Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 6 Special issue [3] 2017: 40-45

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
Global Impact Factor 0.533
Universal Impact Factor 0.9804
NAAS Rating 4.95

FULL LENGTH ARTICLE **OPEN ACCESS**

Standardization of drying technique for different bark materials for making potpourris

G. Sunil Kumar[1*], R. Nagaraju[1], K. Swarajyalakshmi[1] and M. Balakrishna[1]
Department of Postharvest Technology, College of Horticulture, Anantharajupeta, Dr. YSR Horticultural University, Anantharajupeta, Kadapa District, Andhra Pradesh-516105, India. *Email for correspondence – sunilkumarpht.13@gmail.com

ABSTRACT
The present study entitled Standardization of drying technique for different bark materials for making potpourris was conducted at Postharvest Technology Laboratory, College of Horticulture, Anantharajupeta, Andhra Pradesh during the year 2017 under Dr. YSR Horticultural University. For the present experiment five different bark materials were used viz., T_1 (Eucalyptus bark), T_2 (Guava bark) T_3 (Royal palm leaf sheath) T_4 (Tamarind bark) T_5 (Coconut spathe) and these materials were subjected to five drying methods like D_1 (Air drying) D_2 (Sun drying), D_3 (Silica gel drying) D_4 (Hot air oven drying) D_5 (Microwave oven). Data recorded on different parameters were subjected to statistical analysis with factorial CRD. Among the bark materials selected for study tamarind bark retained maximum dry weight (97.00 g) when dried in microwave oven, D_3T_4 (hot air oven drying + tamarind bark)*. Whereas, lowest dry weight of bark (39.33 g) was recorded in D_3T_5* (silica gel drying *+ royal palm leaf sheath). Highest* moisture loss *for different bark materials was recorded in D_4T_5 (hot air oven + Coconut spathe)* (87.00%), *whereas lowest was in D_5T_4* (microwave oven + Tamarind *bark)* (3.00%). *Among bark material tried for dehydration in Air drying method, minimum number of 2 days was taken to dry Eucalyptus bark and the maximum was found for Royal palm leaf sheath (7 days). Among the Sun drying method,* Royal *palm sheath dried quickly with in 1 day under sun, while maximum time was taken to dry* Tamarind *bark (4 days). The barks which were kept in Silica gel drying method found to be best in losing their moisture in a short period where the drying process completed within 1 day for both Eucalyptus bark and* Tamarind *bark. Whereas,* Coconut *spathe took maximum (4 days) duration. Drying temperature influenced significantly to dry different barks in hot air oven drying at 65^0c where, tamarind bark took minimum duration (10 hours) and* Royal *palm leaf sheath took maximum of 26 hours* to dry*. Under* microwave oven *drying process* Guava *bark,* Royal *palm leaf sheath and Tamarind bark took minimum time of 4 minutes to dry, while maximum was taken by* Coconut *spathe (5.30 minutes).*
Keywords – *Barks, dehydration, air drying, sun drying, silica gel drying, hot air oven, microwave drying, potpourri.*

Received 23.07.2017 Revised 10.08.2017 Accepted 25.08. 2017

INTRODUCTION

Drying is a method to remove moisture from the barks and other plant parts. Dried and preserved ornamental products offer a wide range of qualities like novelty, longevity, aesthetic properties, flexibility and year round availability (Joyce, 1998). The range of dried flowers and other attractive plant parts is quite extensive, namely, roots, shoots, stems, buds, flowers, inflorescences, fruiting shoots, fruit peel, fruits, cones, seeds, foliage, bracts, thorns, barks, lichens, fleshy fungi, mosses and selaginella (Deshraj, 2001). Dried flowers and foliage are used for making decorative floral segments like wall hangings, landscape calenders, potpourris *etc.,* for various purposes with potpourris being the major segment of drying flower industry valuing at Rs. 55 crores in India alone (Nirmala *et al*., 2008). In India industry provides direct employment to around 15,000 persons and indirect employment to around 60,000 persons. Nearly 60% of the raw materials sourced from natural forests and plains, only 40% of the flowers are cultivated for drying, bleaching and coloring. Easy availability of products from forests, possibility of manpower available for labour intensive craft making and availability of wide range of products throughout the year are the reasons for development of dry flower industry in India. Potpourris are used for income generation through drying different plant parts will be helpful to self help groups, young entrepreneur, and unemployees *etc*., even for empowering women in rural households by income

