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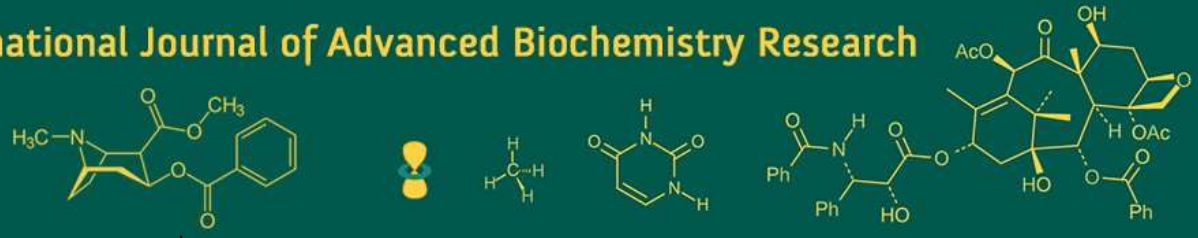

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Impact of growing media on post harvest parameters of marigold in vertical planting (*Tagetes erecta* L.)

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Abstract
Standardization of growing media for vertical planting of marigold was started at High Tech Floriculture Project farm, College of Agriculture, Pune, during *Rabi* 2023-2024. The present investigation was undertaken on marigold crop during *rabi* 2023-2024, with a view to study the post harvest characters of marigold as influenced by growing media combination in vertical planting. The experiment was laid in Randomized Block Design comprising three replications with nine treatments. The results of present investigation concluded that treatment T_4: [Red Soil 50% + Cocopeat 25% + Spent Mushroom 25% (v/v)] followed by T_2: [Red Soil 50% + Spent Mushroom 50% (v/v)] is beneficial to increase growth, flowering and yield quality of marigold compared to all other treatments and in vertical planting and absolute control.

Keywords: Marigold, growing media, vertical planting, cocopeat, spent mushroom, bagasse, red soil

Introduction
India has a long history and tradition with flowers. It is said in India that a man is born with flowers and dies with flowers as well. Flowers also contribute to human well-being, with studies showing their ability to improve mood, reduce stress and enhance overall mental health. Marigold (*Tagetes erecta* L.) is an immensely popular annual flower crop, widely grown throughout the world. Marigold belongs to the family Compositae and the genus *Tagetes*. The genus *Tagetes* comprises about 33 species, of which *Tagetes erecta* (African marigold) and *Tagetes patula* (French marigold) are under commercial cultivation in India. Marigold is native to Central and South America, especially Mexico. The chromosome number is X = 12 and 2n = 24. The other species introduced in India are *Tagetes signata* Linn. *Tagetes minuta* Linn, *Tagetes lucida*, and *Tagetes tenuifolia*. Marigold is a major loose flower crop that can be grown in different media. Proper media formulation typically includes a blend of organic and inorganic components that provide adequate aeration, drainage and nutrient retention. Vertical planting offers several advantages for marigold cultivation. It improves air circulation around the plants, reducing the risk of fungal diseases, and allows for better drainage, preventing root rot (Roper *et al*., 2018) [7]. Thus, keeping the above facts in view, the experiment was conducted to study the effect of growing media on growth, flowering and yield attributes were studied in marigold (*Tagetes erecta* L.) in vertical planting.

Materials and Methods
The information pertaining to the details of the experiment, materials used, methodology adopted and statistical techniques followed during the investigation entitled "Standardization of Growing Media for Vertical Planting of Marigold (*Tagetes erecta* L.)*"* is systematically outlined in this chapter. The present investigation was undertaken in the month of January 2023–2024 at High Tech Floriculture, College of Agriculture, Pune, Maharashtra. The experiment was conducted with the African Marigold variety Seracole. The UV- stabilized polypropylene bags of size 22" x 38" were used for growing the marigold crop for this experiment. For experimental purposes, different media such as red soil, cocopeat, spent mushroom and bagasse were used in various combinations as treatments in UV stabilized polybags.

The planting material were obtained from reliable sources and planted. The planting of Marigold seedlings was done on 28th January, 2024.The experiment was laid out in a randomized block design with three replications and nine treatments. Treatment details are:

T_1: Red Soil 50% + Cocopeat 50% (v/v), T_2: Red Soil 50% + Spent Mushroom 50% (v/v), T_3: Red Soil 50% + Bagasse 50% (v/v), T_4: Red Soil 50% + Cocopeat 25% + Spent Mushroom 25%(v/v), T_5: Red Soil 50% + Cocopeat 25% + Bagasse 25% (v/v), T_6: Red Soil 50% + Spent Mushroom 25% + Bagasse 25% (v/v), T_7: Red Soil 25% + Cocopeat 25% + Spent Mushroom 25% + Bagasse 25% (v/v), T_8: Red Soil 100% (v/v), T_9: Absolute control.

