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EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH, YIELD AND QUALITY IN ONION cv. PUSA MADHVI

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Abstract

The present investigation entitled **"**Integrated Nutrient Management in Onion cv. Pusa Madhvi" was conducted with the aim to understand the better utilization of nutrients for growth, yield and quality improvement of onion. The result of experiment showed that maximum plant height (73.33cm) was recorded under the RDF 75% + Vermicompost 25% while length of leaves (64cm), number of leaves (13.33), neck thickness (1.69cm) and number of scales were found in RDF 75% + Azotobacter 25%. Whereas, diameter of bulb (7.67cm), bulb length (6.80cm) and yield (42.33 t/ha) were observed in RDF 75% + Phosphobacteria 25% and all the growth and yield parameters were recorded minimum under control. The quality parameters in respect of TSS (14.00 ^{0}B) and dry weight of leaves (2.17g) were found maximum under the RDF 75% +Azotobacter 25% and minimum under control and Azotobacter 100% for better quality parameters, respectively.

Key words : Recommended dose of fertilizer, vermicompost, phosphobacteria, azotobacter, onion, bulb yield and quality.

Introduction

Onion (*Allium cepa* L.) is the oldest known and most important commercial crop grown in India. It is a short duration and quick growing crop having various purposes such as vegetables, spices and medicinal. India produces onion about 151.18 million tonnes in an area of 10.64 lakh hectares (Anon, 1999). India ranks second in the world for onion production of 19.90 percent and the first being China. India exports onion mainly to other countries like Malaysia, Russia, Kuwait, Sri Lanka, Singapore, Germany, Japan, Iran, Myanmar and U.K. etc. (Shinde and Sontake, 1993). *Alliums* are characterized by the presence of remarkable sulphur containing compound, which give them their distinctive smell and pungency. Onion contains methyl and propyl derivatives of allins but not true allin. Onion oil containing allyl propyl disulphide $(C_3H_5)_2S$. There has been interest in medicinal effect *Alliums*. It is known to benefit in the prevention and treatment of atherosclerosis and coronary heart disease. They can inhibit the aggregation of human blood platelets for arterial blocking. Studies showed that eating moderate amounts (<200 g of onion/week) results in less tendency to form blood clots and lower levels of cholesterol and lipoproteins associated with heart disease in their blood serum than in abstainers (non eaters). The antifungal properties of onion is due to presence of catechol a phenolic compound and it is used to cure earache, swelling and bite of insect and many other diseases like jaundice. The red pigment of onion bulb is due to presence of anthocyanin and yellow pigment is largely the flavonol quercetin. Onion bulb contains protein, vitamin C and rich in minerals like phosphorus, calcium and carbohydrates. Nutritional value for 100 g edible onion bulb contains moisture 86.8 g, mineral 50 g, carbohydrate 11.0 g, protein 1.2 g, fiber 0.6 g, nicotinic 0.4 mg, riboflavin 0.01 mg and dry matter 7-15%.

Onion is one of the important vegetable crops grown in this country in a large area of 10,64,000 hectares producing 151,18,000 mt bulbs for local consumption as well as for export purposes. The world production is 759,77,209 metric tonnes from an area of 39,71,505 hectares. India ranks second in area and production in world after China and third in export after Netherlands and Spain. Maharashtra however is the leading state with 415.0 "000" hectares area and 4905.0 "000" mt production followed by Karnataka (190.5 "000" hectares area and 2592.2 "000" mt production). The average yield per unit area in India is (14.2 t/ha). In India, per ha yield is highest in Gujarat (24.4 t/ha) followed by Haryana (20.5 t/ha) and per capita availability is about 7.94 kg.

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Onion is a heavy feeder of mineral elements. A crop of 35 t/ha removes approximately 120kg of N, 50kg of P_2O_5 and 160 kg of K_2O per ha (Tandon, 1987). Hence, the greater its ability to utilize nutrients for crop production, the greater is the yield potential. So that the present experiments entitled Integrated Nutrient Management in Onion cv. Pusa Madhvi was carried out to study the above application.

