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Effect of Different Source of Nutrients on the Performance, Growth and Quality of Summer Onion

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Abstract: The field experiments were conducted for one season rabi 2008-09 at the Multilocation testing site Magura on calcareous soil to study the effect of integrated nutrient management on the growth and yield of onion (cv. BARI piaj 2). The experiment was laid out in a RCB design. There were five treatments involving four inorganic levels and organic levels another absolute control (no manure and no NPK). Higher level of inorganic T_1 i.e., (120-45-85-40 kg ha^{-1} NPK S+ 5 t/ha CD) produced significantly higher bulb yield (18.76 t/ha) which was on par with T_4 (17.87 t/ha) i.e., 5 t/ha poultry manure + remaining amount from inorganic fertilizer T_2. The results also indicated that the same treatments recorded the highest single bulb weight, bulb yield as well as gross returns and MBCR (7.14) as compared to other treatments.

Key words: Growth, Inorganics, Organics, Onion, Yield

Introduction

Onion (*Allium cepa*. L) is one of the most important commercial spices in Bangladesh. It stands second in respect of area and production in Bangladesh. At present Bangladesh produces12 lakh metric tons of onion from 1.42 lakh hectares of land (DAE, 2009). The average production is 5.72 ton/ha. The annual national demand of onion is about 16 lakh ton. There is a running short is about 4 lakh ton (Annon., 2006).. Every year Bangladesh import huge amount of onion from the neighboring countries and expend about 500 to 600 crore taka. (Annon., 2005-06). However, the productivity of onion in Bangladesh is quite low as compared to world's productivity. So, there is an acute shortage of onion in relation to its requirement. This can be done by many ways of which the most important are the continuous and liberal use of inorganic fertilizer alone affects soil health and thus resulting in lower yield with poor quality produce (Mamatha, 2006). Plant nutrition plays an important role for enhancing yield and quality in onion. The cost of inorganic fertilizers has been enormously increasing to an extent that they are out of reach of the poor, small and marginal farmers.

Integrated Plant Nutrition System (IPNS) is 'the management of all available plant nutrient sources, organic and inorganic, to provide optimum and sustainable crop production conditions within the prevailing farming system' (BARC, 2005). In Bangladesh, Several scientists were revealed that the integrated nutrient management with organic and inorganic fertilizers to conserve the soil health and to get good quality produce. Although, the weather conditions seem to be friendly for the proper growth of onion but research work is very insufficient.

Organic material such as farmyard manure, mustard oil cake, vermicompost, poultry manure and bio-slurry improve soil physical and chemical properties that are important for plant growth (Synman *et al.,* 1998). Many researchers have found that addition of animal manure resulted in higher onion yield and nutrient uptake compared to NPK fertilizer. (Kumar et *al.,* 2001, Rumpel, 1998 and Sharma *et al.,* 2003). Mixture of chicken manure and bio-fertilizer increases the yield of onion and enriched nutrient content in tuber was reported by Shaheen *et al.,* (2007). Keeping in view these aspects, the present research work was initiated to determine the ideal integrated nutrient management package on growth, yield and quality of onion.

Materials and Methods

The experiment was carried out in the farmer's field at the MLT site Magura during 2008-09. Four different treatments with control and six dispersed replications were conducted in 15 plots. T_1 (Recommended from Ph.D work)= (120-45-85-40 kg ha^{-1} NPK S+ 5 t/ha CD), T_2 (Recommended from spice research center)= (90-55-75-20 kg ha^{-1} NPKS), T_3(IPNS)= 3 t/ha poultry manuare + remaining amount from inorganic fertilizer T_2, T_4(IPNS)= 5 t/ha poultry manuare + remaining amount from inorganic fertilizer T_2 and T_5= (00-00-00-00 kg ha^{-1} NPKS).

