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Standardization of different drying techniques for Dutch rose

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Abstract

The present investigation was carried out to evaluate different methods of drying for Dutch rose flowers for obtaining better quality of dried flowers from three Dutch rose variety viz., Top secret, Skyline and Ravel. Flowers of variety Top secret dried in microwave oven embedded in silica gel for 150 seconds were more acceptable for quality parameters such as appearance (2.65), shape (2.49), colour (2.75) and texture (2.62) of flower. While unacceptable quality was obtained in Air drying method. The flowers dried in microwave and hot air oven by using silica gel as embedding media maintained proper shape, colour, texture and appearance without disturbing its original form. Flowers of cv. 'Top secret' dried by using silica gel resulted in best quality of dried flowers as it scored maximum points for all the quality parameters studied.

Keywords: Dutch rose, flower drying, Microwave, Silica gel, hot air oven, air drying

Introduction

Flowers are most beautiful creation of nature, which always plays very important role in every celebration of human life. Flowers brings a sense of freshness and beauty in humanlife and for this reason the people of the developed world utilize flowers in their daily life. Almost every country is gifted with a noteworthy biodiversity of ornamentals and flower plants from the end of the mother nature which can help to mitigate the thirst for flower across the globe. Dry flowers are naturals, dried and preserved with an everlasting value that can be cherished for longer period (Sheela, 2008) ^[1]. Dry flowers offer wide range of qualities such as novelty, longevity, aesthetic values, flexibility and year round availability (Joyce 1998) ^[5]. It can be utilized for the preparation of flower vase or bouquets decoration just like fresh flowers, floral arrangements and various floral handicrafts like greeting cards, segments, wall hangings, calendars, candle, picture frames, floral jewellery, mirror decorative, arrangements in glass containers etc. (Bhutani,1990) ^[2]. Dried ornamental plant parts are generally less expensive and are sought for their everlasting and attractive appearance. The original shape, colour and size of flower remain as it was before dehydration and thus, making it highly suitable raw materials for interior decoration (Datta 1999) ^[3].

Dried flowers are used as a common component of potpourris. Rose petals, gomphrena, marigold petals, lotus pods are ideally suitable for making pot-pourris (De. L.C. 2020) ^[4]. Sachets it is also used by peoples to maintain freshness and scent in homes, sew little aromatic sachets to include in dresser drawers and closets (Khiromani Nag 2021) ^[6]. Considering the potential of Dutch roses in dry flower trade, and attempt was made in the present investigation to determine the best mode of desiccation, best cultivar and best time level for drying rose flowers in microwave, hot air oven and air drying method of flower drying.

Material and Methods

The present study was carried out at Dry flower laboratory, Department of Floriculture and Landscape Architecture, Dr. Panjabrao Deshmukh Krishi Vidhyapeeth, Akola during 2021. Flowers of three cultivars of Dutch roses were used for the present study included red variety 'Top secret', yellow variety 'Skyline' and pink variety 'Ravel'. All the three cultivars belongs 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.

The flowers of all the three Dutch rose cultivars were dehydrated inelectrically operated microwave oven at three different time levels (90 sec, 120 sec and 150 sec), Hot air oven at three different time levels (35 hr, 40 hr Hot air oven at three different time levels (35 hr, 40 hr and 45 hr) and Air drying the flowers were tied by using wire and just hanged in room for three different timing (8 days, 10 days and 12 days). The flowers were embedded in silica gel and then placed in microwave oven and hot air oven. The data obtained from the laboratory experiments was analysed by factorial completely randomized design. Visual quality parameters were recorded with the help of 1-5 pointer scale.

Result and Discussion

Among the different drying methods the microwave oven drying method of flower drying was found to be best than other method. Because it uses both microwave energy and hot air oven energy in combination as a medium for drying. The difference in fresh flower weight of flowers was non-significant.

