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Studies on the Effect of Macro and Micro Nutrients on Growth and Yield of Garlic (*Allium sativum* L.)

Y.R. Shukla*, Manisha Kaushal and V.I.J. Shilpa

Department of Vegetable Science, DR Y S Parmar University of Horticulture and Forestry, Nauni, Solan-173 230 HP, India

**Corresponding author*

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A B S T R A C T

The present investigation entitled "Studies on the effect of macro and micro nutrients on yield and quality of garlic (*Allium sativum* L.)" was conducted during rabi season of 2015-16 at Horticultural Research and Training Station and KVK, Kandaghat of Dr Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan. Ten combinations of different macro and micro nutrients were replicated thrice in the form of ten treatments in a plot having dimensions of 2.0 x 2.0 m. The experiment was laid out in a randomized block design with three replications involving a spacing of 20 x 10 cm. The cloves of garlic variety 'Kandaghat Selection' were sown on 1st October, 2015. The data were recorded on plant height (cm), number of leaves per plant, days to harvest, bulb weight (g), bulb diameter (cm), number of bulbs per kg, bulb yield per plot (kg) and per hectare (q), clove diameter (cm), number of cloves per bulb. The results revealed that application of 125% of recommended dose of NPK + Zn @ 7.5kg/ha produced best results in terms of characters like plant height (cm), number of leaves per plant, bulb weight (g), bulb diameter (cm), weight of 100 unpeeled and peeled cloves (g), bulb yield per plot (kg) and per hectare (q), clove diameter (cm), number of cloves per bulb.

Introduction

Garlic (*Allium sativum* L.) is the most widely used cultivated *Allium* species after onion belonging to the family Amaryllidaceae.

Garlic is one of the main *Allium* vegetable crops known worldwide with respect to its production and economic value.

Garlic is cultivated all over India mainly in Gujarat, Orissa, Madhya Pradesh, Rajasthan, Uttar Pradesh and Maharashtra.

Keeping in view the increasing population of India and decreased cultivated crop area, there is a need to enhance the production as well as productivity to meet out the vegetable requirement of the country. Modern agriculture largely depends on the use of chemical fertilizers. Imbalanced use of fertilizers leads to loss of soil fertility, causes soil degradation and has adverse effect on agricultural productivity. Despite its importance and increased production, garlic productivity in many parts of the world is low due to genetic and environmental factors

affecting its yield and yield related traits (Nonnecke, 1989). Reasons for low yield of garlic are mainly depletion of macro and micro nutrients from the soil, use of low yielding varieties with low or no inputs and poor management practices. The use of chemical fertilizer helps in achieving maximum yield of the crop (Singh and Tewari, 1968).

Bulbous crops are heavy feeder, requiring optimum supplies of nitrogen, phosphorus, potassium, zinc, sulphur and other nutrients which can adversely affect growth, yield and quality of bulbs under sub optimal levels in the soil (Gubb and Tavis, 2002). Mallangouda *et al.,* (1995) were of the opinion that nitrogen, phosphorus and potassium plays an important role in improving vegetative growth and yield of garlic.

Materials and Methods

'Kandaghat Selection' variety was chosen for the studies. It is a local clonal selection from Himachal Pradesh. The plants are of long day type. Bulbs are creamish white having diameter ranging from 3.5-5.5cm. Bulbs have 13-16 yellowish white cloves having diameter of 1.1-1.7cm. The cultivar is suitable for cultivation in Northern hilly regions of India. It is a medium storer and tolerant to common diseases. Average yield per hectare ranged from 140-200 q/ha. The experiment was laid out in randomized block design with three replications and ten treatments. The plot size was taken 2.0 x 2.0 m with spacing of 20 x 10 cm and total number of plots was thirty.

The soil had 7.11 and 0.40 dS/m of pH, and electrical conductivity respectively. The soil had fertility status of 279.25 kg nitrogen/ha, 30.25 kg phosphorus/ka and 355.28 kg potassium/ha. Annual precipitation of the area is 1120 mm, which is received during monsoon (June- September).

Results and Discussion

The data on growth and yield parameters are presented in Table 1. Maximum number of leaves per plant (10.00) was observed in T_{10} (125% recommended dose of NPK + Zn @ 7.5 kg /ha) which was closely followed by T_9 (9.33). The positive effect of N and P on leaf number could be attributed to the favourable effects of these two nutrients on plant growth and development (Minard, 1978). The stimulating effect of NPK combination on leaf number was also confirmed by Jilani *et al.,* (2003) who found that NPK doses (150:100:50 kg/ha) resulted in maximum number of leaves per plant and more plant height in onion compared to control. Tisdale *et al.,* (1985) who reported that Zn deficiency cause shortening of the stem or stalk and stunted growth. Maximum plant height (50.47cm) was recorded in the treatment T_{10} (125% recommended dose of NPK + Zn @ 7.5 kg /ha). The stimulating effect of NPK combination on plant height was also confirmed by Jilani *et al.,* (2003), who found that NPK doses (150:100:50 kg/ha) resulted in the tallest plant height and maximum number of leaves per plant in onion compared to control. According to Mudziwa (2010), garlic plant height and neck diameter significantly increased with time in respect of growth up to 175 days with different levels of ammonium nitrate and calcium sulphate, maximum being at 200 kg/ha. Maximum bulb weight (62.20g) was recorded in T_{10} (125% recommended dose of NPK + Zn @ 7.5 kg/ha) which was statistically at par with T_9 (59.10g).

