VALUE ADDITION IN FLOWER CROPS THROUGH PRODUCTION OF POTPOURRI

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Abstract

Consumer acceptance of naturally dried decorative materials is fairly good. Left-over floriculture produce can be turned into value-added eco-friendly products like Potpourri. Experiments were conducted to evaluate the ability of dried-petals of roses to obtain and retain diverse colour shades for production of potpourri. Dip-dyeing method was employed for tinting of dried rose-petals for potpourri-production. Results have shown that potpourri tinted with edible-dyes and mixed with essential-oils could be commercially produced on a large scale for greater consumer acceptability. Present study confirmed that tinting of dried rose-petals with edible-dyes can enhance the value of potpourri by providing a hue of colours and it helps farmers in earning more returns. Potpourri is a 100 per cent natural product and can be effectively used to combat the detrimental effects of synthetic-fragrances or artificial air-freshners.

Introduction

Farmers across the globe are letting their flower crops rot in the fields as the coronavirus pandemic have disrupted the supply and demand for a wide variety of perishable goods including flowers. Potpourri is a major segment of dry flower industry which allows the flower growers to utilise the unused or surplus floral produce of farms which can be turned into valueadded products. It comprises of a mixture of dried naturally fragrant plant materials often displayed in bowls / sachets in homes and offices for decoration, colour, and fragrance) has a history dating back to mid-18th century (Frances et al. 2015). Potpourri can be defined as a floral product with a combination of dried flowers, leaves, petals, seeds, stems, roots and other plant materials with spices or other fragrance materials and it is used to scent the air. It acts as a natural air/room freshner and can be placed in living room in our houses and buildings, cupboards, drawers, vehicles etc or can be given as gifts. Potpourri production require a "fixative", for absorbing the aromatic oils and slowly releasing them. Dried flowers and its value-added products have great demand in global markets (Sankari and Anand 2014). There is growing ecoconsciousness towards the use of natural and organic colours (Sankat and Siddique, 2008) for dyeing as natural dyes are non-toxic and do not create environmental problems due to their biodegradable nature (Grover and Patni, 2011). Dry decorative materials are globally accepted as naturals since they are eco-friendly, long lasting and generally inexpensive. It is a major segment of dried flower industry (Murugan et al. 2007). Rimports USA LLC was ranked second amongst the leading potpourri/sachet manufacturer, with sales amounting to 82.32 million U.S. dollars during 2020. Procter and Gamble potpourri/sachets brands generated approximately 35.49 million U.S. dollars in sales in that period (Ridder 2020). Despite significant visibility within the Floriculture trade, plant materials used in potpourri along with their combinations and dyes used for tinting potpourri are understudied. With this background, the present study was undertaken for standardizing the techniques of production of potpourri through drying and dyeing or tinting of rose petals as a significant step towards value addition. Thus tinting of rose petals with edible dyes was attempted which can enhance the aesthetic value of potpourri by providing a great variety of colours and it helps farmers in earning more returns from their produce.

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Materials and Methods

The present study was carried out to evaluate the ability of rose-petals to obtain and retain different colour shades for production of potpourri. The experiment was carried out in the Laboratory of Horticulture Science Section, ICAR (Indian Council of Agricultural Research) – Central Coastal Agricultural Research Institute, Ela, Old Goa, India.

Different edible dyes *viz.*, Sunset yellow + Carmosine (Orange red / Dark orange), Brilliant blue, Tartrazine+Brilliant blue (Apple green), Pinkish red/Raspberry Red, Light orange/ Kesari and Dark Royal blue were used as colouring agents at 1% concentration and dried rose petals were immersed in dyes for 24 hrs. Dye solution was prepared by properly mixing dyes in distilled water. After immersion of rose petals for 24 hrs, the plant materials were taken out and thoroughly dried to prevent any fungal growth (Fig. 1). Production of potpourri was made using materials like tinted rose petals; cinnamon peels and nutmeg chippings as fixatives; and essential oils. In a mixing bowl, one part of dried and tinted rose petals, quarter part of cinnamon peels and quarter part of nutmeg chippings was added and mixed properly. This mixture was sealed in an airtight container after mixing with two to three drops of essential oils. The mixture was then allowed to mellow for 10 days. Airtight container was shaked every couple of days for proper blending of ingredients. After preparation of the mixture, potpourri was packed in glass bowl, and also sachets of potpourri was prepared by using two types of packing material ie, Polythene Cover and Net Material.

