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Effect of Potting Media on Growth, Flower Yield and Quality of Rose (*Rosa hybrida* L.) CV. Top Secret under Protected Condition

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ABSTRACT

The experiment entitled "Effect of potting media on growth, flower yield and quality of rose (Rosa hybrida L.) cv. Top Secret under protected condition" was carried out at Hi-Tech Horticulture Park, Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh during 2016-17. The experiment was laid out in a Completely Randomized Design (CRD) with three repetitions and seven treatment combinations of different available growing media viz., cocopeat, FYM, leaf mould, perlite and soil (control) in greenhouse condition. The growth parameters viz., plant height (60.46 cm), leaf area (36.98 c m^2), number of leaf per flowering stalk (20.23) and stalk length of cut flower (36.23 cm) were si gnificantly maximum obtained with soil + cocopeat + leaf mould (1:1:1) media combination which followed by soil + cocopeat + perlite. Whereas, flowering parameters viz., number of days to bud initiation (13.23 days) and days taken to bud opening (12.72 day) were also recorded significantly minimum with the proportion of soil + cocopeat + leaf mould treatment followed by with soil + cocopeat + perlite (1:1:1). Similarly, the significantly maximum flower diameter (8.23 cm), length of petal (3.76 cm), width of petal (3.85 cm) and number of flowers per plant (19.48) were recorded in soil + cocopeat + leaf mould treatment and were found followed by soil + cocopeat + perlite (1:1:1). The quality parameters viz., shelf life (7.35 days) and vase life of flower (8.18 days), fresh weight of cut flower (11.69 g) and dry weight of cut flower (3.27 g) were also recorded in soil + cocopeat + leaf mould treatment and were found followed by soil + cocopeat + perlite (1:1:1).

Key words: *Rose, Top Secret, Growing media, Cocopeat, Vase life.*

INTRODUCTION

"Some words instantaneously suggest beauty because they are associated with things that Afford pleasure and delight. The Rose is one of them"[11]. Rose is one of the natures beautiful creation and is usually acclaimed as queen of flowers. No other flower is a better symbol of love, adoration, innocence and other virtues than the rose and not in our time only, but so it has been for thousands of years. It is said that rose came first and man afterward.

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Fossils of the rose found in Oregon and Colorado (USA) are estimated to be more than thirty million years old. The history of man and rose is linked together for about 5000 years[7].

It is one of the nature beautiful creation and is universally known as the "Queen of flower'' due to it's with majestic fragrance, brilliant colour, attractive shape, varying sizes and excellent keeping quality. It belongs to the family Rosaceae. Globally, about 150 species of roses are found, out of these 34 species are cultivated in India. It is the most powerful symbol in metaphysica. Rose *(Rosa spp.)* or "Taruni pushpa" in Sanskrit belongs to the family *Rosaceae.* Rose has ever been the world's most favorite and unchallenged flowers making the number one in world's trade. Species of the genus *Rosa* have been identified almost everywhere in the Northern Hemisphere, as far North as Alaska and Norway, The Chinese were probably the first to cultivate roses for over 2000 years before. China roses were introduced to the European markets in the mid eighteenth century[6].

The commercial importance of flowers has been realized throughout the world. The huge demand for flowers has led to growing market that with the passage of time has turned into an industry. The international floriculture trade is estimated to be 40 billion US dollars (Rs. 1,25,000 Crores) of which cut flower account for nearly 60 per cent i.e., 25 billion US dollars (Rs. 80,000 Crores). Rose is the most preferred flower in the international market. The demand for roses has been growing at a higher rate as compared to other flowers. Roses alone share 51 % of European market[12].

The area under flower crops is 2,55,000 hectares with 17,54,000 metric tons production of loose flowers and 543 lakh flowers. The total area under flower crops in Gujarat is 17,300 ha. with production of 1,63,600 metric tons loose flowers[1]. The major flower growing states are Karnataka, Tamil Nadu, Maharashtra, West-Bengal, Rajasthan, Uttar Pradesh, Punjab and Andhra Pradesh are the leading flower producing states in the country.

Roses is planting in a container is also having a benefit as it saves space. Potted plants are highly valued for urbanization and flat system of housing. Potted plants are the only group of the plants which can provide freshness even in small space and good source for decreasing the air pollution in indoor.[10] Rose occupies a unique place both in open as well as in protected cultivation. Quality of flowers under open field condition is not suitable for international markets hence, recently the polyhouse cultivation showed the way to Indian growers for getting higher yield with export quality produce also with an introduction of numbers of varieties from abroad. The gorgeous flowers of Dutch rose are extremely fragrant and well-loved. It is available in every colour except blue and true black. The Dutch rose is specially grown in the Netherlands and other countries for horticultural business. Production has changed from traditional area to hi-tech polyhouse cultivation. Number of Dutch varieties like Gladiator, Super Star, Happiness, Top Secret, Shakira, Naranga, Noblesse and Gold Strike etc. introduced in India for greenhouse cultivation among them cv. 'Top Secret' is leading major share in world export market.

