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ASSESSMENT OF DIFFERENT GERMPLASM OF *AGLAONEMA* FOR POT AND REMOVAL OF PARTICULATE MATTER IN AIR

ABSTRACT

The aim of the experiment is to screen twelve germplasm of *Aglaonema* for their suitability as pot plants and removal of particulate matter in air. The experiment was designed using Completely Randomized Design (CRD) at the greenhouse complex of the Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture, Navsari (Gujarat), during 2023-24. Morphological parameters were measured using various methods, including a measuring tape for plant height, a digital leaf area meter for leaf area, and manual counting for leaves and branches. Leaf color was evaluated on visual grading system and the RHS Colour Chart (2015), to assess visual appeal and characteristics and percent removal of particulate matter (PM) by the plant was measured using digital air quality index meter. *Aglaonema* 'Emerald Bay' exhibited maximum plant height (73.18 cm), leaf area (311.66 cm²), leaf length (39.28 cm), leaf width (15.26 cm), internodal length (3.43 cm) and visual leaf colour grade (4.88) and dark green leaf colour (137A) as per RHS colour chart followed by *Aglaonema commutatum* with the plant height (69.58 cm), leaf area (298.09 cm²), leaf length (34.28 cm), leaf width (11.10 cm), internodal length (3.34 cm) and visual leaf colour grade (4.80) and dark green leaf colour (139 A). Maximum number of leaves were recorded in *Aglaonema* 'Cutlass' (43.90), while maximum number of branches per plant were observed in *Aglaonema brevispathum* (13.56). *Aglaonema* 'Emerald Bay' showed the maximum removal rate of PM₁ per 24 hours (92.16%) followed by *Aglaonema commutatum* (85.97%). Among all the germplasms, *Aglaonema* 'Emerald Bay' and *Aglaonema commutatum* have been highly suitable as pot plant owing to its good plant height, leaf area and their efficiency in removal of PM₁.

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10 *Keywords: Aglaonema, pot plant, morphological, visual leaf colour, particulate matter.*

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1. INTRODUCTION

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Indoor gardening has been gaining high impetus with enhanced sense of emotional comfort, air quality and stress-free happy environment during the post COVID era [1]. Further, pot plant trading is growing with rapid urbanization and hasty life style [2],[3] and [4].

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Aglaonema, commonly known as Chinese evergreens, is a genus of 21 species within the Araceae family, native to Southeast Asia, Northeast India, and Southern China, with a distribution extending to Malaysia, New Guinea, and the Philippines [5],[6]. This genus has been extensively studied for its adaptability to indoor environments and its potential uses [7],[8]. It is known for its striking foliage and adaptability, is a widely cultivated genus of ornamental plants, particularly valued as pot plants, it encompasses a diverse range of species and cultivars, each exhibiting unique morphological traits that influence their suitability for pot cultivation. *Aglaonema* is ideal for indoor environments due to its air-purifying capabilities, adaptability to low light, aesthetic diversity, low maintenance, making it both functional and visually appealing [9],[10]. It is essential to evaluate and screen various germplasms for desirable characteristics as pot plant and its ability to curb indoor pollution.

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27 Aglaonema's contribution to indoor air quality is supported by its ability in removal of
28 particulate matter and other pollutants, that makes it a valuable addition to indoor
29 environments, promoting healthier and cleaner air [11]. However, there are different species
30 and varieties of Aglaonema that needs to be studied for air quality purification.

31 Hence this study focused on the screening of twelve Aglaonema germplasms,
32 namely *Aglaonema siam aurora* (Lipstick), *Aglaonema* 'Emerald Bay', *Aglaonema*
33 *commutatum*, *Aglaonema alumina*, *Aglaonema* 'Key Lime', *Aglaonema* cutlass, *Aglaonema*
34 'White Rain', *Aglaonema brevispathum*, *Aglaonema* lime narrow, *Aglaonema commutatum*
35 (variegated), *Aglaonema* white Chinese evergreen (Golden Bay), and *Aglaonema* Red
36 Valentine. The evaluation is based on key morphological parameters and its ability to curb
37 indoor pollution.