The difference in dry weight of flowers and methods of drying was significant. The variety Top secret recorded maximum dry weight of flower (2.69 g), and variety Skyline recorded minimum dry (1.72g) weight of flower. This might be due to inherent weight of fresh flowers and different quantity of moisture loss in different varieties. Similar result were recorded by Sindhuja *et al.* 2017 [12] in Carnation. The maximum dry weight (3.17 g) of flower was recorded in microwave drying for 90 seconds and the minimum dry weight of flower (0.95 g) was recorded in air drying for 12 days. In air drying the minimum dry weight of flower recorded. Might be due to direct exposure of flowers to different microclimatic condition leading to rapid and uncontrolled water loss. Similar result were recorded by Sindhuja *et al.* 2017 [12] in Carnation. Interaction effect of variety and different method of drying on dry weight of flower was found significant. The treatment hot air oven drying for 35 hours recorded maximum dry weight of flower (4.04 g). Ravel variety dried by air drying method for 12 days recorded minimum dry weight of flower (0.88 g).

Moisture loss of flowers by varieties was found to be non-significant. The drying method showed significant differences. The maximum moisture loss (83.46%) of flower was observed in air drying method for 12 days. While Minimum moisture loss (53.10%) of flower was observed in microwave drying for 90 seconds. The moisture loss of flower is different in different methods of flower drying. In air drying maximum moisture loss of flower occurred due to continuous variation in temperature and humidity in room condition and air circulation in room takes away moisture vapor which leads to more moisture loss in flowers. Duration of air drying also affects the moisture loss in flower. In microwave oven minimum moisture loss of flower is observed because the heating time in microwave oven is less as compared to other methods an duration is also less. Significant difference is observed in interaction on moisture loss of flower. The variety Top secret dried in air dried method for 12 days, recorded maximum moisture loss of flowers (86.40%) and minimum moisture loss of flower (46.34%) was observed in top secret variety dried in microwave oven drying method for 90 seconds.

In respect of Initial diameter of flower varieties and drying methods non-significant difference noted.

Diameter of dry flower was influenced by varieties and drying

methods. Significant difference is observed in diameter of flower varieties. The variety Top secret, recorded maximum diameter of dry flower (2.15 cm), while minimum dry diameter of flower (1.65cm) was observed in variety Skyline. Difference amongst the treatment was found significant this might be due to inherent varietal variation of flower variety and different moisture loss in different drying conditions. This result obtained in present investigation is in accordance with Sindhuja *et al.* (2017) [12] in Carnation. Significant difference in diameter of flowers was observed in different drying methods. Air drying for 8 days recorded minimum (1.58 cm) dry diameter of flower and maximum dry diameter of flower (2.12 cm) is recorded in Microwave oven drying method for 90 second. The air drying method of flower drying recorded minimum dry diameter of flower might be due to absence of support provided by embedding medium and slow and uneven drying process that caused more shrinkage and petal wrinkling. This result were in accordance with Ugale *et al.* (2016) [14] in rose. The interaction effect of different flower varieties and drying methods was found non-significant.

Reduction in diameter of flowers was found to be significant. The variety Top secret recorded maximum reduction in diameter of flowers (0.30 mm), while Minimum reduction in diameter of flower was recorded in variety Skyline (0.21 mm). The fresh diameter of skyline variety is already low as compared to other varieties so reduction in diameter of flower is also minimum after drying and this is can be attributed to the inherent difference in the flower diameter of the varieties results are in confirmly with Rameza *et al.* (2012) [8] in orchid. Significant difference is observed in methods of flower drying of flowers. The drying method air drying for 10days recorded maximum reduction in diameter of flower (0.49 mm). The minimum reduction in diameter of flower was observed in hot air oven drying for 45 hours (0.10 mm). Maximum reduction in diameter of flower in air drying may be due to uneven petal cell shrinkage due to no pressure of embedding media. These results were in line with Nirmala *et al.*, (2008) [7] in Carnation. The interaction effect of variety and different method on reduction in diameter of flower was found significant. The variety top secret dried by air drying method for 8 days, recorded maximum reduction in diameter (0.62 mm) and minimum reduction in diameter of flower (0.08 mm) was recorded in top secret variety dried by hot air oven drying for 40 hours.

Appearance of flower influenced by varieties and drying methods are found to be significant. The variety Top secret, recorded maximum score for appearance i.e. (2.65) in visual quality parameters, while minimum score (2.33) was recorded in variety Skyline. The difference recorded in respect of appearance of flowers in different variety might be due to varietal character an variation of flower, this result is in accordance with Sindhuja *et al.* (2017) [12] in Carnation. Maximum score of appearance of flower was recorded in microwave drying for 150 seconds and Minimum score (1.72) was recorded in air drying for 12 days. The difference recorded in respect of appearance of flowers in different drying method might be due in microwave oven the flowers exposure for minimum time and were embedded in silica gel. Silica gel by acting as drying agent could produce better quality of dry flowers in microwave oven and hot air oven. This result is in accordance with Safeena and Patil (2013) [9] in Dutch rose. The interaction effect of variety and different method on appearance of flower was found significant. The

variety Top secret dried by microwave drying method for 150 seconds recorded maximum score (3.90) and minimum score of appearance (1.70) was recorded in Ravel variety dried by air drying method for 12 days.

