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Storage studies of cabinet oven dried carnation flowers

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Abstract

The present experiment entitled "Effect of drying temperature in cabinet oven dryer for carnation flower" was carried out during the academic years 2015-16 and 2016-17 at Department of Horticulture, Post Graduate Institute, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola to find out suitable duration for drying of carnation flower. The experiment was laid out in Randomized Block Design with four replications. The treatments comprised of six different treatments of drying durations in cabinet oven dryer viz. 1, 1.5, 2, 2.5, 3 and 3.5 minutes. Cabinet oven drying for 3.5 minutes scored maximum scores for extent of colour fading at 60 and 180 days after drying during storage, whereas minimum scores were recorded in treatment of 1-minute cabinet oven drying. With respect to incidence of pest and diseases scores of flowers during storage at 60 and 180 days after drying, treatment 3.5 minutes cabinet oven drying scored maximum points whereas, minimum scores and maximum damage by pests and diseases were recorded in 1-minute cabinet oven drying treatment T₁.

Keywords: Storage, flower, cabinet drying, dehydration, colour, damage, score

Introduction

Shelf life of fresh cut flowers is limited, in spite of using best chemicals for improvement of keeping quality and enhancement vase life. Hence, the fresh cut flowers cannot be stored for a long time. Non availability of flowers at times and places where one wants them very much is an additional problem. Efforts are being made since centuries to find alternatives for fresh flowers. For these efforts, dried flowers hold an economic and eco-friendly answer.

In this context flowers can be dried, preserved and processed to retain its beauty as well as everlasting value. The use of dried flowers has made it possible to enjoy their beauty for several years. Therefore, to overcome this problem as well as maintaining the charm of the flowers, the application of dehydration technology can play a vital role. 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 and sweet-smelling pot pourries (Raghupathy *et al.*, 2000) [7].

Carnation is essentially a florist crop, widely cultivated on commercial scale in different part of the world. It belongs to the family *Caryophyllaceae* and member of genus *Dianthus*. Drying of flowers and foliage by various methods like air drying, sun drying, oven and microwave oven drying, freeze drying and embedded drying can be used for making decorative floral crafts items like cards, floral segments, wall hangings, landscapes, calendars, potpourris etc. for various purposes (Bhutani 1990) [1] Potpourris being the major segment of drying flower industry valuing at Rs 55 crore in India alone. Dried flowers are a good standby for the florist's, since designs can be made up during the slack periods and arrangements can be displayed where fresh flowers are unsuitable from the growers point of view and the price is less than equivalent fresh flowers (Salinger 1987) [10]. The demand for dry flowers and attractive plant parts, dried floral arrangements and floral crafts has increased manifold during the last decade. Dry flowers constitute more than two-thirds of the total floriculture exports. The demand for dry flowers is increasing at an impressive rate of 8-10 per cent annually thus offering a lot of opportunities for the Indian entrepreneurs to enter in the global floricultural trade (Singh 2009) [1]. Thus, looking to the importance of dry flower, experiment was conducted on storage studies of dried carnation flower.

Materials and Methods

The present investigation was conducted in the Laboratory, Department of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during the year 2015-16 and 2016-17. The cut flowers of carnation were produced under naturally ventilated polyhouse. The healthy, disease free and uniform flower stems of carnation were harvested in the morning hours between 8.00

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to 9.00 am. Immediately after harvest, the cut ends of the flower stalks were immersed in water. After bringing to the laboratory, the flowers were sorted for petal damage, pests and diseases. Stems of uniform size were selected and trimmed to 10 cm length and the treatments were imposed immediately.

The flowers were kept in trays and dried in an electrically operated cabinet oven at the temperature 60°C for 1, 1.5, 2, 2.5, 3 and 3.5 minutes. At the end of drying, the petals of the flowers were pressed with fingers to check the presence of moisture. If the moisture was still present, then the flowers were further exposed for drying for complete elimination of moisture. The well dried flowers were packed in cardboard boxes and stored at ambient temperature and observations were recorded on extent of colour fading and damage of dried flowers for six months at 30 days intervals by scoring on a five point scale given by Safeena (2005) [9] viz. very low - 3.5-4.0, low - 2.5-3.4, medium - 1.5-2.4, high - 0.5-1.4 and very high- 0.0-0.4. The data was analyzed statistically using RBD variance as per methods given by Panse and Sukhatme (1985) [5].