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39 **2. MATERIAL AND METHODS**

40 The experiment was conducted during 2023-24 at the greenhouse complex of Department of
41 Floriculture and Landscape Architecture, ASPEE College of Horticulture, Navsari (Gujarat),
42 using a Completely Randomized Design (CRD) to screen twelve Aglaonema germplasms for
43 their suitability as pot plants and removal of particulate matter in air. The plants were
44 maintained under uniform growing conditions to ensure consistency in environmental factors
45 such as light, water, and nutrients. Morphological parameters were recorded both at the start
46 of the experiment and after two months. Plant height was measured from the soil level to the
47 growing tip using a measuring tape. Leaf area was determined using a digital leaf area
48 meter, while leaf length and width were measured using a meter scale. The number of
49 leaves and branches per plant were counted manually. The visual colour grade of
50 Aglaonema plants was assessed using a standardized grading system [12]. This system
51 evaluates leaf colour grade based on greenness with freshness and luster, assigning scores
52 1= poor colour, 3= good, light green and 5= excellent dark green & silver contrast, and visual
53 leaf color was evaluated using the RHS Colour Chart (2015). Internodal length was
54 measured between nodes using a meter scale. Particulate matter (PM₁) level in air was
55 recorded by using enclosed chamber using digital air quality index meter [13] before and
56 after 24 hours and the PM₁ removal rate by the plant was calculated on per cent basis. The
57 data on all the parameters was collected twice at an interval of two months were pooled and
58 statistically analyzed as per the method given by Panse and Sukhatme [14] and the results
59 were evaluated at 5% level of significance.

60 **3. RESULTS AND DISCUSSION**

61 Observations on morphological parameters viz., plant height (cm), leaf area (cm²), leaf
62 length (cm), leaf width (cm) and internodal length (cm) of twelve germplasm of *Aglaonema* are
63 represented in the table 1. Maximum plant height exhibited by *Aglaonema* 'Emerald
64 Bay' (73.18 cm), closely followed by *Aglaonema commutatum* (69.58 cm). In contrast,
65 *Aglaonema siam aurora* (lipstick) displayed the minimum plant height (30.68 cm). Maximum
66 leaf area exhibited by *Aglaonema* 'Emerald Bay' (311.66 cm²), closely followed by
67 *Aglaonema commutatum* (298.09 cm²). In contrast, *Aglaonema siam aurora* (lipstick)
68 displayed the smallest leaf area (111.55 cm²). *Aglaonema* 'Emerald Bay' showed the
69 maximum leaf length (39.28 cm) followed by *Aglaonema commutatum* (34.28 cm) while it was
70 minimum in *Aglaonema siam aurora* (lipstick) (15.25 cm). *Aglaonema* 'Emerald Bay' exhibited
71 maximum leaf width (15.26 cm), closely followed by *Aglaonema* 'white Rain' (13.30 cm),
72 whereas *Aglaonema* 'cutlass' displayed the narrowest leaves (4.83 cm). Maximum internodal

73 length was recorded in *Aglaonema* 'Emerald Bay' (3.43 cm), closely followed by *Aglaonema*
 74 *commutatum* (3.34 cm). In contrast, *Aglaonema* 'lime narrow' exhibited the shortest
 75 internodal length (1.52 cm).

76 Observations on number of leaves, number of branches per plant, visual leaf color grade of
 77 twelve germplasm of *Aglaonema* are represented in the table 2. Maximum leaf count was
 78 observed in *Aglaonema* 'Cutlass' (43.90), followed by *Aglaonema* 'Alumina' (25.08), while
 79 *Aglaonema* 'White Rain' had the minimum (11.16). *Aglaonema brevispathum* exhibited
 80 maximum number of branches per plant, with an average of 13.56, closely followed by
 81 *Aglaonema* 'Cutlass' (12.24 branches per plant). In contrast, *Aglaonema siamauror*'
 82 (Lipstick) displayed the lowest branching frequency, with an average of 4.20 branches per
 83 plant. *Aglaonema* 'Emerald Bay' exhibited the highest visual leaf color grade (4.88), closely
 84 followed by *Aglaonema* 'Alumina' (4.80) on the basis of 5 point visual grade for freshness,
 85 greenness and luster. Variation with regard to colour as per RHS chart among different
 86 germplasms was observed, wherein *Aglaonema* 'Emerald Bay', *Aglaonema*
 87 *commutatum* and *Aglaonema alumina* exhibited dark green colour, *Aglaonema siam aurora*
 88 (*Lipstick*) exhibited dark purple red, *Aglaonema* 'Key Lime' and *Aglaonema* lime narrow
 89 exhibited medium yellow green, *Aglaonema* cutlass exhibited medium green, *Aglaonema*
 90 'White Rain', *Aglaonema commutatum* (variegated) and *Aglaonema* white Chinese
 91 evergreen (Golden Bay) exhibited light green and *Aglaonema* Red Valentine exhibited light red
 92 pink colour.

