

Performance of ZZ (*Zamioculcaszamiifolia*) cultivars on different organic potting mixtures

ABSTRACT

An experiment was carried out at the research-instructional farm, Department of Horticulture, School of Agricultural Sciences, Nagaland University, Medziphema, India (2022-2023). The experiment was laid out in completely randomized design (CRD), replicated thrice with 14 treatments, using rooted leaf cuttings of ZZ cultivars (and Factor I: Cultivar: Super Nova, and Black Raven) and 7 organic substrates (and Factor II: FYM, Vermicompost, Used tea leaves, Forest litter, Cocopeat, Perlite and Rice husk) in the ratio of 1:1:1. The rooted leaf cuttings of ZZ cultivars were planted in different organic substrates along with Garden soil and sand in the ratio of 1:1:1. Among the cultivars, C₁ (Super Nova) was found to be significantly better than Black Raven. Amongst the organic substrates, T₅ (Garden soil + sand+ cocopeat) was found to be statistically superior in terms of all observed parameters except for plant height. T₄ (Garden soil + sand + forest litter) had the maximum plant height. T₅ also had the highest profit (Rs. 12250) and benefit cost ratio (1.89) on ZZ cultivar Black Raven.

Keywords: ZZ (*Zamioculcaszamiifolia*), potting mixture, cocopeat, forest litter

Comment [OP1]: Improve abstract

Introduction

Zamioculcaszamiifolia, also called Zanziber Gem, ZZ plant, ZuZu plant, Aroid palm and Eternity plant is an ornamental plant grown for its attractive glossy foliage. *Zamioculcas* is a member of the family of Araceae (Bentham and Hooker, 1883; Engler and Prantl, 1889) and originates from South Africa. *Zamioculcaszamiifolia* is the only known species of the *Zamioculcas* genus so far (Chen *et al.*, 2002). The aesthetic utility of ZZ plant is due to its special appearance, potential to flourish in low light conditions and its tolerance to drought conditions. The potential of the plant to resist drought and low light conditions has promoted its horticultural

significance at international level (Chen and Henny, 2003). ZZ plant has no known pest or disease incidences under interior conditions and has utmost tolerance to less light and drought conditions (Chen *et al.*, 2002). Therefore, it serves as a great house plant. It is drought tolerant due to the succulent rhizome that stores water until favourable conditions resume. In drought condition, the above ground portion of the plant (leaflets and rachis) usually falls and leaves only

the reserved swollen petiole base, like the pseudobulbs in orchids to aid the plant until the next irrigation or rain (Brown, 2000).

Comment [OP2]: Add 2 paragraphs presenting the studied cultivars (shortly describe plant height, leaf color, ornamental interest, market availability, etc.)

Soil is the pool of nutrients for plants thereby making it the most important factor for plant growth. Mixing of organic substances ~~altogether~~ increases effectiveness, compared to the use of its ingredients separately, the efficiency than when used individually. Use of organic matter improves the soil health by improving the soils aeration, buffering capacity, faster release of nutrients, better water and nutrient supply capacity and also increases the activity of beneficial soil microorganisms. Growing media has different origins and they take the place of soil and serve as a means of anchorage for the root system, supply water and nutrients for the plants and aerify the root area (Gruda *et al.*, 2006). A good media provides enough anchorage or prop the plant, provide water and nutrients, aid in oxygen diffusion to the plant roots and allow gaseous exchange between the roots and the atmosphere outside the root substratum (Argo 1998 and Abad *et al.*, 2002). The production and quality of potted ornamentals is highly affected by the growing media prepared in different compositions (Gheorghe and Monica., 2015).

MATERIAL AND METHODS

An experiment was conducted during 2022-2023 at the Research ~~cum~~ Instructional farm of School of Agricultural Science, Nagaland University, Medziphema, India, located at 320 m above mean sea level at a latitude of 27°06'00" North and longitude of 93°37'12" East. The climatic condition of Medziphema is sub-tropical with high relative humidity and moderate temperature having medium to high rainfall. The temperature ranges from 25°C-31°C during summer and 10°C-20°C in winter. During monsoon, the area receives good amount of rainfall ~~with~~ of average of 3000 mm annum⁻¹.

The experiment was laid out in completely randomized design (CRD), replicated thrice with 14 treatments, using rooted leaf cuttings of ZZ cultivars (Super Nova, Black Raven) and 7 organic substrates (FYM, Vermicompost, Used tea leaves, Forest litter, Cocopeat, Perlite and Rice husk) in the ratio of 1:1:1 with garden soil and sand.

