

Original Research Article

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Effect of Organic Manure on Growth, Yield and Quality of Garlic (*Allium sativum* L.) under Hadauti Region

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ABSTRACT

Garlic (*Allium sativum* L.) is the second important bulb crop after onion. It is very hardy vegetable crop and is grown throughout India. It reduces the cholesterol in the blood. The garlic extracts also the nematicidal fungicidal and bacterial properties. Garlic is in flavorings food, preparing chutneys, pickles, curry powder, tomato ketchup etc. It is rich in proteins, phosphorus, calcium, magnesium and carbohydrates. China rank 1st in area and production (7.79 lakh ha and 179.68 lakh MT, respectively) and India is the second in area (2.05 lakh ha) and production (10.70 lakh MT). Egypt tops in list (23.83t/ha) productivity followed by China (23.06t/h). The research was conducted during *rabi* season 2016-2017 at the field of Horticulture department, School of Agricultural Sciences, Career Point University- Kota, Rajasthan, India. The annual rainfall of the region is 650 – 1000 mm, most of which is contributed by south west monsoon from July to September. The following observations on various characters were recorded during the period of experimentation is under Shoot observations and Root observations. In experiments indicates that maximum plant height at 30, 60 and 90 days after sowing was found with the treatment T₈ (75% RDF+25% Vermi-compost) and followed by T₅ (50% RDF+50% Vermicompost) and T₁ (control) respectively, while minimum plant height was recorded under the control treatment. It is clearly indicates that maximum number of leaves per plant at 30, 60 and 90 days after sowing were found with the treatment T₈ (75% RDF+25% Vermicompost) 4.80,4.61,6.11 per plant followed by T₅ (50% RDF 50% Vermi-compost) 3.75, 4.86, 6.34 and T₁ (control) respectfully while minimum number of leaves per plant was recorded under the control treatment. The maximum clove length are recorded under treatment T₈ (75% RDF +25 % Vermi-compost) 2.66 cm and followed by T₅ (50% RDF + 50% Vermicompost) 2.59 cm. While minimum in treatment T₁ (control) 1.67 cm. Length of clove was measure after harvesting. T₈ Treatment and T₅ Treatment also show possible significant response for length of cloves. Length of clove show positive response of good yield.

Keywords

Organic, Fertilizer,
Garlic, Bulb crop,
Vermi-compost etc.

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Introduction

Garlic (*Allium sativum* L.) is the second important bulb crop after onion. It is very hardy vegetable crop and is grown throughout India. It reduces the cholesterol in the blood. The garlic extracts also the nematicidal fungicidal and bacterial properties. The foliage of garlic is flattened rather than hollow like than of the onion. Garlic contains amino acid 'Allion' which is colourless.

However when cloves are crushed alliin is formed due to the enzymatic reaction of allinase. The economic yield is obtained from its underground herb, which is considered of bulbets, popularly called as cloves. Garlic is in flavorings food, preparing chutneys, pickles, curry powder, tomato ketchup etc. It is rich in proteins, phosphorus, calcium, magnesium and carbohydrates. The uninjured bulb content a colourless, odorless water soluble amino acid allion by crushing the garlic bulb, the enzyme alliances break down allion to produce alliin of which the principle ingredient is the odouriferous diallyl-disulfide (60%) diallyl-trisulfide (20%), allylpropyl disulfide (6%) and small quality of diethyl disulfide and probably diallyl polysulfide.

The world production of garlic was 222.82 lakh MT, from 3.71 lakh hectare areas (Annon.2009).china, India Republic of Korea, Russian Fed, Myanmar Ethiopia USA and Egypt are the major garlic growing countries. China rank 1st in area and production (7.79 lakh ha and 179.68 lakh MT, respectively) and India is the second in area (2.05 lakh ha) and production (10.70 lakh MT). Egypt tops in list (23.83t/ha) productivity followed by China (23.06t/h). Whereas it is quit low (5.22t/h) in India compared to world average (16.26t/ha). Among the different state in India Madhya Pradesh is the leading accounting for the 27% of area and 23% of production with average yield of 4.47 t/h.

Materials and Methods

The present investigation entitled "Effect of Organic Manure fertilizer of growth, yield and quality of Garlic (*Allium sativum* L.)" under Hadauti Region" was conducted during *rabi* season 2016-2017 at the field of Horticulture department, School of Agricultural Sciences, Career Point University- Kota, Rajasthan, India. The experiment was conducted to find out the best IBA concentration and appropriate time of planting for improving the rooting potentially of cuttings, when propagated through hardwood cuttings. This zone possesses typically sub-tropical climatic conditions characterized by mild winters and moderate summers associated with high relative humidity during the months of July to September. The annual rainfall of the region is 650 – 1000 mm, most of which is contributed by south west monsoon from July to September.

