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*RESEARCH PAPER*

# Effect of drying methods and packaging on retention of carotenoid pigment in dried petals of marigold cv. seracole

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**Abstract :** An experiment was conducted in Department of Horticulture, Assam Agricultural University, Jorhat, to study the effect of drying methods and packaging on retention of carotenoid content in dried petals of marigold cv. Seracole during 2016-2017. Petals were subjected to drying employing three different methods *viz.,* sun drying, shade drying and cabinet drying. Among the various drying methods tested, cabinet drying gave the highest carotenoid content (337.64µg/g) compared to the other methods. Three different packaging materials *viz*., LDPE 200 gauge, LDPE 300 gauge and LDPE 400 gauge were utilized for the experiment. The carotenoid content was highest in the first month with LDPE packaging materials of 400 gauge (270.47 µg/g), 300 gauge (269.64 µg/g) and 200 gauge (266.94 µg/g) which decreased with advancement of storage period.

**Key Words :** Marigold, Carotenoid, Drying methods, Packaging, LDPE

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## INTRODUCTION

Marigold (*Tagetes erecta*) is one of the most commonly grown commercial flower crops in India. Commercially marigold is grown for loose flower production throughout the Country, especially in the plains. In India, it ranks first among loose flowers followed by chrysanthemum, Jasmine, tuberose and crossandra (Kavitha and Anburani, 2009). Marigold petals are rich source of carotenoids where xanthophyll is a major carotenoid fraction. Gonzalez de *et al*. (1997) reported that marigold fresh petals or as dried powder can be used as food colourant and ingredient in cooking, in the form of spice, tea or medicine (tinctures, ointments and creams). The finding of Handelman *et al.* (1999) indicated that higher intake of carotenoids such as lutein and zeaxanthin reduced the risk of age-related macular degeneration in the retina of eye. The carotenoids extracted from petals of marigold are the major source of pigment for poultry industry as a feed additive to intensify the yellow colour of egg yolks and broiler skin which was reported by Narsude *et al.* 2010 and Kaul *et al* in 1997. The petals are dried in such condition that maximum carotenoids retain in them. These dried petals and concentrates are used as feed additives to improve the pigmentation of the poultry skin and the eggs yolk.

Drying is an important process for handling raw

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materials in order to prolong shelf-life, as the drying process limits microbial growth. Since the availability of marigold flower is seasonal, flower preservation becomes vital in the extraction of marigold oleoresin as well as carotenoid. For long term storage and use, proper packing is a must for any product since dried product has a tendency to absorb moisture quickly from the atmosphere. If flowers are not properly stored and preserved, carotenoid content will decrease. Proper drying and storage are prerequisite to inhibit carotenoid degradation and prolong their shelf life, thereby enhancing market value of the product. Keeping these in view, the present investigation was undertaken to standardize the drying methods and packaging for retention of carotenoid in dried marigold petal.

## Material and Methods

A Completely Randomized Block Design experiment was carried out at the Department of Horticulture, Assam Agricultural University, Jorhat. Three different drying methods *viz.,* sun drying, shade drying and cabinet drying along with three different packaging materials *viz.,* LDPE 200 gauge, LDPE 300 gauge and LDPE 400 gauge were utilized for drying and packaging the marigold petals. For sun drying the sample was spread on paper and was kept in open sun (air temperature). The sample was dried till constant moisture content was achieved. In case of shade drying, marigold petals were dried under ambient condition of 30±2°C of room temperature under shade and was dried till constant moisture content was achieved.The cabinet drier (NISCO make, Universal Oven) was used for cabinet drying of the marigold petals. The trays containing the samples were placed inside the cabinet drier maintained at 60±2°C and was dried till constant moisture content was achieved.

