



Research Article

EFFECT OF NITROGEN AND POTASSIUM ON GROWTH AND YIELD OF RADISH (*RAPHANUS SATIVUS* L.) IN AGRO-CLIMATIC CONDITION OF TRIPURA

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Abstract- A field experiment was conducted on sandy loam soil to study the effect of nitrogen and potassium on growth and yield of radish. Different doses of nitrogen showed significant variation in respect of all the parameters studied except for dry matter content of leaf. Potassium and interaction of N and K failed to significantly increase the number of leaves, and dry matter content with an exception of N and K interaction on LAI. Application of potassium significantly influence their attributes while the influence of N and their interaction failed to reach the level of significance except for fresh weight. High N levels (150 kg) topped the list followed by 100 kg N (21.46). Minimum yield (18.71) was recorded in control. In general, N₃ (150kg/ha) and K₃ (75 kg/ha) proved to be promising than all other treatments.

Keywords- LAI, Agro-climatic condition

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Introduction

Radish (*Raphanus sativus* L.) is one of the important root vegetables, belongs to brassicaceae family, which is grown in tropical and temperate region. It is most frequently consumed root vegetables in different part of India because root and leaves are rich source of carbohydrate, Vitamin A, vitamin C and minerals. The crop generally requires cool weather and abundant sunshine for best growth and development. The optimum temperature for growth and root development is 10-15°C. Moreover, the plant grows best when provided with uniform moisture and well-drained soil [1]. Its roots can be eaten raw as salad or cooked as a vegetable. It is recommended to the patients suffering from piles, liver trouble, enlarged spleen and jaundice. Radish being a quick growing crop required proper fertilization for sustaining better economic productivity. Fertilization has an immense bearing on production of the crop and NPK are considered important for maximizing the production of radish [2]. A fertilizer schedule based on location specific field experiment will be more meaningful for recommendations to the growers of these areas, in order to increase the production of radish. Therefore, a need was felt to study the effect of various levels of N & K on growth & yield of radish & there by formulate a fertilizer schedule under the prevailing agro-climatic conditions of Tripura.

Materials and Methods

This study was carried out at ICAR Research Complex for NEH Region, Lembucherra, Tripura, during 2014-15. The experimental field was located at 25°53'N latitude to 91°55'E longitude at an elevation of 16.2 m above mean sea level. The soil was sandy-loam in texture, well drained with 5.0 pH, organic carbon 1.05 % and available NPK 24.67 kg/ha, 4.52 kg/ha, 28.0 kg/ha, respectively. The seeds of cv, Pusa Chetki were sown on 10th October, 2014 at a spacing of 30x10 cm in a plot size of 1.5 x 3 m² area. The seeds are sown at ridges of 25 cm above the soil surface. The experiment was laid out in factorial randomized block design with 3 replication and 4 levels each of N (0, 50, 100, 150 kg/ha) and K (0, 25, 50 & 75 kg/ha). Urea and muriate of potash were used as a source of nitrogen and potassium.

Full dose of K₂O and half of N along with a constant dose of P₂O₅ in the form of SSP was applied at the time of sowing while the remaining half dose of N was applied 30 days after sowing (DAS). The crop was harvested when most of the leaves turned and after attaining full size root. The experimental plot was regularly observed & ten plants were randomly selected from each plot for taking observations. The data on vegetative growth & yield were recorded at the time of harvesting & analyzed statistically.

Result and Discussion

Plant Height

Significant variation in the plant height was found due to different nitrogen levels applied. The minimum plant height (48.63 cm) was found at control (0 kg N/ha) while the maximum plant height (57.34 cm) was noticed at the highest dose of nitrogen (150 kg/ha). Plant height showed a general trend of increase with the increasing levels of nitrogen. The tallest plants at the highest dose of nitrogen were obtained due to the fact that plant received more nutrients (nitrogen) which might have encouraged more vegetative growth. The results in respect of plant height showed in accordance with those of Bhople *et al.* (1998) who reported significant increase in plant height due to increasing rate of nitrogen [3]. Jadhao *et al.* (1999) conducted an experiment on radish (cv. pusa chetki) plants with combination of 2 rates of N (50 and 100 kg/ha), P (25 and 50 kg/ha) & K (0 and 25 kg/ha) in Akola, Maharashtra, India, during the *rabi* season and found that, the highest plant height was obtained from 100 kg N/ha + 50 kg P/ha + 25 kg K/ha followed by 100 kg N/ha + 50 kg P/ha + 0 kg K/ha.

