

## Original Research Article

# Effect of Organic Sources of Nutrients on Growth, Yield and Quality of garlic (*Allium sativum* L.)

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## ABSTRACT

A field experiment was carried out during *rabi* season of 2017-18 at the Organic Research Farm, Karguwanji, Bundelkhand University, Jhansi to study the effect of organic sources of nutrients on growth, yield and quality of garlic (*Allium sativum* L.). The growth parameter viz. height of plant, number of leaf, length of leaf, and fresh weight of plant, performed significantly better when three organic sources viz. Poultry Manure, Farm Yard Manure applied in equal ratio(33% each) compared to the control and the treatment wherein nutrients were applied through chemical sources. Consequently, the yield attributes viz fresh weight of bulb, biological yield, girth of bulb, length of clove and girth of clove also showed better trend resulting the highest yield(113.5 q/ha) under the treatment involving integration of three organic sources in equal portion. Based on economics, the highest gross return of Rs 458239 /ha, net return of Rs 387844/ha and profitability of Rs2585 ha/day were also recorded in the treatment involving integration of three sources of nutrients confirming the superiority of the treatment. The B.C ratio however was highest in control as cost involved for cultivation was low. As far as quality aspect is concerned, the highest percentage of sulphur (1.24) was recorded in treatment (T1) wherein 100% nutrient applied through FYM. In case of ash, the values were highest when nutrient were supplied through FYM and Poultry Manure @50% each.

### Keywords

Organic sources,  
Nutrients, Yield,  
Quality, Garlic

## Introduction

Garlic (*Allium sativum* L.) is one of the most important spices and condiments used in daily cooking in India. It is an important crop among all the spice crops due to its medicinal as well as flavour and taste imparting characters. There is a keen awareness in recent years on the excessive use of inorganic fertilizers and other chemicals causing environment pollution. Sustained production strategies often involve reduced application of inorganic fertilizers with organic sources.

Organic manures being economical and eco-friendly are gaining importance for sustainable crop production. Organic manures including FYM, vermin-compost, goat manure, crop residues etc. are very well known to improve physic - chemical and biological soil properties and thereby improve the fertility and productivity of soils on a sustainable basis.

In fact, serious attention is now being paid towards organic farming. However, the scientific information on nutrient

management in garlic through organic sources is very limited especially for Bundelkhand region. Therefore, an attempt was made to find out the effect of organic sources of nutrients on growth, yield and quality of garlic.

## Materials and Methods

The field experiment was conducted during *rabi* season 2018-19 at the Organic Research Farm, Karguwanji, Institute of Agricultural Sciences, Bundelkhand University, Jhansi (U.P.). The soil of the experimental field was sandy loam having pH 6.8, EC dS/m, OC 0.38%, available N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O 120, 18 and 94 kg/ha, respectively. The rainfall received during the cropping season was up to 10.2 mm. The experiment was laid out in a randomized block design keeping three replications.

The treatments were 9 having different combinations of organic manures viz. T<sub>0</sub>=RDF (100%) N<sub>100</sub>P<sub>75</sub>K<sub>50</sub>, through chemical sources (Urea, SSP and MOP); T<sub>1</sub>=Farmyard manure (FYM 20 t / ha). T<sub>2</sub>=Vermicompost (Vermicompost 10 t /ha), T<sub>3</sub>=Poultry Manure (Poultry manure 3.33 t /ha), T<sub>4</sub>= Berdmankhad (BK 6.66 t / ha), T<sub>5</sub>= FYM+VC 50% each, T<sub>6</sub>= FYM +PM 50% each, T<sub>7</sub>= FYM + BK 50% each, T<sub>8</sub>=FYM + PM + VC 33% each.

Full dose of nutrients was applied at the time of sowing. The garlic variety G-1 was sown on 4 November, 2017 at the planting density of 15 x 10 cm. The crop was grown using recommended package of practices.

The observation on growth, yield and quality were recorded as per standard procedures. The crop was harvested on 5 April, 2018. The economics of the cultivation was calculated based on the prevailing cost of inputs and sale price of Garlic during the season. The

data was analysed following procedure described by Williams and Steinbergs (1969).

