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Research Paper

Impact of potting medium composition on morphological development of chrysanthemum in in -vivo conditions of (*Chrysanthemum morifolium* Ramat cv. Sonar Bangla)

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The light-weight growing medium compositions were evaluated in the present study for optimum growth and flowering of potted Chrysanthemum morifolium Ramat cv. Sonar Bangla. Plants were grown in three differ- ent potted medium compositions – control: garden soil + (farmyard manure (FYM) 2 : 1), composting manure + FYM (2 : 1), composting manure+ FYM+garden soil (1:1:1). Results revealed vegeta- tive growth with maximum plant height, number of leaves and root suckers per plant in the case of composting manure + FYM (2 : 1), whereas flower quality, i.e. dura- tion of flowering and flower diameter was highest in media + FYM (2 : 1 composting manure+ FYM+garden soil (1:1:1).). Moreover, plants showed significant (P < 0.05%) vegetative growth with better flowering time and quality in composting manure + garden soil + FYM (1 : 1 : 1). Therefore, the present findings suggest that for growing potted chrysanthe- mum cv. Snowball for display, light-weight growing medium composition of composting manure + garden soil + FYM (1 : 1 : 1) is the best with better plant morphological development and sustained quality flower production.

Keywords: *Chrysanthemum, composting manure, growing me- dium, morphological development.*

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NOW-A-DAYS, with an increased demand for ornamental potted plants within the country and abroad, the need for light-weight growing medium has become more desirable due to its easy portability and shipment during exhibi- tions and flower shows to foreign countries. Soil sup- plemented with various light-weight growing media, i.e. cocopeat, leaf mould, farmyard manure (FYM), munici- pal sewage sludge, vermicompost, etc. alters the physico- chemical characteristics of the growing mixtures and affects plant growth, root system, nutritional status as well as the value of potted ornamental plants. There is evidence for growing chrysanthemum plants in soilless growing media, including perlite, peat, creamsite, rice husk ash, soilrite, treated coir dust, carbonized rice husk and cocopeat + soilrite, cocopeat + compost . The plant height, spread, flower weight and number of flow- ers in chrysanthemum variety 'Punjab Anuradha' were observed to be maximum in cocopeat + sand + FYM + vermicompost in equal ratio . The cocopeat-based me- dium combination could replace the traditional potting medium (soil) for pot production in chrysanthemum cv. Sadbhavana . The ability of the growing medium to maintain a healthy balance between water content and gaseous exchange is critical for the keeping quality of many ornamental plants, particularly chrysanthemum[11]. Therefore, we studied the effect of different growing media on morphological development of *Chrysanthemum morifolium* cv. Sonar Bangla to standardize the light-weight potting medium with desirable physio-chemical proper- ties for quality flower production.

The composting manure used in the experiment is prepared from the composting machine which is installed in horticulture nursery PGIMER sector 12 chandigarh and works on the principle of providing complete composting system in a single machine. The horticulture waste of the institute is collected in nursey and segragated before putting in machine. Both the shredding and composting take place in a machine employing thermophilic micro-organisms to convert the shredded organic waste to compost.the temprature required for thermophillic process 50-55 degree celsiusis achieved by heating mechanism installed inside the machine which maintains the mass at that temprature with mixing. The input is first fed to a built in shredder which reducesthe waste material size to maximize surface area available for uniform heating and contact with micro -organisms to achieve quick composting. Aerobic composting being exothermic reaction reaction generates heat which further helps in removing the moisture by evaporation and renders dry, ready to use

compost in a few days. The air exchanges from the composting chamber ensure adequate availability of air required for aerobic composting. finally the compost is ready to use after 24 hours.