Observations such as colour, appearance, aroma, design and uniqueness, overall acceptability etc. were recorded. Sensory evaluation was carried with a panel of judges. Panel of judges assessed the different quality parameters of finished potpourri product by scoring on a five-point scale *i.e.* very bad, bad, good, very good and excellent with the weight age of 0-0.9, 1.0-1.9, 2.0-2.9, 3.0-3.9, 4.0-5.0, respectively by means of sensory evaluation. Treatments were arranged in a completely randomised design (CRD) with three replications for each treatment. The data on all qualitative parameters were subjected to statistical analysis as per the procedure outlined by Panse and Sukhatme (1985). Results have been presented and discussed at a probability level of 0.05 or 5 per cent probability.

Results and Discussion

Results obtained on the effect of fragrance and colour combination on quality attributes like colour, appearance, aroma, design and overall acceptability of potpourri packed in glass bowl presented in Table 1 showed that the colour of glass bowl packed potpourri differed significantly due to fragrance and colour combination. Among the different treatments, the colour was better in potpourri mixed with mogra essential oil and tinted with Pinkish red / Raspberry Red dye (FG₁₁) which received the maximum score (4.474). This was followed by the treatment FG_{14} (potpourri packed in glass bowl in layer wise manner), FG₁₅ (Potpourri packed in glass bowl with mixed up tinted petals) and FG_2 (Potpourri mixed with lemon grass essential oil and tinted with Brilliant blue dye) which received scores of 4.470, 4.402 and 4.40, respectively. Colour combination influenced the appearance of glass bowl packed potpourri significantly. Among the different treatments, FG₁₄ (potpourri packed in glass bowl in layer wise manner) was superior for retention of good appearance, which scored a maximum of 4.728 points followed by the treatments FG₁₅, FG₂ and FG₁₁ with scores of 4.622, 4.460 and 4.311, respectively. Significant differences were observed due to fragrance-colour combination with respect to aroma of glass bowl packed potpourri. The potpourri mixed with lemon grass essential oil and tinted with Brilliant blue dye (FG_2) obtained maximum score of 4.573 for retention of good aroma. This was followed by the treatments FG_{11} (potpourri mixed with mogra essential oil and tinted with Pinkish red / Raspberry

Red dye), FG₁ (Potpourri mixed with sandal essential oil and tinted with Sunset yellow + Carmosine (Orange red /Dark orange) and FG_{14} (potpourri packed in glass bowl in layer wise manner) with scores of 4.227, 4.108 and 4.073, respectively. The fragrance - colour combination had significant effect on the overall acceptability of glass bowl packed potpourri. The overall acceptability score was highest in potpourri packed in glass bowl in layer wise manner (FG_{14}) which received the maximum score of 4.683 followed by the treatments FG_2 (Potpourri mixed with lemon grass essential oil and tinted with Brilliant blue dye), FG₁₁ (Potpourri mixed with mogra essential oil and tinted with Pinkish red / Raspberry Red, FG15 (Potpourri packed in glass bowl with mixed up tinted petals), FG_8 (Potpourri mixed with rose essential oil and tinted with Dark Royal blue dye) FG₁ (Potpourri mixed with sandal essential oil and tinted with Sunset yellow + Carmosine (Orange red /Dark orange) and FG7 (Potpourri mixed with chameli essential oil and tinted with Tartrazine + Brilliant blue (Apple green) which recorded scores of 4.647,4.402, 4.397,4.334,4.260 and 4.172, respectively. Results show that potpourri tinted with edible dyes like Brilliant blue, Pinkish red / Raspberry Red Tartrazine + Brilliant blue (Apple green) and Sunset yellow + Carmosine (Orange red /Dark orange) and mixed with essential oils like lemon grass, mogra, rose, sandal etc could be commercially produced on a large scale for greater consumer acceptability. Bharati et al. (2016) observed that colour intensity and colour absorption in case of food dyes were medium to high in ornamental grass Lagurus ovatus.