93 Observations on removal rate of Particulate Matter 1 per 24 h (PM1) (%) is represented in the
 94 table 3. *Aglaonema* 'Emerald Bay' showed the maximum removal rate of PM1 (%) in 24
 95 hours (92.16%) followed by *Aglaonema commutatum* (85.97%) while it was minimum
 96 in *Aglaonema* Red Valentine (63.06%). The results suggest that the morphological
 97 characteristics of plants play a crucial role in reducing PM concentration. Leaf traits,
 98 including shape, arrangement, and the leaf area and hair structure on the surface, are
 99 particularly important for PM accumulation. Plants remove PM through stomatal uptake and
 100 deposition on the leaf surface. PM particles can penetrate the stomata and accumulate
 101 beneath the epidermis or in the palisade layer of leaves [15],[16],[17],[18],[19] and [20].
 102 Higher leaf area in *Aglaonema* 'Emerald Bay' and *Aglaonema commutatum* contributed to
 103 higher PM removal rate.

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Table 1: Morphological characters of twelve germplasm of *Aglaonema*

Morphological characters					
Treatments Pooled data of two months					
	Plant Height (cm)	Leaf area (cm ²)	Leaf length (cm)	Leaf width (cm)	Internodal length (cm)
G₁	30.68	111.55	15.25	6.28	1.92
G₂	73.18	311.66	39.28	15.26	3.43
G₃	69.58	298.09	34.28	11.10	3.34
G₄	40.24	212.43	21.71	10.53	2.91

G₅	54.74	212.26	23.22	11.69	3.08
G₆	45.07	113.70	27.82	4.83	2.23
G₇	62.75	236.36	33.94	13.30	2.06
G₈	56.48	271.19	29.14	12.57	3.00
G₉	56.15	269.81	25.40	7.57	1.52
G₁₀	66.49	154.72	26.09	8.30	2.25
G₁₁	35.42	252.93	25.58	12.21	2.80
G₁₂	37.05	119.65	20.61	6.35	1.81
S.Em ±	0.39	1.76	0.45	0.15	0.04
CD at 5%	1.13	5.03	1.30	0.38	0.10

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Table 2: Morphological characters of twelve germplasm of *Aglaonema*

Morphological characters					
Treatments	Pooled data of two months				
	Number of leaves	Number of branches per plant	visual leaf colour grade		
(5-point scale)			RHS Colour group	colour code	
G₁	13.43	4.20	4.21	Dark purple red	46 A
G₂	14.16	4.89	4.88	Dark green	137 A
G₃	11.18	8.36	4.80	Dark green	139 A
G₄	25.08	9.35	4.79	Dark green	131B
G₅	19.78	6.58	4.34	Medium yellow green	151 D
G₆	43.90	12.24	4.61	Medium green	144 A
G₇	11.16	10.83	4.30	Light green	141D
G₈	13.63	13.56	4.71	Medium grey green	191 C
G₉	12.86	11.56	4.71	Medium yellow green	154 D
G₁₀	15.85	9.11	4.68	Light green	144 B
G₁₁	11.79	5.11	4.69	Light green	145 D
G₁₂	12.93	5.00	4.06	Light red pink	49 D
S.Em ±	0.34	0.13	0.03		
CD at 5%	0.98	0.36	0.10		