Results and Discussion

Colour fading of cabinet oven dried carnation flowers

Data pertaining to the years 2015-16, 2016-17 and pooled on extent of colour fading scores of cabinet oven dried carnation flowers are presented in Table 1. at 60 and 180 days after drying.

Table 1: Effect of cabinet oven drying on extent of colour fading scores of dried carnation flowers at 60 and 180 days after drying

Treatment	Scores at 60 DAD			Scores at 180 DAD		
	Durations at 60 °C	2015-16	2016-17	Pooled	2015-16	2016-17
T ₁ -1.0 min	1.23	1.25	1.24	1.15	1.13	1.14
T ₂ -1.5 min	1.30	1.35	1.33	1.23	1.33	1.28
T ₃ -2.0 min	1.23	1.20	1.21	1.30	1.23	1.26
T ₄ -2.5 min	3.50	3.45	3.48	3.15	3.28	3.21
T ₅ -3.0 min	3.60	3.55	3.58	3.63	3.58	3.60
T ₆ -3.5 min	3.78	3.83	3.80	3.75	3.70	3.73
F Test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE m±	0.08	0.06	0.06	0.07	0.14	0.08
CD at 5%	0.24	0.19	0.18	0.22	0.41	0.23

At 60 days, data was found to be significant regarding scores of extents of color fading of dry carnation flowers as influenced by duration of cabinet oven drying. Significantly, maximum sensory scores (3.78, 3.83 and 3.80) were recorded in treatment T₆ (3.5 min), which was at par (3.50, 3.45 and 3.48) and (3.60, 3.55 and 3.58) with treatment T₄ (2.5 min) and treatment T₅ (3.0 min), while minimum scores (1.23, 1.25 and 1.24) were found in treatment T₁ (1.0 min) during the years 2015-16,2016-17 and in pooled result, respectively.

At 180 days, data was found to be significant regarding extent of color fading scores of dry carnation flowers as influenced by drying durations of cabinet oven drying. Significantly, maximum sensory scores (3.75, 3.70 and 3.73) were recorded in treatment T₆ (3.5 min), which was at par with a treatment T₄ (3.15, 3.28 and 3.21) and T₅ (3.63, 3.58 and 3.60), while minimum scores (1.15, 1.13 and 1.14) were found in treatment T₁ (1.0 min) during the years 2015-16, 2016-17 and in pooled result, respectively.

Incidence of pest and diseases of cabinet oven dried carnation flowers

Data pertaining to the years 2015-16, 2016-17 and pooled on incidence of pest and diseases scores of cabinet oven dried carnation flowers are presented in Table 2. and 3. at 60, 120, 150 and 180 days after drying.

Table 2: Effect of cabinet oven drying on incidence of pest and diseases scores of dried carnation flowers at 60 and 120 days after drying

Treatment	Scores at 60 DAD			Scores at 120 DAD		
	Durations at 60 °C	2015-16	2016-17	Pooled	2015-16	2016-17
T ₁ -1.0 min	1.13	1.10	1.11	1.23	1.13	1.18
T ₂ -1.5 min	1.33	1.05	1.19	1.30	1.38	1.34
T ₃ -2.0 min	1.28	1.33	1.30	1.28	1.25	1.26
T ₄ -2.5 min	3.15	3.10	3.13	3.50	3.28	3.39
T ₅ -3.0 min	3.63	3.58	3.60	3.50	3.53	3.51
T ₆ -3.5 min	3.80	3.75	3.78	3.73	3.75	3.74
F Test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE m±	0.10	0.10	0.08	0.07	0.07	0.05
CD at 5%	0.31	0.29	0.24	0.20	0.21	0.15

At 60 days, data was found to be significant regarding incidence of pest and diseases scores of dry carnation flowers as influenced by drying methods. Significantly, maximum sensory scores (3.80, 3.75 and 3.78) were recorded in treatment T₆ (3.5 min), which was recorded at par (3.15, 3.10 and 3.13) and (3.63, 3.58 and 3.60) with treatment T₄ (2.5 min) and T₅ (3.0 min), while minimum scores (1.13, 1.10 and 1.11) was found in treatment T₁ (1.0 min) during the years 2015-16,2016-17 and in pooled result, respectively.