Significant difference in respect of colour of variety of dried flower was observed. The variety Top secret, recorded maximum score of flowers (2.75) in visual quality parameters and minimum score i.e. (2.31) were recorded in variety Skyline. The red colour variety scored maximum points in colour of flower after drying might be due to varietal character and brighter the flower longer the colour last these results were in line with Safeena and Patil (2013) [9] in Dutch rose. Significant difference was observed in method of flowers drying. The drying method microwave drying for 150 seconds, recorded maximum score (3.33) for colour of flower. Minimum score (1.80) for colour of flower was recorded in method air drying for 12 days. The difference recorded in colour of flower after drying in different method might be due to different time levels in microwave oven. Silica gel is excellent drying agent for absorbing moisture from the flowers because it absorbs moisture from flowers rapidly which helps preserve the colour of flower this result is in accordance with Sell and Aakre (1993) [10]. The interaction effect of variety and different method on colour of flower were found significant. The variety Top secret dried in microwave oven drying for 150 seconds recorded maximum score i.e. (3.90) and the minimum score (1.67) was observed in Ravel variety dried by air drying method for 12 days.

Shape of flower influenced by varieties was found significant. The variety Top secret, recorded maximum score of flowers (2.49) in visual quality parameters. Minimum score (2.07) of shape of flower was recorded in variety Skyline. This might be due to varietal character and different shape of flowers Sindhuja *et al.* (2017) [12] in Carnation flower. The drying method microwave drying for 150 second, recorded maximum score (3.26) for shape of flower and minimum

score (1.16) of shape of flower was recorded in air drying method for 12 days. This might be due to flowers were embedded in silica gel and it removes moisture in faster rate without affecting the structural integrity of flowers. This result is accordance with Acharyya *et al.* (2013) [11] in Rose and shape retention obviously was due to embedding flowers in the media as previously suggested by Singh and Dhaduk (2005) [13] in Rose and Calendula. The interaction effect of variety and different method on shape of flower were found significant. The variety Top secret dried in microwave oven drying method for 150 seconds, recorded maximum score (3.88) and minimum score (1.00) recorded in skyline variety dried by air drying method for 12 days.

Significant difference was recorded in varieties, method and interaction in texture of flower. The variety Top secret, recorded maximum score of texture of flowers (2.62) after drying in visual quality parameters and minimum score (2.23) was recorded in variety skyline. The difference amongst the treatment were significant, this might be due to varietal character of flowers Sindhuja *et al.*, (2017) [12] in Carnation flower. The method microwave drying for 150 second, recorded maximum score (3.26) for texture of flower after drying while minimum score (1.59) of texture is recorded in air drying method for 12 days. It was observed by Safeena and Patil (2013) [9], smooth petal texture was observed in ‘Lambada’ cultivar of rose when embedded in silica gel, because silica gel is composed of a vast network of interconnecting microscopic pores which attracts and hold moisture by the phenomenon known as physical adsorption and capillary condensation. Interaction effect of variety and different method on texture of flower were found significantly. The variety top secret and microwave oven drying method for 90 seconds recorded maximum score (3.85) in texture of flowers. Minimum score of texture (1.37) were recorded in Ravel variety dried by air drying method for 10 days.

