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Value addition of gypsophila flowers for women entrepreneurship

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Abstract
An experiment was conducted on value addition of gypsophila flowers at Floricultural research station, Rajendranagar, Hyderabad during 2019 and 2020. Gypsophila flowers tinted with various food dyes viz., Lemon yellow, Apple green, Orange red and rose pink@ 3% concentrations by stem absorption, dipping and spraying method revealed that the interactions of the treatments due to food dyes and methods of application recorded maximum percentage of flowers tinted (92.00%) was recorded in the treatment D_1M_1 (Lemon yellow by stem absorption) and lowest (65.33%) in D_4M_2 (Orange red by dipping method) at 3% concentrations respectively. The highest mean value for vaselife of flowers (5.00 days) was recorded in M_1 (Stem absorption method) and lowest value (3.83 days) in M_3 (Spraying method). Among drying methods at ambient conditions, hot air oven and micro wave oven with fine sand and silica gel as media, embedded drying of gypsophila flowers with silica gel kept at micro wave conditions for 180 °C for 60 sec. recorded maximum percentage of moisture loss (84.43%) in the treatment T_7 (Control) (Air drying under shade) and minimum value (45.66%) in T_6 (Embedded drying in silica gel kept in Micro wave oven) and maximum over all acceptability (4.60 score) was recorded in the treatment in the treatment T_6 (Embedded drying in silica gel kept in Micro wave oven at 180 °C) minimum overall acceptability (1.30 score) were recorded in the treatment air drying under shade (control).The tinted, dried gypsophila flowers recorded maximum storage life in the display material where in flowers are packed with acrylic boxes (5.0 score) compared to glass material cases, photo frames, shadow boxes and resin moulds.

Keywords: Food dyes (Lemon yellow, apple green, Orange red and rose pink), sand, silica gel, hot air oven, microwave oven, resin moulds, glass material cases, photo frames, acrylic boxes, shadow boxes and gypsophila tinted and dried flowers

Introduction
Gypsophila (*Gypsophila paniculata* L.) is commonly known as baby's breath. The genus name is derived from the greek word 'Gypsos' (Gypsum) and 'philos' (loving) refers to the growth of the plant on gypsum rich substrates. Many species are found on calcium rich soils, including gypsum, which is depicted in the name of the genus " gypsophila " (Walker, 1994) [10]. The light airy mosses of small white to pink flowers of gypsophila makes good contrast to large flowers in bouquets as flower filler which acclaims a great value as cut flower in floristry. It is one of the top ten cut flowers in international market. Value addition aims at improving quality, enhance selling, gain profit, reduces postharvest losses and generates employment. Value addition also comprises tinting, drying and packing of tinted, dried flowers with various display materials. Tinting techniques has already been experimented in tuberose (Sambandhamurthy and Appavu, 1980; Mekala *et al*., 2012) [7, 3]. Dried flowers can be used for making decorative floral crafts like cards, floral segments, wall hangings, landscapes, calendars, pot pourris etc for various purposes (Bhutani, 1990) [1]. They are long lasting and are in demand throughout the year (Susan, 1990) [8]. The demand for dried flowers has been increased since last decade due to changes in life style of human-beings.

Materials and Methods
The experiment was carried out at Floricultural Research Station, Rajendranagar, Hyderabad, during the years 2019 and 2020 on gypsophila with the cultivar crystal white and four food dyes namely Lemon yellow, Apple green, Rose pink and Orange red at 3% concentrations respectively and different methods of tinting i.e., Stem absorption method, dipping method and spraying method to find out the efficacy on vase life of gypsophila flowers.

Uniform spikes of 60 cm length with more than 75% open florets were harvested and used in the study. The harvested spikes were placed in the 200 ml flasks with 100 ml of dye solutions of 3 per cent concentration. After tinting by different methods, the spikes were transferred to 500 ml glass bottles containing 200 ml of distilled water to study the vase life. The tinted flowers are subjected to different drying methods viz., Ambient conditions, hot air oven method and Microwave oven method by embedding in different media like sand and silica gel. Value addition was studied by recording data on tinting, different media, drying methods and packing materials. The data recorded was statistically analysed using OPSTAT software and the difference of means was compared at five per cent level of significance. Scores were evaluated by the panel of five judges at Floriculture research station. Sensory score was made based on 5-point hedonic scale ranging from 1 to 5. The value-added products were evaluated by a panel of five judges comprising of staff and post graduate students. Judges were requested to evaluate the effect of packing material on display appearance and storage life of Gypsophila dried flowers after three months by using the evaluation proforma and based on the score obtained from the five judges.

