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Performance and assessment of suitable container and growing media for double type tuberose genotype

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Abstract

The experiment was laid out in Factorial Completely Block Design at AICRP on Floriculture, ZARS, Ganeshkhind, Pune during the year 2018-19. The double type tuberose genotype (GK-T-D-7) was used with two containers earthen and plastic pots while the four medias were used viz. soil, soil + FYM (1:1), Cocopeat and Cocopeat + FYM (1:1) with eight treatment combinations replicated thrice. Each treatment consisted of 15 pots and in each pot one bulb was planted.

The study revealed that growth parameters such as days for sprouting, plant height, number of leaves and spread of plant were found better in earthen pot than plastic pot in double type of tuberose genotype GK-T-D-7. Among the different media used for the growth of plants Cocopeat + FYM proved its superiority for most of the growth parameters. the treatment combination of earthen pot with media Cocopeat + FYM (C₁M₄) was performed best for various characters viz. plant height (61.05 cm), number of leaves (88.40), spread of plant (60.22 cm NS, 57.00 cm EW), flower stalk emergence (63.27 days), rachis length (25.90 cm), number of florets per spike (34.55), number of flower opened at a time (10.38). The treatment combination of soil + FYM in plastic pot (C₂M₂) recorded better performance for characters viz. maximum spike length (61.78 cm), longevity of flower stock (13.00 days). It is concluded that the overall performance of double type tuberose genotype GK-T-D-7 performed well in pot culture. Among the interaction between containers and media, the interaction Soil + FYM in plastic, Cocopeat + FYM in earthen pot and Cocopeat + FYM in plastic pot showed better performance during the study.

Keywords: Double type tuberose, media, container and growth parameters

Introduction

Floriculture is a fast emerging sector worldwide more than 140 countries are actively involved in commercial floriculture. Tuberose (*Polianthes tuberosa* L.) is commonly known as 'Rajnigandha', 'Sugandharaja', 'Nishigandha', 'Gulchery' belongs to family Amaryllidaceae and is native to Mexico. Tuberose is the most important commercial bulbous ornamentals of sub-tropical and tropical areas and is always in great demand for its attractive and fragrant spikes as well as for loose flowers. Tuberose is largely cultivated in Italy, France, Egypt, South Africa, Taiwan and Morocco. In India tuberose occupies a prime position because of its popularity as cut flower, loose flower as well as its potential in perfume industry. Tuberose is being commercially cultivated mainly in the states of Andhra Pradesh, Assam, Gujarat, Haryana, Karnataka, Maharashtra, Orissa, Tami Naidu, Uttar Pradesh, Uttarakhand and West Bengal. The nomenclature of different types of tuberose is based on the number of rows of petals each flower possesses. The cultivar with single row petals is designated with single type while the one which bears more than three rows of petals is called double type tuberose. The cut spikes of tuberose remain fresh for long time and can also withstand long distance transportation owing to the reason that tuberose cut flowers have longer vase life. Tuberose is also grown for garden decoration in pots, beds and borders. The quality of tuberose flower is affected by various pre and post-harvest factors such as temperature, relative humidity, frequency of irrigation, picking time and nutrition. Generally tuberose is cultivated in open field but it can have very great ornamental value as potted plant if it is grown in pot culture which can keep in offices, in homes as a substitution for cut flower in flower pot. Hence, it is important to study the performance of double type tuberose genotype under pot culture.

Materials and Methods

The experiment was laid out in Factorial Completely Block Design at AICRP on Floriculture, ZARS, Ganeshkhind, Pune during the year 2018-19 as per the method suggested by Panse and Sukhatme (1995) [1].

The double type tuberose genotype (GK-T-D-7) was used with two containers earthen and plastic pots while the four medias were used viz. soil, soil + FYM (1:1), Cocopeat and Cocopeat + FYM (1:1) with eight treatment combinations replicated thrice. Each treatment consisted of 15 pots and in each pot one bulb was planted. The planting material that is bulbs were obtained from AICRP on Floriculture, ZARS, Ganeshkhind, Pune. The uniform sized bulb were selected and treated with Bavistin (10 g/ 10 lit of water) for 20 minutes to prevent from stem rot. Planting was carried out on 18th April, 2018 in earthen and plastic pots of size 10 inches as per experimental design.

