

Evaluation of the Colour of Dried Dutch Rose Flowers Using a Colorimeter

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Abstract

The visual appearance of flowers, fresh fruits and vegetables is one of the first quality determination made by the consumer. Often the appearance of the commodity is the most critical factor in the initial sale. The flower colour of fresh and dried Dutch rose varieties at Regional Horticultural Research and Extension Centre, UHS (Campus) GKVK, Bengaluru was documented using a Minolta CR-10 portable tristimulus colorimeter. With the colorimeter, flower chromaticity was recorded in Commission Internationale d' Eclairage L*, C* and h° colour space coordinates. In this system of colour representation the values L*, C* and h°, where L value corresponds to the brightness of the flower, C describes the intensity of the colour and h° represents the hue angle. The colorimeter, however, allowed the description of colours that fell between the colour charts and had the ability to compare the specific colour attributes of different varieties of similar and different colour. The ability to interpolate colours with the colorimeter allows a greater precision in documentation and discrimination of flower colour.

Keywords: Dutch rose; Minolta CR-10 colorimeter; Lightness; Chroma; Hue angle

Introduction

Rose as cut flower has great demand in the internal as well as export markets. The demand for cut flowers is increasing day by day with the increasing standard of living, aesthetic sense and awareness in the people. Fresh rose flowers though exquisite in their beauty are highly perishable and delicate in nature and cannot retain their beauty and fresh look for a long time in spite of using best chemicals for enhancing vase life. Moreover, there is a non-availability of fresh flowers all-round the year in all places [1]. In this context rose flowers can be dried, preserved and processed to retain its beauty as well as everlasting value. Dried flowers are long lasting, can be used several times and also meet the decorative demand throughout the year [2]. With growing eco-consciousness, the use of more and more nature-friendly things like dry flowers come as a natural choice for decoration. The life of dried flowers varies according to the species, texture of their petals and total consistency of flowers. Dried flowers can be effectively used for making decorative floral craft items for interior decoration and commercial exploitation [3]. Considering the potential of Dutch roses in dry flower trade, the present studies were undertaken to evaluate the colour of dried Dutch rose flowers of different drying methods using a colorimeter Minolta CR-10. It was selected as an improved colour measurement to more accurately describing the colour.

Materials and Methods

Dutch rose flowers were evaluated on the plants that were grown under greenhouse condition. Flower petals of both fresh and dried flowers was measured under natural daylight conditions using the colorimeter. The colour parameters corresponding to the uniform colour space CIELAB were obtained directly from the apparatus.

Colour measurements: Colour measurements of the surface colour of fresh and dried flower petals of Dutch rose varieties (Taj Mahal, Gold Strike, Noblesse, and Avalanche) were evaluated with Minolta CR-10 colorimeter at CIE D65/2° illuminative/viewer conditions. Parameters measured were L* (brightness), C* (chroma) and h° (hue angle). The colours were expressed as CIE L*, C* and h° values and the average of five flowers of each varieties was used. The CIE L*C* h° system is a one colour system that takes into account all aspects to describe colour. The L* describes the lightness of the colour, its an appropriate measurement of luminosity, which is the property according to which each colour can be considered as an equivalent to a number of the gray scale, between black and white taking values within the range 0-100.

The C* describes the chroma (saturation) of the colour, a measure of how far from the grey tone the colour is. The higher the C* value the more saturated the colour is. The last parameter h°, describes the hue of the colour, i.e. colour tonalities (red, green, yellow etc.). This is based on the CIE L*C* h° system [4,5]. A red colour has h° around 0° while yellow is described by h° around 90°. In this way, it's easy to predict that for instance h°-45° corresponds to orange.

Dried flower of two different drying methods viz., Air drying and Hot air oven drying were assessed for colour by using colorimeter.

Results and Discussion

The data pertaining to the lightness, chroma and hue angle of fresh and dried Dutch rose flowers is presented in Table 1.

Influence of lightness, chroma and hue angle of fresh flowers using colorimeter had showed significant difference with respect to Dutch rose varieties, maximum lightness (87.18) was recorded in var. Avalanche. Whereas, it was minimum (20.33) in var. Taj Mahal. With respect to the chroma (saturation) maximum was in var. Gold Strike (60.40) and it was minimum with var. Noblesse (20.10). The highest hue angle was noticed in the var. Avalanche (97.02°), minimum was recorded in var. Taj Mahal (5.20°). This is supported by Ayala-Silva et

al. [6] where he opined that the colorimeter was more precise and more informative than Royal Horticultural Society Colour Chart while describing amaryllis flower colour.