Observations with respect to quality attributes like Colour, Appearance, Aroma, Design and Overall acceptability of potpourri packed in polythene sachets presented in Table 2 showed that fragrance as well as the colour combination influenced the quality attributes like colour, appearance, aroma, design and overall acceptability of potpourri packed in polythene sachets significantly. Significant differences were observed due to fragrance colour combination in which FP_{15} (Potpourri packed in polythene sachets with mixed up tinted petals) scored the highest (4.367) for retention of colour. This was followed by the treatments FP_3 (Potpourri mixed with Champa essential oil and tinted with Tartrazine + Brilliant blue (Apple green), FP₉ (Potpourri mixed with palmarosa essential oil and tinted with Tartrazine + Brilliant blue (Apple green) and FP₂ (Potpourri mixed with lime essential oil and tinted with Brilliant blue) with scores of 4.333, 4.152 and 4.095, respectively. The study conducted by Byun et al. (2004) showed that optimum dyeing condition for artificial blue and green pigments in rose cut flowers. Influence of fragrance + colour combination of potpourri packed in polythene sachets on appearance was also found to be significant. The highest points for appearance (4.076) was scored by FP₉ (Potpourri mixed with palmarosa essential oil and tinted with Tartrazine + Brilliant blue (Apple green) followed by FP₃ and FP14 with scores of 4.033 and 3.993, respectively. Fragrance-colour combination of potpourri packed in polythene sachets also exhibited significant differences for aroma. Among the different treatments, FP₃ (Potpourri mixed with Champa essential oil and tinted with Tartrazine + Brilliant blue (Apple green) had good aroma and received maximum rating of 4.127 which was followed by the treatments FP_1 and FP_9 with scores of 3.950 and 3.926, respectively. Significant differences were noticed due to fragrance -colour combination for overall acceptability of potpourri packed in polythene sachets in which the treatment, FP₃ (Potpourri mixed with Champa essential oil and tinted with Tartrazine + Brilliant blue (Apple green) gave the highest score for overall acceptability which recorded maximum score of 4.240 while least score (3.146) was recorded in the control treatment (FP12). Significantly higher scores for overall acceptability was also recorded in the treatments FP_2 (Potpourri mixed with lime essential oil and tinted with Brilliant blue) FP_9 (Potpourri mixed with palmarosa essential oil and tinted with Tartrazine + Brilliant blue (Apple green) and FP14 (Potpourri packed in polythene sachets in layer wise manner) which recorded scores of 4.068, 4.044 and 4.040 respectively. It was observed that different shades of respective colours could be successfully imparted to rose petals by immersing in different edible dye

solutions like Tartrazine + Brilliant blue (Apple green), Brilliant blue etc. Development of different shades of blue, red, scarlet, rose and yellow by dipping flower spikes in different stains was previously reported by Sambandamurthy and Appavu (1980).