The unit plot size was 2m x 2m. Fifty days old seedling BARI Piaj-02 was planted on 07 April 2008 maintaining the row spacing 15cm and plant to plant distance 10 cm. Fertilizers were applied as per treatments. Total cowdung /poultry manure, TSP and Gypsum were used at final land preparation. 1/3rd urea and ½ MP were used as 1st top dress on 19 April

2008. 1/3rd urea were used as 2nd top dress on 30 April 2008 and rest 1/3 rd urea and ½ MP were used as 3rd top dress on May 2008. The crop was irrigated thrice April 8, 19 and 27 of 2008 and harvested on 10 June 2008. The data were collected; analyzed statistically and mean separation was done by DMRT. Data were recorded by selecting plants randomly from each treatment plot and average was calculated for the statistical analysis. The parameters under study were plant height (cm), number of leaves per plant, Single Bulb weight (g), No. of bulb/kg, bulb diameter (cm), and total yield per hectare (tones). The mean data were subjected to the Analysis of Variance Technique (Steel and Torrie, 1984) using the "MSTATC" Computer software package. Duncan's Multiple Range Tests (Duncan, 1955) was adopted for comparing their means among the treatments showing significant difference. Here, total variable cost (TVC) estimate through fertilizer price.

Results and Discussions

Data about effects of organic and chemical fertilizer on onion yield contributing criteria are given below in Table 1. The highly significant data pertaining to plant height as affected by different application of treatments on onion. The T_1 treatment resulted in tallest plant height (39.57 cm) closely related to T_4 and T_2 treatments with 34.17 cm and 33.67 cm plant height respectively. Similarly, significantly higher plant height in onion with application of vermin compost was reported by Reddy and Reddy (2005). Higher levels of FYM significantly increased the plant height, number of leaves per plant (Reddy and Reddy, 2005) and leaf area per plant (Lal *et al*., 2002) in onion. The maximum leaves per plant was observed from the treatment T_1 (7.83) which was statistically differ from the other treatments.

The data regarding single bulb weight was observed that all the treatments significantly affected bulb weight. The highest single bulb weight was obtained from the treatment T_1 (20.33 gm) which was statistically similar with T_4 (19.00 gm). The lowest single bulb weight was obtained from the treatment T_5 (12.00 gm).

The data pertaining to number of bulb per kg showed that all the treatments affected significantly number of bulb per kg. The treatment T_5 (82.67) showed highest number of bulb per kg followed by T_3 and T_2 treatments. The lowest number of bulb per kg was observed from T_1 (49.67) treatment. Increased bulb weight with increased inorganic levels was also reported by Varul *et al.,* (1997).

There are no significantly different on bulb diameter as affected by different treatments. The highest bulb diameter 3.87 from treatment T_1 followed by T_2 (3.61) and T_4 (3.54) treatments. Mamatha, (2006) observed the highest bulb diameter with the application of FYM + vermicompost in onion. Similar effect was also observed in bitter gourd (Samuvel, 1984). The yield was significantly influenced by different sources of nutrients. Significantly highest yield was recorded from the T_1 (18.76 t/ha) treatment which was statistically similar with T_4 (17.87 t/ha) and T_3 (16.46 t/ha) and lowest yield was 11.88 from T_5 treatment. This application increased yield by 24% compared to the control plots. Similar result was found also by Rather *et al.,* (2003), Sharma *et al.,* (2003), Kumar *et al.,* (2001), Dixit (1997) and Mallanagouda *et al.,* (1995) but Akoun (2005), Agudelo and Casierra (2004), Blay *et al.,* (2002), Rumpel (1998), Singh *et al.,* (1997), and Vural *et al.,* (1987) reported the opposite of the others.