Results and Discussion

a) Tinting

Percentage of flowers tinted (%)

Data recorded on percentage of flowers tinted with different food dyes and methods of application differed significantly. Highest mean value of percentage of flowers tinted was recorded in the treatment D_1 (Lemon yellow) (87.11%) followed by D_2 (Apple green) (81.44%) and lowest was recorded in the treatment D_4 (Orange red) (67.89%) at 3% concentration. The highest mean value (80.25%) was recorded in M_1 (Stem absorption) followed by M_3 (Spraying method) (77.67%) and lowest value (76.33%) in M_2 (Dipping method). The interactions of the treatments due to food dyes and methods of application for percentage of flowers tinted differed significantly. Highest (92.00%) was recorded in the treatment D_1M_1 (Lemon yellow by stem absorption) and lowest (65.33%) in D_4M_2 (Orange red by dipping method) at 3% concentrations respectively. These are in accordance with reports of Sambandamurthy and Appavu (1980) [7] in tuberose cut flowers.

Vase life of flowers (days)

The highest mean value (5.00 days) was recorded in the treatment D_1 (Lemon yellow) which is on par with D_2 (Apple green) (4.44), D_3 (Rose pink) (4.11), D_4 (Orange red) (4.00) and lowest mean value (4.00) in the treatment D_4 (Orange red). The highest mean value (5.00 days) was recorded in M_1 (Stem absorption method) and lowest value (3.83 days) in M_3 (Spraying method). This might be due to optimum reserve of food materials which are utilized for long time and extended the vase life. The reduced vase life might be due to toxic effect on the cell metabolism when kept in the edible dye solution for 3% concentration. (Sweta Kumari *et al*., 2018) [9]. The interaction effect of food dyes and methods of application on vase life of gypsophila cut flowers did not differed significantly. The results are attributed due to the fact that higher water absorption maintained better water balance and flower freshness, saved from early wilting and enhanced vase life.

b) Drying methods

Percentage of moisture loss in flowers (%)

The gypsophila flowers treated with different methods of drying by using fine sand and silica gel as embedding media differed significantly. Maximum percentage of moisture loss (84.43%) was recorded in the treatment T_7 (Control) (Air drying under shade) and minimum value (45.66%) in T_6 (Embedded drying in silica gel kept in Micro wave oven). This might be due to drying of gypsophila flowers in micro wave oven for shorter time (60 sec) and the remaining treatments recorded intermediate values. The maximum percentage of moisture loss in gypsophila flowers dried without embedding in air under shade may be due to direct exposure of flowers to different climatic conditions resulting in rapid moisture loss. These results are in accordance with Dhatt *et al.* (2007) [2] in rose buds.

Over all acceptability of Flowers (Scores)

The data related to sensory scores on over all acceptability of gypsophila cut flowers reveals that the treatments subjected to different drying methods by using fine sand and silica gel as embedding media differed significantly. Maximum score (4.60) was recorded in the treatment T_6 (Embedded drying in silica gel kept in Micro wave oven at 180 °C) and minimum score was recorded in the treatment T_7 (1.30) control (Air drying under shade). The remaining treatments recorded intermediate values which were on par with each other. These results are in accordance with Nirmala (2008) [5] who reported that over all acceptability was highest when carnation flowers were embedded in silica gel. Nair and Singh (2011) [4] reported that chrysanthemum flowers embedded in silica gel scored the maximum points for good appearance. The highest score on over all acceptability with embedded drying in silica gel kept in micro wave oven at 180 °C might be ascribed to the beneficial effect of silica gel in maintaining the original color and shape of the gypsophila flowers.

