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Response of garlic to organic and inorganic fertilizers

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ABSTRACT

An experiment was carried out to study the response of organic and inorganic fertilizers on growth, yield and quality of garlic (*Allium sativum* L.) cv. Yamuna Safed-3. The results revealed that the combined application of 25% RDF with 75% N through FYM @ 20 t/ha gave higher marketable bulb yield of 19.34t/ha as compared to other treatments which were statistically on par with 100% RDF (18.53 t/ha) and 50% RDF + 50% N supplied as FYM (18.94 t/ha). It is suggested that for better biometric observations, bulb characters and marketable bulb yield in garlic, combined use of inorganic and organic source of nutrient supply is preferable.

Key words: Organic, biometric, garlic

INTRODUCTION

India is the largest producer of garlic in the world with an annual production 5,65,000 tones at an average productivity of 4.74 t /ha (Shanmugasundaram. 2005), which is much lower than the potential productivity. Garlic, being a nutrient loving crop, responds well to added fertilizers in the soil. Warade *et al* (1995) stated that continuous application of inorganic fertilizers deteriorate the soil. Therefore, to maintain soil fertility in order to supply plant nutrients in balanced proportion for optimum growth, yield and quality of crop, under different agro-ecological situations an integrated use of inorganic and organic source of plant nutrients is to be practiced. Keeping this in view, an experiment was conducted to study the response of organic and inorganic fertilizers on growth, yield and quality of garlic.

MATERIAL AND METHODS

A field experiment was carried out at Department of Horticulture, Marathwada Agricultural University, Parbhani. Maharashtra, India during *rabi* 2005 on response of organic and inorganic fertilizers on garlic, variety Yamuna Safed - 3 by adopting Randomized Block Design with eight treatments viz., T_1-100 % Recommended dose of fertilizers (RDF),T_{2-} 50 % RDF + 50 % N through vermicompost, T_3 -25 % RDF+ 75% N through vermicompost, T_4 -50 % RDF + 50 % N through neem cake, T_5 -25 % RDF +75 % N through neem cake, T_6 -50 % RDF +50 % N through FYM, T_7 -25 % RDF +75 % N through FYM and T_8 –Control (no manures and fertilizers). The soil was medium black with pH 7.6 containing 0.74 % Organic Carbon, 255.02 kg / ha N, 18.32 kg/ha P_2O_5, 327.68 kg/ha K_20. The garlic variety Yamuna Safed-3 was (clove) planted at 15 x 7.5 cm spacing in 1.95 m x 1.35 m plots. The organic manures were applied 10 days before sowing. The inorganic chemical fertilizers, as per the above treatments, were applied through urea, single superphosphate and muriate of potash. Growth parameters were recorded 30, 45, 60, 90, 105 and 120 days after planting (DAP). Statistical analyses of biometrical characters were done following Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

The data on the plant height number of leaves, bolting percentage, days to maturity, neck thickness, polar diameter, equatorial diameter, and shape index are presented in Table 1 which revealed that there were significant differences between organic and inorganic fertilizer treatments. At 120 DAP, the maximum plant height of 71.90 cm was observed in the treatment 25 % RDF+75 % N through FYM and found significantly higher than the control, closely followed by application of 100 % RDF (19.64 cm) and 25 % RDF + 75% N through neem cake (71.34 cm). Treatments T_1, T_2, T_3, T_4, T_5, T_6 AND T_7 did not show significant differences. The control (T_8) showed the lowest plant height (70.06 cm) which may be due to addition of no organic or inorganic fertilizers. Similar finding was reported by Waghachaure (2004) in onion.