Experimental design: Factorial Randomized Block Design (FRBD)

Number of replications: 3

Number of cuttings per treatments: 10

Number of treatment combinations: 3x3

Total number of cuttings: 3x3x3x10=270

Experimental details

A. Time of plantings

DATE	NOTATION
25 TH DECEMBER	T ₁
10 TH JANUARY	T ₂
25 TH JANUARY	T ₃

B. IBA concentration

CONDITION	NOTATION
500PPM	C ₁
1000PPM	C ₂
CONTROL	C ₂

Treatment combinations

T ₁ C ₁	T ₂ C ₁	T ₃ C ₁
T ₁ C ₂	T ₂ C ₂	T ₃ C ₂
T ₁ C ₃	T ₂ C ₃	T ₃ C ₃

Treatments

- T₁: Control
- T₂: RDF (NPK) 100%
- T₃: Vermi-compost 100%
- T₄: FYM 100%
- T₅:50% RDF+50% Vermicompost
- T₆:50% RDF+50% FYM
- T₇:50% Vermicompost+50% FYM
- T₈:75% RDF+25% Vermicompost
- T₉:75% RDF+25% FYM
- T₁₀:50% RDF+25% FYM+25% Vermicompost

Preparation of cuttings of plants selected for cuttings were disease free, moderately vigorous and healthy. The cuttings were made from healthy and partially matured shoots having 4-5 nodes. The length of the cuttings varied between 15-20cm (6-8 inches) and, the diameter for hardwood cutting (1.3-1.5cm), respectively. The cuttings were collected early in the morning when leaves and shoots of stock plants were turgid. The required concentrations of growth regulator IBA (500 and 1000 ppm) was prepared by dissolving 0.5g and 1g of IBA in few ml of 80 % ethanol and the volume was made up to one litre by adding distilled water in 1000 ml volumetric flasks. Quick dip method was adopted for treatment of the cuttings with IBA solutions. The basal portions of cuttings up to 2.5-3 cm were soaked with solution for 10 seconds. After 10 seconds of treatment, the cutting were removed from the solutions and immediately planted in the polythene bags carefully with the help of dibbler without any injury to the buds on December 25th, January 10th and January 25th. At the time of planting,

1/3 part of cutting was inserted in the rooting media. Each polythene bag consists of one cutting. The soil around the cuttings was tightly pressed and then light watering was given to the cuttings. The following observations on various characters were recorded during the period of experimentation is under Shoot observations is taken Percentage of sprouted cuttings, Percentage of unsprouted cuttings, Average number of sprouts per cutting, Length of longest sprouts(cm), Number of leaves on new shoots and Root observations and under Root observations is taken Percentage of rooted cuttings, Number of primary roots, Length of longest roots(cm), Fresh weight of roots per cutting(gm), Dry weight of roots per cutting(gm). Shoot observations the following observations of the cuttings were recorded at 15 days intervals. The number of sprouted cutting was counted in each treatment at 10 days interval and the mean number of sprouted cuttings was worked out. The number of unsprouted cutting was counted in each treatment at 10 days interval and the mean number of unsprouted cuttings was worked out.

The average numbers of sprouts per cutting in each treatment at 15 days interval were calculated and the mean average number of sprouts per cutting was recorded. Length of sprouts (cm) was measured with the help of scale in each previously tacked shoots at 15 days interval and the mean length of sprouts was found. The total numbers of leaves were counted on newly emerged shoots of cuttings at 15 days interval and average number of leaves per shoots was calculated. The following observations were taken at the end of study period after uprooting the sprouted cuttings. Percentage of rooted cuttings Total number of rooted cuttings was noticed and calculated the rooting percentage on the basis of following formula:

Percentage of rooted cuttings =

$$\frac{\text{Number of rooted cuttings}}{\text{Total number of cutting}} \times 100$$

Three randomly selected cuttings from each treatment each replication was taken for recording the data on number of primary roots. Average number of primary roots cutting was calculated by dividing the total number of primary roots, with the number of cuttings. This observation was recorded at the termination of experiment after three months. Length of root was measured with the help of measuring scale and mean value was calculated. The randomly selected cuttings were used to measure fresh weight of roots (gm) with the help of electronic balance. The average fresh weight of roots was calculated by dividing the total weight by number of cuttings. The same samples of fresh root from cuttings per replication were also dried for dry weight (gm) in oven at $58 \pm 2^{\circ}\text{C}$, until attaining a constant weight. The average dry weight of roots was calculated by dividing the total dry weight of roots with number of cuttings. The experiment was laid out in the Factorial Randomized Block design (FRBD) with three replications as described by Cochran and Cox (1992). Valid conciliations were drawn after the analysis of data at 5 percent level of significance. Critical difference was calculated in order to compare the treatment means. The experimental results are presented with the help of tables and diagrams wherever found necessary.

