DOI: 10.54083/ResBio/4.2.2022/55-57

Res. Bio., 2022, 4(2):55-57

Research Biotica

e-ISSN: 2582-6743

June, 2022

Article ID: RB109

Short Communication

Site Specific NPK Requirements of Potato

Pranabjyoti Sarma*, Athikho Kayia Alice, Tasso Yatung and B.N. Hazarika

College of Horticulture and Forestry, CAU, Pasighat, Arunachal Pradesh (791 102), India

Corresponding Author

Pranabjyoti Sarma

✉: pranabhort@rediffmail.com

Conflict of interests: The author has declared that no conflict of interest exists.

How to cite this article?

Sarma *et al*., 2022. Site Specific NPK Requirements of Potato. *Research Biotica* 4(2): 55-57.

Abstract

The field experiments were conducted during the two successive winter seasons of 2018-19 and 2019-20 at the Vegetable Research Farm under the AICRP on Potato, Department of Vegetable Science, College of Horticulture and Forestry, CAU, Pasighat, Arunachal Pradesh to develop site specific NPK requirements of potato variety Kufri Jyoti on growth and yield attributes. The experiments included seven different treatments of Nitrogen, Phosphorous and Potassium percentage and were evaluated in Randomized Block Design with three replications. Results showed that among the all the treatments maximum plant height was recorded in T_3 (150% RDF of NPK), maximum number of shoots per plant was observed in T_2 (50% RDF of NPK) and highest tuber yield was recorded (18.15 t ha^{-1}) in 150% RDF. Therefore, it was indicated that in both the years, the yield of potato greatly depend on the dose of fertilizers *i.e.*, NPK application which influenced progressively in terms of producing highest tuber yield and net returns of the crop.

Keywords: De-haulming, Growth, NPK, Potato

Introduction

Potato (*Solanum tuberosum* L.) belongs to Solanaceae family, commonly known as the "King of Vegetables" is an important and striking crop in agricultural production system due to its high yielding potential with high nutritive value which helps in solving food and nutritional security problems of India's rapidly growing populations (Koch *et al.*, 2020). Potato is one of the most productive vegetables in the world and is an important source of nutrition and income for many people and communities. Potato has good nutritional value due to its dry matter content, eatable energy and eatable protein. It is a multipurpose high-carb food and has 20% dry matter content and an average water content of 80% when it is freshly harvested. In the North-East plains of India potato is the fourth most important food crop after rice, wheat and maize (Tiwari *et al*., 2017). In many parts of the world potato is considered as an important staple food since it is a rich of carbohydrates beside that it is a good source of proteins, vitamins, minerals and fats (Drewnowski and Rehm, 2013; King and Slavin, 2013). Unlike other crops, the usage possibilities of potatoes are unusually high which makes their production more eye-catching (Koch *et al.*, 2020). Productivity of potato is low due to poor agronomic practices like use of low-quality seed tubers, poor pest management practices, improper fertilization and depletion of soil nutrients (Fuglie, 2007; Chanie *et al.*, 2017). Potato is a heavy feeder and highly input intensive crop, due to its high requirement of NPK and other nutrients fertilization with inorganic sources of nutrients plays a vital role for increasing its production and economic return (Chatterjee *et al*., 2010; Tiwari *et al.,* 2017). Therefore, the present study was initiated to identify the optimum requirement of NPK fertilizer for economical production of potato in Arunachal Pradesh.

Materials and Methods

The experiment was carried out during the *rabi* seasons in 2018-19 and 2019-20 at Vegetable Research Farm, Department of Vegetable Science, College of Horticulture and Forestry, Central Agricultural University, Pasighat, Arunachal Pradesh having an altitude of 153 m above mean sea level, latitude of 28°04' N and longitude of 95°22' E. The soil of the experimental field was sandy loam with pH 5.6 and organic carbon 2.1%. The experiment was laid out in Randomized Block Design having three replications with a plot size was 3.6 m × 3.6 m. The tubers of potato variety

Article History

RECEIVED on 15th March 2022 RECEIVED in revised form 26th May 2022 ACCEPTED in final form 28th May 2022