## Results and Discussion

### Growth parameters

The maximum values of growth parameters viz. 87.1 cm plant height, 44.7 cm leaf length, 7.8 leaves per plant, 62.43 g fresh weight per plant and 10.29 g dry weight per plant (Table 1) were recorded where the nutrients were applied through three sources (T-8) 33 percent each of FYM, Vermicompost and poultry manure (6.60t FYM + 3.33 t VC + 1.0 t PM/ha). The second best treatment was T<sub>7</sub> wherein nutrients were applied through two organic sources (50% each) involving 10 t FYM + 3.33 t berdmankhad/ha. The other treatments exerted almost identical influence upon growth parameters. The remarkable increase in growth parameters under T<sub>8</sub> and T<sub>7</sub> treatments might be due to integrated influence of FYM + VC + PM upon the enhanced supply of multi-nutrients, most favourable physio-chemical and biological properties of soil, thereby increased photosynthesis, acceleration of cell elongation and cell division. The increased growth parameters of garlic due to different organic sources have also been observed by Adewale *et al.*, (2011), Kuldeep Sevak *et al.*, (2012), Damse *et al.*, (2014), Sachin *et al.*, (2017), Manish *et al.*, (2017), Jay Prakash *et al.*, (2017) and Fikru and Gedamu (2018).

### Yield and Yield attributes

Application of recommended doses of nutrients through three organic sources (33 % each) in integrated manure as applied in treatment T<sub>8</sub> (6.6 t FYM + 3.33 t VC + 1.0 t PM/ha) also resulted significantly highest values of yield attributes viz., 5.26 cm girth of bulb, 2.15 g weight of clove, 3.6 cm length of

clove, 4.59 cm girth of clove and 26.9 cloves/plant compared to other treatments.

The remaining treatments showed almost equal effect on the yield attributes of garlic are remained on par.

The significant increase in yield attributing parameters under the combined influence of organic manures (FM + VC + PM) may be owing to variation in their nutrient composition, decomposition of organic residues, C: N ratio, nutrient release pattern, climate and soil characteristics. These results of present study are in agreements with those of Damse *et al.*, (2014), Nainwal *et al.*, (2015).

### **Yield, quality and economics**

Application of recommended nutrients through three organic sources viz. T<sub>8</sub>, FYF, Vermicompost and Poultry manure (33 % each) resulted in significantly higher garlic yield of 113.51 q/ha and the maximum sulphur content (1.22%) revealing the superiority of nutrient management through integration of organic sources for obtaining higher yield with better quality. In economic terms the highest net return of Rs.387844/ha with B:C ratio of Rs. 5.50 was also obtained in T<sub>8</sub> involving integrated use of organic

sources (Table 2). The second best treatment was the application of nutrients through chemical fertilizers (N<sub>100</sub>P<sub>75</sub>K<sub>50</sub>) applied through urea, single super phosphate and potash, resulting the yield of 103.7 q/ha with net return of Rs. 3,70311/ha and of B:C ratio 8.13.

The remaining treatments viz, T<sub>2</sub> (20 t FYM/ha), T<sub>4</sub> (6.66 t BK/ha), T<sub>5</sub> (10 t FYM + 5 t VC/ha) and T<sub>6</sub> (10 t FYM + 1.66 t PM/ha) were at par among themselves and inferior to treatment T-8.

The improvement in bulb yield under the integrated treatment may be ascribed due to the improved nutrients absorption resulting increased vegetative growth and photosynthesis, thereby increased translocation of food materials (assimilates) towards the sink. Similar findings have also been reported by Hamma *et al.*, (2013).

Based on the results obtained on various aspects, application of nutrients through integrated organic sources like Farm Yard Manure, Poultry Manure and Vermi -compost (33% of each) was identified to be the best option for realizing higher yield with better quality and profitability for raising garlic under organic farming.