Results and Discussion

The results obtained from the study on growth, yield and quality of garlic are discussed. The effect of the organic manure fertilizers significantly increased the plant height recorded in the treatment RDF and FYM along with the vermi-compost

application. It is clearly indicates that maximum plant height at 30, 60 and 90 days after sowing was found with the treatment T₈ (75% RDF+25% Vermi-compost) and followed by T₅ (50% RDF+50% Vermi-compost) and T₁ (control) respectively, while minimum plant height was recorded under the control treatment. It is clearly indicates that maximum diameter of stem at 30, 60 and 90 days after sowing was found with the treatment T₈ (75% RDF+50% Vermi-compost) 5.05, 6.89, 16.73cm followed by T₅ (50% RDF+50% Vermicompost) 4.84, 6.23, 16.00cm and T₁ (control) 3.69, 5.44, 9.62 respectively, while minimum diameter of stem was recorded under the control treatment. The reason for maximum diameter of stem due to the higher concentration of soil enzymes, soil organic matter and soil for rapid mineralization and transformation of plant nutrients in soil, application of RDF, Vermi-compost nutrient resulting in increased to the diameter of stem. The result of this study are agreements with the Mandloi *et al.*, (2008), Ali *et al.*, (1998) Gunadi *et al.*, (1996) and Naidu *et al.*, (2000) in garlic crop. It is clearly indicates that maximum number of leaves per plant at 30, 60 and 90 days after sowing were found with the treatment T₈ (75% RDF+25% Vermi-compost) 4.80, 4.61, 6.11 per plant followed by T₅(50% RDF% 50% Vermi -compost) 3.75,4.86,6.34 and T₁ (control) respectfully while minimum number of leaves per plant was recorded under the control treatment. The reason for maximum number of leaves due to the higher N found in experimental plant than control, NPK nutrient resulting in increased to the number of leaves. The results of this study are agreements with the Suthar (2009), Singh *et al.*, (1994), Setty *et al.*, (1989) and Kore *et al.*, (2006) in garlic crop. Effect of organic manure fertilizers significantly higher leaf length recorded in the treatment RDF along with the vermicompost application is given. It is clearly indicates that maximum leaf length at 30, 60 and 90 days

after sowing were found with the treatment T₈ (75% RDF+25% Vermi-compost) 18.41, 30.84, 42.48cm followed by T₅ (50% RDF+50% Vermicompost) 17.67, 29.44, 41.36 and T₁ (control) respectively, while minimum leaf length was recorded under the control treatment. The reason for maximum leaf length due to the earthworm casts application there was an increase in number of tillers and of leaves application of Vermicompost with NPK nutrient resulting in increased to the leaf length. The results of this study are agreements with the Singh *et al.*, (1994) and Naidu *et al.*, (2000) in garlic crop. It is clearly indicates that maximum leaf width at 30, 60 and days after sowing were found with the treatment T₈ (75% RDF+25% Vermi-compost) 0.57, 0.97, 1.77 mm followed by T₅ (50% RDF + 50% Vermicompost) 0.53, 0.95, 1.60 and T₁ (control) 0.34, 0.79, 1.06 respectively, while minimum leaf width was recorded under the control treatment. The reason for maximum leaf width because in the form of traditional inorganic NPK and in the form of Vermi-compost, brings an excellent biochemical changes in soil structure, which ultimately promotes plant growth. The results of this study are agreements with the Naidu *et al.*, (2000) and Suthar (2009). Effect of organic manure fertilizers significantly higher plant height recorded in the treatment RDF along with the vermin-compost application was given. It is clearly indicates that maximum weight of bulb at harvesting time was found with the T₈ (75%RDF+25%Vermicompost) 48.47g followed by T₅ (75%RDF + 25% Vermicompost) 47.41g and T₁ (control) 32.97g respectively, while minimum weight of bulb was recorded under the control treatment. The reason for maximum weight of bulb due to the RDF and Vermi-compost application in the soil enhances the biochemical potential of soil and consequently effect plant production. The results of this study are agreements with the Suther (2009), Jahangiret *al.*, (2005) and

