RESPONSE OF POTTING MIXTURES AGAINST GROWTH AND FLOWERING OF CHRYSANTHEMUM CV. HALDIGHATI

MONIKA, KULVEER SINGH YADAV & ANKUSH CHANDLA

School of Agricultural Sciences and Technology, RIMT University, Mandi Gobindgarh, Punjab, India

ABSTRACT

To study the effect of different potting mixtures on growth and flowering of chrysanthemum cv. Haldighati a pot experiment was conducted at Agriculture Farm, School of Agricultural Sciences & Technology, RIMT University, Mandi Gobindgarh, Punjab, India during 2019. The experiment was laid out in completely randomized block design along with three replications. The different treatments included the combinations of sand, soil, coco peat, vermicompost, farm yard manure, perlite in equivalent ratio. The results revealed that the overall performance of chrysanthemum was better in media having T₇ i.e. Perlite + FYM + Garden soil (2:1:1) except T₅ i.e. Vermicompost + FYM + Garden soil (2:1:1) were recorded the highest number of main and sub branches per plant, number of ray florets per flower, length and width of ray florets. On the basis of result obtained it is concluded that potting media treatment combination consisting from Perlite + FYM + Garden soil (2:1:1) were found best for pot mum chrysanthemum production over treatments.

KEY WORDS: *Potting Mixture, Production, Vermicompost, Perlite and Chrysanthemum*

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INTRODUCTION

Chrysanthemum (*Dendranthema grandiflora*) is a valuable commercial flower crop, belongs to Asteraceae family and grown for its attractive flowers in all over the world. Chrysanthemum is a perennial herbaceous plant that is widely cultivated throughout the world for its lovely flowers with excellent vase life. Chrysanthemum is one of the important species of ornamental plants in which it has a high economic value, either in the form of cut flowers and pot plants. The demand for chrysanthemum is increasing, especially on religious holidays such as Christmas, New Years and Valentine's (Warnita *et al.*, 2017). Potted chrysanthemums or potted mums are popular choices for beautifying living spaces, balconies and terraces. Chrysanthemum may also be used in pot mums, bedding, border plant and hanging baskets (Raj, 2015). Demand of chrysanthemum flowers in India exists in big metropolitan cities like Delhi, Calcutta, Mumbai, Bangalore, Coimbatore etc. (Kumar *et al.*, 2014). Pot mums occupy an important place in the European, North American and Japanese floriculture trade. The major producing countries are Germany, Italy, Poland, Hungary and Russia. The Netherland and Columbia are the main exporters of chrysanthemum (Nair and Bharathi, 2015).

Chrysanthemum cultivation has grown in various Indonesian production centres as a profitable source of income for farmers. Nowadays, because it is easy to move and display during exhibitions and flower shows, ornamental pots raised in light potting media have been found to be more ideal choices (Dubey *et al.*, 2013). The potting medium is one of the most important factors needed to produce high-quality pots. It is known that the

growth medium has the value of potted ornamental plants and plays an important role in the germination rate and many other physiological parameters including plant height, leaf number, spike length, number of florets per spike, spike diameter and yield etc (Ikram *et al.*, 2012). Choosing a good medium should be used as storage for plant nutrients, to provide support for plant growth, provide water for plants, and promote gas exchange between the root system and the atmosphere above the root system. When the best growth medium is used in conjunction with a substrate with less soil, it should have proper aeration, water retention capacity and sufficient nutrient supply (Khobragade *et al.*, 1997).

Coco peat is an organic by-product of the coconut husk industry. It is obtained by extracting fibre from coconut husk. Coco peat is light in weight, low shrinkage, low bulk density, slow biodegradation and longer decomposition time (10 years). The coco peat can be effectively recovered and has an acceptable pH (5.2-6.8) (Evans *et al.*, 1996). Coco peat contains soluble salts of chloride and sodium as well as higher contents of potash. Vermicompost is also known as worm casting, worm humus or worm fertilizer and the end product of decomposing organic matter. This compost is an odourless, clean organic material, which contains sufficient amounts of N, P, K and several micronutrients necessary for plant growth. Perlite is a siliceous mineral derived from volcanic rocks. First crush the grades used in the container medium, and then heat until the combined water vaporizes and expands into a light powdery substance. The lightness and uniformity of perlite is very useful for increasing aeration and drainage. Cattle manure is a waste fertilizer of cattle farms, which plays a role in improving soil physical properties and enriching soil nutrients (Situmeang *et al.*, 2017).