Treatment details of double type tuberose genotype (GK-T-D-7)

- T₁: Earthen pot (C₁) + Soil (M₁)
 T₂: Earthen pot (C₁) + Soil+ FYM (M₂)
 T₃: Earthen pot (C₁) + Cocopeat(M₃)
 T₄: Earthen pot (C₁) + Cocopeat+ FYM (M₄)
 T₅: Plastic pot (C₂) + Soil (M₁)
 T₆: Plastic pot (C₂) + Soil +FYM (M₂)
 T₇: Plastic pot (C₂) + Cocopeat (M₃)
 T₈: Plastic pot (C₂) + Cocopeat + FYM (M₄)

Statistical model of Factorial Completely Block Design (FCRD)

$$Y_{ij} = \mu + C_i + M_j + C_iM_j + e_{ij}$$

Where

- Y_{ij} = yield of flower from jth media and ith container
 μ = Overall mean
 C_i = effect due to ith container
 M_j = effect due to jth media
 C_iM_j
 = interaction effect due to jth media and ith container
 e_{ij} = error term, $e_{ij} \sim N(0, \sigma_e^2)$

$$\sum C_i = 0, \sum M_j = 0, \sum C_iM_j = 0$$

Results and Discussion

Growth parameters

The results of growth parameters of double type tuberose genotypes are presented in Table 1. The growth parameters such as days to sprouting, plant height, number of leaves and spread of plant were found better in earthen pot than plastic pot in double type of tuberose genotype GK-T-D-7. Among the different media used for the growth of plants Cocopeat + FYM proved its superiority for most of the growth parameters followed by Soil + FYM mixture. Earlier sprouting (9.97 days) was observed in earthen pot than plastic pot (14.22 days). Media comprising of Cocopeat+ FYM recorded earlier sprouting (10.94 days); late sprouting was in soil (13.39 days). Among different treatment combinations, Cocopeat+ FYM in earthen pot recorded earlier sprouting (7.66 days) and it was late for Soil+ FYM in plastic pot (14.89 days).

The plant height was observed maximum (61.05 cm) in Cocopeat+ FYM and was minimum in Soil (57.66 cm). The plant height was found non-significant for containers. It was observed more (60.85 cm) where plants were grown in earthen pots than in plastic pots (58.69 cm). The treatment combination of Soil + FYM in earthen pot recorded maximum

plant height (66.00 cm) followed by Cocopeat + FYM in earthen pot (64.66 cm). It was minimum in interaction of Cocopeat in plastic pot (54.38 cm). The present findings are in line with findings by Chauhan *et al.* (2014) and Nair and Bharati (2019) in tuberose in which they stated that increased plant height might be due to the use of organic matter in growing media.

The number of leaves per plant at flowering was found to be maximum (88.40) in earthen plots than plastic pot (80.77), while among the media, it was maximum in Cocopeat + FYM (121.05). The treatment combination where plants grown in Cocopeat + FYM in earthen pot (169.66) recorded maximum number of leaves and it was found minimum (49.55) for Cocopeat in earthen pot. The similar results were reported by Dalai *et al.* (2015) in dahlia, Chauhan *et al.* (2014) who reported that Sand + FYM produced maximum leaves per plant in tuberose and Soil +FYM (1:1) recorded maximum number of leaves in gerbera. The spread of plant was observed maximum (60.22 cm E-W, 57.00 cm N-S) for media Cocopeat + FYM and was minimum in soil (47.50 cm E-W, 49.89 cm N-S). The spread of plant was observed maximum (59.00 cm E-W, 61.22 cm N-S) for treatment combination Cocopeat +FYM in plastic pot and minimum (43.11 E-W, 48.11 cm N-S) for Cocopeat in plastic pot. However, it was non-significant for container. The results are in line with the findings reported by Samia *et al.* (2013)^[7], Nair and Bharathi (2019)^[5] in tuberose where they observed and reported that different growing media with combination of organic matter like FYM, leaf mould and vermicompost had significant effect on most of the vegetative growth characteristics of tuberose. The minimum days for sprouting were observed in earthen pot (9.97 days) than plastic pot (14.22 days). It was significant for media and interactions. The media Cocopeat + FYM recorded earlier sprouting (10.94 days); late sprouting (13.39 days) was in Soil; among different treatment combinations, Cocopeat + FYM in earthen pot recorded earlier sprouting (7.66 days) and it was late for soil + FYM in plastic pot (14.89 days).

Flower stalk emergence was found earlier (63.27 days) in earthen pot than plastic pot (70.72 days). Among different media minimum number of days required for stalk emergence (63.72 days) was in Cocopeat +FYM and it was late in Soil+ FYM (69.27 days). It was non-significant for interactions. The similar finding was reported by Nair and Bharathi (2019)^[5].