Materials and Methods

The experiment was laid out during the *rabi* season of 2012-13 at Horticulture Research Farm, Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Lucknow (Uttar Pradesh), India; which is subjected to the extreme of weather conditions. The climate of region is subtropical with maximum temperature ranging from 22^0C to 45^0C in summer, minimum temperature ranging from 3.5^0C to 15^0C in winter and relative humidity ranging from 60 - 80% in different season of the year. Before start of the experiment, the representative soil samples were taken randomly a depth of 15 cm from experimental field and brought to laboratory for physical and chemical analysis. The results of soil analysis have been presented in the soil of field may texturally be classified as sandy loam and slightly alkaline in reaction. Onion seeds of Pusa Madhvi were sown on nursery beds of Horticulture Research Farm, Babasaheb Bhimrao Ambedkar University, Lucknow (U.P.), India; by broadcasting method on 22 August 2012. Raised bed about 5–6 meter long, one meter width and 10 cm above ground level was prepared for that purpose. The seed beds were covered with compost, mulches and thatches with polythene paper above the bed to protect the young seedling from adverse climatic condition. 60 Days after sowing, bulb lets were ready for transplanting. These healthy bulbs let uniform shape and size were selected and transplanted in well prepared field. The experiment was laid out in Randomized Block Design with three replications. Seeds were germinated after 5-6 days. The land of the experimental site was irrigated prior to showing for optimum moisture level. The required area was then marked and plots were prepared according to the layout plan. The land of the experimental site was irrigated prior to transplanting for optimum moisture level. The first ploughing was done with disc plough and sub-sequent ploughing was done with cultivator followed by planking. About 100:50:70 of NPK and Vermicompost @ 1.9 tones/ha is applied at the last ploughing. Seedling were treated with Azotobacter (100%) @1 Kg/ha and PSB @ 2kg/ha. Sixty days old bulblets of uniform size (1.5 cm long and 0.25 cm diameter) were selected. After dipping, they were transplanted in field on November 7, 2012 at a spacing of 10 cm × 15 cm. From every plot 5 plants of onion were taken randomly for recording periodical data. The observations were recorded on the plant height (cm), leaf size (cm), number of leaves (cm), neck thickness (cm), diameter of bulb (cm), bulb length (cm), yield (t/ha), number of scales, total soluble solids, bulb weight (g) and dry weight of leaves. The data was analyzed using analysis of variance (ANOVA) under RBD following the procedure as stated by Panse and Sukhatme (1967).

Results and Discussion

The data showed the maximum plant height (73.33 cm) was recorded in Vermicompost 100% and minimum plant height was recorded in $\mathbf{T_1}$ (52.33 cm). The data showed that the maximum number of leaves were recorded in RDF 75% + Azotobacter 25% (13.33) followed by $\mathbf{T_{11}}$ (11.67) and $\mathbf{T_9}$ (11.67). Varu *et al.* (1997) recorded significantly higher number of leaves per plant (6.25) and plant height (46.70 cm) with NPK 100:50:50 kg per ha over the control. Maximum neck thickness was recorded in $\mathbf{T_4}$ (1.69 cm). Whereas, minimum neck thickness is observed in control (1.10 cm). The diameter of bulb was measured with the help of Verneer Callipers, just after harvesting. The data showed that the maximum diameter of bulb was recorded in Phosphobacteria 100% (7.67 cm) and followed by $\mathbf{T_9}$ (7.60 cm) and $\mathbf{T_5}$ (7.40 cm). Thimmiah (1989) observed the higher bulb diameter of onion (5.65 cm) with the application of 175 kg N + 75 kg P_2O_5 + 175 kg K_2O per ha. The maximum length of bulb was recorded in treatment $\mathbf{T_6}$ (6.80 cm) and it was followed by treatment $\mathbf{T_9}$ (6.57 cm). The number of scales per bulb was counted after harvest on sampled bulbs. The maximum number of scales was recorded in $\mathbf{T_5}$ (8.67 / bulb) followed by treatment $\mathbf{T_9}$ (7.33). Total soluble solids (T.S.S.) were measured in the sampled onion bulbs with the help of refractometer. Maximum T.S.S. (14.00^0B) is found in treatment $\mathbf{T_5}$ and which is followed by treatments $\mathbf{T_6}$ (13.33 ^{0}B) and $\mathbf{T_9}$ (13.00 ^{0}B). Whereas, minimum T.S.S. (11.00^OB) is found in treatment $\mathbf{T_1}$ (control). Ethel *et al.* (2009) recorded 2.1 per cent higher TSS (14.31%) with FYM application @ 30 t ha compared to control (12.2%). Data regarding that yield of fresh onion bulbs (t/ha) was measured after harvesting and the mean value of yield of fresh onion bulbs (t/ha) has been presented in table 1 and clearly indicate that yield per ha was significantly affected by different doses of different fertilizers in treatments. It was observed that the maximum yield of fresh bulb (42.33 t/ha) was recorded in treatment $\mathbf{T_6}$ and which is followed by $\mathbf{T_9}$ (35.67 t/ha)