The moisture content of the samples were determined by oven drying as:

$$\text{\% moisture content (Wet basis)} = \frac{\text{Loss of weight after drying (g)}}{\text{Fresh weight (g)}} \times 100$$

The dried petals of marigold after drying at the best drying method were packed in 200, 300 and 400 gauge LDPE packets of size (30cm×15cm)and stored at ambient temperature (23-30°C) for four months. The analysis of total carotenoid of the packed petals was determined at one month interval according to Rodriguez-Amaya (1999).

## Results and Discussion

Data revealed that there was significant difference among the different drying methods. Considering the residual moisture, the highest carotenoid (337.64 µg/g) was recorded in cabinet drying method followed by shade drying (195.56 µg/g), which was at par with sun drying (187.37 µg/g). However, on moisture free basis, higher

**Table: 1 Moisture (%) and carotenoid content (µg/g) in marigold petals as influenced by drying methods**

| Treatments | Moisture content (%) | A | B |
|---|---|---|---|
| Sun drying | 11.83 ± 0.21b | 187.37±6.38b | 213.73±7.73b |
| Shade drying | 12.5± 0.30a | 195.56±1.03b | 222.08±0.93b |
| Cabinet drying | 8.74±0.15c | 337.64±8.04a | 371.02±8.84a |
| S.E.± | 0.18 | 4.87 | 5.55 |
| C.D. (P=0.05) | 0.46 | 11.90 | 13.59 |

(A: Carotenoid content considering residual moisture) (B: Carotenoid content on moisture free basis)

**Table 2 : Carotenoid content (µg/g) in different storage period using different packaging material**

| Month | 200 gauge | 300 gauge | 400 gauge | Mean |
|---|---|---|---|---|
| 1st | 266.94 | 269.64 | 270.47 | 269.01 |
| 2nd | 209.03 | 219.67 | 221.51 | 216.74 |
| 3rd | 180.70 | 187.78 | 192.44 | 186.97 |
| 4th | 105.22 | 148.37 | 152.38 | 135.32 |
| Mean | 190.47 | 206.36 | 209.20 | |
| S.E.± | 2.06 | 1.03 | 1.18 | |
| C.D. (P=0.05) | 4.25* | 2.12** | 2.45*** | |

*(Month × packaging material), ** (Packaging material), ***(Month)

levels of carotenoid were detected for all the three methods of drying. The highest carotenoid (371.02 μg/g) was recorded in cabinet drying method followed by shade drying (222.08 μg/g), which was at par with sun drying (213.73 μg/g). The initial moisture content (67.76%, fresh basis) was reduced to final moisture content 8.74%, 12.5% and 11.83% in a period of 18 hours, 72 hours and 48 hours for cabinet drying, shade drying and sun drying, respectively.

The interaction between months and packaging material exhibited significant difference for carotenoid in dried petal. It is evident from the data that the maximum carotenoid content (μg/g) was recorded after the first month of storage in packaging material 400 gauge (270.47), 300 gauge (269.64) and 200 gauge (266.94). The total carotenoid content decreased with advancement of storage period for all three packaging materials. materials of lower thickness.

The carotenoid content was the highest for cabinet drying because, in cabinet drying a comparatively higher temperature, low relative humidity and constant air flow prevailed which might have attributed to faster drying rate and consequent reduced loss of carotenoid due to oxidation (Singh *et al.,* 2008). Singh *et al*. (2008) reported similar results and obtained better retention of total carotenoid in cabinet drying method. Ahluwalia *et al.* (2014) studied the influence of different drying methods on chemical constituents and functional properties of marigold petals from three varieties *viz.,* Pusa Basanti Gainda, Pusa Narangi Gainda and Solan1. The marigold flower petals were dried by four methods *viz.,* vacuum drying, cabinet drying, fan drying and solar drying. They reported that the vacuum dried samples retained better quality although, the cabinet dried samples had comparative quality and it was found to be more economical. on moisture free basis, higher levels of carotenoid were detected for all the three methods of drying. Kushwaha (2012) reported that loss of moisture caused an increase in condensation of nutrients in the onion leaves. In case of sun drying the petals were directly exposed to sunlight which caused oxidation of pigments. The method of sun drying was not efficient in moisture removal. This might be due to low air temperature, high relative humidity and poor air flow. Similarly, in case of shade drying longer drying period might caused oxidation of carotenoid. Matouk *et al*. (2016) reported that drying rate of "pot marigold" whole flowers and petals increased with the increase of drying air temperature while, it was decreased with the increase of relative humidity. They observed that in general, the drying at air temperature of 70°C and relative humidity of 40 % achieved the best quality in terms of total carotenoids. Drying of pot marigold petals showed higher content of total carotenoids at shorter drying time.