Comment [OP3]: 2 cultivars, 7 organic substrates, 3 replicates. Is the total number of plants 42?

Comment [OP4]: Explain the choice of these cultivars

Factor I: Cultivars

Cultivars	Super Nova (C1) Black Raven (C2)
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Comment [OP7]: This information should be a table (Table 1)

Factor II: Organic substrates

Treatments	Organic substrates
T ₁	Garden soil+sand+FYM

Comment [OP5]: Explain the acronym

T ₂	Garden soil+sand+Vermicompost
T ₃	Garden soil+sand+Used tea leaves
T ₄	Garden soil+sand+Forest litter
T ₅	Garden soil+sand+Cocopeat
T ₆	Garden soil+sand+Perlite
T ₇	Garden soil+sand+ Rice husk

Comment [OP6]: Garden soil and forest litter should have been analyzed (NPK content may be sufficient for plant nutrition, and garden soil is often variable in nature and composition)

Before transplanting, polybags of 20 x 15 cm (L X B) dimensions were obtained. Garden soil, sand and various organic substrates, each measuring 500 gm were measured separately, thoroughly mixed together and filled in the polybags. The rooted plants were planted in the centre of the polybags. The first watering was given immediately after transplanting the plant, thereafter irrigation was given on plant demand and the surrounding conditions. Weeding and earthing up was done as when required or deemed necessary. The observations were made on rhizome size at transplanting and 8 months after transplanting, number of days to shoot emergence, number of days to unfurling of leaves, plant height at 3,6 and 8 months after transplanting, number of shoots at 3,6 and 8 months after transplanting, rachis girth at 3,6 and 8 months after transplanting, growth rate at 3,6 and 8 months after transplanting and benefit cost ratio.

Comment [OP8]: In the abstract is 'rooted cuttings'
You must have explained with further detail the plant material used in the experiment:
-What was the size of the leaflets?
- How long ago were the cuttings prepared?
-Were the leaflets all from the same part of the leaf?

The recorded data was subjected to analysis of variance method (Gomez and Gomez.,1983) and tested against error mean square using Fisher Snedecor 'F' test at 0.5% level of significance.

Comment [OP9]: Explain the place where the plants were maintained: greenhouse or exterior; the spacing between polybags, natural light or artificial light (shadow or full light?)

Comment [OP10]: Additionally to ANOVA, a post-hoc test (Duncan ou other) allowing to separate de average values should have been done

RESULTS AND DISCUSSION

Rhizome size at transplanting and rhizome size

Among the cultivars, C₁ (Super Nova) recorded the maximum (2.84 cm and 3.97 cm) rhizome size. Kumar *et al.* (2020) reported that the difference among the cultivars might be attributed to differences in genetic makeup of the cultivars. Among the organic substrates, the maximum (2.83 cm and 3.65 cm) rhizome size were recorded in T₅ (Garden soil+sand+cocopeat), followed by T₆ (Garden soil+sand+perlite) with a rhizome size of 2.74 cm and 3.48 cm at transplanting and 8 months after planting. The minimum (1.78 cm and 2.84 cm) rhizome size were observed in T₃ (Garden soil+sand+used tea leaves) (Table 1). The maximum rhizome size in cocopeat might be due to the fact that although cocopeat as low levels of is low in nitrogen, calcium and magnesium, as but it is high levels of in phosphorous and potassium. Phosphorous is good for root growth and development (Gohil *et al.*,2018).

Table 1: Effect of potting mixture on rhizome size at transplanting and 8 months after transplanting. Average of 3 plants for each treatment.

Comment [OP11]: The table should be merged with table 2

Cultivars (C)	Rhizome size (cm)	
	At transplanting	8 months after transplanting
C ₁	2.84	3.97
C ₂	1.95	2.63
SEm (±)	0.14	0.10
CD a 5 %	0.40	0.30
Organic substrates (T)		
T ₁	2.27	3.29
T ₂	2.29	3.22
T ₃	1.78	2.84
T ₄	2.38	3.29
T ₅	2.83	3.65
T ₆	2.74	3.48
T ₇	2.50	3.35
SEm (±)	0.23	0.20
CD at 5 %	0.67	0.57
Interaction (C X T)		
SEm (±)	0.37	0.28
CD at 5 %	NS	NS

Comment [OP12]: The acronyms should be explained at the table footer: CD?;SEm? NS? The same in all other tables