Scores given by the panel members for qualitative traits like colour, appearance, aroma, design and overall acceptability during sensory evaluation of potpourri packed in net material sachets presented in Table 3 showed that fragrance-colour combination exhibited highly significant differences for the colour of potpourri packed in net material sachets. The highest acceptability for colour (4.313) was recorded in FN₃ (Potpourri mixed with champa essential oil and tinted with Tartrazine + Brilliant blue (Apple green) followed by the treatments FN_9 , FN_{15} and FN₂ with scores of 4.210, 4.197 and 4.195, respectively. Sravan Kumar et al. (2015) imparted different shades of respective colours in spikes of gladiolus pulsed with 5% of food dve solution i.e. Lemon yellow, Kesar yellow, Kalakatta, Tomato red, Violet, Blue, Orange red and Apple green for two hours. Among different treatments, FN₁₅ (Potpourri packed in net material sachets with mixed up tinted petals) had good appearance and received maximum rating of 4.321. This was followed by the treatments FN₉ (Potpourri mixed with palmarosa essential oil and tinted with Tartrazine + Brilliant blue (Apple green) and FN₃ (Potpourri mixed with champa essential oil and tinted with Tartrazine + Brilliant blue (Apple green) with scores of 4.081 and 4.020 respectively. Sudha and Harshal (2008) reported that higher concentration (1.5 %) can be used for dyeing the flowers of candytuft. Significant differences were observed due to fragrance-colour combination for retention of aroma in which the treatment FN₃ scored the maximum rating of 4.413. The treatments viz, FN_{15} (Potpourri packed in net material sachets with mixed up tinted petals), FN_{14} (potpourri packed in net material sachets in layer wise manner) and FN₉ (Potpourri mixed with palmarosa essential oil and tinted with Tartrazine + Brilliant blue (Apple green) also scored better values for aroma with scores of 4.110, 4.091 and 4.048, respectively. Similarly, significant differences were noticed for overall acceptability of potpourri packed in net material sachets due to fragrance-colour combination. The treatment FN₁₅ (Potpourri packed in net material sachets with mixed up tinted petals) gave the highest score (4.386) for overall acceptability. The treatment FN_{15} was followed by FN_3 (Potpourri mixed with champa essential oil and tinted with Tartrazine + Brilliant blue (Apple green), FN_9 (Potpourri mixed with palmarosa essential oil and tinted with Tartrazine + Brilliant blue (Apple green) FN_{14} (potpourri packed in net material sachets in layer wise manner) and FN_2 (Potpourri mixed with lime essential oil and tinted with Brilliant blue) which recorded scores of 4.373, 4.351, 4.203 and 4.045, respectively for overall acceptability. The least score (3.248) for overall acceptability was observed in the control treatment (FN_{12}). Sangama (2002) reported that different colour shades could be imparted in flower crops like tuberose by using different stains.

Date pertaining to the effect of different types of packaging material and fragrance-colour combination on quality attributes like colour, appearance, aroma, design and overall acceptability of finished potpourri product (Fig. 2) is presented in Table 4. Results of scores given by the panel members during sensory evaluation of finished potpourri product shows that the score for overall acceptability differed significantly due to different types of packaging material. The highest score for overall acceptability (4.066) of potpourri was obtained when glass bowl (P₁) was used as the packaging material followed by packing in net material sachets (3.655). Packing in polythene sachets recorded least score (3.481) for overall acceptability. Results obtained with respect to different types of fragrance-colour combination for overall acceptability of potpourri immersed in different edible dyes is presented in Table 4. Among the different fragrance-colour combination, the overall acceptability score was highest (4.420) in potpourri mixed with lemon grass essential oil and tinted with Brilliant blue dye (F₂) followed by potpourri mix (F₁₅) which recorded a score of 4.275. Significantly higher scores for overall acceptability was also recorded in potpourri mixed

