Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(5): 2371-2373
Received: 04-07-2018
Accepted: 06-08-2018

YR Shukla
Department of Vegetable Science, Dr. Y S Parmar University of Horticulture and Forestry, Nauni-Solan, Himachal Pradesh, India

Manisha Kaushal
Department of Vegetable Science, Dr. Y S Parmar University of Horticulture and Forestry, Nauni-Solan, Himachal Pradesh, India

Priyanka Bijalwan
Department of Vegetable Science, Dr. Y S Parmar University of Horticulture and Forestry, Nauni-Solan, Himachal Pradesh, India

Correspondence
YR Shukla
Department of Vegetable Science, Dr. Y S Parmar University of Horticulture and Forestry, Nauni-Solan, Himachal Pradesh, India

Studies on the effect of macro and micro nutrients on yield and economics of garlic (*Allium sativum* L.) cultivation

YR Shukla, Manisha Kaushal and Priyanka Bijalwan

Abstract
The present investigation entitled "Studies on 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 2.0x2.0m. The experiment was laid out in a randomized block design with three replications involving a spacing of 20x10cm. The cloves of garlic variety 'Kandaghat Selection' were sown on 1st October, 2015. The data were recorded on bulb yield per plot (kg) and per hectare (q) and economics. The results revealed that application of 125 per cent of recommended dose of NPK + Zn @ 7.5kg/ha produced best results in terms of bulb yield per plot (kg) and per hectare (q) whereas, minimum values were recorded in the absolute control. It was concluded that application of 125 per cent of recommended dose of NPK + Zn @ 7.5kg/ha gave better results and hence, can be recommended for harvesting maximum yield from garlic after repeating the experiment for another two years.

Keywords: Macro and micro nutrients, yield and economics

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. Garlic has several medicinal properties and its reputation as a medicine has increased to such an extent that garlic oil capsules are now marketed through pharmacies and health food stores (Rahim and Fordham, 1994) [16]. The global scenario of area and production of garlic shows that it is grown on an area of 12.25 lakh hectares with a production of 164.17 lakh tons and productivity of 13.39 tons per hectare globally. In India, it is grown in an area of 231000 hectares with a production of 1252000 ton. In Himachal Pradesh, Garlic is number one bulbous crop grown in an area of 3957 hectares with total production of 68,235 MT (Anonymous, 2015) [3].

Keeping in view the increasing Indian population 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) [14]. 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) [17]. In order to improve garlic production, different means of fertilizer application (type, time and rate) are considered to be the limiting factors which should be given due consideration (Brewster and Butler, 1989) [5] and the production of vigorous sprouts is one of the most important factors of successful garlic production through balanced nutrient application (Potgieter, 2006) [15]. 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) [8]. Mallangouda *et al*. (1995) [10] were of the opinion that nitrogen, phosphorus and potassium plays an important role in improving vegetative growth and yield of garlic.

Improved management of nitrogen, phosphorus, potassium and other inputs in the soil could improve yield and quality of vegetables and other crops (Nai-hua *et al*., 1998) [13]. Garlic is a long day crop and has special root architecture i.e., shallow root system, low root densities and lack of root hairs, so it needs a high concentration of N, P and K in the soil solution to satisfy the potential demand. Hence garlic needs high levels of N, P and K in the soil. High yield and good quality of garlic can therefore be obtained through efficient and balanced use of macro and micro nutrients.

Material and Methods

'Kandaghat Selection' variety was choosen 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 range 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 of pH, 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 1120mm, which is received during monsoon (June- September).

Result and Discussion

Yield is responsible for commercial viability and is one of the most important trait attaining highest consideration in research programmes. The yield per plot was calculated by weighing all the marketable bulbs in a plot and was multiplied with a suitable factor to work out yield per hectare. In the present studies, 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. The treatment which produced maximum yield i.e. T_{10} also produced significant effects with T_9 (8.57 kg/plot) and T_8 (8.47 kg/plot) followed by T_7 (187.88), T_6 (182.40) and T_5 (176.63). Higher yield of garlic was observed in the plots fertilized with N, P, K and Zn fertilizers over the others.

The present findings are in line with those of Amin *et al*. (1995) [2], Khodabakhshzadeh (2001) [9], Al-Moshileh (2001) [1], Gaviola and Lipinski (2008) [7], (Chanchan *et al*., 2013) [6] and Assefa *et al*. (2015) [4],who also reported that better nitrogen supply to the plant increases the rate of metabolism where more carbohydrate is synthesized and 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. Nitrogen and phosphorus are often referred to be the primary macro nutrients Marschner, (1995) [11] and Minard (1978) [12] because of the probability of plants being deficient in these nutrients and because of the large quantities of them taken up by plants from the soil relative to other essential nutrients.

An examination of the data revealed that maximum gross income of ` 13,79,000 was observed in treatment $T_{10}$ (125% of recommended dose of NPK + Zn @ 7.5kg/ha) followed by ` 13,51,000 in T_9 (125% of recommended dose of NPK + Zn @ 5kg/ha) and minimum gross income of `9,73,000 was observed in $T_1$ (Absolute control). Similarly, net income was maximum (` 8,85,192) in the treatment T_{10} (125% of recommended dose of NPK + Zn @ 7.5kg/ha) and minimum (` 4,92,422) in Absolute control (T_1). Highest B:C ratio (1.79) was worked out when 125% of recommended dose of NPK + Zn @ 7.5kg/ha (T_{10}) was applied, however minimum B:C ratio (1.02) was computed in the control. The treatment T_{10} (125% of recommended dose of NPK + Zn @ 7.5kg/ha) was, therefore, rated as the most cost effective treatment which also produced maximum yield.