Table 1. Effect of organic and inorganic fertilizers on biometric characters of garlic cv. Yamuna Safed-3

Sl. No.	Treatment	Plant height (cm) at 120 DAP	No. of leaves at 120 DAP	Bolting (%)	Maturity (days)	Neck thickness (cm)	Polar diameter (cm)	Equatorial diameter (cm)	Shape index
T_1	100 % RDF	71.64	10.26	21.19	127.33	1.24	4.5	5.1	0.89
T_2	50 % RDF+50% N through vermicompost	71.12	10.33	24.04	130.67	1.16	4.0	4.5	0.84
T_3	25 % RDF+75 % N through vermicompost	71.00	10.20	27.34	132.33	1.13	3.8	4.4	0.86
T_4	50 % RDF+ 50 % N through neem cake	71.26	10.20	24.00	130.33	1.10	4.4	4.9	0.88
T_5	2 5% RDF+ 75 % N through neem cake	71.34	10.13	28.99	129.67	1.04	4.0	4.7	0.86
T_6	50 % RDF+ 50 % N through FYM	70.96	10.40	19.89	126.10	0.99	4.5	5.1	0.90
T_7	25 % RDF+ 75 % N through FYM	71.90	10.80	17.70	126.67	0.93	4.7	5.2	0.90
T_8	Control	70.06	9.73	37.68	133.00	1.22	3.6	4.4	0.81
	SE ±	0.50	0.09	0.84	1.52	0.04	0.07	0.07	0.01
	CD*(P=0.05)*	1.58	0.29	2.56	4.60	0.14	0.22	0.24	0.04

Significantly higher number of leaves per plant (10.80) at 120 DAP was produced under the treatment 25% RDF + 75% N through FYM as compared to other treatments. The second best treatment in this regard was T_6. Treatments T_1, T_2, T_3, T_4, T_5 and T_6 were statistically on par with each other. The lowest number of leaves per plant (9.73) was observed in the control. As regards bolting percentage, it was observed that the treatment T_7 (25% RDF+ 75 % N through FYM) showed a value of 17.70%. Significantly higher bolting (37.68%) was observed in the treatment T_3 Treatment T_6 recorded the earliness in bulb maturity (126.10 days) and found to be significantly higher than the treatment T_3 and T_8 control. The next best treatment for attaining early maturity was treatment T_7 (25% RDF + 75 % N – through FYM) (126.67 days), which was statistically at par with the treatments T_1, and T_5.

The treatment T_8 (control) took maximum days (133.00 days) for bulb maturity. The lowest neck thickness (0.93 cm) in garlic bulbs was recorded in the treatment T_7. Maximum neck thickness in garlic bulbs (1.24 cm) was recorded in the treatment T_1, which was found statistically at par with the treatments T_2, T_3 and T_8. As regards polar diameter, maximum polar diameter of bulb (4.7 cm) was recorded in the treatment T_7, which was significantly higher than the other treatments except T_1 and T_6. Significantly minimum polar diameter (3.6cm) was recorded in the treatment control (T_8).

Similar trend was observed in respect of equatorial diameter of garlic bulbs. Maximum equatorial diameter of bulb (5.2 cm) was recorded in the treatment T_7 (25% RDF+75% N through FYM) the lowest equatorial diameter of bulb (4.4 cm) as found in the treatments T_3 (25% RDF+ 75 % N through vermicompost) and were statistically similar with each other.

Highest shape index of garlic bulb (0.90) was recorded in the treatment T_6 and T_7 while significantly lowest shape index of bulb (0.81) was recorded in the treatment control T_8. Thus, positive influence of combined treatment T_7 on biometric characters of garlic could be attributed due to solubilization of plant nutrients exerted by addition of farm yard manure on native and applied plant nutrients as well as chelating effect on metal ions leading to subsequent uptake of NPK by plant (Subbiah *et al*, 1982). Further, FYM might have enhanced the use efficiency of chemical fertilizer.

The data on bulb characters and yield of garlic shown in the Table 2. Significant differences in respect of fresh weight of bulb and cured weight of bulb were observed in treatments receiving organic and inorganic fertilizers. Maximum fresh weight of bulb (35.60 g) was recorded in the treatment T_7, which was significantly higher than other treatments except treatment T_6. The treatments T_2, T_3, T_5 and T_8 were statistically at par with each other. Significantly lower fresh weight of bulb (24.00 g) was recorded in the treatment T_8. The trend observed in respect of cured weight of bulb (33.40 g) was also similar in the treatment T_7, which was significantly higher than other treatments except the treatments T_1 and T_6. Significantly lower cured weight of bulb (20.40 g) was recorded in the treatment T_8. Similar finding was reported by Lal *et al* (2004) in onion. The maximum number of cloves per bulb (22.00) was recorded in the treatment T_8 followed by T_3 (20.00) and T_2 (19.00).