At 120 days, data was found to be significant regarding incidence of pest and diseases scores of dry carnation flowers as influenced by drying duration in cabinet oven dryer. Significantly, maximum sensory scores (3.73, 3.75 and 3.74) were recorded in treatment T₆ (3.5 min), which was recorded at par (3.50, 3.28 and 3.39) and (3.50, 3.53 and 3.51) with treatment T₄ (2.5 min) and treatment T₅ (3.0 min), while minimum scores (1.23, 1.13 and 1.18) were found in treatment T₁ (1.0 min) during the years 2015-16,2016-17 and in pooled result, respectively.

Table 3: Effect of cabinet oven drying on incidence of pest and diseases scores of dried carnation flowers at 150 and 180 days after drying

Treatment	Scores at 150 DAD			Scores at 180 DAD		
	Durations at 60 °C	2015-16	2016-17	Pooled	2015-16	2016-17
T ₁ -1.0 min	1.18	1.23	1.20	1.25	1.18	1.21
T ₂ -1.5 min	1.28	1.28	1.28	1.30	1.30	1.30
T ₃ -2.0 min	1.35	1.33	1.34	1.33	1.25	1.29
T ₄ -2.5 min	3.43	3.40	3.41	3.38	3.48	3.43
T ₅ -3.0 min	3.60	3.63	3.61	3.53	3.55	3.54
T ₆ -3.5 min	3.70	3.68	3.69	3.73	3.75	3.74
F Test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE m±	0.04	0.06	0.04	0.06	0.07	0.05
CD at 5%	0.14	0.17	0.12	0.19	0.21	0.14

At 150 days, data was found to be significant regarding incidence of pest and diseases scores of dried carnation flowers as influenced by durations of drying in cabinet oven dryer. Significantly, maximum sensory scores (3.70, 3.68 and 3.69) were recorded in treatment T₆ (3.5 min), which was recorded at par (3.43, 3.40 and 3.41) and (3.60, 3.63 and 3.61) with treatment T₄ (2.5 min) and treatment T₅ (3 min), while

minimum scores (1.18, 1.23 and 1.20) were found in treatment T₁ (1.0 min), during the years 2015-16, 2016-17 and in pooled result, respectively.

At 180 days, data was found to be significant regarding incidence of pest and diseases scores of dry carnation flowers as influenced by drying methods. Significantly, maximum sensory scores (3.73, 3.75 and 3.74) were recorded in treatment T₆ (3.5 min), which was recorded at par (3.38, 3.48 and 3.43) and (3.53, 3.55 and 3.54) with treatment T₄ (2.5 min) and treatment T₅ (3.0 min), while minimum scores (1.25, 1.18 and 1.21) was found in treatment T₁ (1.0 min) during the years 2015-16, 2016-17 and in pooled result, respectively.

The results are in line with those of Joykumar (1997)^[4] who reported that colour of dried flowers of rose, aster and chrysanthemum were good in oven drying with silica gel as embedding medium. Peggy (1978)^[6] reported silica gel as the most appropriate dessicant for proper retention of colour. Venugopal and Patil (2000)^[14] reported that helichrysum flowers dried at 50°C in oven for 48 h were found to retain good colour for 150-180 days. Similar results were also observed by Safeena (2005)^[9]. Among the two conditions of storage, flowers stored without any lining recorded higher scores with respect to retention of colour on storage. Thomler (1997)^[13] suggested that well dried flowers could be stored in cardboard boxes in a cool dry place. The dried material had to be held firmly to avoid breakage. Rengasamy *et al.* (1999)^[8] reported that selection of proper packaging, giving proper cushioning and use of moisture barrier packaging materials are of prime consideration in dry flower industry. Boxes should be free from insects since they chew the soft tissue and flower petals. Yan (1999)^[15] recommended the wrapping of dried flowers in newspaper and placing them in a cardboard box. The box should not be stored in an unusually damp or very dry place. A few moth balls can be kept to protect from small rodents and insects. Similar results are also obtained by Safeena (2005)^[9] during his work.

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