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## Effect of foliar fertilization on growth and yield attributes of garlic

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**ABSTRACT :** An experiment was conducted during *Rabi* season of 2015-16 at Saidapur Farm, University of Agricultural Sciences, Dharwad to know the effect of foliar fertilization on growth, yield and yield attributes of garlic. The plants grown with application of recommended dose of fertilizer along with foliar spray of one per cent 19:19:19 at 60 days after sowing ( $T_{11}$ ) recorded significantly higher plant height (51.99 cm.), number of leaves per plant (6.00), leaf length (41.05 cm), leaf breadth (1.03 cm), neck diameter (4.76 mm), bulb weight (15.60 g), bulb diameter (33.23 mm), number of cloves per bulb (25.93), clove length (1.98 cm), hundred clove weight (108.49 g), yield (6.98 t/ha) and B:C ratio (2.84). While, the poor growth, yield and yield attributes were observed in without any foliar spray treatment *i.e.*, application of recommended dose of fertilizer only.

**KEY WORDS :** Garlic, Foliar fertilizers, Growth, Yield, Yield attributes

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Garlic (*Allium sativum* L.) is one of the important spice crop belongs to family Alliaceae. In the world trade of garlic China is number one exporter country followed by Argentina, Spain and Netherlands. India ranks second in area and production. In India, Madhya Pradesh is the leading state in area and production while the productivity maximum in Punjab (12.16 t/ha). In Karnataka garlic is cultivated in an area of 4,730 ha with 8,420 tones production. Though, the crop is commercially important and export oriented, its yield levels are very low in India (5.42 t/ha) owing to its unscientific nutritional management practices. The soil application of nutrients undergoes various losses and become unavailable to plants. To overcome this anomaly, the foliar application of fertilizer becomes an alternative to the existing practice. Hence, to increase production and productivity of garlic the present study was undertaken.

### RESEARCH METHODS

The experiment was carried out in Completely Randomized Block Design with three replications during *Rabi* season of 2015-16 at Saidapur Farm, University of Agricultural Sciences, Dharwad. Thirteen foliar spray treatments with different intervals were analyzed for growth and yield parameters of garlic. The improved garlic variety DWDG-1 was used for the study. As per the recommended spacing cloves were dibbled and at the time of dibbling, half the recommended dose of nitrogen, full dose of phosphorus and potassium were applied as basal dose. Remaining half dose of nitrogen was top dressed at 30 days after sowing. The light irrigation was given immediately after dibbling and protective irrigations were given subsequently at fortnight intervals depending on weather condition. The crop was raised successfully by adopting proper cultural practices and plant protection measures (Anonymous, 2014). Five plants in each plot were randomly selected for taking

observations. The bulbs were harvested at full maturity and data on yield was computed. Fisher's method of analysis of variance was applied for analysis and interpretation of data. Level of significance of 'F' test used was P=5 per cent (Gomez and Gomez, 1984).

## RESEARCH FINDINGS AND DISCUSSION

Significant variation in growth and yield attributes of garlic was observed in different foliar fertilizers sprays (Table 1 and 2). Higher bulb yield of garlic (6.98 t/ha) was obtained in RDF + foliar spray of one per cent 19:19:19 at 60 days after sowing ( $T_{11}$ ) treatment compared to control ( $T_{13}$ ) accounting to increase of 7.88 per cent. The higher yield obtained in  $T_{11}$  was at par with  $T_{10}$ ,  $T_7$ ,  $T_3$ ,  $T_{12}$  and  $T_6$ . The significant increased yield in  $T_{11}$  is may be due to increased vegetative growth parameters like plant height (51.99 cm.), number of leaves per plant (6.00), leaf length (41.05 cm), leaf breadth (1.03 cm) and neck diameter (4.76 mm) (Table 1). Similarly higher yield with foliar spray of one per cent 19:19:19 was observed in garlic (Yadav, 2005); chilli (Baloch *et al.*, 2008; Deepa Devi and Shanthi, 2013 and Kiran Kumar, 2013), tomato (Chaurasia *et al.*, 2005), brinjal (Karpagam *et al.*, 2002; Batra *et al.*, 2006 and Narayanamma *et al.*, 2006) and okra (Sundaram and Kanthaswamy, 2005).

Further, significantly higher garlic bulb yield (6.98

t/ha) obtained with RDF + foliar spray of one per cent 19:19:19 at 60 DAS ( $T_{11}$ ) may be attributed to significantly higher bulb weight (15.60 g), bulb diameter (33.23 mm), clove length (1.98 cm), number of cloves per bulb (25.93) and hundred clove weight (108.49 g) (Table 2).