The experiment was carried out in the Horticulture Nursery, Department of Engineering and Planing, PGIMER, Chandigarh during year, i.e. 2020–2021. Three different medium compositions were selected and prepared by mixing at different ratios and filled in 8-inch earthen pots uniformly by tapping to maintain equal compaction levels. The terminal cuttings (5–7 cm) were pinched (taken) from mother stock plants in the end of May were treated with rooting hormone indole butyric acid (IBA) (400 mg/l) and planted in burnt rice husk/sand for rooting in June–July under shade. The rooted cuttings were transplanted individually in July–August in the earthen pots filled with growing medium compositions. The growing medium combination treatments are as follows: T_1 (control: garden soil + FYM (2 : 1)), T_2 (composting manure+ FYM (2 : 1)), T_3 (composting manure + FYM +Garden Soil(1 : 1: 1) . After the cuttings were transplanted, liquid fer- tigation of 300 ppm nitrogen and 200 ppm potassium was applied at 15 days interval till mid-October; thereafter, 200 ppm of nitrogen and potassium each was applied for the remaining months. The weeds were removed manually and plants were watered regularly depending upon the season. Disbudding, the removal of axillary buds, was done at the end of November by retaining the terminal bud for large-sized terminal flower. Staking was done with single stake to provide vertical support to keep the plants erect and maintain proper shape of plant and bloom. Suckers were separated when 4–5 green leaves appeared and planted at a spacing of 30 × 20 cm in the field during February– March. Diethane M-45 @ 0.3% and Rogor or Malathion @ 0.3% were sprayed at fortnightly intervals to control diseases and insect attacks respectively.

The experiment was conducted according to treatments in completely randomized design (CRD) with three repli- cations comprising five pots per replication. The observa- tions, i.e. vegetative and flower parameters were recorded during the year (2020-21) and analysed statistically using SAS software. The treatment means were compared using Duncan multiple range test (DMRT) at 5% level of significance.

The different physical and chemical properties of growing medium compositions were determined to identi- fy factors that affect the morphological development of chrysanthemum plants. The medium samples were used for determination of pH (1 : 2 medium : water suspen- sion), electrical conductivity (EC; 1 : 2 media : water sus- pension; dS m^{-1}), maximum water-holding capacity (WHC;

%) using Keen's box[13], bulk density (BD; g/cm^3) using the soil core method[14] and total nitrogen (%) by Kjel- dahl's method.

In *Chrysanthemum morifolium* cv. Sonar Bangla, the differ- ent growing medium compositions significantly ($P < 0.05$) influenced plant height, number of leaves at 30, 45, 60 and 75 days after planting (DAP) and root suckers per plant (Tables 1–3). Plant height at 30, 45, 60 and 75 DAP varied significantly among the different medium compo- sitions, with minimum in T_1 (10.10, 22.34, 47.26 and 59.55 cm respectively) and significantly ($P < 0.05$) max- imum in T_2 (13.45,29.05,52.48 and 70.25 cm respective- ly). The plant height recorded at 45 and 60 DAP in T_2 was followed by T_3 (27.85 and 51.35 cm respectively) . The number of leaves at 30, 45, 60 and 75 DAP was significantly better in T_2 (12.45, 15.86, 27.01 and 31.92 respectively) and minimum in control (9.38, 12.91, 21.55 and 24.06 respec- tively). The number of leaves recorded at 30, 45 and 60 DAP in T_2 was followed by T_3 (11.54, 14.44 and 24.89 respectively) . The number of leaves 75 DAP were recorded highest in T_2 (31.92) followed by T_3 (28.09), both of which were at par among themselves. The number of root suckers per plant was significantly better in T_2 (11.85) followed by T_3 (10.69) , both of them at par among themselves and minimum in control (8.88). Vegetative growth was recorded higher in composting manure- based medium compositions with maximum in composting manure + FYM (2 : 1). This could be due to its better physio- chemical characteristics, including lower bulk density, higher total porosity, water-holding capacity and higher nitrogen availability to the plants. The superiority of manure over other pot mixtures has been reported earli- er in pothos and roses. The highest values of leaf number and shoot length in pothos were observed in medium containing manure only. A significant increase in leaf number of pot anthurium has also been reported using coir dust[20].