generation. In present modern days people preference towards aesthetic products like floral segments, wall hangings, landscapes, calendars, potpourris, dry landscapes *etc.,* is increasing day by day.
Eucalyptus is a large genus of mostly large trees of the Family Myrtaceae. The appearance of eucalyptus bark varies with the age of the plant, the manner of bark shed, the length of the bark fibres, the degree of furrowing, the thickness, the hardness, and the colour. In many species, the dead bark is retained. Guava bark is smooth and reddish brown in color. The bark was also shown to exhibit antibacterial effects. *Roystonea regia*, commonly known as the Cuban royal palm, best known as an ornamental, *R. regia* is also used as a source of thatch, construction timber. Tamarind (*Tamarindus indica*) is a leguminous tree in the family Fabaceae indigenous to Tropical Africa. The tamarind is a slow-growing, long-lived, massive tree reaches and has dark-gray, rough, fissured bark. Mainly used for culinary purpose. The coconut inflorescence is enclosed in a double sheath or spathe, the whole structure known as a 'spadix' which is borne singly in the axil of each leaf. It is used for drying purpose.

MATERIALS AND METHODS

The present study entitled Standardization of drying technique for different bark materials for making potpourris was conducted at Postharvest Technology Laboratory, College of Horticulture, Anantharajupeta during 2016- 17. For the present experiment different bark materials used *viz.,* Eucalyptus bark, guava bark, royal palm leaf sheath, tamarind bark, coconut spathe. Drying of bark materials were dried under various dehydration methods used *viz.,* air drying, sun drying, hot air oven and microwave oven drying and silica gel drying to carry out present experiment. 100 g of bark materials was taken to carried out the experiment and replicated thrice. The experiment was laid out in Factorial Completely Randomised Design with factorial concept with 5 plant materials (F_1) and 5 drying methods (F_2) and their combinations (25) (F_1 X F_2). These combinations were replicated thrice. Observations were recorded for dry weight, moisture loss (%), time taken for drying. The data collected were analyzed statistically using factorial completely randomized design as per the procedure outlined by Panse and Sukhatme (1985) and valid conclusions were drawn only on significant differences between treatments mean at 0.05 per cent level of significance.

RESULTS AND DISCUSSION

Dry weight (g)

There were significant differences among the plant materials with respect to the dry weight of bark (Table 4.1). Among the different bark materials tried maximum mean bark dry weight was retained in T_4 (Tamarind bark) (92.60 g) followed by T_2 (Guava bark) (89.80 g), while minimum was observed in T_5 (Coconut spathe) (43.60 g**)** and followed by T_3 (Royal palm leaf sheath) (78.73 g).With respect to drying methods, highest mean dry weight was recorded in D_5 (Microwave oven) (83.87 g) followed by D_3 (Silica gel drying) (78.00 g), while minimum was noticed in D_1 (Air drying) (71.80 g) followed by D_4 (Hot air oven) (73.20 g).The data presented in Table 4.1 interaction effects of bark materials and drying methods were found to be significant under study with dry weight of bark. Dry weight of bark was recorded in D_5T_4 (Microwave oven drying + Tamarind bark) (97.00 g) was highest, which was statistically on par with D_3T_4 (Silica gel drying **+** Tamarind bark) (96.67 g), whereas lowest dry weight of bark (39.33 g) was obtained in D_3T_5 (Royal palm leaf sheath dried by silica gel drying). Highest dry weight was recorded in tamarind bark dried by microwave oven because of drying was completed only in minutes electronically produced microwaves liberate moisture from organic substances by agitating the water molecules is the principle lying behind the quickest microwave oven drying (Bhutani, 1990). Lowest was recorded in royal palm leaf sheath dried by silica gel drying because of bark are easily dried in silica gel which absorb the moisture of barks.

Moisture loss (%)

The fresh and dry weights of different bark taken for calculating the percentage moisture loss. Per cent loss in weight was analysed with completely randomised design and the data were subjected to arc sine transformation. Data indicate the influence of bark materials, drying methods and their interactions on per cent loss of moisture (Table 4.2). Significant difference were observed under study with reference to moisture loss, maximum moisture loss was noticed in T_5 (Coconut spathe) (62.87%) followed by T_3 (Royal palm leaf sheath) (21.27%), while minimum was observed in T_4 (Tamarind bark) (6.93%**)** and followed by T_2 (Guava bark) (10.20%). With respect to drying methods significant difference was recorded with moisture loss. Highest moisture loss was recorded in D_4 (Hot air oven) (32.60%) followed by D_1 (Air drying) (28.20%), while minimum moisture loss was observed in D_5 (Microwave oven**)** (16.13%) followed by D_3 (Silica gel drying) (22%). Significant differences were observed for the interaction effects of bark materials and drying methods (Table 4.2). Maximum moisture loss was recorded in D_4T_5 (Coconut spathe dried by Hot air oven) (87.00%) followed by D_3T_5 (60.67%). Whereas, lowest moisture was recorded in