MATERIALS AND METHODS

The investigation was carried out during the year 2019 at Agriculture Farm, School of Agricultural Sciences and Technology, RIMT University, Mandi Gobindgarh, Punjab. A pot experiment was conducted to determine the effect of different potting mixtures on the growth and flowering of chrysanthemum cv. Haldighati. The experiment consist of seven treatments viz. Garden Soil : Control (T_1), Coco peat + Garden soil (1:1) (T_2), Coco peat + FYM + Garden Soil (2:1:1) (T_3), Vermicompost + Garden Soil (1:1) (T_4), Vermicompost + FYM + Garden soil (2:1:1) (T_5), Perlite + Garden soil (1:1) (T_6), Coco peat Perlite + FYM + Garden soil (2:1:1) (T_7) in a Completely Randomized Design (CRD) with three replications. Potting mixture is prepared by using different media like coco peat, vermicompost, perlite, garden soil and farm yard manure. All the experimental pots have been filled with different type of media according to the treatments. The size of the pot used in this experiment was 12 inches. The total number of pots in the experiment is 21. Before filling the potting medium, thoroughly wash and clean the pot. According to the treatment method, 21 pots were filled with the required potting medium. Mix the potting media used for other treatments in the same way and complete the potting. The 5-7 cm long cuttings are taken from healthy original plants of Lucknow CSIR-NBRI. Healthy cuttings were planted in the pots and gently spray the water with the help of rose can. Three equally spaced plants were kept in one pot in one replication. Frequent irrigation is required for proper growth of the plant. Observe the plants every day and water them manually with a hand sprinkler when needed. The chrysanthemum plants were pinched one month after planting in order to break their apical dominance to increase their lateral spread. Weeding was done as and when required to keep the crop free from weeds. The data on various vegetative characters and floral characters were recorded and statistically analysed. The qualitative parameters characters were analyzed by the analysis of variance (ANOVA) technique. The data was subjected to statistical analysis adopting the standard procedure as laid down by Panse and Sukhatme (1964). The critical difference values were calculated at 1 percent level of significance.

RESULT AND DISCUSSION

Growth Parameters

Data on growth is presented in Table 1. Treatment T₇ (Perlite + FYM + Garden soil (2:1:1)) resulted maximum stem diameter (0.43 cm) was recorded with the treatment followed by T₅ (0.37 cm), T₆ (0.34 cm) and T₃ (0.32 cm), whereas, the minimum stem diameter (0.18 cm) was recorded under T₂ (Coco peat + Garden Soil (1:1)). These results corroborate the findings of Mehwish *et al* (2007) in dahlia and Talukdar *et al* (2003) in chrysanthemum was reported maximum stem diameter with growing media combinations sand + silt + leaf. This is because the growing medium can improve proper aeration, water retention, and absorb a large amount of nutrients through the roots, thereby converting them into photosynthetic products, helping cell division, and cell elongation resulting in a larger stem diameter. The highest plant spread (12.80 cm) was recorded with the treatment T₇ i.e. Perlite + FYM + Garden soil (2:1:1) followed by T₅ (12.23 cm), T₃ (12.13 cm) and T₄ (10.44 cm). While the lesser plant spread (8.30 cm) was noticed under T₁ (control). The results are supported by the findings of Turhan *et al* (2007) in saffron, Gohil *et al* (2018) in chrysanthemum and Naggar and Nasharty (2009) in *Hippeastrum vittatum* who indicated that the maximum plant spread was obtained in media containing sand + poultry manure. The greater fresh weight of leaf (0.41 g) was recorded with the treatment T₇ (Perlite + FYM + Garden soil (2:1:1)) followed by T₅ (0.28 g), T₃ (0.20 g) and T₆ (0.18 g), the lowest fresh weight of leaf (0.10 g) was found under T₄ (Vermicompost + Garden Soil (1:1)). This is in accordance with the findings of Nazari *et al* (2011) in hyacinth and Gohil *et al* (2018) in chrysanthemum, who had reported highest fresh weight of leaf in media containing coco peat combined with soil. The maximum leaf biomass (6.70 g) was recorded with the treatment T₇ (Perlite + FYM + Garden soil (2:1:1)) followed by T₅ (4.86 g), T₃ (4.34 g) and T₆ (3.34 g) while, the least leaf biomass (2.10) was reported under T₁ (control). This result also supported by the findings of Jin *et al* (2002) in lily and Pal and Biswas (2005) in tuberose. They observed that composted rice husk + sawdust + pine bark (1:1:1) is a more suitable medium for producing the highest leaf biomass. The maximum number of suckers per plant (2.44) were counted under T₇ (Perlite + FYM + Garden soil (2:1:1)) followed by T₅ (2.11), T₃ (1.55) and T₆ (1.00) while the less number of suckers per plant (0.44) were recorded under T₁ (control). Present findings get support from the work done by Barreto and Jagtap (2006) and Singh (2018) in gerbera, who reported highest number of suckers with media containing in coir pith + vermicompost.