Flower parameters

The results of flower parameters of double type tuberose genotypes are presented in Table 2. Among the different containers used the various flowering characters such as spike length, rachis length, number of floret, number of flowers and number of flower opened at a time was found good in earthen pot as compared to plastic pot.

The maximum spike length was observed in Soil + FYM (58.44 cm) and it was less in Cocopeat (50.89 cm). In the different treatment combinations of media plants grown in Soil + FYM in plastic pot recorded maximum spike length (61.78 cm), it was minimum in Cocopeat using plastic pot (46.33 cm). However, it was found non-significant for containers and their interactions with media. The results are in conformity with the findings reported by Dalai *et al.* (2015) in dahalia, Mahato *et al.* (2016)^[4] and Samia *et al.* (2013)^[7], Habib *et al.* (2016)^[3] and Satya Prakash (2015)^[8] in tuberose.

The rachis length was observed more in plastic pot (25.90 cm) than earthen pot (20.20 cm). The media Cocopeat + FYM recorded maximum (24.78 cm) rachis length and it was found minimum in (20.89 cm) in soil, however the rachis length was found non-significant for various interactions with media and container.

The number of floret per spike was recorded more (34.55) in media Cocopeat+ FYM and it was less where the plants were grown in Soil (29.16). Among the different treatment combinations, the plants grown in Cocopeat+ FYM using earthen pot (36.44) and Cocopeat + FYM in plastic pot (32.66) recorded maximum number of floret. It was found minimum (27.66) in treatment combination of Soil in earthen pot. However, it was found non- significant for containers. The results are in agreement with the findings reported by Mahato *et al.* (2016)^[4], Samia *et al.* (2013)^[7] and Habib *et al.* (2016)^[3] in tuberose. The longevity of flowering stock was observed maximum (12.72 days) in plastic pot than earthen pot (11.94 days). Among different media longevity was recorded maximum where plants were grown in Soil + FYM (13.00 days), it was found minimum in Cocopeat (11.55 days). However, it was found non-significant for various interactions. The number of flowering stocks were recorded more (5.97) in plastic pot rather than earthen pot (4.80). Among the different media Cocopeat+ FYM recorded maximum number of flowering stock (6.50) and it was minimum in Soil (4.39). However, it was found non-significant for container and treatment combinations.

The number of flower opened at a time was observed maximum in plant grown in earthen pot (9.80) than that of plastic pot (8.88). Among the different media Cocopeat +FYM recorded maximum (10.38), it was minimum in Soil (8.38). The treatment combination Soil +FYM with earthen pot recorded maximum (11.77) number of flowers opened at a time. It was found minimum in plants grown in Soil using plastic pot (8.33). These findings are in line with the findings by Nair and Bharathi (2019)^[5] in tuberose and they stated that

number of flowers opened at a time were not influenced by media the more number of flower open at a time might be due to contribution of other factors.

Bulb Parameters

The results of bulb parameters are presented in Table 3. Number of bulb produced per clump showed significant difference for containers, growing media but it was non-significant for their interactions. The maximum number of bulb per clump (6.50) was observed when tuberose was grown in plastic pot than earthen pot (4.36). The number of bulb per clump was significantly maximum for media Soil+ FYM (6.38) over other treatments except Cocopeat + FYM (6.11) which was at par. The minimum number bulb per clump (4.33) was recorded in soil.

The interaction between container and media was non-significant for number of bulb per clump. The interaction of Soil +FYM in plastic pot showed maximum number of bulbs per clump (7.55) followed by interaction except the Cocopeat + FYM in plastic pot (7.22). It was found minimum in Soil in earthen pot (4.33). The similar results were reported by Nair and Bharathi (2019)^[5] in tube rose. The maximum number of bulblet per clump (65.22) was observed in plants grown in plastic pot than earthen pot (41.75). The number of bulb per clump was significantly maximum (62.89) for media Cocopeat +FYM over rest of media except Soil +FYM (53.22) which was at par. The minimum number of bulblets per clump (47.77) recorded in Soil. The interactions between container and media showed significant difference for number of bulb per clump. The interaction of Cocopeat +FYM in plastic pot showed maximum (78.89) number of bulb per clump followed by Cocopeat in plastic pot (64.77). It was found minimum when plants were planted in Soil in plastic pot (34.77). It might be due to effect of media and organic matter alone in combinations. These findings are in agreement with the findings by Mahato *et al.* (2016)^[4] and Satya Prakash (2015)^[8] in tuberose.