In *C. morifolium* cv. sonar bangla, the medium composi- tions significantly ($P < 0.05$) influenced days to bud appearance, colour break stage and full bloom, duration on flowering, flower diameter, number of flowers per plant and nitrogen content in plants. Flower bud appear- ance, colour break stage and full bloom were delayed with medium compositions amended with compost (Table 4). The days to flower bud appearance, colour break stage and full bloom were maximum in T_2 (69.59,83.50 and 115.69 days respectively) and minimum in control (61.55, 75.22 and 108.01 days respectively). The days to flower bud appearance were maximum in T_2 (69.59 days) was followed by T_3 (67.54 days) . The days to colour break stage were maximum in T_2 (83.50 days) followed by T_3 (79.35 days) both of them were at par among themselves. The duration of flowering, flower dia- meter and nitrogen content differed significantly among different medium compositions in the plants (Table 3).

The duration of flowering, flower diameter and nitrogen content in plants were found minimum in control (11.55 days, 13.55cm and 0.89% respectively). The duration of flowering was significantly better in T_3

(12.96 days) fol- lowed by T_2 (12.58 days). The minimum duration of flo- wering obtained in control was a 11.55 days. The flower diameter was maximum in T_3 (15.22cm) followed by T_2 (14.86 cm), both of them were non-significantly different. The nitrogen content in plants was highest in T_2 (1.39%).

The more number of days taken to flowering in plants grown in composting manure-based medium mixtures could be due to higher availability of nitrogen in these medium compo- sitions, which encourages vegetative growth with delayed reproductive stage. The duration of flowering and flower diameter showed superiority of composting-based potting medium over other medium compositions, with highest in Composting Manure + FYM+Garden Soil (1: 1 : 1). This might be due to higher availability of potassium in manure-based medium mixture compared to the other mixtures. These results are supported by significant increase in flower size by the application of urea with a combination of potash and FYM in dahlia[21].

The physical and chemical characteristics, viz. BD, WHC and total nitrogen greatly differed among different treatments (Table 5). It shows the effect of me- dium composition on BD and WHC. Composting manure + FYM (2 : 1) recorded the highest WHC (338.30%), whereas the lowest value (30.17%) was recorded in garden soil + FYM (2 : 1). The highest value of BD (1.10 g/cm^3) was recorded in garden soil + FYM (2 : 1) and the lowest (0.16 g/cm^3) in composting manure + FYM (2 : 1). The maximum value of total nitrogen (1.49%) was obtained in composting manure + FYM (2 : 1) whereas the minimum

(0.22%) was obtained in garden soil + FYM (2 : 1). The physical properties of growing media like aeration and WHC are the most important factors, while among the chemical characteristics, nutritional status and salinity level play a crucial role in plant development[22]. The availability of higher nitrogen content as a source of nutrition with lower BD, higher porosity and WHC in compost-based medium mixtures might be the reason for better plant growth and flower production, as reported earlier in chrysanthemum[10]. As pot weight is an important factor during transport and shipping, and soil is heavy and prone to diseases, may get compacted after potting. Hence, cocopeat-based medium compositions could re- place the traditional potting medium (soil) for chrysan- themum production. The medium combination of compost + FYM (2 : 1) resulted in the best vegetative growth, However, there was delay in time of flowering and deterioration in flower quality. The flower quality parameters, i.e. duration of flowering and flower diameter were best in case of Composting Manure +Garden Soil+ FYM (1:1:1), but showed poor vegetative growth. plants showed significant ($P < 0.05\%$) vegetative growth with better flowering time and quality in Composting Manure +Garden Soil+ FYM (1:1:1), Therefore, the present findings suggest that for growing plants composting manure is very helpful as it is light-weight growing medium, good for morphologi- cal development and sustained quality flower production. **Moreover composting manure prepared from composting machine compress the waste material which is non smelling, rich in nutrients which is necessity in hospitals , universities and institutions.**

[1]. Dubey, R. K., Singh, S., Kukal, S. S. and Kalsi, H. S., Evaluation of different organic growing media for growth and flowering of petunia. *Commun. Soil Sci. Plant Anal.*, 2012, **44**, 1777–1785.