Packing materials

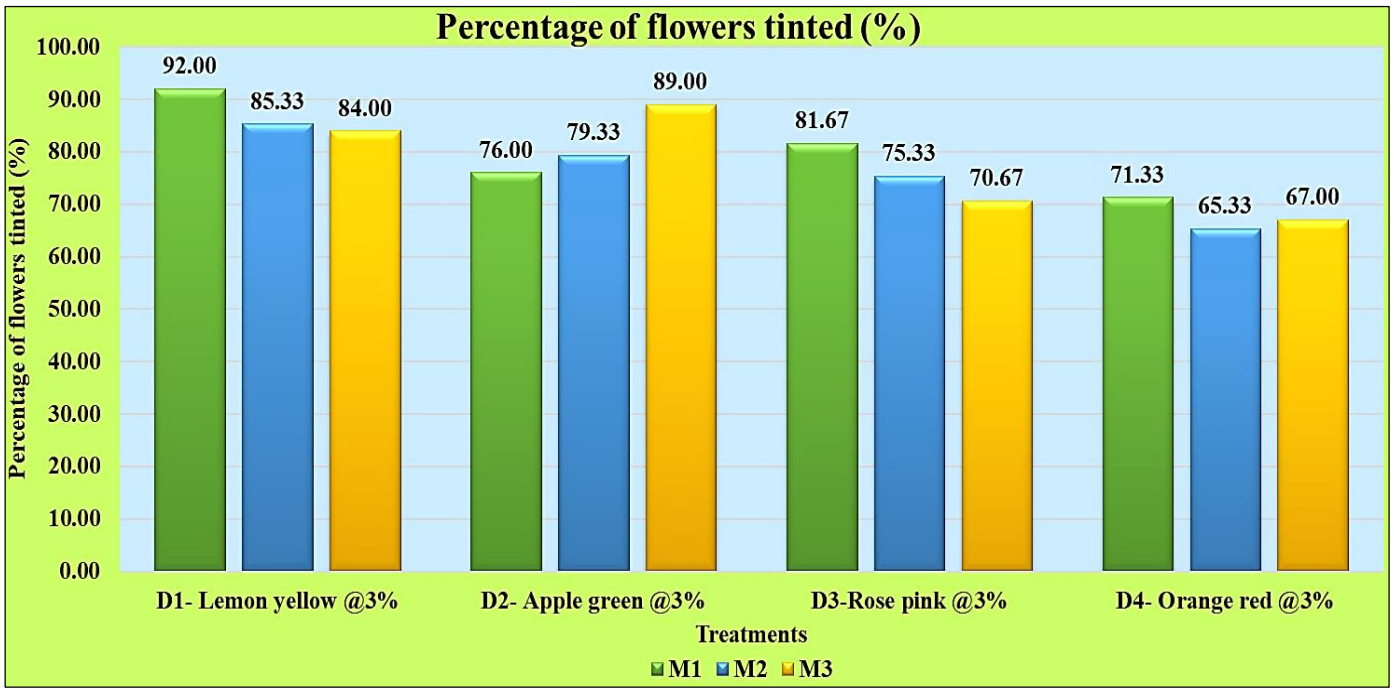
Over all acceptability (Scores)

Data pertaining to sensory scores over all acceptability of packing material for gypsophila dried flowers recorded maximum score (5.0) in the treatment (T_2) acrylic boxes and minimum score (3.5) in (T_4) shadow boxes. These results are in accordance with Radha Rani (2011).

The results revealed that among all types of packing materials (Glass material cases, acrylic boxes, photo frames, shadow boxes and resin moulds) judges mostly preferred acrylic boxes. The reasons for acceptance might be due to excellent visibility of the packed material, light in weight and sturdy, long durability and easy in maintenance of the stored products due to the fact that acrylic is rigid, provides good insulation, and can be produced in numerous different shapes. The transparency of acrylic allows consumers to see the product. Finally, acrylic packaging benefits the environment because it is reusable and recyclable which is necessary to fulfill the purpose of value-added products.

