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Influence of Drying Method on Fresh Weight, Dry Weight, Moisture Loss and Time Take For Drying Dutch Roses

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ABSTRACT

Rose is the top ranking cut flower in the flower trade on the basis of average production and consumption. Rose flowers are diverse having exquisite shape, size, beautiful colours and delightful fragrance. In India, roses are grown for cut flowers, for making garlands, bouquets, in flower arrangement, vase decoration, hair adornment, for worshipping, to prepare gulkand, pankhuri and to extract essential oil, attar and rose water.

***Key words**: Dutch rose, Hot air oven, Moisture loss and gain, Drying method.*

INTODUCTION

Value addition is any step taken to increase the value of a product anytime between harvesting and sale of the final product. It increases the value and appeal of any floriculture product or commodity through changes in processing or diversification. Any product can be considered value-added if it is originally grown by the farmer and increased in value "by labour and creativity." Value addition means consumers are willing to pay more than they would for a raw product. Flower preservation is as early as the history of man, although deliberate flower preservation is a more recent phenomenon. Many value added products can be made from dried flowers such as collages, flower pictures, flower balls, greeting cards, covers, pomanders, festive decorations, bouquets and wreaths, sweet-smelling pot pourries[4].The literature available on drying techniques is mostly related to the flora and fauna of temperate regions. But, nearly 60 per cent of raw material is obtained from natural geographic land that lies close to western, eastern and northern Himalayan ghats and plains, while remaining 40 per cent of the flowers are exclusively cultivated for dry flower industry employing nearly one lakh people[5].

MATERIAL AND METHODS

Present investigation on "Evaluation of Dutch rose varieties and drying methods on quality dried flower" was carried out during 2014-2015 in the laboratory of Department of Floriculture and Landscape Architecture, Regional Horticultural Research Extension Centre Bengaluru, College of Horticulture, Bengaluru, University of Horticultural Sciences, Bagalkot.

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Details of the location, materials used and techniques followed for different experiment are described in this chapter.

Material

Rose varieties used for the present study were Taj Mahal (Red), Avalanche (White), Gold Strike (Yellow) and Noblese (Pink) brought from IFAB (International Flower Auction Centre) Bengaluru, dried in hot air oven using silica gel (60- 120 mesh), microwavable containers and acrylic air tight storage containers.

Source of flowers

Four Dutch rose varieties, which were evenly matured and uniform coloured cut flowers, obtained from various farmers around Bengaluru through IFAB, which were grown under naturally ventilated polyhouse to carry out the experiments. All the flowers which were being used in the experiment were of standard export quality roses. These flowers were harvested in the morning hours between 8.00 and 9.00 am, immediately after harvest, the cut ends of the flower stalks were immersed in clean water and kept in the cold storage unit. After bringing the flowers to the laboratory, they were sorted for petal damage, pests and diseases if any. Stems of uniform size were selected and trimmed to uniform length and the treatments were imposed immediately. Drying method was standardized by adopting different methods as described under each experiment.

Cultivars and their description: The four cultivars and their description include:

Variety	Characters
Taj Mahal	Deep red colour with large size flowers and long stalks
Gold Strike	Dark yellow colour, large head size and high petal count
Noblesse	Medium sized pink flower
Avalanche	True eggshell white colour, large bloom and gentle edges

All the above four cultivars belong to the class of Hybrid Teas. Main characteristics of these cultivars are production of blooms on long canes, elongated buds and slow opening of flowers[1].The stages of harvest were fixed based on the nature of crop growth and flower development. Two stages of harvest namely, tight bud stage and half bloom stage among this in our experiment half bloom stage was assessed under each variety based on the earlier literature, at which drying is perfect to retain colour, shape and the visual quality at its best. Half bloom stage is that when around fifty per cent of the petals are open. Flower buds took fourteen to sixteen days from bud appearance to reach this stage. Experiment was carried out to find the best method among Air drying and Hot air oven drying. In air dying a sample size of five flowers per replication of four varieties were tied separately using thread and hanged upside down in the room with good ventilation and left for seven to twelve days for dying. In another method, by using hot air oven at 40^0C with silica gel as an embedding material was used to dry the flowers at a uniform drying rate. Here a sample size of five flowers per replication of all four varieties were used. Among this, the best drying method in order to improve the dried flower quality was selected for the second experiment. The flowers harvested at half bloom stage were selected and used for standardization of drying method and to find out varietal suitability for quality dried flower production among different Dutch roses.

Fresh weight (g)

Among Dutch rose varieties evaluated for dry flower making, fresh weight was significantly higher in the var. Taj Mahal (13.53 g) which was followed by var. Noblesse (11.11 g) and var. Gold Strike (10.62 g). Whereas, it was lowest in var. Avalanche (9.73g). Among drying method evaluated, fresh weight was found non-significant. However, fresh weight was recorded highest in air drying (11.30 g) over hot air oven (11.19 g) drying. Interaction effect between varieties and drying method found non-significant for fresh weight. However treatment combination V1D1 (var. Taj Mahal x Air drying) recorded highest fresh weight of 13.73 g followed by V1D2 (var. Taj Mahal x Hot air drying) 13.33 g. whereas, it was lowest in V4D2 treatment combination (var. Avalanche x Hot air drying) (9.53 g).