Number of leaves

Number of leaves per plant was significantly influenced by various level of N, while potash and their interaction did not have any effect on the number of leaves/plant. N, treatment (50 kg N/ha) was found to be more promising than higher levels of N. These findings are in agreement with the observation made by Ndang and Sema (1999) [4].

Table-1 Effect of different levels of nitrogen & potassium on various growth & yield parameters in Radish

Treatments	Total plant height after harvesting (cm)	No. of leaves	Leaf length (cm)	Root length (cm)	Fresh weight of Root (g)	Root yield / plant (g)	Dry matter content%	Leaf area index
Nitrogen	48.63	14.32	19.73	23.16	125.87	18.71	7.85	8.5
N ₀	51.05	15.9	25.2	24.32	139.2	20.75	5.15	10.6
N ₁	54.01	15.69	27.9	24.52	137.45	21.46	7.82	10.61
N ₂	57.34	15.12	31.1	24.89	139.41	21.85	7.98	9.25
N ₃	-	0.68	-	0.76	4.89	1.98	0.35	0.59
SE $\pm$	1.21	1.34	N. S	N. S	9.57	N. S	N. S	1.12
LSD (P=0.05)								
Potassium								
K ₀	49.74	14.85	19.89	22.81	116.98	17.56	8.1	9.88
K ₁	51.41	15.3	25.98	23.62	132.88	19.68	7.76	9.41
K ₂	53.41	15.61	27.49	24.43	138.14	21.84	7.52	9.36
K ₃	56.46	15.32	32.1	25.59	152.2	22.69	8.25	10.11
SE $\pm$	-	0.69	-	0.75	4.98	1.98	8.35	0.57
LSD (P=0.05)	1.21	N. S	N. S	N. S	9.58	3.87	N. S	N. S
Interactions (N x K) SE $\pm$								
LSD (P=0.05)	1.1	1.25	-	1.48	9.79	3.92	0.69	1.14
	N. S	N. S	N. S	N. S	19.17	N. S	N. S	2.24

Leaf length

The data regarding leaf length differ non-significantly for N & K respectively. Minimum leaf length (19.73 cm) was noted in control. Similar results have been reported by Kakar *et al.* (2002) who noted significant effect of nitrogen upto a certain extent, on leaf length and number of leaves in garlic.

Root length

The data showed a non-significant difference in root length due to nitrogen & K doses. However, comparatively longer roots *i.e.*, 24.89 cm was recorded in N₃ (100 kg N/ha) and K₃ treatments (50 kg K/ha) respectively while the minimum root length (23.16 cm and 22.81 cm) were noted in N₀ & K₀ treatment control. Pervez *et al.* (2004) reported maximum root length in radish when 200 kg N per hectare was applied. Root length was not significantly influenced by N, K & their interactions.

Fresh weight of root

Fresh weight of root was significantly influenced by N, K and their interaction with N₃ & K₃ recorded the maximum fresh weight of root; while minimum fresh weight of root was recorded in control. Marked increase in root weight of radish was also recorded by Bagchi (1982) [5]. The positive response of nitrogen application to radish is also recorded by Guvenc (2002) and Liao *et al.* (2009) [6,7]. The higher root weight in radish might be result of on time, balanced nutrition of the crop, use of recommended cultural practices including proper plant spacing & sowing time which produced healthy, vigorous plants.

Root yield

High N and K doses excelled in root yield with a non-significant difference among themselves. High N level (150 kg) topped the list followed by 100 kg N (21.46). Minimum yield (18.71) was recorded in control. Higher marketable root yield was also obtained with higher nitrogen levels by Sounda *et al.* (1998). Similar results have also been reported by Ali *et al.* (2006). However, in case of K, the highest yield was recorded in K₃ (75 kg/ha) treatment. Park and Fritz (1983) found that with rising level of N there was a slight increase in the yield of radish cv. Rex [8]. The increase in root yield with N application might be due to the accelerated synthesis of protein and enzymes [9]. Mishra (1987) conducted an experiment with 3 levels of N, P & K each at 0, 40, 80 kg/ha on growth. Seed yield & quality of radish in India and reported that N did not show any significant effect in increasing the height and number of the main branches and of 100 seed weight, P increased plant height significantly. He also reported that the seed yield increased & the increase in the dose of N & P, but K beyond 40 kg/ha did not show any significant effect. Bhole *et al.* (1998) conducted experiment of the Nitrogen and Phosphorus on growth and yield of radish (cv pusa chetki) at Akola and found that application of 100 kg N/ha produced the highest root yield. Singh *et al.* (1995) observed the effect of N (0, 50 & 100 kg/ha) and P (0, 40 & 80 kg/ha) in the growth & yield of radish in Nagaland. Increasing concentration of N & P significantly increased leaf