**Table.1** Growth attributes of garlic as influenced by the different organic sources of nutrients.

<b>Treatments</b>	<b>Plant height at 120 DAS(cm)</b>	<b>Length of leaf at 120 DAS(cm)</b>	<b>Leaves/plant at 120 DAS(Nos)</b>	<b>Fresh weight/ plant at 120 DAS (g)</b>	<b>Dry weight/ plant at 120 DAS(g)</b>
T <sub>0</sub> -RDF (N <sub>100</sub> P <sub>75</sub> K <sub>50</sub> , through chemical sources)-control	79.2	43.2	6.9	42.60	6.71
T <sub>1</sub> - Farmyard manure (100%)	81.2	42.4	6.8	44.13	7.26
T <sub>2</sub> - Varmicompost (100%)	83.5	44.6	6.9	41.79	7.75
T <sub>3</sub> - Poultry Manure (100%)	79.7	41.8	7.2	47.66	8.22
T <sub>4</sub> - Berdmankhad (BK 100%)	78.3	40.3	6.1	36.04	6.98
T <sub>5</sub> - FYM+VC (50% each)	83.9	40.5	6.9	39.67	9.59
T <sub>6</sub> - FYM +PM (50% each)	84.3	44.0	6.9	47.34	8.29
T <sub>7</sub> - FYM + Berdmankhad (50% each)	85.8	44.3	7.3	50.28	8.35
T <sub>8</sub> - FYM + PM + VC (33% each)	87.1	44.7	7.8	62.43	10.29
<b>CD (P=0.05)</b>	<b>3.1</b>	<b>3.1</b>	<b>0.5</b>	<b>6.92</b>	<b>1.96</b>

**Table.2** Yield-attributes, bulb yield of garlic, quality and its economics as influenced by the different organic sources of nutrients

<b>Treatments</b>	<b>Girth of bulb (cm) 150 DAS</b>	<b>Weight of clove (g)</b>	<b>Length of clove (cm)</b>	<b>Girth of clove (cm)</b>	<b>No. of Cloves/plant</b>	<b>Yield of garlic (q/ha)</b>	<b>Moisture in clove (%)</b>	<b>Ash in clove (%)</b>	<b>Sulphur in garlic on dry wt. basis (%)</b>	<b>Net return (Rs/ha)</b>	<b>B:C ratio</b>
T <sub>0</sub> -RDF (N <sub>100</sub> P <sub>75</sub> K <sub>50</sub> , through chemical sources)- control	4.60	1.54	2.9	3.54	24.22	103.70	74.5	0.60	0.99	370311	8.13
T <sub>1</sub> - Farmyard manure (100%)	4.84	2.05	3.5	4.00	22.77	96.39	75.9	0.76	1.24	333986	6.06
T <sub>2</sub> - Varmicompost (100%)	4.37	2.02	3.1	3.91	20.22	87.22	61.1	0.40	0.71	256966	2.70
T <sub>3</sub> - Poultry Manure (100%)	4.63	1.84	3.2	4.13	23.55	83.51	62.3	0.40	1.01	275379	4.07
T <sub>4</sub> - Berdmankhad (BK 100%)	4.31	1.97	3.1	3.94	21.78	92.40	71.1	0.60	1.05	287918	3.38
T <sub>5</sub> - FYM+VC (50% each)	4.74	1.85	3.1	3.57	24.10	93.80	63.0	0.40	1.11	321858	5.48
T <sub>6</sub> - FYM +PM (50% each)	4.61	1.91	3.1	4.27	23.33	98.33	65.5	0.61	0.85	320245	4.28
T <sub>7</sub> - FYM + Berdmankhad (50% each)	4.51	2.23	3.5	4.37	22.22	83.97	63.7	0.79	0.86	208886	3.83
T <sub>8</sub> - FYM + PM + VC (33% each)	5.26	2.15	3.6	4.59	26.89	113.51	66.2	0.62	1.22	387844	5.50
<b>CD (P=0.05)</b>	<b>0.33</b>	<b>0.38</b>	<b>0.30</b>	<b>0.33</b>	<b>2.52</b>	<b>8.70</b>	<b>2.4</b>	<b>0.05</b>	<b>0.05</b>	<b>--</b>	<b>--</b>

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