Table 1: Effect of different methods of application of Food dyes on percentage of flowers tinted (%) of gypsophila cut flowers cv. Crystal White

Percentage of flowers tinted (%)				
Treatment	**M_1**	**M_2**	**M_3**	**Mean**
D_1-Lemon yellow @ 3%	92.00	85.33	84.00	87.11 [a]
D_2-Apple green @ 3%	76.00	79.33	89.00	81.44 [b]
D_3-Rose pink @ 3%	81.67	75.33	70.67	75.89 [c]
D_4-Orange red @ 3%	71.33	65.33	67.00	67.89 [d]
Mean	80.25 [a]	76.33 [c]	77.67 [b]	
	S.Em±		CD (P=0.05)	
D (Dyes)	0.46		1.37	
M (Methods of absorption)	0.40		1.20	
DXM (Interactions)	0.80		2.36	



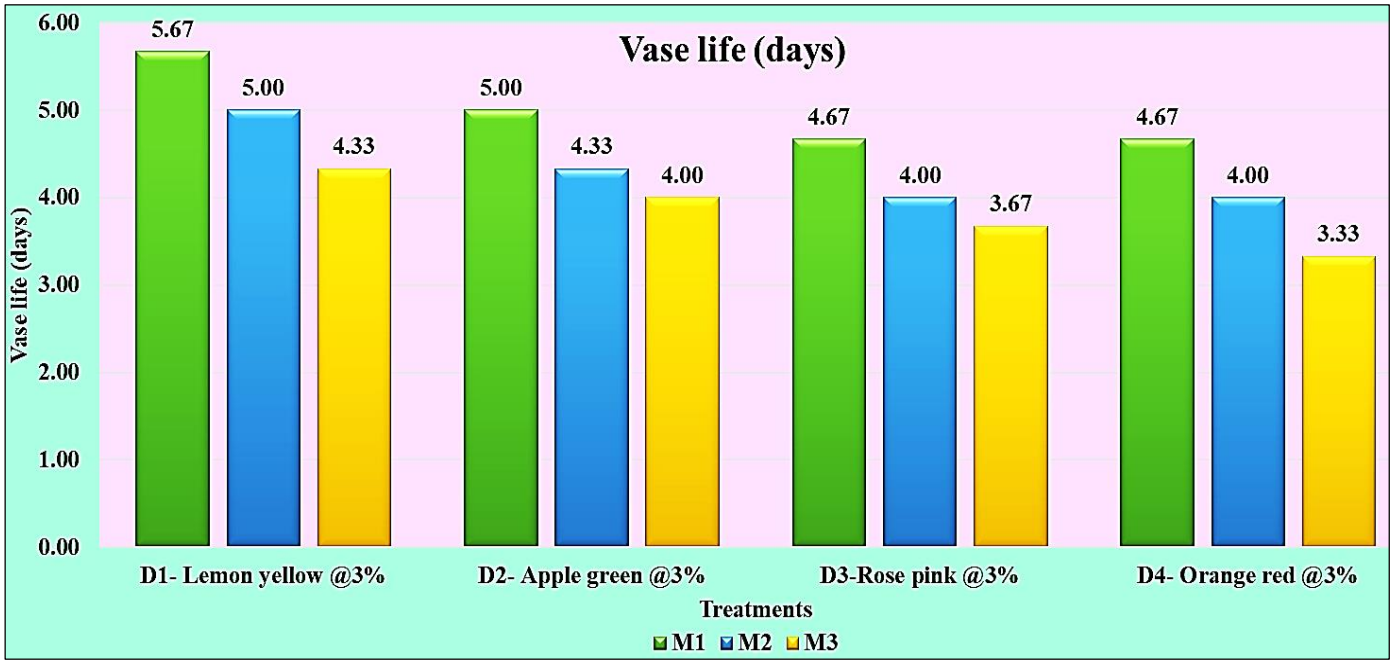
M_1: Stem Absorption method.
M_2: Dipping method.
M_3: Spraying method.