Table 1: Effect of different treatments and drying methods of rose varieties on their quality parameters

Treatments variety	Fresh weight of the flower (cm)	Dry weight of flower (cm)	Moisture loss of flowers (%)	Initial diameter of flower (cm)	Diameter of dry flower (cm)	Reduction in diameter of flower (cm)	Appearance of flower	Colour of flowers	Shape of flowers	Texture of flowers	
V1 (Top secret)	8.24	2.69	68.87	2.35	2.15	0.30	2.65	2.75	2.49	2.62	
V2 (Skyline)	7.25	1.72	65.65	2.00	1.65	0.21	2.33	2.31	2.07	2.23	
V3 (Ravel)	7.78	1.74	67.52	2.08	1.75	0.27	2.63	2.63	2.41	2.43	
F test	NS	Sig	NS	NS	Sig	Sig	Sig	Sig	Sig	Sig	
SE (M)	0.29	0.12	1.81	0.10	0.06	0.02	07	0.07	0.07	0.09	
CD at 1%	-	0.46	-	-	0.23	0.06	0.26	0.27	0.27	0.33	
Drying methods											
Air drying	M1	7.75	1.04	78.77	1.96	1.58	0.48	2.37	2.49	1.59	2.00
	M2	8.23	0.97	80.54	2.12	1.59	0.49	1.86	2.04	1.33	1.74
	M3	7.88	0.95	83.46	2.11	1.59	0.47	1.72	1.80	1.16	1.59
Microwave drying	M4	7.69	3.17	53.10	2.34	2.12	0.17	2.44	2.42	2.70	2.40
	M5	7.66	3.14	56.84	2.34	2.10	0.24	3.16	3.27	3.03	3.09
	M6	7.40	2.79	62.66	2.05	2.01	0.15	3.48	3.33	3.26	3.26
	M7	7.99	2.46	63.32	2.02	1.90	0.17	2.23	2.43	2.48	2.39
Hot air oven drying	M8	7.73	2.19	65.83	2.18	1.97	0.11	3.30	3.28	3.24	3.24
	M9	7.47	1.76	68.27	2.18	1.76	0.10	2.27	2.04	2.14	2.11
F test	NS	Sig	Sig	NS	Sig	Sig	Sig	Sig	Sig	Sig	
SE (M)	0.50	0.21	1.81	0.18	0.11	0.03	0.12	0.12	0.12	0.15	
CD at 1%	-	0.79	5.11	-	0.40	0.10	0.45	0.47	0.47	0.57	

(V1) - Top secret (Red)

M1- Air drying for 8 days,

M3- Air drying for 12 days.

M5- Microwave drying for 120 seconds,

M7- Hot air oven drying for 35 hours.

(V2) – Skyline (Yellow)

M2- Air drying for 12 days.

M4- Microwave drying for 90 seconds,

M6- Microwave drying for 150 seconds.

M8- Hot air oven drying for 40 hours

(V3) - Ravel (Pink)

M9- Hot air oven drying for 45 hours

Table 2: Interaction of different treatments and drying methods of rose varieties on their quality parameters