Table 1: Growth parameters of tuberose Double cv. GK-T-D-7

Particulars	Days to sprouting	Plant height (cm)	Number of leaves per plant	Spread of plant N-S (cm)	Spread of plant E-W (cm)
Factor A (C- Container)					
C ₁ - Earthen pot	9.97 ^a	60.85	88.4 ^b	54.88	53.89
C ₂ – Plastic pot	14.22 ^b	58.69	80.77 ^a	52.72	52.47
SE±	0.29	0.91	1.32	0.80	1.09
CD at 5%	0.90	NS	4.01	NS	NS
Factor B (M- Media)					
M ₁ - Soil	13.39 ^b	57.66 ^{ab}	67.72 ^a	49.89 ^a	47.50 ^a
M ₂ – Soil + FYM	12.88 ^b	66.00 ^c	83.77 ^b	55.39 ^b	55.72 ^b
M ₃ - Cocopeat	11.16 ^a	54.38 ^a	65.83 ^a	49.72 ^a	52.50 ^b
M ₄ – Cocopeat+ FYM	10.94 ^a	61.05 ^b	121.05 ^c	60.22 ^c	57.00 ^b
SE±	0.42	1.29	1.88	1.14	1.54
CD at 5%	1.27	3.91	5.68	3.45	4.66
Interaction (Container X Media)					
C ₁ M ₁	13.22 ^c	58.11	51.88 ^{ab}	49.55 ^b	47.78
C ₁ M ₂	10.88 ^b	64.66	107.77 ^c	54.44 ^{cd}	55.89
C ₁ M ₃	8.11 ^a	57.99	49.55 ^a	56.33 ^d	56.88
C ₁ M ₄	7.66 ^a	62.65	144.44 ^c	59.22 ^{de}	55.00
C ₂ M ₁	13.55 ^c	57.22	83.55 ^c	50.22 ^{bc}	47.22
C ₂ M ₂	14.89 ^c	66.00	59.77 ^b	56.33 ^d	55.55
C ₂ M ₃	14.22 ^c	54.38	82.11 ^c	43.11 ^a	48.11
C ₂ M ₄	14.22 ^c	61.05	97.66 ^d	61.22 ^e	59.00
SE±	0.59	1.83	2.65	1.61	2.18
CD at 5%	1.80	NS	8.03	4.88	NS

Note: Treatment means having common superscripts are statistically non-significant and treatment means having different superscripts are statistically significant