Fig 1: Bearing same letters did not differ significantly

Table 2: Effect of different methods of application of Food dyes on vase life (days) of gypsophila cut flowers cv. Crystal White

Treatment	**Vase life (days)**			
	M_1	**M_2**	**M_3**	**Mean**
D_1: Lemon yellow @ 3%	5.67	5.00	4.33	5.00[a]
D_2: Apple green @ 3%	5.00	4.33	4.00	4.44[b]
D_3: Rose pink @ 3%	4.67	4.00	3.67	4.11[b]
D_4: Orange red @ 3%	4.67	4.00	3.33	4.00[b]
Mean	5.00[a]	4.33[b]	3.83[c]	
	S.Em±		CD(P=0.05)	
D (Dyes)	0.15		0.46	
M (Methods of absorption)	0.13		0.39	
DXM (Interactions)	0.25		NS	

Figures bearing same letters did not differ significantly



M1: Stem Absorption method
M2: Dipping method
M3: Spraying method

Fig 2: Effect of different methods of application of Food dyes on vase life (days) of gypsophila cut flowers cv. Crystal White

Table 3: Effect of different drying methods on percentage of moisture loss (%) in gypsophila cut flowers cv. Crystal White

Treatments	Percentage of moisture loss in flowers (%)
T_1: Embedded drying in Fine sand kept in ambient conditions	79.54 [b]
T_2: Embedded drying in Silica gel kept in ambient conditions	73.25 [c]
T_3: Embedded drying in Fine sand kept in hot air oven @ 40 °C	66.06 [d]
T_4: Embedded drying in Silica gel kept in hot air oven @ 40 °C	59.30 [e]
T_5: Embedded drying in Fine sand kept in Micro wave oven @ 180 °C	53.76 [f]
T_6: Embedded drying in Silica gel kept in Micro wave oven @ 180 °C	45.66 [g]
T_7: Air drying under shade (Control)	84.43 [a]
S.Em±	1.09
CD (P=0.05)	3.28

Figures bearing same letters did not differ significantly.

Table 4: Effect of different drying methods on Overall acceptability (Score) of gypsophila cut flowers cv. Crystal White

Treatments	Over all acceptability (Score)
T_1: Embedded drying in Fine sand kept in ambient conditions.	1.60[c]
T_2: Embedded drying in Silica gel kept in ambient conditions.	2.24[c]
T_3: Embedded drying in Fine sand kept in hot air oven @ 40 °C.	3.33[b]
T_4: Embedded drying in Silica gel kept in hot air oven @ 40 °C.	3.25[b]
T_5: Embedded drying in Fine sand kept in Micro wave oven @ 180 °C.	4.53[a]
T_6: Embedded drying in Silica gel kept in Micro wave oven @ 180 °C.	4.60[a]
T_7: Air drying under shade (Control).	1.30[c]
S.Em±	0.32
CD (P=0.05)	0.97

Figures bearing same letters did not differ significantly

Table 5: Effect of different packing material on over all acceptability (scores) of gypsophila dried flowers cv. Crystal White

Treatments	Over all acceptability (scores)
T_1: Glass material cases	4.5
T_2: Acrylic boxes	5.0
T_3: Photo frames	4.0
T_4: Shadow boxes	3.5
T_5: Resin moulds	4.5

Table 6: Hedonic scale showing the description of scores ranging from 1-5 for evaluation of packing material on over all acceptability (scores) of gypsophila dried flowers cv. Crystal white

Scores	Over all acceptability (scores)
1.	Very poor
2.	Poor
3.	Moderate
4.	Good
5.	Excellent

Conclusion

The results revealed that in tinting, among different food dyes on tinting and various methods of application of food dyes, the treatment D_1M_1 (Lemon yellow dye through stem absorption at 3% concentration) was found to be the best treatment for enhancing the vase life of gypsophila cut flowers and drying methods with different media, gypsophila flowers are embedded in silica gel kept in micro wave oven at 180 °C recorded maximum overall acceptability (4.60) compared to other treatments.

Among different types of packing materials (Glass material cases, acrylic boxes, photo frames, shadow boxes and resin moulds) judges mostly preferred acrylic boxes. The reasons for acceptance might be due to excellent visibility of the packed material, light in weight and sturdy, long durability and easy in maintenance of the stored products due to the fact that acrylic is rigid, provides good insulation, and can be produced in numerous different shapes. The transparency of acrylic allows consumers to see the product. Finally, acrylic packaging benefits the environment because it is reusable and recyclable which is necessary to fulfill the purpose of value-added products.

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