Better growth and yield parameters observed in  $T_{11}$  (RDF along with foliar spray of one per cent 19:19:19 at 60 DAS) might be the resultant of timely supply of nutrition to crop without any losses. As the foliar fertilizers directly penetrate through leaf cuticle or stomata leads to efficient absorption and translocation of nutrients in turn to increase plant metabolites for better allocation of photosynthesis from source to sink results in enhanced crop growth and yield. Higher yield observed in RDF along with foliar spray of one per cent 19:19:19 at 60 DAS ( $T_{11}$ ) is in accordance with earlier findings of Yadav (2005). Similar positive response of foliar application of fertilizers was observed in tomato (Chaurasia *et al.*, 2005; Krishnan *et al.*, 2014 and Narayan *et al.*, 2011) and chilli (Somimol, 2012).

On the contrary, poor yield and yield attributes of garlic observed in without foliar spray treatment ( $T_{13}$ - application of RDF alone) might be due to higher degree of nutrient losses through leaching, fixation, physico-chemical transformation in soil and less absorption of nutrients through roots. Similar results were observed in brinjal (Karpagam *et al.*, 2002; Narayanamma *et al.*,

**Table 1: Growth parameters of garlic as influenced by foliar application of fertilizers**

Sr. No.	Treatments	Plant height (cm)	No. of leaves /plant	Leaf length (cm)	Leaf breadth (cm)	Neck diameter (mm)
1.	$T_1$ : RDF + 2 % Urea (30 DAS)	41.00	5.33	35.60	0.77	3.11
2.	$T_2$ : RDF + 2 % DAP (30 DAS)	43.47	5.40	39.67	0.89	3.57
3.	$T_3$ : RDF + 1 % 19:19:19 (30 DAS)	46.50	5.53	40.27	0.94	3.61
4.	$T_4$ : RDF + 2 % 19:19:19 (30 DAS)	44.39	5.37	36.22	0.81	3.15
5.	$T_5$ : RDF + 2 % Urea (45 DAS)	42.39	5.00	35.53	0.79	3.57
6.	$T_6$ : RDF + 2 % DAP (45 DAS)	45.07	5.73	39.43	0.92	4.19
7.	$T_7$ : RDF + 1 % 19:19:19 (45 DAS)	47.76	5.80	40.34	0.97	4.57
8.	$T_8$ : RDF + 2 % 19:19:19 (45 DAS)	44.29	5.53	38.67	0.83	3.69
9.	$T_9$ : RDF + 2 % Urea (60 DAS)	45.22	5.07	37.24	0.89	3.97
10.	$T_{10}$ : RDF + 2 % DAP (60 DAS)	47.79	5.87	40.49	0.98	4.53
11.	$T_{11}$ : RDF + 1 % 19:19:19 (60 DAS)	51.99	6.00	41.05	1.03	4.76
12.	$T_{12}$ : RDF + 2 % 19:19:19 (60 DAS)	45.70	5.40	39.07	0.91	4.27
13.	$T_{13}$ : RDF (No foliar spray)	39.06	4.93	31.73	0.71	3.07
	Mean	44.97	5.46	38.10	0.88	3.85
	S.E. $\pm$	2.18	0.21	1.76	0.04	0.19
	C.D. (P= 0.05)	6.36	0.60	5.12	0.12	0.58

Note: RDF - 125: 62.5: 62.5 kg NPK + 25 t FYM/ ha, DAP - Di-ammonium phosphate, DAS - Days after sowing

2006 and Batra *et al.*, 2006), tomato (Yadav *et al.*, 2004), okra (Sundaram and Kanthaswamy, 2005) and garlic (Yadav, 2005).

The economics of commercial garlic production with different foliar fertilizers levels is presented in Table 3. It is evident from the present investigation that, RDF + foliar spray of one per cent 19:19:19 at 60 DAS (T<sub>11</sub>) recorded the maximum net returns (Rs.5,16,264 /ha) and benefit to cost ratio (2.84) compared to other levels of

foliar fertilizers. Such increased returns obtained in T<sub>11</sub> may be attributed to higher gross income (Rs. 6,98,000/ha) as a consequence of higher bulb yield (6.98 t/ha). A similar trend of higher net returns and B:C ratio was observed with foliar spray of one per cent 19:19:19 by Yadav (2005) in garlic, Chaurasia *et al.* (2005); Narayan *et al.* (2011) and Krishnan *et al.* (2014) in tomato, Karpagam *et al.* (2002) in brinjal, Somimol (2012) in chilli and Rahman *et al.* (2014) in common bean.