Among different drying methods significant lightness was recorded (67.83%) highly under hot air oven drying. While it was lowest (65.70%) under air drying method, with respect to the chroma and hue angle was found non-significant.

Interaction effect of varieties and drying methods with respect to lightness and hue angle was found significant but for chroma it was non-significant. Maximum lightness and hue angle was with treatment combination V4D2 (var. Avalanche x Hot air drying) which recorded highest lightness of 88.47 and V4D2 (var. Avalanche x Hot air drying) 88.47°. Whereas, lowest lightness was recorded in treatment combination V1D2 (var. Taj Mahal x Hot air drying) (19.40), minimum hue angle was observed in V1D1 (var. Taj Mahal x Air drying) (5.03°) respectively.

There was significant difference for lightness, chroma and hue angle between the varieties of dried Dutch roses at zero days after storage days. Among dried Dutch rose varieties maximum lightness (77.60) was recorded in var. Avalanche, while it was lowest (20.12) in var. Taj Mahal. With respect to the chroma (saturation) maximum was in var. Gold Strike (54.72) and minimum was with var. Noblesse (26.07). Maximum angle of hue was recorded in var. Avalanche (90.53°). Whereas, minimum was recorded in var. Taj Mahal and was nearer to the original red colour (2.00°). This result is in confirmative with the findings of Misra et al. (2003) observed that after dehydration, yellow and pink flowers retain their colour properly, but white become off-white, red, blue and darker flowers becomes considerably dark.

Non-significant results were obtained for lightness, chroma and hue angle with respect to drying methods and among interactions.

Significant difference was recorded in dried Dutch rose varieties maximum Lightness at 30 and 60 days after storage was recorded in var. Avalanche (74.03) and var. Noblesse (69.52), and it was lowest in

var. Taj Mahal (20.58 and 19.90). With respect to the chroma (saturation) at 30 and 60 days after storage, maximum was with var. Gold Strike (46.73 and 41.95) respectively. Whereas, minimum was with var. Avalanche at 30 and 60 days after storage (24.48 and 22.78). Maximum angle of hue at 30 and 60 days after storage was recorded in var. Avalanche (85.67° and 81.02°). Whereas, minimum was recorded in var. Taj Mahal and was nearer to the original red colour (2.65° and 3.52°). This is in agreement with the findings of Donald H. Voss. [7] opined that instrumental measurement for visual color evaluation, thereby providing more accurate color notation and avoiding pitfalls of visual evaluation.

There was significant difference among the drying methods with respect to lightness, chroma and hue angle at 30 and 60 days after storage. Maximum lightness (61.47), chroma (33.87) and hue angle (57.61) at 30 days and at 60 days after storage lightness (61.28), chroma (35.03) and hue angle (57.78) was recorded for flowers dried under hot air oven drying method, in which most the varieties were nearer to their original colours and the least was noticed in the air drying method at 30 and 60 days after storage for lightness (55.59 and 52.87), chroma (27.53 and 24.50) and hue angle (53.83° and 51.30°).

Interaction effect of varieties and drying method had found highly significant with respect to the lightness and hue angle but with respect to chroma (saturation) it was found non-significant at 30 days after storage. Treatment combination V3D2 (var. Noblesse x Hot air oven drying) recorded maximum lightness (79.03) at 30 and 60 days after storage (80.03) under hot air oven drying. Whereas, minimum (19.77) was noticed in treatment combination V1D1 (var. Taj Mahal x air drying) at 30 days and 60 days after storage (17.39) under hot air oven drying. However maximum angle of hue was noticed in the treatment combination V4D1 (var. Avalanche x air drying) (88.50°) at 30 and 60 days after storage (87.20°). However, it was minimum in V1D1 (var. Taj Mahal x air drying) (3.47°) treatment combination, at 30 and 60 days after storage (4.47°) in V1D1 (var. Taj Mahal x air drying) under hot air oven drying.

