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Original Research Article

Response Of Nutrient Sources And Mulching On Yield And Economic Analysis Of Tuberose

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ABSTRACT

The study was conducted at the Horticultural Farm of Sher-e-Bangla Agricultural University, Dhaka, Bangladesh during the period from May 2013 to February, 2014. The experiment consisted with two factors. Factor A- Five levels nutrient sources: F_0 - Control, F_1 - Cowdung 5 t + 260 kg Urea + 200 kg TSP + 200 kg MP/ha, F_2 - Poultry litter 3 t + 260 kg Urea + 200 kg TSP + 200 kg MP/ha, F_3 - Cowdung: 10 t/ha and F_4 - Poultry litter: 6 t/ha; Factor B: Three levels of mulch: M_0 - control, M_1 -Rice straw mulch and M_2 - water hyacinth mulch. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. Application of fertilizer with different mulches showed significant variations on most of the parameters. The highest yield of spike (3,66,280 /ha) was found from F_1M_2 and the lowest (2,97,300 /ha) from F_0M_0. The highest benefit cost ratio (2.36) was found from F_1M_2 and the lowest benefit cost ratio (1.50) was obtained from F_0M_0. So, application of cowdung 5 t + 260 kg Urea + 200 kg TSP + 200 kg MP per hectare with water hyacinth mulch was found suitable for growth and yield of tuberose.

Key Word: Tuberose, nutrient sources, mulching, yield and economic analysis.

INTRODUCTION

Tuberose (*Polianthes tuberosa* L.) is one of the most popular bulbous ornamental plants of tropical and sub-tropical areas in the family Amaryllidaceae, produces attractive, elegant and fragrant white flowers. The flowers remain fresh for quite a long time and stand long distance transportation and fill a useful place in the flower market. [1] It is used as vase decoration, bouquets, making veni, garland, button-holes or crown and frequently used during marriage or religious ceremonies. [2] The long flower spikes of tuberose are excellent as cut flowers for table decoration when arranged in bowls and vases. The natural flower oil of tuberose remains today as one of the most expensive of the perfumes raw materials.

Tuberose is a native of Mexico from where it spreads to the different parts of the world during 16 century. How and when the tuberose found its entrance to India, Ceylon and elsewhere in the orient is probably an unanswerable question. [3] In Bangladesh, for the last few years, tuberose has become a popular cutflower for its attractive fragrance and beautiful display in the vase. Now, it is one of the most important commercial cutflowers. Tuberose has high demand in the market and its production is highly profitable. In Bangladesh, its commercial cultivation was introduced during 1980 by some pioneer and innovative farmers at Panishara union of Jhikorgacha thana under Jessore district near the Benapol border.

Tuberose is a half-hardy bulbus perennial multiplying itself through the bulblets. Roots are mainly adventitious and shallow, the leaves are long, narrow, linear grass like, green and arise in rosette, the flowers have a funnel shaped perianth, waxy white in color and borne in a spike. There are three types of tuberose: single with one row of corolla segments, semi- double bearing flowers with two to three rows of corolla segments and double having more than three rows of corolla segments.

Plant growth and economic cultivation of tuberose are affected by many factors among them fertilizer is important one. Effect of NPK on tuberose production has been reported by several authors of different geographical region. [4,5 ,6 ,7 ,8] Nitrogen has significant effect on bulb production of tuberose. It also increases plant height, number of leaves, spike per hill, earlier flowering and higher number of flowers per spike. [7,9] Phosphorus has a significant effect on spike production and floret quality. [10,11] Potash appears to help increasing the number of spike, flower per spike and number of flowers per hill. [4,5] However, under Bangladesh condition a few reports are available regarding the fertilizers requirement of this economically important cut flower.

Tuberose is known to be thermo photo sensitive crop and grown in Bangladesh all the year round. The role of mulching is well known on the growth and production of plants. Due to long growing period it requires several irrigations. Mulching helps retaining moisture in the soil and sometimes even substitutes soil. [12] It protects the plants from loss of soil moisture by wind and soil evaporation and reduces the irrigation requirements. [12,13] Mulches help checking weed growth and improving the soil structure and fertility. [14] Mulches also help proper utilization of all nutrients in the soil meeting up the requirements of irrigation and thus increase crop yield. Mulching is the common and cheapest method for the weed control. For these reasons mulching is more common in organic farming and its benefits include weed control, soil moisture conservation, and soil temperature moderation. [15]

There is a scope of increasing flower yield, quality of flower and bulb production of tuberose using fertilizer and mulch. Considering the present situations and above facts the present investigation was undertaken with the following objective to determine the suitable combination of nutrient sources with mulch for better yield and economic analysis of tuberose.