length, size, fresh weight, dry weight & increased the yield. N uptake significantly while K uptake decreased at higher N rates. Application of P significantly increased the uptake of P & K, no influence on N uptake was observed. Dry matter content Jadhaio *et al.* (1999) conducted an experiment on radish (cv. pusa chetki) plants with combination of 2 rates of N (50 and 100 kg/ha), P (25 and 50 kg/ha) & K (0 and 25 kg/ha) in Akola, Maharashtra, India, during the *rabi* season and found that, the highest root yield per hectare (256.13 q) was obtained from 100 kg N/ha + 50 kg P/ha + 25 kg K/ha followed by 100 kg N/ha + 50 kg P/ha + 0 kg K/ha. Dry matter accumulation was not significantly influenced by N, K and their interaction. However, maximum dry matter accumulation was noted with the N₃ and K₃ treatment. Enhanced dry matter accumulation might be ascribed to better vegetative growth of the plant.

Leaf area index

Significant influence of nitrogen treatment on leaf area index (LAI) was evident, with N₀ treatment recording the lowest LAI and N₁ & N₂ recorded the highest LAI. This increase in LAI was due to increased number of leaves and size of leaf. An increase in LAI with rising level of N has been reported by Hedge (1987) [10]. Srinivas and Naik (1990) also noted a highest LAI in 100 kg N/ha treatment. Potassium in general did not have any significant affect on LAI, barring a marginal increase following the treatment with K₃. When the nutrient supply is sub-optimal, the leaf growth rate was low and thus the LAI can be limited to low rates of net photosynthate and insufficient cell expansion [11-17].

Application of research: LAI was significantly influenced by the interaction of nitrogen & potassium.

Research Category: Agro-climatic condition

Abbreviations: N: Nitrogen, P: Phosphorus, K: Potassium

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Study area / Sample Collection: ICAR Research Complex for NEH Region, Lembucherra, Tripura, during 2014-15

Cultivar / Variety name: *Raphanus sativus* L cv pusa chetki

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Ethical Committee Approval Number:

References

- [1] Choudhury B. (2000) *Vegetables National Book Trust, New Delhi, India*, 133-140.
- [2] Bhat K.L. (1996) *Crop Research*, 11(2), 204-206.
- [3] Bhople S.R., Bharat S.G., Dod V.N. and Gholap S.V. (1998) *The Orissa Journal of Horticulture*, 26(2), 34-36.
- [4] Ndang Z. and Sema Akali (1999) *Indian Journal of Hill Farming*, 12(1&2), 84-87.
- [5] Bagchi D.K. (1982) *In Frontiers of Research in Agriculture (Edited by Roy, S.K) Calcutta, India, India Statistical Institute*, 497-505.
- [6] Guvenc I. (2002) *European J. of Horticultural Science*, 67(1), 23-27.
- [7] Liao Y., Rong S., Zheng S., Liu Q., Fan M., Peng J. and Xie G. (2009) *Frontiers of Agriculture in China*, 3, 122-129.
- [8] Park K.W. and Fritz, D. (1983) *Garten banwissenschaft*, 48(5), 227-230.
- [9] Rajput C.B.S. and Singh V.B. (1982) *Haryana J. Hort. Sci.*, 11, 135-139.
- [10] Hedge D.M. (1987) *Indian J. Agronomy*, 32(1), 24-29.
- [11] Marschner H. (1986) *Mineral Nutrition of Higher Plants. Academic Press, London*
- [12] Alam M.K, Farooque A.M, Nuruzzaman M. and Jamal Uddin A.F.M. (2010) *Bangladesh Research Publications Journal*, 3(3), 998-1006.
- [13] Choudhury B. and Sirohi P.S. (1975) *Vegetable crops. Edited by Bose, T.K.; Som, M.G. and Babir, J. Pub. Naya Prakash, Calcutta-Six.*
- [14] Day A.D. and Ludeka K.L. (1993) *Springer-Verlag, Berlin, Heidelberg.*
- [15] Joshi D.L. and Chauhan K.S. (1985) *Indian J. Hort.*, 42 (3), 263-267.
- [16] Pandey U.C. and Joshua S.D. (1987) *Haryana J. Hort. Sci.*, 16 (1-4), 125-129.
- [17] Ghanti P., Sounda G. and Ghatak S. (1989) *Env. And Ecol.*, 957-959.