[2]. Beckmann-Cavalcante, M. Z., Pivetta, K. F. L., Meinken, E. and Roeber, R., Growth of *Chrysanthemum × grandiflorum* in differ- ent peats and change of peat properties during cultivation. *Acta Hortic.*, 2009, **819**, 181–184.

[3]. Vendrame, A. W., Maguire, I. and Moore, K. K., Growth of selected bedding plants as affected by different compost percentages. *Proc. Fla. State Hortic. Soc*., 2005, **118**, 368–371.

[4]. Zhang, W., Fukai, S. and Goi, M., Morphology of capitulum initi- ation and floret development of *Dendranthema* species native to Japan. *J. Jpn. Soc. Hortic. Sci*., 1998, **67**, 347–350.

[5]. Pawar, V., Jagtap, K. B., Srinath, B. M. and Jagdhav, S. V., Comparative studies on pot mum chrysanthemum (*Dendranthema grandiflora*) with respect to varieties, pots and substrates.

[6]. *J. Maharashtra Agric. Univ*., 2005, **30**, 269–271.

[7]. Kreij, C. and Leeuwen, J. L., Growth of pot plants in treated coir dust as compared to peat. *Commun. Soil Sci. and Plant Anal.*, 2001, **32**(13 and 14), 2255–2265.

[8]. Budiarto, K., Sulyoa, Y., Dwi, E. and Maaswinkelb, R. H. M., Effects of types of media and NPK fertilizer on the rooting capacity of chrysanthemum cuttings. *Indones. J. Agric. Sci*., 2006, **7**(2), 67–70.

[9]. Dutt, M., Patil, M. T. and Sonawane, P. C., Effect of various sub- strates on growth and flowering of chrysanthemum. *Indian J. Hor- tic*., 2002, **59**, 191–195. Nair, S. A. and Bharathi, T. U., Influence of potting media compo- sition on pot mum production. *Bioscan*, 2015, **10**(1), 73–76.

[10]. Dressboll, D. B., Effect of growing media composition, compac- tion and periods of anoxia on the quality and keeping quality of potted roses (*Rosa* sp.). *Sci. Hortic*., 2010, **126**, 56–63.

[11]. Duncan, D. B., Multiple range and multiple *F* tests. *Biometrics*, 1955, **11**, 1–42.

[12]. Richard, L. A., *Diagnosis and Improvement of Saline and Alkali Soils*, 1954, pp. 7–33.

[13]. Blake, G. R. and Hartge, K. H., Bulk density. In *Methods of Soil Analysis, Part I* (ed. Klute, A.), ASA Monograph No 9. Madison, WI, USA, 1986, pp. 363–376.

[14]. Subbiah, B. V. and Asija, C. L., A rapid procedure for the estima- tion of available nitrogen in soils. *Curr. Sci*., 1956, **25**, 259–260.

[15]. Awang, Y., Shaharom, S. A., Mohamad, R. B. and Selamat, A., Chemical and physical characteristics of cocopeat-based media mixtures and their effects on the growth and development of *Celo- sia cristata*. *Am. J. Agric. Biol. Sci*., 2009, **4**, 63–71.

[16]. Khayyat, M., Nazari, F. and Salehi, H., Effects of different pot mixtures on pothos (*Epipremnum aureum* Lindl. and Andre 'Golden Pothos') growth and development. *Am. Eurasian J. Agric. En- viron. Sci*., 2007, **2**(4), 341–348.

[17]. Maloupa, E., Khelifi, S. and Zervaki, D., Effect of growing media on the production and quality of two rose varieties. *Acta Hortic*., 2001, **548**, 79–83.
[18]. Sameei, L., Khalighi, A., Kafi, M. and Samavat, S., Peat moss substituting with some organic wastes in pothos (*Epipremnumaureum* 'Golden Pothos') growing media. *Iran. J. Hortic. Sci. Technol*., 2004, **6**, 79–88.
[19]. Wuryaningsih, S., Sutater, T. and Tjia, B., The growth of orna- mental pot *Anthurium andraeanum* on coir dust growing media.
[20]. *J. Penelitian Pertanian*, 1999, **18**, 31–38.