'*Kufri Jyoti*' having average crop duration of 90 days were planted in first week of November and harvested in last week of February the next year. Fertilizer dose of N:P:K @ 150:120:100 (kg ha^{-1}) was applied. At the time of planting half dose of nitrogen and full doses of phosphorus and potassium were applied as basal dressing through urea, single supper phosphate and muriate of potash, respectively. The remaining half dose of N was applied at earthing up. The tubers were planted at a spacing of 20 cm apart in the furrows of 60 cm distance and covered immediately after planting. The earthing up was done along with weeding at 30 days after planting to facilitate the development of tubers with the help of spade. Haulm cutting of the potato plants were done 10 days before harvesting. The treatments consisting of different levels of RDF were applied to potato as per treatments; the details of the treatments are given in Table 1.

Table 1: Treatment details

Treatments		Kg ha^{-1}
T_1	:	50% RDF of NPK
T_2	:	100% RDF of NPK
T_3	:	150% RDF of NPK
T_4	:	Without N fertilizer (PK)
T_5	:	Without P (NK)
T_6	:	Without K (NP)
T_7	:	Without NPK (Absolute control)

The data for vegetative (emergence of tubers, plant height, No. of shoots plant^{-1}) and yield (weight of tubers) parameters were recorded as follows,

Plant emergence (%) at 30 days after planting:

Plant emergence (%) =(Total number of tubers germinated/ Total number of tubers planted)×100

Plant height (cm): The maximum plant height was measured from the ground to the tip of longest leaf documented at 45 days after planting. The mean of five plants in each treatment was worked out.

Number of shoots plant^{-1}: The number of shoots per plant was recorded at 45 days after planting. The mean of the five plants in a treatment was worked out.

Yield (t ha^{-1}): The final yield were recorded per plot and transformed into tonnes per hectare.

Tuber Dry matter (%): Tubers were dried at 70 °C in oven to constant weight (for about 70 hrs) and then dry matter (%) was determined.

Results and Discussion

The pooled data of consecutive two years (Table 2) has shown that the emergence percentage of tubers were unaffected by varied level of nutrients, maximum plant height was recorded in T_3 (150% RDF of NPK) with 38.79 cm, this increase in plant height might be due to increase in availability and uptake of nutrients especially nitrogen, phosphorus and potassium (Ramana *et al*., 2010; Patel *et al.,* 2007; Tiwari *et al*., 2017). However, maximum number of shoots plant^{-1} was observed in T_2 (50% RDF of NPK). The tuber yield of *Kufri Jyoti* was significantly influenced by the nutrient levels, highest tuber yield was recorded (18.15 t ha^{-1}) in 150% RDF and the lowest yield (12.31 t ha^{-1}) was recorded in T_7 (without NPK i.e., Absolute control). The dry matter (%) ranged from 20.81% to 25.06%. Maximum dry matter % was observed in T_1 (50% RDF of NPK). Most of the treatments showed higher accumulation of dry matter % compared to control which may be due to higher nutrient availability resulting in better growth and development of the plant (Gangwar and Dubey, 2012; Kumhar *et al.*, 2012). The yield on tuber dry weight basis (kg ha^{-1}) was found maximum in T_5 (524.24 kg ha^{-1}) while the minimum yield on tuber dry weight basis was recorded in T_4 *i.e.*, without N fertilizer (3,960.75 kg ha^{-1}) which may be due to the lack of N as Nitrogen (N) is one of the most crucial macronutrients for plant growth and biomass development (Koch *et al.*, 2020) thereby reducing the rate of photosynthesis of the plants (Tulung *et al.*, 2021) resulting in a decrease of yield on tuber dry weight basis.