Comment [OP13]: I was very concerned about these rhizomes at the beginning of the experiment. In order to compare results, at the beginning all the plants should have the same approximate size, but this is not the case, Cultivars could have different sizes due to their biological differences. But the plants used in the 7 different organic substrates should have been identical. In fact, the initial vigor (rhizome size) was bigger in T₅, and diminishing to T₆, T₇, T₄ and for the last T₃. Curiously the posterior development of the plants seems to be highly correlated with initial rhizome size. Please explain better how the initial plants were produced and chosen. the different initial vigor greatly influenced the results and could compromise the experience. Without further explanation, I cannot understand/assess whether the distinct results with the substrate mixtures must be due to the intrinsic qualities of the substrates or the distinct size of the rhizomes used in the assay setup.

Days to shoot emergence

Cultivar Super Nova took a minimum of ~~(67.97)~~ days to shooting which might be due to difference in vegetative attributes of different genotypes exhibiting varied growth rate and genetic make up (Thakur *et al.*, 2018). Among the substrates, T₅ (Garden soil+sand +cocopeat) took minimum days (62.89) for shoot emergence while maximum (88.61) days to shoot emergence was recorded in T₃ (Garden soil+sand +used tea leaves) (Table 2). Cocopeat provides a better texture to the growing media and also prevents compaction (Ghosh *et al.*, 2021) which might have contributed to the early shoot emergence.

Days to unfurling of leaves

The minimum (75.54) days to unfurling of leaves was observed in C₁ (Super Nova). Arora and Khanna (1985) and Rani *et al.* (2007) reported that supremacy of some genotypes over other genotypes is because of the variation in genotypes of different varieties. T₅ (Garden soil+sand +cocopeat) took minimum (71.67) days to unfurl the leaves which was followed by T₆ (Garden soil+sand +perlite) which took 73.00 days. The maximum days (95.00) to unfurling of leaves was recorded in plants grown in T₃ (Garden soil+sand +used tea leaves) (Table 2). Cocopeat has the potential to stock and liberate nutrients to plants for an increased length of time (Swetha *et al.*, 2014). Cocopeat has good physical characteristics, high total pore space, elevated water content, low shrinkage, low bulk density and slow biodegradation (Evans *et al.*, 1996; Prasad, 1997) which might have contributed to its superiority as compared to other substrates.

Table 2: Effect of potting mixture on days to shoot emergence and unfurling of leaves

Cultivars (C)	Days to shoot emergence	Days to unfurling of leaves
C ₁	67.97	75.54
C ₂	82.84	87.98
SEm (±)	3.71	3.27
CD a 5 %	10.74	9.47
Organic substrates (T)		
T ₁	72.56	79.33
T ₂	83.50	83.50
T ₃	88.61	95.00
T ₄	79.67	87.22
T ₅	62.89	71.67
T ₆	64.78	73.00
T ₇	75.83	82.61
SEm (±)	6.93	6.12
CD at 5 %	20.09	17.72
Interaction (C X T)		
SEm (±)	9.81	8.65
CD at 5 %	NS	NS

Plant height at 3,6 and 8 months after transplanting

The maximum plant height (11.87 cm, 14.28 cm and 16.60 cm) was recorded in C₁ (Super Nova). Kumari and Kumar (2015) reported that differences in plant height amongst hybrids is attributed to the hereditary traits or the existing conditions of the environment of the growing location. Amongst the treatment, T₄ (Garden soil+sand +forest litter) exhibited the maximum height (10.06 cm, 13.30 cm and 14.89 cm), followed by T₇ (Garden soil+sand + rice husk) recording 9.99 cm, 11.28 cm and 12.87 cm at 3,6 and 8 months of planting. The minimum plant height (8.23 cm, 8.69 cm and 10.28 cm) was noted in T₃ (Garden soil+sand +used tea leaves).The maximum plant height in forest litter maybe attributed to the fact that flavonoids which are known to play a role in attracting beneficial microbes such as rhizobia may remain in plant tissue after senescence and affect plant growth by scavenging free radicals and improving stress tolerance (Barazani and Friedman,2001).