Carotenoid content was highest in the first month with LDPE packaging materials of 400 gauge, 300 gauge and 200 gauge which decreased with advancement of storage. The results indicated that the thickness of packaging materials was having effect on total carotenoid content of the stored petals. It was found that petals stored at packet made of 400 gauge LDPE retained the carotenoid to the highest level in comparison to the other two packaging materials of lower thickness. It might be due to entry of moisture and air into the packaging of lower thickness. Similar findings were reported by Singh *et al.* (2008) for storing marigold. Sagar *et al.* (1997) reported that 400 gauge LDPE packets were far better than 200 gauge LDPE and 150 gauge polypropylene packets for storing onion powder.

## REFERENCES

**Ahluwalia, P., Kaur, A. and Dhillon, G (2014).**Effect of different drying methods on chemical and functional properties of marigold petals. *Internat. J. Food & Nutritional Sci.,* **3** (4) : 2320 - 7876.

**Gonzalez, M.E., Loarca-Pina, G. and Ramos-Gomez, M. (1997).** Antimutagenicity of xanthophylls present in aztec marigold (*Tagetes erecta*) against 1-nitropyrene *Mutation Res.,* **389** : 219 - 226.

**Handelman, W.L., Watkins, R.H., Levy, L.W., Regalado, E., Rivadeneira, D.M., Van Breemen, R.B. and Schwartz, S.J. (1999).** Carotenoid composition of marigold (*Tageteserecta*) flower extract used as nutritional supplement. *J. Agric & Food Chem.,* **47**: 4189-4194 .

**Kaul, V. K., Singh, B. and Sood, R.P. (1997).** *Cultivation and utilization of aromatic plants.* CSIR, Jammu, pp. 255-261.

**Kavitha, R. and Anburani, A. (2009).** Genetic diversity in African marigold (*Tagetes erecta* L.) genotypes. *J. Orn. Hort.,* **12** (3): 198 - 201.

**Kushwaha, S. (2012).** Comparative effect of cabinet, microwave and freeze drying on physical and nutritional quality of onion stalks. *Asian J. Exp. Bio. Sci.,* **3** : 531-535.

**Matouk, A.M., Elkholy, M.M., Tharwat, A. and Marwadat, N. (2016).** Drying of pot marigold whole flowers and petals under controlled drying air temperature and relative humidity. *J. Soil*

*Sc. An Agric. Eng. Mansoura Univ.,* **72** : 221-230.

**Narsude, P.B., Kadam, A.S. and Patil, V.K. (2010).** Studies on the growth and yield attributes of different African marigold (*Tageteserecta* L.) genotypes under Marathwada conditions.*The Asian J. Hor.*, **5** (2): 284-286.

**Rodriguez-Amaya, D.B. (1999).**Changes in carotenoids during processing and storage of foods. *Archivos Latino americanos de Nutrition,* **49**: 385-475.

**Sagar, V.R. and Maini, S.B. (1997).** Studies packaging and storage of onion powder. *Indian Food Packer*, **41** : 234-240.

**Singh, D. and Misra, K.K. (2008).** Genetic variability in quantitative characters of marigold. *Indian J. Hort.*, **65** (2): 187-192.

**Singh, D. and Kumar, S. (2008).** Studies on genetic variability, heritability, genetic advance and correlation in marigold. *J.Orn. Hort.*, **11** (1) : 27-31.