Maximum bulb weight might be due to the role of nitrogen on chlorophyll, enzymes and protein synthesis; the role of P on root growth development, phospho-proteins and phospho-lipids formation as well as due to the role of K on promotion of enzymes activity and enhancing the translocation of assimilates (El-Desuki *et al.,* 2006a and 2006b).

Table.1 Effect of macro and micro nutrients on growth and yield of garlic

Treatment code	Treatments	No. of leaves/plant	Plant height (cm)	Bulb weight (g)	Bulb diameter (cm)	No. of bulbs/kg	Bulb yield (q/ha)	No. of cloves/bulb	Clove diameter (cm)
T1	Absolute control	7.33	42.40	47.87	3.33	19.333	138.75	13.00	1.05
T2	75% of RD of NPK	7.67	42.85	48.13	3.83	18.667	158.25	13.17	1.12
T3	75% of RD of NPK + Zn @ 5 kg/ha	8.00	42.86	55.00	4.00	16.00	162.38	13.67	1.18
T4	75% of RD of NPK + Zn @ 7.5 kg/ha	8.33	46.30	54.33	4.40	16.00	170.25	14.00	1.22
T5	RD of NPK	8.00	47.67	57.87	4.57	15.33	176.63	14.35	1.34
T6	RD of NPK + Zn @ 5 kg/ha	8.67	48.06	57.93	4.85	15.33	182.40	14.73	1.30
T7	RD of NPK + Zn @ 7.5 kg/ha	9.00	48.22	58.80	4.88	15.00	187.88	15.17	1.39
T8	125% of RD of NPK	9.00	48.70	58.13	4.97	15.00	190.58	15.73	1.45
T9	125% of RD of NPK + Zn @ 5 kg/ha	9.33	49.84	59.10	5.00	14.33	192.75	15.87	1.55
T10	125% of RD of NPK + Zn @ 7.5 kg/ha	10.00	50.47	62.20	5.47	14.00	197.25	16.08	1.64

Zinc application markedly increased the number of cloves per bulb and weight of cloves. The improvement in weight and number of cloves due to the application of zinc might be due to increase in size and weight of bulbs, as well as rapid transformation and storage of food material in the bulb which ultimately increased the number of cloves per bulb and weight of cloves. The present results are in the conformity with the findings of Sharangi *et al.,* (2003), and Srivastava *et al.,* (2005) in garlic.

Maximum (5.47cm) bulb diameter was recorded in treatment T_{10} (125% recommended dose of NPK + Zn @ 7.5 kg/ha) followed by 5.00cm in T_9 (125% recommended dose of NPK + Zn @ 5 kg/ha). Abdissa *et al.,* (2011) observed that regardless of the rate, N fertilization increased bulb diameter by about 12 per cent as compared to control which may be linked to the increase in dry matter production and allocation to the bulb. Abbas and Sxena (1994) who reported maximum length and diameter of the bulbs using 75 kg N/ha whereas Minard (1978) recorded highest bulb size and yield with the application 210 kg N/ha and 114.75 kg P/ha which he attributed to the favourable effects of both N and P on growth and development of crop.

Minimum number of bulbs (14.00) was recorded in T_{10} (125% recommended dose of NPK + Zn @ 7.5 kg/ha). Less number of bulbs as reported in T_{10} and T_9 might be due to balanced nutrition supplied in the form of 125% N, P and K along with 7.5kg Zn/ha. This character has got direct correlation with bulb diameter and bulb size.

The main objective of cultivation is to have maximum yield for better returns. Yield is responsible for commercial viability and is one of the most important traits attaining highest consideration in research programmes. Per hectare yield ranged from 138.75q/ha (control plot) to 197.25q/ha in treatment T_{10} (125% recommended dose of NPK + Zn @ 7.5 kg/ha) which was 29.65 per cent more. Borabash and Kochina (1987) also recorded significant increase in assimilating leaf area, photosynthetic activity and final bulb yield with the application of 39.27 kg P/ha to the garlic crop. Minard (1978) recorded highest garlic bulb yield with the application of 210 kg N/ha and 114.75 kg P/ha.