Treatments combinations	Fresh weight of flower	Dry weight of flower	Moisture loss of flowers (%)	Initial diameter of flower	Diameter of dry flower	Reduction in diameter of flower	Appearance of flower	Colour of flower s	Shape of flowers	Texture of flowers
V1M1	8.29	1.15	81.85	1.91	1.94	0.62	2.33	2.63	1.53	2.47
V1M2	8.55	1.07	84.38	2.41	2.09	0.56	1.93	2.20	1.67	2.10
V1M3	7.61	1.05	86.40	2.47	2.01	0.47	1.73	2.00	1.30	2.00
V1M4	7.84	4.03	46.34	2.37	2.11	0.22	2.23	2.30	2.60	2.17
V1M5	8.69	3.59	56.22	2.37	1.97	0.36	2.93	3.23	2.83	2.63
V1M6	8.51	3.26	68.80	2.22	2.03	0.18	3.90	3.90	3.88	3.85
V1M7	8.83	4.04	63.48	2.51	2.39	0.11	2.17	2.37	2.43	2.47
V1M8	8.12	3.60	62.94	2.68	2.60	0.08	3.87	3.84	3.87	3.77
V1M9	7.72	2.47	69.42	2.24	2.17	0.11	2.73	2.30	2.33	2.17
V2M1	7.44	1.00	75.75	1.83	1.28	0.25	2.40	2.47	1.53	1.90
V2M2	8.36	0.90	76.52	1.93	1.21	0.27	1.87	1.87	1.07	1.77
V2M3	7.99	0.91	82.04	1.77	1.28	0.32	1.73	1.73	1.00	1.60
V2M4	7.79	2.57	55.92	2.30	2.03	0.18	2.03	2.07	2.43	1.97
V2M5	6.53	2.88	56.72	2.41	2.17	0.26	3.77	2.90	2.50	2.87
V2M6	6.44	2.39	59.65	1.89	2.07	0.16	3.63	3.50	3.52	3.53
V2M7	6.90	1.76	65.15	2.01	1.73	0.27	2.07	1.93	2.07	2.10
V2M8	6.86	1.55	70.57	2.01	1.56	0.13	2.60	2.50	2.60	2.57
V2M9	6.90	1.54	68.55	1.84	1.50	0.10	1.90	1.83	1.93	1.97
V3M1	7.51	0.98	78.72	2.15	1.52	0.59	2.37	2.37	1.70	1.63
V3M2	7.77	0.94	80.73	2.03	1.47	0.60	1.77	2.07	1.27	1.37
V3M3	8.05	0.88	81.93	2.10	1.49	0.61	1.70	1.67	1.17	1.40
V3M4	7.45	2.91	57.04	2.34	2.23	0.11	3.07	2.90	3.07	3.07
V3M5	7.76	2.95	57.57	2.26	2.16	0.10	3.77	3.68	3.77	3.78
V3M6	7.25	2.71	59.54	2.04	1.93	0.11	2.90	2.60	2.38	2.47
V3M7	8.22	1.57	61.33	1.53	1.57	0.12	2.47	3.00	2.93	2.60
V3M8	8.20	1.41	63.99	1.86	1.76	0.12	3.43	3.41	3.24	3.39
V3M9	7.80	1.27	66.84	2.46	1.62	0.10	2.17	2.00	2.17	2.20
F test	NS	Sig	Sig	NS	NS	Sig	Sig	Sig	Sig	Sig
SE (M)	0.87	0.36	2.42	0.31	-	0.05	0.20	0.22	0.22	0.27
CD at 1%	-	1.37	8.85	-	-	0.18	0.77	0.81	0.82	0.99

V1M1- Air drying for Top secret for 8 days,
V1M2- Air drying for Top secret for 10 days,
V1M3- Air drying for Top secret for 12 days,
V1M4- Microwave drying for Top secret for 90 seconds,
V1M5- Microwave drying for Top secret for 120 seconds,
V1M6- Microwave drying for Top secret for 150 seconds
V1M7- Hot air oven for Top secret for 45°C for 35 hours.
V1M8- Hot air oven for Top secret for 45°C for 40 hours
V1M9- Hot air oven for Top secret for 45°C for 45 hours

V2M1- Air drying for Skyline for 8 days
V2M2- Air drying for Skyline for 10 days
V2M4- Microwave drying for Skyline for 90 seconds
V2M5- Microwave drying for Skyline for 120 seconds,
V2M6- Microwave drying for Skyline for 150 seconds
V2M7- Hot air oven for Skyline for 45°C for 35 hours,
V2M8- Hot air oven for Skyline for 45°C for 40 hours
V2M9- Hot air oven for Skyline for 45°C for 45 hours,

V3M1- Air drying for Ravel for 8 days.
V3M2- Air drying for Ravel for 10 days
V3M3- Air drying for Ravel for 12 day,
V3M4- Microwave drying for Ravel for 90 seconds
V3M5- Microwave drying for Ravel for 120 seconds,
V3M6- Microwave drying for Ravel for 150 seconds
V3M7- Hot air oven for Ravel for 45°C for 35 hours,
V3M8- Hot air oven for Ravel for 45°C for 40 hours
V3M9- Hot air oven for Ravel for 45°C for 45 hours

C. Storage studies of flowers for 2 months

Storage study of flowers was observed after drying of flowers and stored in cardboard boxes.

Extent of colour on storage

A - More Bright colour B - Bright colour
C - Colour fading D - More colour fading E - Dull colour

Table 3: Extent of Colour of dry flowers influenced by varieties and drying methods

Treatments	15 days	30 days	45 days	60 days
V1M1	E	E	E	E
V1M2	E	E	E	E
V1M3	E	E	E	E
V1M4	B	B	B	B
V1M5	B	B	B	B
V1M6	B	B	B	C
V1M7	B	B	B	B
V1M8	B	B	B	B
V1M9	B	B	B	B
V2M1	E	E	E	E
V2M2	E	E	E	E
V2M3	E	E	E	E
V2M4	B	B	C	C
V2M5	B	C	C	C
V2M6	B	C	C	C
V2M7	B	B	C	C
V2M8	B	C	C	C
V2M9	B	C	C	C
V3M1	E	E	E	E
V3M2	E	E	E	E
V3M3	E	E	E	E
V3M4	B	C	D	D
V3M5	B	C	D	D
V3M6	B	C	D	D
V3M7	B	C	D	D
V3M8	B	C	D	D
V3M9	B	C	D	D

Flowers dried by different drying methods are stored in cardboard boxes for two months and storage observation was recorded after 15, 30, 45 and 60 days after flower drying.