Comment [OP14]: Is Super Nova a hybrid? Description of cultivars necessary in the introduction

Table 3: Effect of potting mixture on plant height at 3, 6 and 8 months after transplanting

Cultivars (C)	Plant height (cm)		
	3 months	6 months	8 months
C ₁	11.87	14.28	16.60
C ₂	6.02	7.34	8.20
SEm (±)	0.46	1.00	0.54

Comment [OP15]: The table should be merged with tables 3, 4, 5 and 6, placed on a page, horizontally

CD a 5 %	1.32	1.54	1.56
Organic substrates (T)			
T ₁	9.36	10.41	12.00
T ₂	9.75	10.96	12.55
T ₃	8.23	8.69	10.28
T ₄	10.06	13.30	14.89
T ₅	8.55	10.17	11.76
T ₆	9.65	10.83	12.42
T ₇	9.99	11.28	12.87
SEm (±)	0.85	1.00	1.01
CD at 5 %	2.47	2.89	2.92
Interaction (C X T)			
SEm (±)	1.21	1.41	1.43
CD at 5 %	NS	NS	NS

Number of shoots at 3,6 and 8 months after transplanting

Cultivar C₁ recorded the maximum number of shoots (1.13, 1.41 and 1.93) and treatment T₅(Garden soil+sand+cocopeat) revealed the maximum number of shoots (1.26, 1.71 and 2.54) while the minimum number of shoots (0.73, 1.06 and 1.31) was observed in T₃ (Garden soil+sand +used tea leaves). More production of shoots in cocopeat media might be due to an increase in soil porosity, water retention and increase in ion exchange capacity (Devidas,2012).

Table 4: Effect of potting mixture on number of shoots at 3, 6 and 8 months after transplanting

Cultivars (C)	Number of shoots		
	3 months	6 months	8 months
C ₁	1.13	1.41	1.93
C ₂	0.77	1.17	1.73
SEm (±)	0.10	0.13	0.16
CD a 5 %	0.28	NS	NS
Organic substrates (T)			
T ₁	0.88	1.11	1.70
T ₂	0.82	1.22	1.66
T ₃	0.73	1.06	1.31
T ₄	0.96	1.33	1.77
T ₅	1.26	1.71	2.54
T ₆	1.07	1.39	2.17
T ₇	0.93	1.22	1.64
SEm (±)	0.18	0.24	0.30
CD at 5 %	NS	NS	0.42
Interaction (C X T)			
SEm (±)	0.25	0.34	0.42
CD at 5 %	NS	NS	NS

Rachis girth at 3,6 and 8 months after transplanting

The maximum rachis girth (0.17 cm, 0.29 cm and 0.36 cm) was observed in C₁ and T₅ (Garden soil+sand +cocopeat) recording a maximum value of (0.22 cm, 0.29 cm and 0.35cm) on all days of observation. The minimum rachis girth (0.13 cm,0.22 cm and 0.28 cm) was noted in plants grown in T₃ (Garden soil+sand +used tea leaves).The high porosity feature of cocopeat aided to maintain a balanced water retention and aeration for enhanced intake of nutrients in the growth medium confined in a limited and enclosed space (Singh *et al.*, 2015) which might have contributed to the good growth of the plant.

Comment [OP16]: Explain better what is the rachis, Is it from the initial cutting or from the first developed shoot?

Table 5: Effect of potting mixture on rachis girth at 3, 6 and 8 months after transplanting

Cultivars (C)	Rachis girth (cm)		
	3 months	6 months	8 months
C ₁	0.17	0.29	0.36
C ₂	0.16	0.23	0.27
SEm (±)	0.02	0.01	0.01
CD at 5 %	0.05	0.02	0.02
Organic substrates (T)			
T ₁	0.15	0.24	0.29
T ₂	0.17	0.27	0.32
T ₃	0.13	0.22	0.28
T ₄	0.15	0.26	0.31
T ₅	0.22	0.29	0.35
T ₆	0.18	0.28	0.34
T ₇	0.16	0.26	0.32
SEm (±)	0.03	0.01	0.01
CD at 5 %	NS	0.03	0.03
Interaction (C X T)			
SEm (±)	0.05	0.02	0.01
CD at 5 %	NS	NS	NS

Growth rate at 3,6 and 8 months after transplanting

Cultivar Super Nova recorded the maximum growth rate (15.97%, 30.31% and 36.86%) amongst both the cultivars. Treatment wise, T₅ (Garden soil+sand +cocopeat), recorded the maximum growth rate (16.52%, 34.47% and 40.72%) followed by T₆ (Garden soil+sand +perlite) which recorded growth rates of 15.10%, 31.44% and 37.36% while the minimum growth rate (11.00%, 21.37% and 29.83%) was noted in T₃ (Garden soil+sand +used tea leaves) at 3, 6 and 8 months after transplanting.