Table 1 : Effect of different treatments on growth, yield and quality parameter of onion.

Symbol	Treatments	Plant height (cm)	Number of leaves	Length of leaves (cm)	Dry weight of leaves (g)	Neck thickness of Bulb(cm)	Bulb diameters (cm)	Bulb length (cm)	Number of scales/ Bulb	Yield of fresh bulb (t/ha)	T.S.S (°B)
T_1	Control	52.33	8.33	41.67	3.20	1.10	3.77	4.03	4.67	10.00	11.00
T_2	Recommended Dose of Fertilizers(RDF)	67.67	11.33	51.67	3.10	1.47	5.87	5.23	6.67	26.00	11.34
T_3	Azotobacter 100%	72.67	9	64.00	2.00	1.33	7.40	6.37	8.67	35.00	14.00
T_4	RDF 75% + Azotobacter 25%	61.0	13.33	46.67	2.60	1.69	5.60	4.83	6.00	26.33	11.67
T_5	RDF 50% + Azotobacter 50%	67	9.33	50.33	2.90	1.48	6.00	6.00	6.67	28.67	11.67
T_6	Phosphobacteria 100%	71.33	11.67	61.67	2.20	1.67	7.67	6.80	7.00	42.33	13.33
T_7	RDF 75% + Phosphobacteria 25%	65.67	10	48.67	2.50	1.30	6.23	4.97	5.67	29.33	11.34
T_8	RDF 50% + Phosphobacteria 50%	62.67	11	51.00	2.47	1.37	6.43	5.70	6.33	30.00	11.34
T_9	Vermicompost 100%	73.33	11.67	63.00	2.27	1.27	7.60	6.57	7.33	35.67	13.00
T_{10}	RDF75% + Vermicompost 25%	62	9.67	44.33	3.00	1.53	6.10	4.60	5.33	28.00	11.24
T_{11}	RDF50% + Vermicompost 50%	62.33	11.67	47.67	2.77	1.40	6.00	5.60	6.00	28.67	11.24
	S.Em.	1.32	0.64	0.97	0.03	0.04	0.08	0.16	0.37	1.18	0.36
	C.D. 5%	3.88	1.89	2.86	0.08	0.13	0.25	0.47	1.09	3.49	0.96

and T_5 (35.00 t/ha). Whereas, minimum yield was recorded in treatment T_1 (10.00 t/ha). Madan and Sandu (1985) obtained higher onion bulb yield with 120:60:60 kg NPK per ha. The maximum length of leaf was recorded in treatment T_5 (64.00 cm). However, minimum length of leaf was noted in treatment T_1 (41.67 cm). The highest dry weight (3.20 g) was found in Treatment T_1 and which is followed by treatment T_2 (3.10 g) and T_{10} (3.00 g). However, minimum dry weight of leaf was found in treatment T_5 (2.00 g).

Conclusion

On the basis of present investigation, it may be concluded that the application of inoculants RDF 75% + Azotobacter 25% increased growth, yield and quality of onion cv. Pusa Madhvi under Lucknow conditions.

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