Growing media always play a vital role in growth and quality of pot plants. Rose is one such a classical plant requires good medium for better growth and quality of flower production. Physio-chemical properties of growing media determine the nutritional status, water holding capacity and aeration which determine the rate of growth as reported by Sekar and Sujata[13]. Although several media have been successfully used for growing of rose since long back. A light, rich, porous and well drained media is considered ideal for growing of rose cultivation. Soil as a universal growing media doesn't fulfilled all requirements for its quality and better yield. Now a day, growing of rose in soilless media is gaining importance in protected cultivation. Soilless culture has been successfully used from last decades with aim to intensify

production and reduce cost of production. Cultivation of roses in various soilless media is being achieved with promising commercial potentials.

For sustainability of the environment, organic materials from municipal and industrial waste, as well as residues from agriculture and livestock farming are strongly recommended for use as renewable resources that mitigate their negative impact on regional and global environmental degradation. The availability and cost of growing media is a primary concern in the production of container grown and flowering plants. The most widely used growing substrate, coco peat, is a non-renewable resource, and new substrates are searched for worldwide. While cocopeat mixes with the different media are the industrial standard in polyhouse industry. Various alternative growing materials, such as coir, farmyard manure, perlite, and red soil continue to be evaluated for use as container media components, to help reduce media costs. Now, various formulations of alternative growing media for bedding and potting flowers are being developed and effectively used in many production systems as container substrate. The physical and chemical properties of substrates are responsible for providing adequate support and a reservoir for plant water and nutrients. The incorporation of organic materials *viz*, red soil, cocopeat, leaf mould and farm yard manure to reduce costly media and fertilizer usage, without reducing plant quality, is the most important challenge faced by the bedding flower industry.

MATERIALS & METHODS

The present experiment was carried out at High tech green house with fan and pad system at the High tech Horticulture Park, Department of Horticulture, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat) during 2016-17 (April to February). Junagadh is situated at 21.5°N latitude and 70.5°E longitude with an altitude of 60 meters above MSL on the western side at the foot hill of mountain Girnar sierra (Gujarat). Climate is typically subtropical, characterized by fairly cool and dry winter, hot and dry summer and warm and moderately humid monsoon. The rainy season commences by third week of June and ends in September. July and August are the months of heavy precipitation. Winter sets in the month of November and continues till the month of February. December and January are the coldest months of winter. Summer commence in the second fortnight of February and ends in the middle of June. April and May are the hottest months.

The experiment was laid out in completely randomized design (CRD) with seven treatment combination namely; T_1: soil (control), T_2: soil + FYM (1:1 v/v), T_3: soil + cocopeat (1:1 v/v), T_4: soil + cocopeat + leaf mould (1:1:1 v/v), T_5: soil + cocopeat + FYM (1:1:1 v/v), T_6: soil + perlite (1:1 v/v), T_7: soil + cocopeat + perlite (1:1:1 v/v) with replicated in thrice.

The budded plant material of rose cv. Top Secret was used for this study. The budded planting materials were brought from Kama kapil sales Pvt. Ltd., in Ahmedabad, Gujarat. All growing media under study *viz.*, red soil, FYM, cocopeat, perlite and leaf mould were kept in the sunlight for solar sterilization before its mixing then growing media were prepared according to proportion of various red soil, FYM, cocopeat, perlite and leaf mould and filled in uniform size of earthen pots (11"x10").

After proper decomposition, budded rose plants were transplanted during 4th April 2016 in pots. A light irrigation was given immediately after transplanting in the pots for proper establishment. As compared to open field condition, the rose crop needs less water in polyhouse because of lower rate of evaporation losses. Providing irrigation through micro irrigation like drip is desirable as a compared to conventional methods irrigation. The amount of water required for optimum growth varies with the temperature, relative humidity and light. Initially the irrigation was given through drip irrigation for 15 min in a day i.e. approximately 4-5 lit./m^2. For full grown up plant 6-8 lit./m^2 and 8-10

lit./m^2 are applied during winter and summer season, respectively.

Fertilizers N, P and K along with micronutrients are applied twice in a week as par the recommendation. N, P and K are applied @ 15-15-10 g/plant. The commercial micronutrient grade Ormichem @ 0.5 g/plant spraying at weekly interval. Unwanted weeds emerged out which was removed frequently when noticed by simple hand weeding. Light loosening of soil was done at monthly interval to avoid compactness of pot media for better aeration. Flowers were harvested at tight bud stage and also at 2 to 3 petals unfurled for the observation purposes, respectively in the morning hours with the help of secateurs.