Table 2. Response of organic and inorganic fertilizer on biometric observations of garlic cv. Yamuna Safed-3

Sr. No.	Treatment	Mean fresh bulb wt (g)	Mean cured weight of bulb (g)	Mean number of cloves /bulb	Length of clove(cm)	Diameter of clove (cm)	Weight of clove / bulb (g)	Bulb yield / plot (kg)	Bulb yield / ha(q)
T_1	100 % /RDF	32.73	30.26	14.00	3.00	1.30	2.13	4.95	188.26
T_2	50 % TDF + 50 % N through vermicompost	29.44	27.17	19.00	2.26	1.21	1.40	4.67	177.15
T_3	25 % RDF + 75 % N through vermicompost	28.61	25.46	20.00	2.40	1.09	1.26	4.63	175.50
T_4	50 % RDF + 50 % N through neem cake	31.46	29.06	15.00	2.90	1.27	1.93	4.77	180.81
T_5	25 % RDF + 75 % N through neem cake	30.93	28.66	17.00	2.70	1.24	1.66	4.77	180.68
T_6	50 % RDF + 50 % N through FYM	34.33	31.93	14.00	3.20	1.32	2.40	4.97	189.33
T_7	25 % RDF + 75 % N through FYM	35.60	33.40	12.00	3.50	1.35	2.73	5.10	193.31
T_8	Control	24.00	20.40	22.00	2.30	1.08	0.88	4.50	170.47
	SE ±	0.90	1.09	16.00	0.01	0.30	0.11	0.05	2.00
	CD *(P=0.05)*	2.75	3.30	1.04	0.30	0.10	0.34	0.18	6.07

The lowest number of cloves per bulb (12.00) was found in the treatment T_7. As regards clove length, maximum length of clove (3.50cm) was recorded in the treatment T_7. The treatments T_2 (2.60), T_3 (2.40) and T_5 (2.70) were statistically at par with each other. The minimum length of clove was measured in the control treatment T_8 (2.30 cm). Maximum diameter of clove (1.35 cm) was recorded in the treatment T_7. Significantly lower clove diameter (1.08 cm) was recorded in the control. As regards clove weight, maximum mean weight of clove was recorded in the treatment T_7 (2.73 g), which was significantly superior to the rest of the treatments except treatment T_6. The treatments T_2 (1.40g), T_3 (1.26 g) and T_5 (1.66 g) were statistically at par with each other. Significantly lower weight of clove (0.88g) was recorded in the treatment T_8. Highest bulb yield per plot was recorded in the treatment T_7 (5.10 kg) followed by the treatment T_6 (4.97 kg) and treatment T_1 (4.95 kg), which were significantly superior over to rest of the treatments under study. The lowest bulb yield per plot (4.50 kg) was recorded in the treatment T_8. As regards yield per hectare, the treatment T_7 recorded the highest bulb yield (19.33 q / ha). The treatments T_1 and treatment T_6 were statistically at par with the treatment T_7. Lowest bulb yield (17.05 t/ha) was recorded in the treatment T_8. Similar results were reported by Shamra *et al* (2003) in onion.

Biometric observations as well as bulb characters and yield of garlic were significantly influenced by the combined use of inorganic chemical fertilizers with organic sources of nutrients. This might be due to gradual and steady release of nutrient during the growth period as well as enhanced biological activity and proper nutrition to the crop (Nair and Peter, 1990 ; Sharma and Bhal, 1995; Hangarge *et al*, 2001). Thus, for better biometric and bulb character and marketable yield of garlic, combined use of inorganic and organic sources of nutrient supply is suggested.

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