Comment [OP17]: the calculation formula must be added to the methodology section

Table 6: Effect of potting mixture on growth rate at 3, 6 and 8 months after transplanting

Cultivars (C)	Growth rate (%)		
	3	6	8

	months	months	months
C ₁	15.97	30.31	36.86
C ₂	11.11	25.01	32.97
SEm (±)	0.77	1.62	0.94
CD at 5 %	2.24	4.69	2.71
Organic substrates (T)			
T ₁	12.39	26.69	34.48
T ₂	13.40	24.40	23.23
T ₃	11.00	21.37	29.83
T ₄	12.35	25.26	34.47
T ₅	16.52	34.47	40.72
T ₆	15.10	31.44	37.36
T ₇	14.04	29.97	35.33
SEm (±)	1.45	3.03	1.75
CD at 5 %	4.19	8.78	5.08
Interaction (C X T)			
SEm (±)	2.05	4.29	2.48
CD at 5 %	NS	NS	NS

Benefit cost ratio

The highest benefit cost ratio (1.94) was recorded in T₅ (Garden soil+sand+cocopeat) with net returns 9700/100. The least benefit cost ratio and the least net returns was recorded in T₃ (Garden soil+sand+ Used tea leaves).

Table 7: B:C ratio of cultivars Super Nova and Black Raven

Organic substrate	B:C ratio	
	Super Nova	Black Raven
T ₁	1.85	1.82
T ₂	1.79	1.77
T ₃	1.68	1.74
T ₄	1.86	1.84
T ₅	1.94	1.89
T ₆	1.89	1.85
T ₇	1.76	1.76

CONCLUSION

It is concluded that the growth of Super Nova is faster and superior than Black Raven irrespective of the growing medium. The growth of Super Nova and Black Raven was found to do well in potting mixture consisting of Garden soil+Sand+Cocopeat in terms of rhizome size, shoot emergence, unfurling of leaves, number of shoots, rachis girth and growth rate ~~even when grown in the same environmental and potting mixture.~~ The same treatment gave the highest B:C ratio. However for the plant height, the treatment ~~combination~~ of Garden soil+Sand+Forest litter

Comment [OP18]: the definitions and calculation formula must be added to the methodology section
What factors were taken into account to calculate profits?
Do plants with different sizes have different market values?

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was found better for both the cultivars. Therefore, use of garden soil + sand+ cocopeat for growing ZZ plants is recommended.

REFERENCES

- Abad, M., Noguera, P., Puchades, R., Maqueira, A., Noguera, V. 2002. Physico-Chemical and Chemical Properties of Some Coconut Dusts For Use as a Peat Substitute for Containerized Ornamental Plants. *Bioresource Technology*. **82**(3):241-245.
- Argo, W.R. 1998. Root medium chemical properties. *Hort. Technol.* **8**:846-894.
- Arora, J.S., Khanna, K. 1985. Evaluation of gladiolus cultivars. *Journal of research of Punjab Agricultural University*. **22**(4): 655-662.
- Barazani, O., Friedman, J. 2001. Allelopathic bacteria and their impact on higher plants. *Crit. rev. Microbiol.* **27**:41-55.
- Bentham, G., Hooker, J.D. 1883. Genera plantarum. Vol 3. L. Reeve and Co., London.
- Bown, D. 2000. Aroids: Plants of the Arum family, 2nd ed. Timber Press, Portland, Ore.
- Chen, J., Henny, R.J. 2003. ZZ: A Unique Tropical Ornamental Foliage Plant, *HortTechnology*. **13**(3):458-462.
- Chen, J., Henny, R.J. McConell, D.B. 2002. Development of New Foliage Plant Cultivars, *Trend in New Crops and New Uses*, ASHS Press, Alexandria: 446-452.
- Devidas, K.B. 2012. Effect of IBA and rooting media on growth of pomegranate cuttings (*Punicagranatum* L.). Msc Thesis submitted to Vasantrao Naik Marathwada Krishi Vidyaapeeth, Prabhani, Maharashtra, India.
- Engler, A., Prantl, K. 1889. Araceae. *Dienaturlichen pflanzenfamilien* **2**: 102-159.
- Ghosh, M., Talukdar, M.C. 2021. Standardization of growing media for ornamental plant species grown in a vertical garden system in Assam. *International journal of current microbiology and applied sciences*. **10**(10):363-368.
- Gohil, P., Gohil, M., Rajatiya, J., Halepotara, F., Solanki, M., Malam, V.R., Barad, R. 2018. Role of growing media for ornamental of plants. *International Journal of Pure & Applied Bioscience*. **6**(1): 1219-1224.
- Gomez, K.A., Gomez, A.A. 1983. Statistical Procedures for Agricultural Research (2nd edition). John Wiley and Sons, New York. Pp 20-29.
- Gruda, N., Prasad, M., Maher, M.J. 2006. Soilless culture. In: R. Lal (ed) Encyclopedia of soil sciences. Taylor & Francis. Boca Raton, FL, USA.
- Kumar, S., Tirkey, T., Singh, R., Basant, D.K., Markam, I.R. 2020. Performance of different gladiolus (*Gladiolus grandiflora* L.) cultivars under Chattisgarh plains agroclimatic zone conditions. *The pharma innovation journal*. **9**(10): 291-293.
- Kumari, K., Kumar, S. 2015. Evaluation performance of gladiolus varieties for vegetative, floral and corm & cormel characters under Tarai conditions. *International journal of Tropical Agriculture*. **33**(2): 1617-1620.
- Popescu, G.C., Popescu, M. 2015. Effects of Different Potting Growing Media for *Petuniagrandiflora* and *Nicotianaalata* Link & Otto on Photosynthetic Capacity, Leaf Area and Flowering Potential. *Chilean Journal of Agricultural Research*. **75**(1):21-26.
- Prasad, M. 1997. Physical, chemical and biological properties of coir dust. *Acta Horticulturae*. **450**:21-29.