Five plants were selected at random from each treatment and tagged for recording the observations. Required observations were recorded from each repetition of different treatments and average value was calculated. The analysis of variance for experimental design was carried out for all the characters under study.

RESULTS & DISCUSSION

Use of various potting substrates and their mixtures are too close with various phases of plant growth and development. Media and their mixtures on growth and flower production of rose at optimum combination improve the efficiency of plant by modifying various physiological processes such as photosynthesis, transpiration, respiration, water and nutrient uptake, mobilization of nutrients, chlorophyll content of leaves etc. in a beneficial way. The experimental findings obtained from the present study have been discussed here in following heads:

Effect of potting media on growth parameters

The result of the present investigation (Table 1) revealed that the different potting media was significantly affected the growth parameters *viz*., plant height (cm), leaf area (cm^2), number of leaves per stalk and stalk length (cm) of rose.

It seen that the maximum plant height (60.46 cm), leaf area (36.98 cm^2), number of leaves per stalk (20.23) and stalk length (36.23 cm) were recorded in treatment T_4 - Soil + Cocopeat + Leaf mould (1:1:1) which was at par with treatment T_7 - Soil + Cocopeat + Perlite (1:1:1) in all parameters.

The increasing growth parameters might be due to the fact that growth substrate having good favorable physicochemical properties and high nutrient content that supported proper plant growth. If any nutrient in the selected growing medium is absent or in less amount then it reduced the plant growth and development. Increase in the stalk length of the rose grown in coconut coir piece was due to decrease in phenolic compound or organic acids they were leashed from the substrate due to irrigation water. A good amount of leaves coupled with conducive root environment which would have led to proper nutrient uptake in the substrates may resulted in greater accumulation of food matter leading to increase in stalk length of rose. Result showed that the cocopeat and leaf mould show better quantitative effects on growth as compared to the other treatments because of high nutritional level in cocopeat and leaf mould of Ysmeen *et al*[16]. Similar results were recorded by[9] and in Anthurium, Gerbera[8] and[2] in Dendrobiurn orchid[17] in carnation and Rose in.[2]

Effect of potting media on flower yield parameters

The yield and yield attributes parameters such as days to bud initiation, days to bud opening, length of petal, width of petal, number of petals per flower, diameter of flower and number of flowers per plant were also significantly affected by different potting media.

In the present studies, rose plants grown in potting medium (T_4) soil + cocopeat + leaf mould (1:1:1) took minimum number of days to bud initiation (13.23 days) and minimum number of days for bud opening (12.72 days) as compare to soil (T_1). This might be due to vigorous growth of the plant growing in the media and the rapid uptake of nutrients and water has a pronounce effect on early production. This is also attributed to

accumulation of more photosynthetic in this media might have induced early flowering. This is probably due to more protein formation from manufactured carbohydrate deposit in vegetative part and more in protoplast formation. Similar result was also found by Swarup[14] in Gerbera, Anthurium in Jawaharlal *et al*[9] in Rose, Gerbera in[8] and[4].

The length of petal (3.76 cm), width of petal (3.85 cm), number of petals per flower (27.65) and flower diameter (8.23 cm) were also found maximum in T_4 - soil + cocopeat + leaf mould (1:1:1) which was statistically at par with T_7 - soil + cocopeat + perlite (1:1:1). The increase in the size may be the cumulative effect of all growth parameters. The increase in yield parameters throughout the growing media increased the size of the flower provided moisture and nutrient availability of the growing media. The increase in flower size may be due to the increased leaf area which could be due to the increased production and accumulation of photosynthetic from leaves to flowers. The potting media like cocopeat and leaf mould could be attributed to the higher K_2 content, good physico-chemical properties like high porosity, good water holding capacity and higher retention of moisture which leads to improve the length of petal, width of petal, number of petals per flower and flower diameter of rose. It was also conformity by of Ysmeen[16], carnation in[5], gerbera in Barreto and Jagtap[4] and Barman *et al*[3] in rose and Ysmeen[16] in carnation,

The flower production was markedly influenced by the different potting media. The maximum number of flowers per plant (19.48) was recorded in T_4 - soil + cocopeat + leaf mould (1:1:1) and which is statistically at par with T_7 - soil + cocopeat + perlite (1:1:1). This might be due to higher water retention by cocopeat thereby decreasing substrate temperature in the pots[4] and vigorous growth of plants increase the flower production. The more flower production in cocopeat + leaf mould may be because of optimum and balanced supply of plant nutrients present in the substrate which are essential at all critical growth stages, which in turn, encouraged the plant, to grow better due to increased carbohydrate synthesis. The plant growing in soil + cocopeat + leaf mould express their potentiality at optimum bulk density, EC, pH and hence higher flower production. Being humus like products, leaf mould showed analogous properties, which stimulated nutrient uptake and had positive effect on protein synthesis and vegetative growth, hence increased the flower yield. Similar results were obtained by Ysmeen[16] in rose, Anthurium in Jawaharlal *et al*[9], Carnation in[5], Gerbera[8,14] and Carnation in Ysmeen[16].