Treatments	Fresh flowers			Dry flower (0' DAS)			Dry flower (30 DAS)			Dry flower (60 DAS)		
	L*	C*	h0	L*	C*	h0	L*	C*	h0	L*	C*	h0
Variety(V)												
V1-Taj Mahal	20.33	54.28	5.20	20.12	23.08	2.00	20.58	24.73	2.65	19.90	26.40	3.52
V2-Gold Strike	80.32	60.40	86.42	70.92	54.72	81.48	66.18	46.73	78.30	64.56	41.95	77.48
V3-Noblesse	79.22	20.10	57.47	72.27	26.07	56.68	73.32	26.85	56.25	74.32	27.92	56.15
V4-Avalanche	87.18	22.95	97.02	77.60	28.42	90.53	74.03	24.48	85.67	69.52	22.78	81.02
S. Em ±	0.48	0.89	1.07	1.98	2.36	1.03	0.84	1.96	0.77	0.80	1.19	1.02
C.D. at 5%	1.42	2.68	3.20	5.93	7.09	3.08	2.53	5.86	2.32	2.39	3.58	3.06
C.D. at 1%	1.96	3.69	4.41	8.17	9.77	4.24	3.49	8.08	3.19	3.30	4.93	4.21
Drying method (D)												
D1-Air drying	65.70	38.38	60.59	58.59	32.33	57.36	55.59	27.53	53.83	52.87	24.50	51.30
D2-Hot air-oven	67.83	40.48	62.46	61.86	33.82	57.99	61.47	33.87	57.61	61.28	35.03	57.78
S. Em ±	0.34	0.63	0.76	1.40	1.67	0.73	0.60	1.38	0.55	0.56	0.84	0.72
C.D. at 5%	1.01	1.89	NS	NS	NS	NS	1.79	4.15	1.64	1.69	2.53	2.16

C.D. at 1%	1.39	NS	NS	NS	NS	NS	2.46	5.71	2.26	2.33	3.48	2.98
Interaction effect (V x D)												
V1D1-Taj Mahal x Air drying	21.27	53.43	5.03	20.40	22.50	2.33	19.77	21.40	3.47	17.39	21.00	4.47
V1D2-Taj Mahal x Hot air oven	19.40	55.13	5.37	19.83	23.67	1.67	21.40	28.07	1.83	22.40	31.80	2.57
V2D1-Gold Strike x Air drying	78.97	58.57	85.93	70.73	52.83	80.83	62.97	40.87	76.30	61.84	35.13	75.30
V2D2-Gold Strike x Hot air oven	81.67	62.23	86.90	71.10	56.60	82.13	69.40	52.60	80.30	67.28	48.77	79.67
V3D1-Noblesse x Air drying	76.67	19.43	58.93	66.30	26.83	55.17	67.60	24.20	52.70	68.60	20.20	50.60
V3D2-Noblesse x Hot air oven	81.77	20.77	56.00	78.23	25.30	58.20	79.03	29.50	59.80	80.03	35.63	61.70
V4D1-Avalanche x Air drying	85.90	22.10	92.47	76.93	27.13	91.10	72.03	23.67	82.83	63.63	21.67	74.83
V4D2-Avalanche x Hot air oven	88.47	23.80	101.57	78.27	29.70	89.97	76.03	25.30	88.50	75.40	23.90	87.20
S. Em±	0.67	1.26	1.51	2.80	3.34	1.45	1.19	2.77	1.09	1.13	1.69	1.44
C.D. at 5%	2.01	NS	4.53	NS	NS	NS	3.58	NS	3.28	3.39	5.06	4.33
C.D. at 1%	2.77	NS	6.24	NS	NS	NS	4.93	NS	4.52	4.67	6.97	5.96

Table 1: Influence of drying method on Lightness, Chroma and Hue angle of dried Dutch roses at zero, 30DAS and 60 DAS. L*=lightness/brightness of the colour, C*=chroma (saturation) of the colour and h0=hue of the colour, i.e., colour tonalities (red, green, yellow). DAS-Days after storage. '0' DAS (zero days) i.e., immediately after drying of flowers

The L* C* h° colour space is presently one of the most popular colour space for measuring object colour and is widely used in virtually in all fields. Colorimeter express colours numerically according to international standards. By expressing colours in this way, it makes it possible for anyone to understand what colour is being expressed. The measurements from the colorimeter could allow the identification of a cultivar or variety by any single attribute (lightness, chroma or hue) so that the colour differences may be noted more specifically. The ability to accurately describe a varieties colour greatly enhances the informational content of the data.

The colorimeter has been used to document fruit colour in mango [8]; tomato [9]; watermelon [10], pears and pepper [11] and food products such as meat colour [12] and wheat flour [13]. The procedures described here are applicable to a wide variety of specimens; the only exceptions are species of inappropriate size and shape for an instruments measuring aperture. The Minolta CR-10 colorimeter was selected as an improved colour measurement to more accurately describe colour than the RHSCC (Royal Horticultural Society, 2001) and other colour charts available (i.e. Gretag Macbeth Colour Checker).

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