Interestingly, the treatment which produced maximum yield (197.25q/ha) was also rated as the best treatment in terms of net income (8,85,192) and B: C ratio (1.79) indicating that garlic crop may be applied with 125% of recommended dose of NPK + Zn @ 7.5kg/ha for getting maximum yield. Hence, 125% of recommended dose of NPK + Zn @ 7.5kg/ha may be recommended to the growers for getting maximum returns after repeating the experiment for another two years

Table 1: Cost of cultivation, gross income, net income and B:C ratio and yield as affected by different treatments

Treat. Code	Treatments	Bulb yield (kg/plot)	Bulb yield (q/ha)	Cost of cultivation (Rs.`)	Gross income (Rs.`)	Net income (Rs.)	B:C ratio
T1	Absolute control (No application of macro or micro nutrients)	6.17	138.75	480578	973000	492422	1.02
T2	75% of recommended dose of NPK.	7.03	158.25	486277	1106000	619723	1.27
T3	75% of recommended dose of NPK + Zn @ 5 Kg/ha.	7.22	162.38	488777	1134000	645223	1.32
T4	75% of recommended dose of NPK+ Zn @ 7.5 Kg/ha.	7.57	170.25	490027	1190000	699973	1.43
T5	Recommended dose of NPK (100% NPK).*	7.85	176.63	488156	1239000	750844	1.54
T6	Recommended dose of NPK+ Zn @ 5 Kg/ha.	8.12	182.40	490656	1274000	783344	1.60
T7	Recommended dose of NPK+ Zn @ 7.5 Kg/ha.	8.35	187.88	491906	1316000	824094	1.68
T8	125% of recommended dose of NPK.	8.47	190.58	490073	1337000	846927	1.73
T9	125% of recommended dose of NPK+ Zn @ 5 Kg/ha.	8.57	192.75	492573	1351000	858427	1.74
T10	125% of recommended dose of NPK+ Zn @ 7.5 Kg/ha.	8.77	197.25	493808	1379000	885192	1.79
CD (0.05)		0.89	19.91	-	-	-	-

Conclusion

1. Application of 125% of recommended dose of NPK + Zn @ 7.5kg/ha (T_{10}) gave the best performance over almost all other treatments.
2. Treatment involving 125% of recommended dose of NPK + Zn @ 7.5kg/ha (T_{10}) was the most economic treatment as it produced maximum B: C ratio of 1.79:1 besides giving maximum net returns ('8,85,192).

References

1. Al-Moshileh AM. Effect of nitrogen, phosphorus and potassium fertilizers on onion productivity in central region of Saudi Arabia. Assiut Journal of Agricultural Science. 2001; 32(1):291-305.
2. Amin MMU, Rahim MA, Hashem MA. Influences of planting time and nitrogen on the growth and yield of onion. Bangladesh Journal of Scientific and Industrial Research. 1995; 30:2-3.

3. Anonymous. Annual Report. Directorate of Agriculture. Himachal Pradesh, Shimla, 2015.
4. Assefa AG, Mesgina SH, Abrha YW. Effect of inorganic and organic fertilizers on the growth and yield of garlic crop in northern Ethopia. Journal of Agricultural Science. 2015; 7(4):80-86.
5. Brewster JK, Bulter HA. Effect of nitrogen supply on bulb development in onion. Journal of Experimental Botany. 1989; 40:1155-1162.
6. Chanchan M, Hori JK, Ghanti S. Response of garlic to foliar application of some micronutrients. Journal of Crop and Weed. 2013; 9(2):138-141.37.
7. Gaviola S, Lipinski VM. Effect of nitrogen fertilization on yield and colour of red garlic cultivars. Cien. Inv. Agr. 2008; 35(1):57-64.
8. Gubb IR, Tavis MSH. Onion pre harvest and post-harvest considerations. In: H.D. Rabinowitch and L. Currah (Eds.). Allium Crop Science, CABI, 2002, 237-50.
9. Khodabakhshzadeh A. Effect of different levels of nitrogen on growth and development, yield and nitrate accumulation in three cultivars of garlic. M.Sc. Thesis of Horticultural Science. Isamic Azad University. Science Research Unit, 2001.
10. Mallangouda B, Sulikeri GS, Hulamari WS, Murthy BG and Madalgeri BB. Effect of NPK and FYM on growth parameters of onion, garlic and coriander. Current Research University of Agricultural Science. 1995; 24(11):212-13.
11. Marchner H. Mineral Nutrition of Higher Plants. 2nd Ed. Academic Press. London, UK, 1995.
12. Minard HRG. Effect of clove size, spacing, fertilizers and lime on yield and nutrient of garlic. New Zealand Journal of Experimental Agriculture. 1978; 6(2):139-43.
13. Nai-hua Y, Dingguo Z, Wang J. Phosphorus and potassium nutrient management for vegetable soils in Shanghai and Guangdong. In: Donald L. Armstrong (Ed.), Better Crops International. 1998; 12(1):7-9.
14. Nonnecke IL. Vegetable Production, New York, 1989, 657.
15. Potgieter J. Verbal communication on macro elements application time. Researcher, Limpopo. Department of Agriculture, 2006.
16. Rahim MA, Fordham R. Control of bulbing in garlic. Acta Horticultuare. 1994; 358:369-74.
17. Singh JR, Tewari J. Effect of source of organic manures and levels of nitrogen on growth characteristics of garlic (*Allium sativum* L.). Indian Journal of Horticulture. 1968; 25:191-95.