**Table 2 : Yield and yield attributes of garlic as influenced by foliar application of fertilizers**

Sr. No.	Treatments	Bulb weight (g)	Bulb diameter (mm)	Clove length (cm)	No. of cloves / bulb	100 clove weight (g)	Bulb yield (t/ha)
1.	T <sub>1</sub> :RDF + 2 % Urea (30 DAS)	7.72	25.83	1.57	18.60	72.06	5.20
2.	T <sub>2</sub> : RDF + 2 % DAP (30 DAS)	9.38	27.49	1.62	20.73	86.69	5.56
3.	T <sub>3</sub> :RDF + 1 % 19:19:19 (30 DAS)	11.53	30.91	1.77	22.23	95.25	6.18
4.	T <sub>4</sub> :RDF + 2 % 19:19:19 (30 DAS)	9.18	27.16	1.61	20.47	83.30	5.27
5.	T <sub>5</sub> :RDF + 2 % Urea (45 DAS)	8.10	25.41	1.58	19.53	73.52	5.36
6.	T <sub>6</sub> :RDF + 2 % DAP (45 DAS)	10.40	28.50	1.66	21.20	88.34	5.91
7.	T <sub>7</sub> :RDF + 1 % 19:19:19 (45 DAS)	13.27	31.28	1.85	23.13	96.68	6.45
8.	T <sub>8</sub> :RDF + 2 % 19:19:19 (45 DAS)	8.80	27.30	1.63	20.40	81.45	5.83
9.	T <sub>9</sub> :RDF + 2 % Urea (60 DAS)	8.40	26.79	1.70	19.87	79.29	5.60
10.	T <sub>10</sub> :RDF + 2 % DAP (60 DAS)	13.93	31.62	1.86	23.87	102.49	6.70
11.	T <sub>11</sub> :RDF + 1 % 19:19:19 (60 DAS)	15.60	33.23	1.98	25.93	108.49	6.98
12.	T <sub>12</sub> : RDF + 2 % 19:19:19 (60 DAS)	11.42	30.50	1.76	21.99	93.68	6.05
13.	T <sub>13</sub> :RDF (No foliar spray)	6.47	24.87	1.53	17.87	68.23	4.82
	Mean	10.32	28.53	1.70	21.22	87.32	5.84
	S.E. ±	0.65	1.57	0.09	1.28	3.65	0.37
	C.D. (P= 0.05)	1.89	4.57	0.26	3.74	10.65	1.11

Note: RDF - 125: 62.5: 62.5 kg NPK + 25 t FYM/ ha, DAP - Di-ammonium phosphate , DAS - Days after sowing

**Table 3: Economic of garlic production as influenced by foliar application of fertilizers**

Treatments	Cost of cultivation (Rs./ha)	Total yield (t/ha)	Gross return (Rs./ha)	Net return (Rs./ha)	B: C ratio
T <sub>1</sub> :RDF + 2 % Urea (30 DAS)	1,78,709	5.20	5,20,000	3,41,291	1.91
T <sub>2</sub> : RDF + 2 % DAP (30 DAS)	1,79,554	5.56	5,56,000	3,76,446	2.09
T <sub>3</sub> :RDF + 1 % 19:19:19 (30 DAS)	1,81,736	6.18	6,18,000	4,36,264	2.40
T <sub>4</sub> :RDF + 2 % 19:19:19 (30 DAS)	1,85,036	5.27	5,27,000	3,41,964	1.85
T <sub>5</sub> :RDF + 2 % Urea (45 DAS)	1,78,709	5.36	5,36,000	3,57,291	1.99
T <sub>6</sub> :RDF + 2 % DAP (45 DAS)	1,79,554	5.91	5,91,000	4,11,446	2.29
T <sub>7</sub> :RDF + 1 % 19:19:19 (45 DAS)	1,81,736	6.45	6,45,000	4,63,264	2.55
T <sub>8</sub> :RDF + 2 % 19:19:19 (45 DAS)	1,85,036	5.83	5,83,000	3,97,964	2.15
T <sub>9</sub> :RDF + 2 % Urea (60 DAS)	1,78,709	5.60	5,60,000	3,81,291	2.13
T <sub>10</sub> :RDF + 2 % DAP (60 DAS)	1,79,554	6.70	6,70,000	4,90,446	2.73
T <sub>11</sub> :RDF + 1 % 19:19:19 (60 DAS)	1,81,736	6.98	6,98,000	5,16,264	2.84
T <sub>12</sub> : RDF + 2 % 19:19:19 (60 DAS)	1,85,036	6.05	6,05,000	4,19,964	2.27
T <sub>13</sub> :RDF (No foliar spray)	1,78,436	4.82	4,82,000	3,03,564	1.70

Note: RDF - 125: 62.5: 62.5 kg NPK + 25 t FYM/ ha, DAP - Di-ammonium phosphate ,DAS - Days after sowing

The study reveals that, the application of recommended dose of fertilizer along with foliar spray of one per cent 19:19:19 at 60 days after sowing found most suitable for commercial production of garlic.