The treatment V1M1 (air drying on top secret for 8 days), V1M2 (air drying on top secret for 10 days) and V1M3 (air drying on top secret for 12 days) reported dullness of flower colour in storage after 15, 30, 45 and 60 days of flower drying.

The treatments V1M4 i.e. microwave drying for Top secret for 90 seconds, V1M5 i.e. microwave drying for Top secret for 120 seconds observed bright colour in storage after 15, 30, 45 and 60 days of flower drying, and treatment V1M6 i.e. microwave drying for Top secret for 150seconds reported bright colour in storage after 15, 30 and 45 days while colour fading of flower was observed 60 days after flower drying in storage.

The treatment V1M7 (hot air oven on top secret for 45°C for 35 hours), V1M8 (hot air oven on top secret for 45°C for 40 hours) and V1M9 (hot air oven on top secret for 45°C for 45hours) flowers observed bright in colour after 15, 30, 45 and 60 days of flower drying in storage.

The treatments V2M1 (air drying on skyline for 8 days), V2M2 (air drying on skylinefor 10 days) and V2M3 (air drying on skyline for 12 days) reported dullness of flower colour in storage after 15, 30, 45 and 60 days of flower drying.

The treatments V2M4 i.e. microwave drying for skyline for 90 seconds reported bright colour of flower after 15 and 30 days of storage and colour fading of flower was observed after 45 and 60 days of flower drying in storage. In V2M5 i.e. microwave drying for skyline for 120seconds, bright colour of flower was observed after 15 days of flower drying in storage, while colour fading of flowers was reported in storage after

30, 45 and 60 days of flower drying. The treatment V2M6 i.e. microwave drying for skyline for 150 seconds, bright colour of flowers was observed after 15 days of flower drying in storage and colour fading of flower was recorded after 15, 30 and 60 days of flower drying in storage.

The treatments V2M7 i.e. hot air oven on skyline for 45°C for 35 hours, observed bright colour of flowers after 15 and 30 days in storage and colour fading was reported after 45 and 60 days after flower drying in storage. Treatment V2M8 i.e. hot air oven on skyline for 45°C for 40 hours, bright colour of flower was observed after 15 days of flower drying in storage and colour fading of flowers was observed after 30, 45 and 60 days of flower drying in storage. The treatment V2M9 i.e. hot air oven on skyline for 45°C for 45 hours observed, bright colour of flower after 15 days of flower drying in storage and colour fading of flowers was observed after 30, 45 and 60 days of flower drying in storage.

The treatment V3M1 (air drying for ravel for 8 days), V3M2 (air drying for ravel on 10 days) and V3M3 (air drying on ravel for 12 days) reported dullness of flower colour in storage after 15, 30, 45 and 60 days of flower drying.

The treatment V3M4 (microwave drying on ravel for 90 seconds), V3M5 (microwave drying on ravel for 120 seconds) and V3M6 (microwave drying on ravel for 150 seconds) reported brightness of flower after 15 days, colour fading of flower after 30 days, and more colour fading of flower after 45 and 60 days of flower drying in storage.

In treatment V3M7 (hot air oven on ravel at 45°C for 35 hours), V3M8 (hot air oven on ravel at 45°C for 40 hours) and V3M9 (hot air oven on ravel at 45°C for 45 hours) observed brightness of flower after 15 days, colour fading of flower after 30 days, and more colour fading of flower after 45 and 60 days of flower drying in storage.

There was no fungal infection observed within 2 month storage of Dutch rose dried flower in experiment.

Conclusion

Drying the Dutch rose flowers in Microwave oven for 150 seconds by desiccating in silica gel was found to be the best. Top secret variety of Dutch rose was found to be best in all the quality parameters. Minimum flower appearance, colour, shape and texture score was recorded in air drying method.

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