Flowering Parameters

Data about flowering is cited in Table 2. The minimum duration was observed for first colour shown (52.33 days) with the treatment T₇ (Perlite + FYM + Garden soil (2:1:1)) followed by T₅ (53.59 days), T₃ (53.70 days) and T₆ (64.44 days) while, the maximum days to first colour shown (70.92 days) was recorded under T₁ (control). These results are in accordance with the findings of Chauhan *et al* (2014), Singh (2018) in gerbera and Karthikeyan and Jawaharlal (2015) in carnation, who recorded minimum days to first colour shown in Coir pith + Vermicompost media combinations. Treatment T₇ (Perlite + FYM + Garden soil (2:1:1)) was reported with the highest flower diameter (3.24 cm) and it was closely followed by T₅ (2.89 cm), T₃ (2.78 cm) and T₆ (2.64 cm) while, the lowest flower diameter (1.95 cm) was found under T₁ (control). This result agrees with the finding of Younis *et al* (2008) in dahlia, Barman *et al* (2006) in rose and Yasmeen *et al* (2012) in Carnation. They stated that maximum values for number of flowers of were obtained when soil + coco peat + leaf manure was used. This is due to the fact that excess food reserves are only transferred to fewer sinks (flowers), thus producing larger flowers. Treatment T₅ (Vermicompost + FYM + Garden soil (2:1:1)) was noticed with maximum number of ray florets per flower (83.55) followed by T₇ (82.92), T₃ (82.59) and T₆ (78.39). While, the minimum number of ray florets per flower (74.55) was counted under T₁ (control). Present findings are in accordance with the findings of Nowak and Strojny

(2004) in gerbera, Bhatia *et al* (2004) in Carnation and Rani *et al* (2005) in lillium, who recorded maximum number of ray florets with media soil + sand + municipal waste compost. The longest length of ray florets (2.57 cm) was recorded with the treatment T₅ (Vermicompost + FYM + Garden soil (2:1:1)) followed by T₇ (2.47 cm), T₃ (2.38 cm) and T₆ (2.31 cm) while, the shortest length of ray florets (2.11 cm) was reported under T₁ (control). This result agrees with the finding of Yasmeen *et al* (2012) in carnation and Barreto and Jagtap (2006) who had recorded maximum length of ray florets with soil + coco peat + leaf mould media combination. Treatment T₅ (Vermicompost + FYM + Garden soil (2:1:1)) resulted wider width of ray florets (0.53 cm) and it was followed by T₇ (0.50 cm), T₃ (0.48 cm) and T₆ (0.46 cm). Nevertheless, the narrowest width of ray florets (0.40 cm) was recorded under T₁ (control). These results are supported with the findings Barman *et al* (2006) in rose and Yasmeen *et al* (2012) in carnation, who reported that highest width of ray florets in media containing soil + coco peat + leaf mould. Maximum peduncle length (4.94 cm) was measured under T₇ (Perlite + FYM + Garden soil (2:1:1)) followed by T₅ (4.66 cm), T₃ (3.95 cm) and T₆ (3.72 cm). While, T₁ (control) reported for the minimum peduncle length (2.44 cm). Present findings of flowering are in accordance with the findings of Shammy *et al* (2012) in gerbera and Mohapatra *et al* (2000) in chrysanthemum was reported maximum peduncle length with media containing sandy soil and cow dung.

CONCLUSIONS

Therefore, it can be concluded that using vermicompost and perlite together with FYM helps to achieve better plant growth and better chrysanthemum flower quality.

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Tables

Table 1: Effect of Different Potting Media on Growth of Chrysanthemum CV. Haldighati.

Treatments	Stem Diameter (cm)	Plant Spread (cm)	Fresh Weight of Leaf (g)	Leaf Biomass (g)	Number of Suckers Per Plant
Control: Garden Soil	0.28	8.3	0.12	2.10	0.44
Coco peat + Garden Soil (1:1)	0.18	9.72	0.11	2.53	0.13
Coco peat + FYM + Garden Soil (2:1:1)	0.32	12.13	0.2	4.34	1.55
Vermicompost + Garden Soil (1:1)	0.3	10.44	0.1	2.86	0.55
Vermicompost + FYM + Garden soil (2:1:1)	0.37	12.23	0.28	4.86	2.11
Perlite + Garden soil (1:1)	0.34	10.33	0.18	3.34	1
Perlite + FYM + Garden soil (2:1:1)	0.43	12.8	0.41	6.70	2.44
SEm±	0.02	0.23	0.02	0.31	0.33
C. D. at 1 %	0.10	0.99	0.08	1.31	1.43

Table 2: Effect of Different Potting Media on Flowering of Chrysanthemum CV. Haldighati.

Treatments	Days to First Colour Shown	Flower Diameter (cm)	Number of Ray Florets Per Flower	Length of Ray Florets (cm)	Width of Ray Florets (cm)	Peduncle Length (cm)
Control: Garden Soil	70.92	1.95	74.55	2.11	0.4	2.44
Coco peat + Garden Soil (1:1)	67.44	2.22	75.11	2.17	0.43	2.89
Coco peat + FYM + Garden Soil (2:1:1)	53.7	2.78	82.59	2.38	0.48	3.95
Vermicompost + Garden Soil (1:1)	65.18	2.53	76.15	2.27	0.44	3.19
Vermicompost + FYM + Garden soil (2:1:1)	53.59	2.89	83.55	2.57	0.53	4.66
Perlite + Garden soil (1:1)	64.44	2.64	78.39	2.31	0.46	3.72
Perlite + FYM + Garden soil (2:1:1)	52.33	3.24	82.92	2.47	0.5	4.94
SEm±	0.33	0.11	0.23	0.05	0.01	0.17
C. D. at 1 %	1.42	0.49	0.97	0.23	0.06	0.75