## REFERENCES

- Anonymous (2014). Package of practices for horticulture crops, University of Horticultural Sciences, Bagalkot, pp. 180-181.
- Baloch, Q. B., Chachar, Q. I. and Tareen, M. N. (2008).** Effect of foliar application of macro and micro nutrients on production of green chillies (*Capsicum annuum* L.). *J. Agric. Technol.*, **4** (2): 174-184.
- Batra, V. K., Dhankhar, S. K., Bhatia, A. K., Singh, V., Arora, S. K. and Singh, V. P. (2006).** Response of brinjal to foliar feeding of water soluble fertilizers. *Haryana J. Hort. Sci.*, **35** (3-4): 317.
- Chaurasia, S. N. S., Singh, K. P. and Rai, Mathura (2005).** Effect of foliar application of water soluble fertilizers on growth, yield and quality of tomato (*Lycopersicon esculentum* L.). *Sri Lanka J. Agric. Sci.*, **42**: 66-70.
- Deepa Devi, N. and Shanthi, A. (2013).** Effect of foliar spray of water soluble fertilizer on growth and NPK uptake of chilli hybrid (*Capsicum annuum* L.). *Asian J. Hort.*, **8** (1): 222-225.
- Gomez, K. A. and Gomez, A. A. (1984).** *Statistical procedures for agricultural research*. 2<sup>nd</sup> Ed., John Wiley and Sons, New York, pp. 336.
- Karpagam, R., Kannan, M., Natarajan, S. and Srinivasan, K. (2002).** Studies on the efficiency of foliar feeding of water soluble fertilizers on growth parameters and yield of brinjal COBH-1. *South Indian Hort.*, **52**(1-6): 139-142.
- Kiran Kumar, A. (2013).** Effect of foliar application of NPK nutrients on growth and yield of chilli (*Capsicum annuum* L.). *Veg. Sci.*, **24**(1): 56-63.
- Krishnan, A., Indires, K. M. and Anjanappa, M. (2014).** Effect of water soluble fertilizers on growth and yield of tomato (*Solanum lycopersicum* L.). *J. Trop. Agric.*, **52**(2): 154-157.
- Narayanamma, M., Chiranjeevi, C. and Reddy, C.S. (2006).** Influence of water soluble fertilizers on yield of brinjal. *Veg. Sci.*, **33** (2) : 94-95.
- Narayan, K., Dubey, P., Sharma, D., Vijay, T. K. and Rajhansa, K. C. (2011).** Effect of foliar application of water soluble fertilizers on flowering, yield and quality attributes of tomato (*Lycopersicon esculentum* Mill.). *Asian J. Hort.*, **6** (1): 225-228.
- Rahman, I. U., Afzal, A., Iqbal, Z., Ijaz, F., Manan, S., Asghar Ali, S., Khan, K., Karim, S. and Qadir, G. (2014).** Growth and yield of *Phaseolus vulgaris* as influenced by different nutrients treatment in mansehra. *Int. J. Agron. Agric. Res.*, **4** (3): 20-26.
- Somimol, P. V. (2012).** Effect of foliar feeding of 19:19:19 and potassium nitrate (KNO<sub>3</sub>) water soluble fertilizers on yield and quality of Byadgi chillies in a vertisol. M.Sc. (Ag.) Thesis, University Agricultural Sciences, Dharwad, KARNATAKA (INDIA).
- Sundaram, V. and Kanthaswamy, V. (2005).** Response of okra to foliar feeding of water soluble fertilizers. *Veg. Sci.*, **32**(1): 92-93.
- Yadav, B.D., Khandelwal, R.B. and Sharma Y.K. (2004).** Response of tomato to foliar feeding of water soluble fertilizers. *Veg. Sci.*, **31**(1) : 98-100.
- Yadav, M. P. (2005).** Effect of biofertilizer and foliar fertilization on growth, bulb yield and quality of garlic cv.G-1. Ph. D. Thesis, University Agricultural Sciences, RAJASTHAN (INDIA).

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