Results and Discussion

Post Harvest Parameters

The post harvest parameters include shelf life (days), membrane stability index (m.s.i), and dry matter production (g). Further, the observed and analysed data is depicted in Table 1.

Shelf Life (Days)

In Table 1., treatment T_2 (Red Soil 50% + Spent Mushroom 50%) recorded the longest shelf life (6.33 days), which was at par T_4 (Red Soil 50% + Cocopeat 25% + Spent Mushroom 25%) and T_1 (Red Soil 50% + Cocopeat 50%) whose recorded values are (6.20 days) and (5.87 days). Whereas the treatment T_3 (Red Soil 50% + Bagasse 50%) recorded the shortest shelf life of (3.73 days).

The treatments with the highest shelf life T_4, T_2, T_8, and T_1 likely perform best due to the optimal combinations of organic materials and soil amendments. T_2 (Red Soil 50% + Spent Mushroom 50%) offers high nutrient content, which can enhance the health and longevity of the contents. T_4 (Red Soil 50% + Cocopeat 25% + Spent Mushroom 25%) benefits from the moisture-retaining properties of cocopeat and the nutrient boost from spent mushroom, contributing to extended shelf life. T_8 (Red Soil 25% + Cocopeat 25% + Spent Mushroom 25% + Bagasse 25%) provides a balanced mix of aeration, moisture retention, and nutrients, which supports longer shelf life T_1 (Red Soil 100%) serves as a control but may not perform as well as the mixed treatments due to the absence of additional organic amendments that contribute to enhanced shelf life. Overall, combinations of organic materials improve conditions for longer shelf life compared to single-component treatments. Similar results were recorded previously by Patil *et al.* (2011) [4], Raghuvanshi and Sharma (2011) [5] in marigold and Tejaswini (2017) [11] in marigold.

Membrane Stability Index (MSI) (%)

The membrane stability index of loose flowers of marigold in vertical planting has been greatly impacted by the various genetic cell interaction with semi-permeable membrane and soil growing media treatments. The recorded data given in Table 1. revealed that treatment T_6 (Red Soil 50% + Spent Mushroom 25% + Bagasse 25%) recorded the maximum membrane stability index (94.66), which was statistically on par with treatments T_7 (Red Soil 25% + Cocopeat 25% + Spent Mushroom 25% + Bagasse 25%) and T_8 (Red soil 100%) for membrane stability index whose recorded values are (94.63) and (94.06) respectively. Whereas treatment T3 (Red Soil 50% + Bagasse 50%) recorded the minimum membrane stability index (78.89).

Highest m.s.i is observed in T_6 and T_7 which might be due to cell interaction with semi permeable membrane. In both T_6 and T_7 due to decomposition of bagasse in later stage of crop might had led to increase in electrical conductivity as bagasse was partially decomposed increasing membrane stability index in later stages of crop. Thus, more the m.s.i., more is the drought tolerance of the crop. Similar results were found Srinivasan *et al.* (2018) [8], Gholinezhad (2020) [2], Verma and Jhanji (2022) [10] in marigold and Akhtar *et al.* (2022) [1] in marigold.

Table 1: Effect of growing media on shelf life and membrane stability index in marigold (cv. '*Seracole'*) in vertical planting system.

Treatments		Shelf Life (Days)	Membrane Stability Index (M.S.I)
T_1	Red Soil 50% + Cocopeat 50% (v/v)	5.87	86.53
T_2	Red Soil 50% + Spent Mushroom 50% (v/v)	6.33	85.33
T_3	Red Soil 50% + Bagasse 50% (v/v)	3.73	78.89
T_4	Red Soil 50% + Cocopeat 25% + Spent Mushroom 25% (v/v)	6.20	84.96
T_5	Red Soil 50% + Cocopeat 25% + Bagasse 25% (v/v)	4.07	83.23
T_6	Red Soil 50% + Spent Mushroom 25% + Bagasse 25% (v/v)	5.53	94.66
T_7	Red Soil 25% + Cocopeat 25% + Spent Mushroom 25% + Bagasse 25% (v/v)	4.80	94.63
T_8	Red Soil 100% (v/v)	5.27	94.06
T_9	Absolute Control	5.07	88.36
S.E.± (m)		0.28	0.53
C.D. at 5%		0.84	1.60

Conclusion

Conclusions are drawn from the observations and are given here. Based on the results obtained from the present study, it may be concluded that, among all the treatments of media standardization applied in the study, the treatment T_2 [Red Soil 50% + Spent Mushroom 50% (v/v)] followed by T_4 [Red Soil 50% + Cocopeat 25% + Spent Mushroom 25% (v/v)] was found to be most effective in improving the shelf life and T_6 [Red Soil 50% + Spent Mushroom 25% + Bagasse 25% (v/v)] followed by T_7 [T_7: Red Soil 25% + Cocopeat 25% + Spent Mushroom 25% + Bagasse 25% (v/v)] had highest membrane stability index in marigold cv. 'Seracole' in vertical planting.

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