Comment [OP19]: It is very tempting to make this conclusion, but it may not be true:
1 - the initial size of the rhizomes influenced all subsequent results (i.e. the results may not be relevant)
2 - there was no separation of means with post-hoc tests, so it is not known whether T5 is statistically better than the others. The values presented are close enough to T6, T7, T4 and T1 for there to be no statistical differences.

Comment [OP20]: Add:
Thongkham, L., & Phavaphutanon, L. (2018). Effect of position and size of leaflets on rooting and rhizome formation of ZZ plant (*Zamioculcaszamiifolia* (Lodd.) Engl.) leaflet cuttings. *Agriculture and natural resources*, **52**(3), 246-249.
Malla, P., Kedistu, R., & Singh, D. Response of natural rooting substances on leaf cuttings of two cultivars of ZZ plant (*Zamioculcaszamiifolia*).
Abdel-kadir, H. A. R. (2022). Physiological study on the propagation of *Zamioculcaszamiifolia* by spraying with growth regulators and using different growing media. *British Journal of Global Ecology and Sustainable Development*, **8**, 1-8.
Seneviratne, K. A. C. N., Daundasekera, W. A. M., Kulasooriya, S. A., & Wijesundara, D. S. A. (2013). Development of rapid propagation methods and a miniature plant for export-oriented foliage, *Zamioculcaszamiifolia*. *Ceylon Journal of Science (Bio. Sci.)*, **42**(1), 55-62

Comment [OP21]: Not included in the manuscript, eliminate

Comment [OP22]: Eliminate, not included in the manuscript

- Rani,R., K., Prasad,K.K., Ranjan. R. 2007. Study on varietal performance in gladiolus. *TheOrissa journal of Horticulture*. **35**(2): 35-38.
- Singh,S., Dubey,R.K., Kukal, S.S. 2015. Performance of cocopeat amended media mixtures on growth and flowering of chrysanthemum. *Journal of AppliedHorticulture*. **17**(3):230-235.
- Swetha, S., Padmalatha, T., Dhanumjaya, K. and Shankar, A.S. 2014. Effect of potting media on growth and quality in Aglaonema. *The Journal of Horticultural Sciences*. **9**(1):90-93.
- ~~Swetha, S., Padmalatha, T., Dhanumjaya, K. and Shankar, A.S. 2014. Effect of potting media on growth and quality in Aglaonema. *The Journal of Horticultural Sciences*. **9**(1):90-93.~~
- Thakur,N.,Nair,S.A.,Kumar,R.,Bharathi,T.U.,Dhananjaya,M.V.,Venugopalan,R.2018. Evaluation of chrysanthemum (*Dendranthemagrandidflora*Tzevelev) for desirable horticultural traits. *Int.J.Curr.Microbiol.App.Sci*. **7**(8): 565-574.

Comment [OP23]:

UNDER PEER REVIEW