Table 2: Effect of nutrients on plant emergence (%), morphological traits, total tuber yield (t ha^{-1}), dry matter content (%) and tuber yield on dry weight basis (kg ha^{-1})

Treatment	Plant Emergence (%)	Plant height (cm)	No. of shoots plant^{-1}	Total yield of tubers (t ha^{-1})	Dry matter content (%)	Yield on Tuber on dry weight basis (kg ha^{-1})
T_1	85.78	36.08	4.84	15.41	25.06	5049.77
T_2	83.96	36.67	5.43	15.43	20.81	4555.17
T_3	83.16	38.79	3.81	18.15	22.54	5430.31
T_4	85.95	31.82	4.82	13.73	24.52	3960.75
T_5	84.76	34.79	5.26	17.99	24.06	5524.24
T_6	80.81	34.58	5.08	16.50	22.89	4558.77
T_7	84.34	32.37	4.06	12.31	21.49	3484.41
SEd	1.59	0.71	0.14	0.44	0.32	173.58
CD (0.05)	3.34	1.51	0.29	0.92	0.68	367.50

Conclusion

Based upon the results of two-year field trials, it may be concluded that the yield of potato greatly depend on the amount of NPK application. Beside other additional agronomic strategies like irrigation, earthning up, weeding, disease and insect pest control, adequate supply of nutrients to the plants play a vital role for getting desired potato yield. Based on this basic knowledge, a potato grower may decide the specific selection of potato varieties, time of planting and quantity of fertilizers to be applied for getting good yield.

References

Chanie, Y., Teshome, A., Temesgen, Y., Berihun, B., 2017. Characterization of potato production, marketing and utilization in North Western Amhara Region, Ethiopia. *Journal of Horticulture and Forestry* 9(3), 17-25. DOI: 10.5897/JHF2015.0406.

Chatterjee, D., Srivastava, A., Singh, R.K., 2010. Fertilizer recommendation based on targeted yield concept involving INM for potato in tarai belt of Uttarakhand. *Indian Journal of Agricultural Sciences* 80(12), 1048-53.

Drewnowski, A., Rehm, C.D., 2013. Vegetable cost metrics show that potatoes and beans provide most nutrients per penny. *PLoS One* 8, e63277. DOI: 10.1371/journal.pone.0063277.

Fuglie, K.O., 2007. Priorities for potato research in developing countries: Results of a survey. *American Journal of Potato Research* 84, 353-365. DOI: 10.1007/BF02987182.

Gangwar, S., Dubey, M., 2012. Effect on N and P uptake by chickpea (*Cicer arietinum* L.) as influenced by micronutrients and biofertilizers. *Legume Research* 35(2), 164-168.

King, J.C., Slavin, J.L., 2013. White potatoes, human health, and dietary guidance. *Advances in Nutrition* 4, 393S-401S. DOI: 10.3945/an.112.003525.

Koch, M., Nauman, M., Pawelzik, E., Gransee, A., Thiel, H., 2020. The Importance of Nutrient Management for Potato Production Part I: Plant Nutrition and Yield. *Potato Research* 63, 97-119. DOI: 10.1007/s11540-019-09431-2.

Kumhar, M.K., Patel, I.C., Ali, S., 2012. Integrated nutrient management in cluster bean (*Cyamopsis tetragonoloba* L. Taubert). *Legume Research* 35(4), 350-353.

Patel, D., Arvadia, M.K., Patel, A.J., 2007. Effect of integrated nutrient management on growth, yield and nutrient uptake by chickpea on vertisols of South Gujarat. *Journal of Food Legumes* 20(1), 113-114.

Ramana, V., Ramakrishna, M., Purushotham, K., Reddy, K.B., 2010. Effect of bio-fertilizers on growth, yield attributes and yield of French bean (*Phaseolus vulgaris* L.). *Legume Research* 33(3), 178-183.

Tiwari, N.K., Kumar, N., Ahamad, A., 2017. Effect of integrated nutrient management on tuber yield and soil properties of potato (*Solanum tuberosum* L.). *Bull. Env. Pharmacol. Life Sci.* 6(3), 237-244.

Tulung, L.E.A., Amin, M., Manoppo, C.N., 2021. Response of growth and production of potato plants to application of NPK fertilizer. *E3S Web of Conferences* 306, 01018. DOI: 10.1051/e3sconf/202130601018.