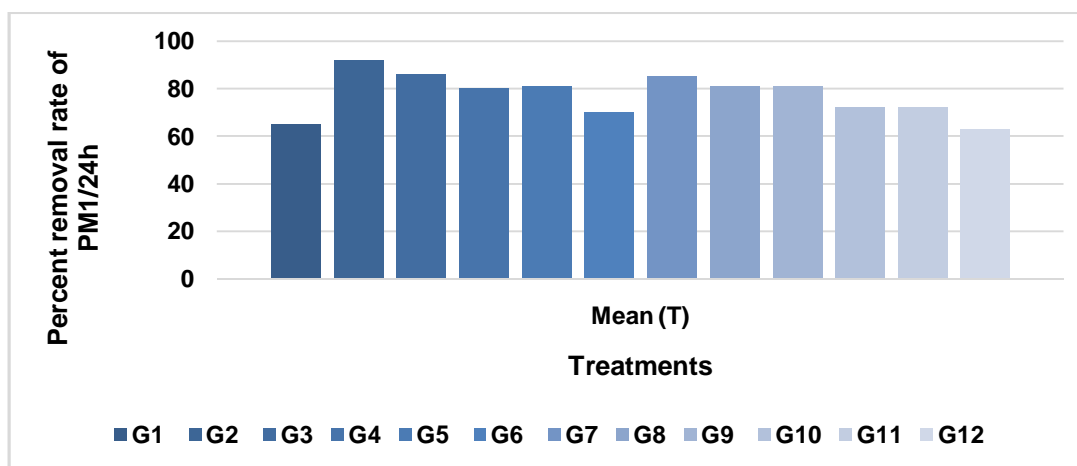
112 **Table .1 and 2.** **G₁:** *Aglaonema siam aurora* (Lipstick), **G₂:** *Aglaonema* 'Emerald Bay', **G₃:** *Aglaonema*
113 *commutatum*, **G₄:** *Aglaonema alumina*, **G₅:** *Aglaonema* 'Key Lime', **G₆:** *Aglaonema cutlass*, **G₇:**
114 *Aglaonema* 'White Rain', **G₈:** *Aglaonema brevispathum*, **G₉:** *Aglaonema lime narrow*, **G₁₀:** *Aglaonema*
115 *commutatum* (variegated), **G₁₁:** *Aglaonema white Chinese evergreen* (Golden Bay), **G₁₂:** *Aglaonema*
116 *Red Valentine*

117 **Table 3:Effect of different germplasms of *Aglaonema* on Removal rate of PM1 (%) in**
118 **24 h**

Removal rate of PM ₁ (%)/ 24 h	
Treatments	Mean (T)
G₁: <i>Aglaonema siam aurora</i> (Lipstick)	64.96
G₂: <i>Aglaonema</i> 'Emerald Bay'	92.16
G₃: <i>Aglaonema commutatum</i>	85.97

G₄: <i>Aglaonema alumina</i>	80.05
G₅: <i>Aglaonema</i> 'Key Lime'	81.09
G₆: <i>Aglaonema</i> cutlass	70.03
G₇: <i>Aglaonema</i> 'White Rain'	85.11
G₈: <i>Aglaonema brevispathum</i>	81.13
G₉: <i>Aglaonema</i> lime narrow	81.15
G₁₀: <i>Aglaonema commutatum</i>(variegated)	72.15
G₁₁: <i>Aglaonema</i> white Chinese evergreen(Golden Bay)	72.15
G₁₂: <i>Aglaonema</i> Red Valentine	63.06
	S.Em ±
	0.12
	CD at 5%
	0.36

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Fig. 1.Effect of different germplasms of *Aglaonema* on percent removal rate of PM₁(%)/24h

G₁: *Aglaonema siam aurora* (Lipstick), **G₂:** *Aglaonema* 'Emerald Bay', **G₃:** *Aglaonema commutatum*, **G₄:** *Aglaonema alumina*, **G₅:** *Aglaonema* 'Key Lime', **G₆:** *Aglaonema cutlass*, **G₇:** *Aglaonema* 'White Rain', **G₈:** *Aglaonema brevispathum*, **G₉:** *Aglaonema lime narrow*, **G₁₀:** *Aglaonema commutatum* (variegated), **G₁₁:** *Aglaonema* white Chinese evergreen (Golden Bay), **G₁₂:** *Aglaonema* Red Valentine

4. CONCLUSION

Based on the findings of the present investigation, *Aglaonema* 'Emerald Bay' and *Aglaonema commutatum* exhibited superior morphological characteristics with maximum values for plant height, leaf area, leaf length, leaf width, visual leaf colour grade with dark green and lustrous leaf colour and along with efficient removal rate of particulate matter and thus, making them the more suitable germplasms for pot plants. Overall, *Aglaonema* 'Emerald Bay' and *Aglaonema commutatum* are promising germplasms for pot plant production and indoor air purification.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

141 **ACKNOWLEDGEMENTS**

142 We acknowledge ASPEE college of Horticulture (NAU, Navsari, Gujrat) for providing the
143 best platform and necessary infrastructure and support in conduction of this research
144 endeavor.

145 **COMPETING INTERESTS**

146 Authorshavedeclaredthatnocompetinginterestsexits.

147 **AUTHORS' CONTRIBUTIONS**

148 Thisworkwascarriedoutincollaborationamongallauthors.

149 Allauthorsreadandapprovedthefinalmanuscript.

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195 quality. *J Environ Manage.* 2019;240: 285–293.
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197 **DEFINITIONS, ACRONYMS, ABBREVIATIONS**

198 **Particulate matter 1 (PM1):** A type of air pollution that refers to particles that are less than 1
199 micron in diameter.