Treatments	Fragrance	Colour combination	Colour	Appearance	Aroma	Design	Overall acceptability
FG1	Sandal	Orange red /Dark orange	4.318	4.167	4.108	4.150	4.260
FG_2	Lime	Brilliant blue	4.400	4.460	4.573	4.407	4.647
FG_3	Champa	Apple green	3.790	3.918	3.332	3.754	3.731
FG_4	Citronella	Dark Royal blue	4.104	4.149	3.926	4.039	4.143
FG_5	Lavender	Dark orange	3.614	3.399	3.508	3.754	3.618
FG_6	Khus	Pinkish red / Raspberry Red	3.748	3.855	3.129	3.908	3.558
FG_7	Chameli	Apple green	3.849	3.940	3.972	4.142	4.172
FG_8	Rose	Dark Royal blue	4.158	4.119	3.581	4.127	4.334
FG_9	Palmarosa	Apple green	3.809	4.102	3.504	3.909	3.948
FG_{10}	Geranium	Light orange / Kesari	3.408	3.516	3.273	3.568	3.623
FG 11	Mogra	Pinkish red / Raspberry Red	4.474	4.311	4.227	4.140	4.402
FG_{12}	Control	No dyeing	3.720	3.746	3.368	3.480	3.523
FG_{13}	Lemon grass	Brilliant blue	3.891	3.801	3.944	3.880	3.942
FG_{14}	Layer wise	Arrangement of tinted petals in layers	4.470	4.728	4.073	4.510	4.683
FG_{15}	Mix	Mixing up of tinted petals	4.402	4.622	3.464	4.504	4.397
	SEm <u>+</u>		0.168	0.161	0.192	0.148	0.117
	CD(0.05)		0.506	0.482	0.575	0.445	0.351

Table 1. Effect of fragrance and colour combination on quality attributes of potpourri packed in glass bowl .

Treatments	Fragrance	Colour combination	Colour	Appearance	Aroma	Design	Overall acceptability
FP_1	Sandal	Orange red /Dark orange	3.991	3.798	3.950	3.867	3.981
FP_2	Lime	Brilliant blue	4.095	3.800	3.892	3.705	4.068
FP_3	Champa	Apple green	4.333	4.033	4.127	3.913	4.240
FP_4	Citronella	Dark Royal blue	3.654	3.463	3.222	3.401	3.271
FP_5	Lavender	Dark orange	4.038	3.778	3.701	3.555	3.662
${ m FP}_6$	Khus	Pinkish red / Raspberry Red	3.723	3.506	3.478	3.507	3.539
FP_7	Chameli	Apple green	3.767	3.580	3.174	3.389	3.482
${\rm FP}_8$	Rose	Dark Royal blue	3.704	3.731	3.557	3.762	3.672
FP_9	Palmarosa	Apple green	4.152	4.076	3.926	3.900	4.044
FP_{10}	Geranium	Light orange / Kesari	3.682	3.629	3.092	3.515	3.726
FP_{11}	Mogra	Pinkish red / Raspberry Red	3.136	3.126	3.127	3.094	3.297
FP_{12}	Control	No dyeing	3.200	3.979	3.041	3.758	3.146
FP 13	Lemon grass	Brilliant blue	3.661	3.507	3.264	2.974	3.319
FP_{14}	Layer wise	Arrangement of tinted petals in layers	3.742	3.562	3.710	3.552	3.702
FP_{15}	Mix	Mixing up of tinted petals	4.367	3.993	3.713	3.840	4.040
	SEm <u>+</u>		0.213	0.176	0.201		0.204
	CD(0.05)		0.641	0.530	0.603	NS	0.613

Table 2. Effect of fragrance and colour combination on quality attributes of potpourri packed in Polythene sachets.