Escaff and Aljaro (1982) recorded significantly higher bulb yield in garlic with the application 150 kg N/ha in combination with 32.72 kg P/ha. Assefa *et al.*, (2015) who also reported increased yield due to the application of N, P, S and Zn, possibly due to the combined effect of contribution of N to chlorophyll, enzymes and protein synthesis, as P is essential for root growth, phospho-proteins and phospho-lipids.

Maximum 16.08 number of cloves per bulb were recorded in T_{10} (125% recommended dose of NPK + Zn @ 7.5 kg/ha) which was found statistically at par with T_9 (15.87) and T_8 (15.73). It is clear from the findings of Sharangi *et al.*, (2003) and Srivastava *et al.*, (2005) that application of zinc markedly increased number of cloves per bulb and weight of cloves. The clove size increased with the increase in fertilizer doses, maximum (1.64cm) being in T_{10} (125% recommended dose of NPK + Zn @ 7.5 kg/ha). It appears from the findings of Nori *et al.*, (2012) that there was increase in the size of bulb and clove with increased fertilizer doses up to 200 kg N/ha and then it decreased with further increase in amount of fertilizer.

Application of 125% of recommended dose of NPK + Zn @ 7.5kg/ha (T_{10}) gave the best performance over almost all other treatments and this treatment was statistically at par with T_9 for plant height, bulb weight, bulb yield per plot and per hectare and number of cloves per bulb.

References

Abbas, M. and Saxena, R. 1994. Effect of nitrogen and potassium on the growth and yield of garlic. *Food Chemistry* 10: 338-342.

Abdissa, Y., Tekalign, T. and Pant, L., M. 2011. Growth, bulb yield and quality of onion as influenced by onion as influenced by nitrogen and phosphorus fertilization on vertisol I. growth attributes, biomass production and bulb yield. *African Journal of Agricultural Research* 6(14): 3252-3258.

Borabash, O., Yu and Kochina, T., N. 1987. The effect of mineral fertilizers on garlic productivity. *Reference Zhurnal*. pp. 12-16. [Cited from Hort. Abstr., 60(5): 3284

El-Desuki, M., Abdel-Monty, M., M. and Ali, A., H. 2006 b. Response of onion Plants to additional dose of potassium application. *Journal of Applied Science Research* 2(9): 592-597.

El-Desuki, M., Mahmoud, A., R. and Hafiz, M., M. 2006 a. Response of onion plants to minerals and bio-fertilizers application. *Research Journal of*

Agricultural and Biological Science 2(6): 292-298.

Gubb, I., R. and Tavis, M., S., H. 2002. Onion pre harvest and post-harvest considerations. *In*: *H.D. Rabinowitch and L. Currah (eds.). Allium Crop Science,* CABI. pp. 237-250.

Jilani, A., M., S., Khaliq, G., and Waseem, K. 2003. Effect of different NPK levels on the yield of three onion (*Allium* cepa L.) varieties. *Asian Journal of Plant Sciences* 2(3): 342-346.

Mallangouda, B., Sulikeri, G., S., Hulamari, W., S., Murthy, B.M., G. and Madalgeri, B., B. 1995. Effect of NPK and FYM on growth parameters of onion, garlic and coriander. *Current Research University of Agricultural Science* 24(11): 212-213.

Minard, H., R., G. 1978. Effect of clove size, spacing, fertilizers and lime on yield and nutrient of garlic. *New Zealand Journal of Experimental Agriculture* 6(2): 139-143.

Mudziwa, N. 2010. Yield and quality responses of Egyptian white garlic (*Allium sativum* L.) and Wild garlic (*Tulbaghia violcea* Harv.) to nitrogen nutrition. M.Sc. Thesis, University of Pretoria.

Nonnecke, I., L. 1989. *Vegetable Production*, New York, 657p.

Nori, M., Alli, J. and Asl, R., S. 2012. Effect of different sources and levels of nitrogen fertilizer on yield and nitrate accumulation in garlic. *International Journal of Agriculture and Crop Sciences* 4(24): 1878-1880.

Sharangi, A., B., Pariari, A., Datta, S. and Chatterjee, R. 2003. Effect of boron and zinc on growth and yield of garlic in New Alluvial Zone of West Bengal. *Crop Research* 25(1): 83-85.

Singh, J., R. and Tewari, J. 1968. Effect of source of organic manures and levels of nitrogen on growth characteristics of garlic (*Allium sativum* L.). *Indian Journal of Horticulture,* 25:191-195.

Srivastava, R., Aggarwal, A., Tiwari, R., S. and Kumar, S. 2005. Effect of micronutrients, zinc and boron on yield, quality and storability of garlic. *Indian Journal of Agricultural Science* 75: 157-159.

Tisdale, S. L., Nelson, W. L., and Beaton, J., D. 1985. Micronutrients and other beneficial elements in soils and fertilizers. *Soil fertility and fertilizers, Zinc* (pp. 387-388). Macmillan Publishing Company, New York.

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