MATERIALS AND METHODS

The experiment was conducted at the Horticultural Farm of Sher-e-Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka, Bangladesh. The location of the study site is situated in 23°74′N latitude and 90°35′E longitude. The experimental soil belongs to the Modhupur Tract under AEZ No. 28. [16] The selected experimental plot was medium high land and the soil series was Tejgaon. [17] The climate of experimental site was under the subtropical,

characterized by three distinct seasons, the monsoon or the winter season from November to February and the pre-monsoon period or hot season from March to April and the monsoon period from May to October. [18] Bulbs of tuberose were used as planting materials and they were collected from Horticultural Farm of Sher-e-Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka- 1207, Bangladesh. The experiment consisted with two factors. Factor A- Five levels nutrient sources: F_0 - Control, F_1 - Cowdung 5 t + 260 kg Urea + 200 kg TSP + 200 kg MP/ha, F_2 - Poultry litter 3 t + 260 kg Urea + 200 kg TSP + 200 kg MP/ha, F_3 - Cowdung: 10 t/ha and F_4 - Poultry litter: 6 t/ha; Factor B: Three levels of mulch: M_0 - control, M_1 -Rice straw mulch and M_2 - water hyacinth mulch. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. There were 45 unit plots, the size of each was 2.0 m x 1.0 m. The experimental plot was opened in the first week of May 2013, with a power tiller and left exposed to the sun for a week. The sources of N, P_2O_5, K_2O as urea, TSP and MP were applied, respectively as per treatment. [19] The entire amounts of TSP and MP were applied during the final land preparation. Urea was applied in three equal installments at 30, 55 and 85 days after planting bulb of tuberose. Well-rotten cowdung and poultry litter also applied during final land preparation as per treatment. The bulbs were planted on 20 May, 2013 with a distance on 20 cm x 20 cm and the number of bulb/plot was 50.

Data of bulb yield per plot and hectare, bulblet yield per plot and hectare were recorded from the sample plants during the course of experiment. Ten plants were randomly selected from each unit plot for collection of data. The cost of production was analyzed in order to find out the most economic treatment of nutrient sources and mulching. All input cost were considered in computing the cost of production. The market price of spike, bulb and bulblet was considered for estimating the return.

The experimental data obtained for different parameters were statistically analyzed. The mean values of all the recorded characters were calculated and analysis of variance was performed by 'F' (variance ratio) test. The significance of the difference among the individual and treatment combinations means was estimated by the Duncan's Multiple Range Test (DMRT) at 5% level of probability. [20]

RESULTS AND DISCUSSION

Yield of spike per hectare

Combined effect of nutrient sources and mulches showed significant variation on spike per hectare of tuberose under the present trial (Table 1). The maximum yield of spike per hectare (3,66,280) was found from F_1M_2 and the minimum yield of spike per hectare (2,57,750) was found from F_0M_0.

Yield of bulb per plot

Significant difference was recorded due to interaction effect of nutrient sources and mulch in terms of yield of bulb per plot of tuberose (Table 1). The maximum yield of bulb per plot (0.61 kg) was found from F_1M_2 and the minimum yield of bulb per plot (0.22 kg) was recorded from F_0M_0.

Yield of bulblet per plot

Variation was recorded due to combined effect of nutrient sources and mulches in terms of yield of bulblet per plot of tuberose (Table 1). The maximum yield of bulblet per plot (0.54 kg) was observed from the treatment of F_1M_2 and the minimum yield of bulblet per plot (0.22 kg) was observed from F_0M_0.

Yield of bulb per hectare

Combined effect of nutrient sources and mulches varied significantly on terms of yield of bulb per hectare of tuberose (Table

1). The maximum yield of bulb per hectare (30.72 ton) was observed from F_1M_1 and the minimum yield of bulb per hectare (11.17 ton) was recorded from F_0M_0.

Yield of bulblet per hectare

Statistically significant variation was recorded due to combined effect of nutrient sources and mulches in terms of yield of bulblet per hectare of tuberose (Table 1). The maximum yield of bulblet per hectare (26.95 ton) was observed from F_1M_2 and the minimum yield of bulblet per hectare (11.00 ton) was observed from F_0M_0.

Table 1. Interaction effect of nutrient sources and mulch on yielding parameter of tuberose

Treatment	Yield of spike per hectare (000)	Yield of bulb (kg/plot)	Yield of bulblet (kg/plot)	Yield of bulb (t/ha)	Yield of bulblet (t/ha)
F_0M_0	257.75 g	0.22 f	0.22e	11.17f	11.00e
F_0M_1	313.40 ea	0.39 e	0.34d	19.50e	17.20d
F_0M_2	320.74 c-f	0.43 c-e	0.37 cd	21.33d	18.67cd
F_1M_0	330.82 b-e	0.39 e	0.36 d	19.61e	17.95 d
F_1M_1	363.49 a	0.53 a-c	0.46 bc	26.43a-c	22.90a-c
F_1M_2	366.28 a	0.61 a	0.54 a	30.72 a	26.95a
F_2M_0	303.59 a	0.36 e	0.34 d	17.78 e	17.12d
F_2M_1	336.89 b-d	0.51 b-d	0.46 bc	25.28b-d	22.76a-c
F_2M_2	361.11 a	0.56 ab	0.49 ab	27.93 ab	24.46ab
F_3M_0	317.17 d-f	0.42 de	0.40 cd	21.04 d	20.24b-d
F_3M_1	339.97 bc	0.50 b-d	0.45bc	24.84b-d	22.67 a-c
F_3M_2	335.80 b-d	0.45c-e	0.38 cd	22.28c-e	19.22cd
F_4M_0	325.85 c-e	0.45c-e	0.40cd	22.33c-e	20.09bc-d
F_4M_1	320.96 c-f	0.43 c-e	0.38 cd	21.62c-e	19.08cd
F_4M_2	347.53 ab	0.51b-d	0.45 bc	25.59b-d	22.60a-c
$LSD_{(0.05)}$	49.93	0.092	0.075	4.336	4.067
CV(%)	6.33	11.52	12.04	11.52	12.04