Treatments	Fragrance	Colour combination	Colour	Appearance	Aroma	Design	Overall acceptability
FN1	Sandal	Orange red /Dark orange	3.998	3.852	3.816	3.903	3.992
FN_2	Lime	Brilliant blue	4.195	3.820	3.792	3.705	4.045
FN_3	Champa	Apple green	4.313	4.020	4.413	4.190	4.373
FN_4	Citronella	Dark Royal blue	3.452	3.270	3.057	3.607	3.580
FN ₅	Lavender	Dark orange	4.153	3.957	3.870	4.000	3.943
FN_6	Khus	Pinkish red / Raspberry Red	3.248	3.269	3.078	3.372	3.476
FN_7	Chameli	Apple green	3.683	3.497	3.327	3.527	3.553
FN_8	Rose	Dark Royal blue	3.802	3.511	3.742	3.739	3.839
FN_9	Palmarosa	Apple green	4.210	4.081	4.048	3.960	4.351
FN_{10}	Geranium	Light orange / Kesari	3.734	3.684	3.027	3.611	3.777
FN 11	Mogra	Pinkish red / Raspberry Red	3.277	3.290	3.331	3.497	3.496
FN 12	Control	No dyeing	3.242	3.155	3.082	3.992	3.248
FN 13	Lemon grass	Brilliant blue	3.501	3.467	3.419	3.489	3.606
FN 14	Layer wise	Arrangement of tinted petals in layers	3.652	3.985	4.091	3.876	4.203
FN 15	Mix	Mixing up of tinted petals	4.197	4.321	4.110	4.241	4.386
	S. Em <u>+</u>		0.225	0.196	1.37		0.185
	CD(0.05)		0.676	0.587	0.708	NS	0.554

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SAFEENA AND THANGAM



Fig. 1. Steps in production of potpourri : Dried rose petals immersed in different edible dyes at 1% concentration and kept for thorough drying. (a. Tartrazine + Brilliant blue (Apple green) b. Sunset yellow + Carmosine (Orange red / Dark orange) c. Pinkish red/Raspberry Red d. Light orange/ Kesari e. Dark Royal blue).



Fig. 2. Finished product of potpourri packed in polythene sachets, net material sachets and glass bowls.

VALUE ADDITION IN FLOWER CROPS THROUGH PRODUCTION

with mogra essential oil and tinted with Pinkish red / Raspberry Red (F_{11}), followed by potpourri mixed with rose essential oil and tinted with Dark Royal blue dye (F_8) and F_1 (potpourri mixed with sandal essential oil and tinted with Sunset yellow+Carmosine (Orange red/ dark orange dye) which received the score of 4.265, 4.243 and 4.107, respectively. Dyeing or tinting of dried rose petals with different edible dyes for production of potpourri would enhance its appearance and thereby market value. It has been reported that dyeing of cut rose 'Akito' using 12 different colours realized various decorative colours available and increased the market value (Lim *et al.* 2012).

	Treatments	Colour	Appearance	Aroma	Design	Overall acceptability
Pack	aging material					
P_1	Glass bowl	4.010	4.055	3.732	4.018	4.066
P_2	Polythene cover	3.617	3.451	3.335	3.324	3.481
P ₃	Net Material	3.564	3.490	3.427	3.534	3.655
	CD(0.05)	0.135	0.120	0.137	0.116	0.100
Frag	rance+ Colour combi	ination				
\mathbf{F}_1	Sandal	4.137	3.939	3.939	3.919	4.107
F_2	Lemon grass	4.349	4.171	4.371	4.170	4.420
F ₃	Champa	3.632	3.550	3.204	3.587	3.527
F_4	Citronella	4.099	3.961	3.832	3.865	3.916
F ₅	Lavender	3.528	3.391	3.355	3.544	3.544
F_6	Khus	3.733	3.644	3.210	3.608	3.531
F_7	Chameli	3.785	3.727	3.757	3.881	3.894
F ₈	Rose	4.173	4.092	3.852	3.996	4.243
F ₉	Palmarosa	3.742	3.805	3.208	3.679	3.817
F ₁₀	Geranium	3.273	3.310	3.244	3.386	3.472
F ₁₁	Mogra	4.306	4.148	4.117	3.963	4.265
F_{12}	Control	3.627	3.573	3.350	3.314	3.483
F ₁₃	Lime	3.762	3.783	3.915	3.769	3.949
F_{14}	Layer wise	1.490	1.576	1.358	1.503	1.561
F ₁₅	Mix	4.322	4.312	3.763	4.195	4.275
	SEm+_	0.101	0.089	0.102	0.086	0.074
	CD(0.05)	0.303	0.269	0.306	0.259	0.224

 Table 4. Effect of different types of packaging material and fragrance-colour combination on quality attributes of finished Potpourri.