Table 1. Effect of organic and inorganic fertilizer in the yield of summer onion

Treatments	Plant Height (cm)	Leave/plant (no)	Single Bulb weight (g)	No. of bulb/kg	Bulb diameter (cm)	Yield (t/ha)
T_1	39.57a	7.83a	20.33a	49.67c	3.87	18.76a
T_2	33.67b	6.70ab	16.33bc	60.67bc	3.61	15.42b
T_3	32.60b	6.03b	15.67c	63.67b	3.44	16.46ab
T_4	34.17b	6.27b	19.00ab	55.00bc	3.54	17.87a
T_5	27.73c	5.33b	12.00d	82.67a	2.86	11.88c
CV (%)	5.15	10.73	9.55	10.03	10.70	21.71
F-test	**	*	**	**	0.70	**

At higher level of organics, improved soil physical conditions might have resulted in better root growth, nutrient absorption and better bulb development. Increased bulb yield were noticed by several workers viz; Varul *et al.,* (1997), Singh *et al.,* (1997) and Lal *et al.,* (2002) with increased FYM levels. The yield parameters like bulb equatorial diameter, polar diameter and bulb weight also increased significantly at higher levels of organics. Significantly higher bulb size was recorded by Lal *et al*., (2002).

Similarly, significantly higher bulb equatorial diameter due to integrated nutrient management

(INM) was recorded by Mallanagouda *et al.,* (1995) and Varul *et al.* (1997).

The highest gross returns of Tk.281400 was obtained with $T_1$the application of (120-45-85-40 kg ha^{-1} NPK S+ 5 t/ha CD) followed by the treatments T_4 (Tk. 268050) and T_3 (Tk. 246900).

The treatment T_1 showed maximum marginal benefit cost ratio (MBCR) 7.14 and lowest was obtained from the treatment T_2 (4.66)

Table 2. Treatment wise economics of summer onion as influenced by different manure and fertilizers

Treatments	Gross return (Tk./ha)	TVC (Tk./ha)	MVP (over control)	MVC (over control)
T_1	281400	14451	103200	14451
T_2	231300	11400	53100	11400
T_3	246900	13376	68700	13376
T_4	268050	14690	89850	14690
T_5	178200	0	0	0

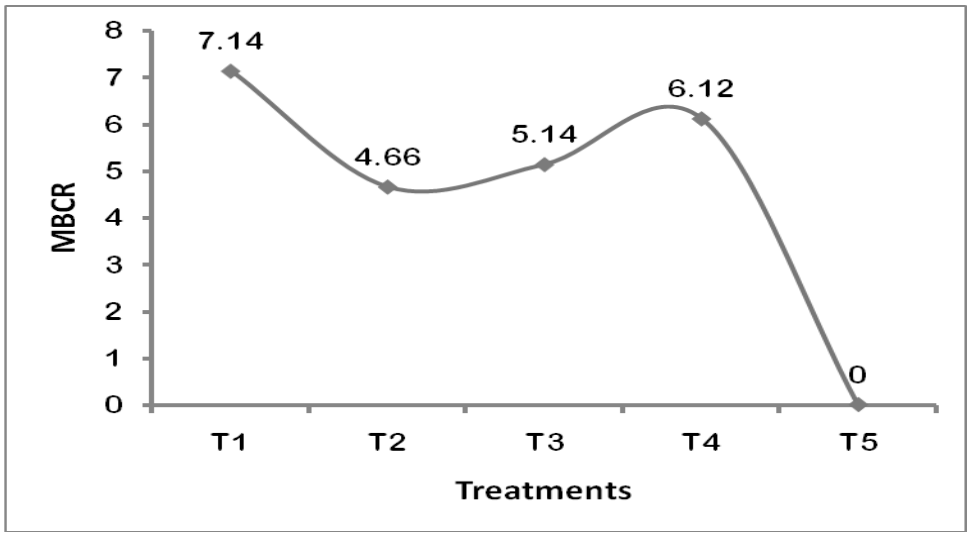

Fig.1. Marginal benifit cost ratio on summer onion production as influenced by different organic and inorganic fertilizer

Conclusions

With these results it can be concluded that higher level of inorganics *i.e.,* T_1 (Recommended from Ph.D work)= (120-45-85-40 kg ha^{-1} NPK S+ 5 t/ha CD), and higher levels of organics *viz.,*T4 and T_3 recorded higher bulb yield individually. This was reflected in growth parameters like plant height, number of leaves and Single Bulb weight as well as yield parameters. The treatment T_1 showed maximum gross return (281400 tk/ha) and lowest was obtained from the treatment T_5 (178200 tk/ha).

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