Dry weight (g)

Significant variation were observed for dry weight with respect to Dutch rose varieties *viz*., Taj Mahal, Gold Strike, Noblesse and Avalanche evaluated. Highest dry weight of 3.58 g was recorded in Dutch rose var. Taj Mahal. While lowest dry weight was recorded in var. Gold Strike (2.51 g). Variation in dry weight of many varieties is attributed to the differences in genetic characters of the varieties. These results are in agreement with the findings of Salma in Dendrobium orchid flowers. Similarly significant difference were also recorded among the drying methods, dry weight was significantly highest under air drying (3.64 g). Whereas, it was lowest under hot air oven drying method (2.24 g). This might be due to influence of surrounding atmosphere in air drying method. Among the interactions of varieties and drying methods for dry weight, highest was recorded in V_1D_1 (var. Taj Mahal x Air drying) (4.56 g). Whereas, lowest dry weight was observed in V_2D_2 (var. Gold Strike x Hot air oven) treatment combination (1.86 g). Among the different drying methods like sun, shade and hot air oven drying methods, oven drying proved better Kulkarni *et al*.[2].

Moisture loss (%)

Significant difference was observed for per cent moisture loss during drying of Dutch rose varieties. Maximum moisture loss of 76.29 per cent was recorded in var. Gold Strike. Among different drying methods significant moisture loss was recorded highest (79.83%) under hot air oven drying. While it was lowest (67.85%) under air drying method. This might be because in oven, plant material is kept at controlled temperature for a specified time typical of the plant species. Temperature plays an important role in drying of flowers and other ornamental plant parts by influencing both qualitative and quantitative parameters. At higher temperature, the rate of transpiration was comparatively much higher[3].Interaction effect between dried Dutch rose varieties and drying methods shown non-significant differences for moisture loss.

Drying duration (hours)

Among varieties of Dutch roses, with respect to duration of drying of var. Gold Strike took lowest hours for drying (117.03 hours). Whereas, the var. Taj Mahal took maximum duration (150.17 hours) for drying compared to rest of the varieties. Similar trend was reported by White *et al.*[7]. Among drying methods, flowers dried under hot air oven took significantly least drying duration of 49.40 hours and it was highest in air drying (215.76 hours). Significant difference was reported for interaction effect between varieties and drying methods with respect to drying duration. The treatment combination V_2D_2 (Gold Strike x Hot air oven) (48.38 hours) recorded lowest drying duration. Whereas, it was significantly highest in V_1D_1 (var. Taj Mahal x Air drying) treatment combination (250.96 hours). This might be due to the influence of surrounding weather factors such as temperature and relative humidity during air drying as stated by White *et al.*[7] more fleshy flowers and foliage took more time for drying and rose bunches could be hung dried in shade within 5-10 days[6].

Table 1: Fresh weight, dry weight, moisture loss and time taken for drying Dutch roses as influenced by the drying method

Treatments	Fresh weight (g/flower)	Dry weight (g/flower)	Moisture loss (%)	Drying duration (hours)
Variety(V)				
V_1 - Taj Mahal	13.53	3.58	73.62	150.17
V_2 - Gold Strike	10.62	2.51	76.29	117.03
V_3 - Noblesse	11.11	2.79	74.94	124.09
V_4 - Avalanche	9.73	2.88	70.52	139.03
S. Em±	0.09	0.06	0.59	1.81
C.D. at 5%	0.28	0.17	1.76	5.43
C.D. at 1%	0.39	0.24	2.42	7.48
Drying method (D)				
D_1 - Air drying	11.30	3.64	67.85	215.76
D_2 - Hot air-oven	11.19	2.24	79.83	49.40
S. Em±	0.07	0.04	0.41	1.28
C.D. at 5%	NS	0.12	1.24	3.84
C.D. at 1%	NS	0.17	1.71	5.29
Interaction effect (V x D)				
V_1D_1 - Taj Mahal x Air drying	13.73	4.56	66.77	250.96
V_1D_2 - Taj Mahal x Hot air oven	13.33	2.59	80.47	49.37
V_2D_1 - Gold Strike x Air drying	10.53	3.16	70.02	185.68
V_2D_2 - Gold Strike x Hot air oven	10.7	1.86	82.56	48.38
V_3D_1 - Noblesse x Air drying	11.02	3.34	69.92	198.80
V_3D_2 - Noblesse x Hot air oven	11.2	2.24	79.95	49.38
V_4D_1 - Avalanche x Air drying	9.93	3.51	64.68	227.60
V_4D_2 - Avalanche x Hot air oven	9.53	2.25	76.35	50.47
S. Em±	0.13	0.08	0.83	2.56
C.D. at 5%	NS	0.24	NS	7.68
C.D. at 1%	NS	0.34	NS	10.58

DAS- Days after storage, '0' DAS (zero days) *i.e.*, immediately after drying of flowers

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