Effect of potting media on quality parameters

The quality parameters such as fresh weight of cut flower, dry weight of cut flower, shelf life and vase life of cut flower were also significantly affected by different potting media.

The fresh weight of cut flower (11.69 g) and dry weight of cut flower (3.27 g) were found significantly maximum with the T_4 - soil + cocopeat + leaf mould. This might be due to the good health plant produce maximum fresh weight and dry weight of cut flower and it also represented that plant were provided with adequate supply of nutrient and water. Similar result was also finding by Younis *et al.*[15] in rose and[8] in gerbera.

The maximum shelf life (7.35 days) and vase life (8.18 days) were recorded considerably in the flowers produced in T_4 - soil + cocopeat + leaf mould (1:1:1) which was statistically at par with T_7 - soil + cocopeat + perlite (1:1:1). This may be due to its ability of superior growth throughout the experimental period which provided the best quality flower. Internal carbohydrate content of the flowers, which is responsible for the vase life of flowers. Substrate having better physical properties, which influence the absorption of nutrients by the plants which ultimately produced long stems and more turgid flowers.[4] Similar results were obtained by[5] in carnation, In gerbera[8,14].

Table 1: Effect of different potting media on growth parameters in rose cv. Top Secret under protected condition

Treatment	Plant height (cm)	Leaf area (cm^2)	No. of leaves per stalk	Stalk length (cm)
T_1	47.36	26.70	12.45	28.62
T_2	55.81	28.16	13.69	29.11
T_3	53.40	32.95	15.35	31.36
T_4	60.46	36.98	20.23	36.23
T_5	49.94	33.40	16.73	33.15
T_6	51.68	28.84	13.76	29.73
T_7	59.87	35.33	18.98	34.66
S.Em. ±	1.53	0.84	0.43	0.98
C.D. at 5 %	4.63	2.54	1.29	2.96
C.V. %	4.90	4.58	4.65	5.35

Table 2: Effect of different potting media on yield and yield attributes parameters in rose cv. Top Secret under protected condition

Treatment	Days taken to bud initiation	Days taken to flower bud opening	Diameter of flower (cm)	No. of petals per flower	Length of petals (cm)	Width of petals (cm)	No. of flowers per plant	No. of flowers per hectare (lac)
T_1	19.62	17.52	6.02	19.41	2.73	2.24	11.80	2.48
T_2	19.49	17.45	6.46	20.03	2.88	2.18	12.03	2.52
T_3	18.81	15.81	7.10	24.04	3.13	2.95	14.65	3.07
T_4	13.23	12.72	8.23	27.65	3.76	3.85	19.48	4.09
T_5	15.76	14.93	7.76	25.84	3.39	2.75	14.42	3.02
T_6	18.73	16.62	6.99	22.18	3.17	2.59	14.58	3.06
T_7	14.78	14.29	7.82	26.65	3.48	3.37	18.66	3.91
S.Em. ±	0.50	0.46	0.17	0.64	0.08	0.07	0.43	0.10
C.D. at 5 %	1.52	1.38	0.52	1.94	0.25	0.22	1.31	0.29
C.V. %	5.07	5.06	4.15	4.68	4.43	4.40	4.96	5.24

Table 3: Effect of different potting media on quality parameters in rose cv. Top Secret under protected condition

Treatment	Fresh weight of cut flower (g)	Dry weight of cut flower (g)	Shelf life of cut flowers (days)	Vase life of cut flowers (days)
T_1	8.76	2.16	5.35	6.02
T_2	9.29	2.23	6.64	6.80
T_3	10.39	2.49	6.63	7.06
T_4	11.69	3.27	7.35	8.18
T_5	11.01	3.14	6.92	7.17
T_6	9.69	2.36	6.68	6.93
T_7	11.22	3.19	7.18	7.77
S.Em. ±	0.33	0.08	0.19	0.20
C.D. at 5 %	1.00	0.25	0.57	0.60
C.V. %	5.54	5.32	4.93	4.84

CONCLUSION

In the light of the results obtained from this investigation, it can be concluded that proportion of potting media *viz*., soil + cocopeat + leaf mould (1:1:1) for getting maximum plant growth, flower yield and quality of rose cv. Top Secret under protected condition.

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