and Baishya *et al.* (2013).

Leaves are the major sight of photosynthesis and act as a 'source' for the 'sink' and influence the weight of haulm in potato. A significant difference in fresh weight of haulm per plant (107.03g) was noticed in T₃ and was maximum among the treatments whereas in control lowest fresh weight of haulm per plant (46.42g). Present finding is in accordance with the findings of Zamil *et al.* (2010) and Chandrakar *et al.* (2013) in potato. Similarly, the highest yield of haulm per hectare (10.08 t ha⁻¹) was recorded with T₃ (150% NPK i.e. 225:120:150) and surprisingly without any nutrition the response was very poor where 4.56 tons per hectare was recorded and this finding is in conformity with the research findings of Zamil *et al.* (2010) and Chandrakar *et al.* (2013) in potato.

Potato a quick bulking and nutrient responsive crop greatly depends upon the climate, soil management and selection of variety suited to a particular condition for commercial cultivation in a profitable manner where number of tubers per plant and weight of tuber per plant play a deciding role for increasing the productivity. The number of tubers produced per plant (5.99) and weight of tuber per plant (238.82g) were recorded highest under T₃ (225:120:150). There existed significant differences among the treatments with control revealing that essential nutrient at different graded doses regulate the number of potato tuber and weight of tuber per plant which is in conformity with the earlier finding of Baishya *et al.* (2010), Kumar *et al.* (2013).

Potato responded well to higher nutrient (T₃) and produced the highest yield of 22.52 t ha⁻¹ with B:C ratio of 1.95. However, with RDF in T₂, the yield was quite good (22.26 t ha⁻¹) and produced the highest B:C raito (2.02) as compared to control in which the B:C ratio was 1.51. It indicates that increase doses of nutrients even though produce higher yield but was not so economical as compared with RDF. The present findings also agree with the economics of potato cultivation as reported by Baishya *et al.* (2010), Singh *et al.* (2014), Narayan *et al.* (2014), Yadav *et al.* (2014).

Conclusion

Table 1 : Effect of NPK on growth attributes.

Treatment	Plant stand % at 30 DAP	Plant height (cm) at 60 DAP	No. of shoots/plant	No. of compound leaves per plant at 60 DAP	Compound leaf area (cm ²)	Compound leaf length (cm)	Compound leaf petiole length (cm)
T ₁	97.71	39.41	4.65	69.65	64.74	6.72	1.56
T ₂	96.87	43.27	3.85	89.55	82.66	8.93	2.04
T ₃	94.37	50.31	4.30	95.35	91.65	9.32	2.22
T ₄	97.92	27.50	3.75	52.20	48.40	6.51	1.49
T ₅	96.45	42.86	4.20	82.80	77.65	8.16	2.04
T ₆	97.92	42.25	3.80	82.80	68.67	7.56	1.80
T ₇	98.33	25.03	3.30	50.00	44.79	6.48	1.40
S. Em. ±	1.43	1.92	0.46	6.73	3.05	0.27	0.08
CD(0.05)	—	5.71	—	19.93	9.07	0.81	0.23

Table 2 : Effect of NPK on yield attributes, yield and economics.

Treatments	Fresh weight of haulm per plant(g)	Fresh yield of haulm(t)/ha	No. of tubers/plant	Weight of tubers/plant (g/plant)	Average tuber weight (g/tuber)	Total tuber yield (t) per ha	B : C Ratio
T ₁	69.85	6.81	5.27	189.51	35.96	18.50	1.75
T ₂	94.54	9.14	5.62	229.63	40.86	22.26	2.02
T ₃	107.03	10.08	5.99	238.82	39.87	22.52	1.95
T ₄	66.31	6.50	4.83	161.03	33.34	15.78	1.46
T ₅	89.26	8.60	5.44	208.52	38.33	20.13	1.90
T ₆	81.58	7.98	5.12	196.92	38.46	19.29	1.80
T ₇	46.42	4.56	4.65	154.05	33.13	15.15	1.51
S. Em. ±	3.72	0.27	0.19	6.25	1.23	0.59	
CD(0.05)	11.05	0.81	0.55	18.56	3.65	1.75	

From the above experiment, it was concluded that the variety Kufri Ashoka can be suitably grown under Odisha agro-climatic condition with a recommended dose of fertilizers (N₁₅₀:P₈₀:K₁₀₀) with other cultural practices. The variety produced a yield of 22.26 t ha⁻¹ with a B:C ratio of 2.02. However, increasing fertilizer doses though produced a higher yield (22.52 t ha⁻¹) but was not found economical. So, a fertilizer dose of 150:80:100 kg NP₂O₅ and K₂O per hectare along with FYM @ 10 t ha⁻¹ and a spacing of 60 × 20 cm is recommended to produce a profitable potato crop in coastal agro-climatic condition.

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