Potpourri is a 100% natural product and can be used to overcome the harmful effects of synthetic fragrances or air freshners. The present study has standardised the methods for potpourri production and its blending with different scents. It makes the environment eco-friendly with a burst of fresh perfumed air, and also refreshes body and mind of human beings. It rejuvenates the environment and revitalise one from depression or gloominess. It is appealing to the eyes and can be arranged in bowls and placed in prominent locations in offices or houses with the intention of providing scent with a touch of aesthetic appeal.

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References

- Bharati Kashyap, Gupta YC, Rakesh Gupta, Priyanka Thakur and Ranjna Sharma. 2016. Studies on dyeing and value-addition of ornamental grass *Lagurus ovatus*. J. Hill Agricult. **7** : 28-31.
- Byun MS, Kim JW and Kim KW 2004. Effect of artificial dyeing on ornamental value and vase life in cut flower of *Rosa hybrida* Cv.Taeinhe. Korean J. Hort. Sci. Tehcnol. **22**: 114-118.
- Frances EM Cook, Christine J Leon and Mark Nesbitt 2015. Potpourri as a sustainable plant product: Identity, origin, and conservation status. Econ. Bot. 20: 1-15
- Grover N and Patni V 2011. Extraction and application of natural dye preparations from the floral parts of *Woodfordia fruticosa* (Linn.) Kurz. Indian J. Nat. Prod. Resou. **2**: 403-408.
- Lim Ki-Byung, Sung Im Shim, Yoon-Jung Hwang, Sung Hwan Bae, Beung-Gu Son, Woo-Chung Park, Sung Tae Kim, Hak-ki Shin, Hyung-Geun Ahn. 2012. Artificial Dyeing of Cut Rose 'Akito' by Absorption Dyes. Flower Res. J. 20: 223-227.
- Murugan PA, Thiyagarajan G and Ramesh K 2007. Dry flower technology. Website: http://www.technopreneur.net/information-desk/ sciencetechmagazine/ 2007/Dec07/Dryflower.pdf
- Panse VG and Sukhatme PV 1985. Statistical Methods for Agricultural Workers, ICAR, New Delhi, 4th edition. pp. 347.
- Ridder 2020. Leading potpourri/sachets manufacturers in the United States in 2020, based on sales (in million U.S. dollars). Website : https:// www. statista. com/ statistics/ 1179683/top-vendors-of-potpourri-us/
- Sambandhamurthy S and Appavu K 1980. Effect of the chemicals on colouring of tuberose (*Polianthes tuberosa* L.). National Seminar on Production Technology for Commercial Flower Crops, TNAU. pp. 73-75.
- Sangama 2002. Tinting technique for value addition of tuberose. National Symposium on Indian Floriculture in the New Millennium, Banglore, Feb 25-27. pp. 18-23.
- Sankari and Anand 2014. Process of making-waste into wealth dry flower technology. Asian J. Horticul. 9: 466-483.
- Sankat D and Siddique N 2008. Studies on environment friendly dyes obtained from plants. J. Environ. Res. Develop. 2: 562-569.
- Sravan Kumar B, Lalitha Kameswari P, Pratap M and Venkateswarrao P 2015. Studies on vase life of tinted spikes of gladiolus cultivar white prosperity. Indian J. Agric. Res. 49: 71-76.
- Sudha D Patil and Harshal E Patil 2008. Value addition of candytuft (*Iberis umbellata* L.) cut flowers coloured with edible dyes. Asian J. Bio Sci. **3**: 163-167.

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