Table 2: Flowering parameters of tuberose Double cv. GK-T-D-7

Particulars	Days for flower stalk emergence	Spike length (cm)	Rachis length (cm)	Inter floret length at bottom (cm)	Inter floret length at middle (cm)	Inter floret length at top (cm)	Number of florets/spike	Length of floret (cm)	Diameter of floret (cm)	Longevity of flower stalk (days)	No. of flower stalks/plant	No. of flower stalk at a time	Interval between flower stalk emergence (days)	Number of flower opened at a time
Factor A (C- Container)														
C ₁ - Earthen pot	63.27	54.94	20.20 ^a	6.98 ^a	3.27 ^a	1.34 ^a	31.80	5.75	4.43	11.94 ^a	4.80 ^a	1.56	142.89 ^a	9.80 ^b
C ₂ – Plastic pot	70.72	54.22	25.90 ^b	7.98 ^b	3.85 ^b	1.71 ^b	31.52	5.96	4.56	12.72 ^b	5.97 ^b	1.75	151.11 ^b	8.88 ^a
SE ±	0.42	0.95	0.30	0.04	0.03	0.03	0.48	0.08	0.05	0.22	0.25	0.12	0.77	0.18
CD at 5%	1.28	NS	0.92	0.14	0.10	0.11	NS	NS	NS	0.68	0.76	NS	2.35	0.54
Factor B (M- Media)														
M ₁ - Soil	67.94 ^{bc}	52.22 ^a	20.89 ^a	6.96 ^a	3.39 ^a	1.48 ^a	29.16 ^a	5.66 ^a	4.36	12.05 ^{ab}	4.39 ^a	1.27 ^a	143.28 ^b	8.38 ^a
M ₂ - Soil + FYM	69.27 ^c	58.44 ^b	23.06 ^a	7.17 ^b	3.72 ^c	1.78 ^b	31.44 ^b	6.14 ^b	4.50	13.00 ^b	5.66 ^b	1.72 ^{ab}	136.65 ^a	9.83 ^b
M ₃ - Cocopeat	63.72 ^a	50.89 ^a	23.46 ^b	7.81 ^c	3.49 ^b	1.38 ^a	31.50 ^c	5.63 ^a	4.62	11.55 ^a	5.00 ^{ab}	1.44 ^a	158.45 ^d	8.77 ^a
M ₄ – Cocopeat + FYM	67.05 ^b	56.77 ^b	24.78 ^c	7.97 ^c	3.66 ^c	1.45 ^a	34.55 ^d	5.97 ^{ab}	4.51	12.72 ^b	6.50 ^b	2.16 ^b	149.6 ^c	10.38 ^b
SE ±	0.60	1.35	0.43	0.06	0.05	0.05	0.68	0.12	0.07	0.31	0.35	0.18	1.10	0.25
CD at 5%	1.81	4.08	1.30	0.20	0.15	0.15	2.05	0.38	NS	0.96	1.08	0.54	3.33	0.77
Interaction (Container X Media)														
C ₁ M ₁	63.66	50.55 ^{ab}	18.11	6.06 ^a	2.92 ^a	1.31 ^a	27.66 ^a	5.38	4.33 ^a	11.66	3.66	1.22	143.00 ^b	8.44 ^a
C ₁ M ₂	65.11	55.11 ^b	19.66	6.29 ^a	3.26 ^b	1.46 ^{ab}	31.55 ^b	6.02	4.50 ^{ab}	12.44	5.00	1.55	132.78 ^a	9.88 ^b
C ₁ M ₃	61.55	55.44 ^b	20.59	7.67 ^b	3.38 ^{bc}	1.26 ^a	31.55 ^b	5.71	4.25 ^a	11.11	4.00	1.55	151.77 ^c	9.11 ^{ab}
C ₁ M ₄	62.77	58.65 ^{bc}	22.44	7.90 ^b	3.54 ^{cd}	1.32 ^a	36.44 ^c	5.89	4.66 ^b	12.55	6.55	1.89	144.00 ^b	11.77 ^c
C ₂ M ₁	72.22	53.89 ^b	23.68	7.85 ^b	3.86 ^f	1.65 ^b	30.66 ^b	5.94	4.40 ^a	12.44	5.11	1.33	143.55 ^b	8.33 ^a
C ₂ M ₂	73.44	61.78 ^c	26.45	8.00 ^c	4.17 ^g	2.11 ^c	31.33 ^b	6.26	4.49 ^a	13.55	6.33	1.89	140.53 ^b	9.77 ^b
C ₂ M ₃	65.88	46.33 ^a	26.33	7.94 ^{bc}	3.60 ^{de}	1.50 ^b	31.44 ^b	5.56	5.00 ^c	12.00	6.00	1.33	165.13 ^d	8.44 ^a
C ₂ M ₄	71.33	54.89 ^b	27.13	8.05 ^c	3.78 ^{ef}	1.57 ^b	32.66 ^b	6.06	4.35 ^a	12.89	6.44	2.44	155.22 ^c	9.00 ^a
SE ±	0.85	1.91	0.61	0.09	0.70	0.70	0.96	0.17	0.11	0.45	0.50	0.25	1.55	0.36
CD at 5%	NS	5.77	NS	0.28	0.21	0.22	2.91	NS	0.33	NS	NS	NS	4.71	1.08

Table 3: Bulb parameters of tuberose Double cv. GK-T-D-7

Particulars	Number of bulbs/clump	Number of bulblets/clump
C ₁ - Earthen pot	4.63 ^a	41.75 ^a
C ₂ – Plastic pot	6.50 ^b	65.22 ^b
SE±	0.18	1.80
CD at 5%	0.52	0.60
M ₁ - Soil	4.72 ^a	47.77 ^a
M ₂ – Soil + FYM	6.38 ^b	53.22 ^b
M ₃ - Cocopeat	5.05 ^a	55.05 ^a
M ₄ – Cocopeat+ FYM	6.11 ^b	62.89 ^b
SE±	0.26	2.58
CD at 5%	0.73	0.85
C ₁ M ₁	4.33	34.77 ^{ab}
C ₁ M ₂	5.22	41.67 ^b
C ₁ M ₃	4.00	43.66 ^{bc}
C ₁ M ₄	5.00	46.89 ^c
C ₂ M ₁	5.11	60.77 ^c
C ₂ M ₂	7.55	64.77 ^f
C ₂ M ₃	6.11	56.44 ^d
C ₂ M ₄	7.22	78.89 ^a
SE±	0.34	3.65
CD at 5%	NS	1.20

Conclusion

On the basis of overall performance of tuberose genotype GK-T-D-7 performed well in pot culture. Among the interaction between containers and media, the interaction Soil + FYM in plastic, Cocopeat + FYM in earthen pot and Cocopeat + FYM in plastic pot showed better performance.

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