Table 2. Economic analysis of tuberose cultivation as influenced by nutrient sources and mulch

Treatment	Cost of production (USD/ha)	Price of bulb (USD/ha)	Price of bulblet (USD/ha)	Price of cut flower (USD/ha)	Gross return (USD/ha)	Net return (USD/ha)	Benefit cost ratio
F_0M_0	3,623.91	1,117.00	1,100.00	3,221.90	5,438.90	1,814.87	1.50
F_0M_1	3,751.60	1,950.00	1,720.00	3,917.47	7,587.47	3,835.87	2.02
F_0M_2	3,751.60	2,133.00	1,867.00	4,009.30	8,009.30	4,257.70	2.13
F_1M_0	4,259.16	1,961.00	1,795.00	4,135.22	7,891.22	3,632.06	1.85
F_1M_1	4,386.86	2,643.00	2,290.00	4,543.65	9,476.65	5,089.78	2.16
F_1M_2	4,386.86	3,072.00	2,695.00	4,578.55	10,345.55	6,208.68	2.36
F_2M_0	4,291.08	1,778.00	1,712.00	3,794.82	7,284.82	2,993.73	1.70
F_2M_1	4,418.77	2,528.00	2,276.00	4,211.12	9,015.12	4,596.35	2.04
F_2M_2	4,418.77	2,793.00	2,446.00	4,513.92	9,752.92	5,334.15	2.21
F_3M_0	3,943.13	2,104.00	2,024.00	3,963.62	8,092.62	4,149.48	2.05
F_3M_1	4,070.82	2,484.00	2,267.00	4,249.65	9,000.65	4,929.82	2.21
F_3M_2	4,022.93	2,228.00	1,922.00	4,197.50	8,347.50	4,324.56	2.07
F_4M_0	4,006.94	2,233.00	2,009.00	4,073.12	8,315.12	4,308.15	2.08
F_4M_1	4,134.67	2,162.00	1,908.00	4,011.95	8,081.95	3,947.27	1.95
F_4M_2	4,006.97	2,559.00	2,260.00	4,344.12	9,163.12	5,156.15	2.29

Economic analysis

Input costs for land preparation, seed cost, nutrient sources, irrigation and manpower required for all the operations from planting to harvesting of tuberose flower, bulb and bulblet were recorded for unit plot and converted into cost per hectare. Price of tuberose flower, bulb and bulblet was considered as per market rate. The economic analysis presented under the following headings-

Gross return: The combination of nutrient sources and mulch showed different gross return (Table 2). The highest gross return (USD 10,345.55) was obtained from F_1M_2

and the lowest gross return (USD 5,438.90) was obtained from F_0M_0.

Net return: In case of net return different treatment combination showed different concentration of net return (Table 2). The highest net return (USD 5,958.68) was found from F_1M_2 and the lowest (USD 1,814.98) net return was obtained F_0M_0.

Benefit cost ratio: In the combination of nutrient sources and mulch highest benefit cost ratio (2.36) was noted from F_1M_2 and the lowest benefit cost ratio (1.50) was obtained from F_0M_0. From economic point of view, it was apparent from the above results that the combination of F_1M_2 was more profitable than rest of the combination (Table 2).

CONCLUSION

The highest yield of spike (3,66,280 /ha) was found from F_1M_2 and the lowest (2,97,300 /ha) from F_0M_0. The combination of nutrient sources and mulch the highest gross return (Tk. 8,27,644) was obtained from F_1M_2 and the lowest gross return (Tk. 4,35,112) was obtained from F_0M_0. The highest net return (Tk. 4,76,695) was found from F_1M_2 and the lowest (Tk. 1,45,194) net return was obtained F_0M_0. In the combination of nutrient sources and mulch highest benefit cost ratio (2.36) was noted from F_1M_2 and the lowest benefit cost ratio (1.50) was obtained from F_0M_0. So, application of cowdung 5 t + 260 kg Urea + 200 kg TSP + 200 kg MP per hectare with water hyacinth mulch was found suitable for growth and yield of tuberose.

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