Abdel *et al.*, (2002) in garlic crop. It is clearly indicates that maximum diameter of bulb at harvesting time was found with the treatment T₈ (75%RDF+25% Vermicompost) 5.45cm followed by T₅ (50%RDF+50% Vermi-compost) 5.26cm and T₁ (control) 3.84cm respectively, while minimum diameter of bulb was recorded under the control treatment. The probable reason for maximum diameter of bulb is may be due to the application of RDF which enhanced the activity of some microbial population vermin-compost along with NPK nutrient resulting in increase to the diameter of bulb. The results of this study are agreements with the Bhati *et al.*, (2002), Verma *et al.*, (1996) and Yadav (2003) in garlic crop. Effect of organic manure fertilizer significantly higher number of cloves per bulb at harvesting time was recorded in the treatment RDF along with the vermin-compost application was given. It is clearly indicates that maximum number of cloves per bulb at harvesting time were found with the treatment T₈ (75% RDF + 25% Vermicompost) 40.05/bulb followed by T₅ (50% RDF + 50% vermicompost) 39.09/bulb and T₁ (control) 25.75/bulb respectively, while minimum number of cloves per bulb was recorded under the control treatment. Application of RDF and vermicompost, nutrient resulting in increase of cloves number per bulb. The results of this study are agreements with the Yadav (2003), Reddy *et al.*, (2000), Ali *et al.*, (1998) and Verma *et al.*, (1996) in garlic crop. Effect of organic manure fertilizers significantly maximum yield q/ha were recorded in the treatment RDF along with the vermicompost application was given. It is clearly indicates that maximum yield q/ha was found with the treatment T₈ (75% RDF + 25 % Vermi-compost) 310.66q/ha followed by T₅ (50% RDF + 50% Vermicompost) 284.32q/hand T₁ (control) 250.00q/ha respectively, while minimum yield q/ha was recorded under the control treatment. The application of RDF and

vermin-compost, and micro nutrients setting are affected the soil ability and balancing nutrient supply to the plant increase with the result with the study are agreement with the findings of Yadav (2003), Patil *et al.*, (2007), Sharma (1988), Singh *et al.*, (1994) and Jahangir *et al.*, (2005) in garlic crop. The maximum clove length are recorded under treatment T₈ (75% RDF + 25% Vermicompost) 2.66 cm and followed by T₅ (50% RDF + 50% Vermicompost) 2.59 cm. While minimum in treatment T₁ (control) 1.67 cm. Length of clove was measure after harvesting. T₈ Treatment and T₅Treatment also show possible significant response for length of cloves. Length of clove show positive response of good yield. The maximum neck thickness of bulb recorded in treatment T₈ (75% RDF + 25% Vermicompost) 1.50 cm and Followed by T₅ (50% RDF + 50% Vermicompost) 1.40 cm and the lowest is the T₁ (control) 1.02cm T₈ treatment is perfect compared to other treatment combination. The maximum number of bulb/kg was recorded in treatment T₈ (75% RDF + 50% Vermicompost) 48.74 bulb/kg and followed by T₅ (50% RDF + 50% Vermicompost) 39.10 bulb/kg. While minimum in control treatment T₁ (control) 34.74 bulb/kg.

Summary and conclusion of the study are as follows:

Regarding growth parameter mainly plant height, Number of leave/plant, Length of leave/plant, Width of leave, Diameter of stem, Diameter of bulb, Number of clove/bulb, Length of clove/bulb, Neck Thickness of bulb, Weight of bulb (g), Number of bulb/kg, Yield of bulb q/ha. The RDF, Vermi-compost and FYM manure and fertilizer along with some combination was applied in the field crop of the garlic to test its importance of plant growth and productivity. There was excellent plant growth as well as yield quality

in garlic plants that received vermin-compost as nutrient supplier in field. The result indicated the advantage of vermin-compost in such field crop production, but here such effect could be attributed to the nutritional status of vermin-compost and to a variety of other factor (soil microbial structure and activity, mineralization and soil enzymatic factors). The data clearly indicates that vermin compost may be an efficient plant growth media for sustainable plant production, if applied with some combination RDF.

Therefore it may be concluded on the basis of above investigation that the combination of organic manure and inorganic fertilizer i.e. treatment T₈ (75% RDF+25% Vermicompost) can be recommended for garlic growers to achieve the better growth, higher and qualitative yield under the Hadauti Region of Rajasthan.

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