D_5T_4 (Tamarind bark dried by Microwave oven) (3.00%) followed by D_5T_4 (4.00%). Maximum loss of moisture was noticed from coconut spathe dried by hot air oven, uniform temperature in the oven removed the moisture and due to small size of the bark, moisture was lost at a faster rate. From the discussion, its concluded that drying the coconut spathe in electrically operated hot air oven at 65^0C was found to be the best. Tamarind bark dried by microwave oven drying was recorded in lowest loss in moisture may because of less initial moisture.

Time taken for drying (days/hours/minutes)

Among barks tried for took dehydration in air drying method, minimum number of 2 days was taken to dry eucalyptus bark and the maximum was found for royal palm leaf sheath (7 days) followed by coconut spathe (6 days), guava and tamarind bark (4 days) (Fig 4.1). From the Fig. 4.2. it can be noticed that among the sun drying method, royal palm leaf sheath dried quickly with in 1 day under sun, while maximum time was taken to dry tamarind bark (4 days), eucalyptus bark and coconut spathe (3 days), while guava bark took 2 days to dry. The barks which were kept in silica gel drying method (Fig. 4.3) found to be best losing their moisture in short period where the drying process completed within 1 day for both eucalyptus bark and tamarind bark. Whereas, coconut spathe took maximum (4 days) duration followed by royal palm leaf sheath (3 days) and guava bark (2 days). Drying temperature influenced significantly to dry different barks in hot air oven drying at 65^0C (Fig. 4.4) where, tamarind bark took minimum hours (10 hours) followed by guava bark (13 hours), coconut spathe and eucalyptus bark (21 hours) and royal palm leaf sheath took maximum 26 hours to dry. Under microwave oven drying process (Fig. 4.5) the bark took 4 minutes to 5.30 minutes for complete drying where silica gel used as embedding material with a setting time of 4 hours. Guava bark, royal palm leaf sheath and tamarind bark took minimum time to dry (4 minutes), while maximum time was taken by coconut spathe (5.30 minutes) and followed eucalyptus bark (5 minutes) to complete dehydration process. Barks dried in this method retained colour with less drying time.

CONCLUSION

From the investigations it can be concluded that effects of bark materials and drying methods, highest dry weight was recorded in D_5T_4 (Microwave oven + Tamarind bark) (97.00 g), whereas lowest dry weight of bark (39.33 g) was observed in D_3T_5 (Silica gel drying + Royal palm leaf sheath). Highest moisture loss was recorded in D_4T_5 (Hot air oven + Coconut spathe) (87.00%), whereas lowest moisture loss was recorded in D_5T_4 (Microwave oven + Tamarind bark) (3.00%). In Air drying method minimum number of 2 days was taken to dry Eucalyptus bark. Among the Sun drying method, Royal palm sheath dried quickly with in 1 day. The barks which were kept in Silica gel drying method found to be best in losing their moisture in a short period where the drying process completed within 1 day for both Eucalyptus bark and Tamarind bark. Dry different barks in hot air oven drying at 65^0c where, tamarind bark took minimum duration (10 hours). Under microwave oven drying process Guava bark, Royal palm leaf sheath and Tamarind bark took minimum time of 4 minutes to dry.

Table – 1. Dry weight (g) of barks as influenced by different methods of drying

Method of drying	T1	T2	T3	T4	T5	Mean
D1 (Air drying)	79.00	87.33	57.33	87.67	47.67	**71.80**
D2 (Sun drying)	80.00	91.67	80.67	90.00	43.00	**77.07**
D3 (Silica gel drying)	82.67	91.67	79.67	96.67	39.33	**78.00**
D4 (Hot air oven)	68.00	84.33	80.00	91.67	42.00	**73.20**
D5 (Microwave oven)	86.33	94.00	96.00	97.00	46.00	**83.87**
Mean	**79.20**	**89.80**	**78.73**	**92.60**	**43.60**	

	SED	SE m±	CD at 5%
Treatments	0.69	0.98	1.97
Drying methods	0.69	0.98	1.97
Interaction	1.55	2.19	4.41
CV (%)	3.50		

T1	: Eucalyptus bark	T4	: Tamarind bark
T2	: Guava bark	T5	: Coconut spathe
T3	: Royal palm leaf sheath		

Table – 2. Influence of drying methods on moisture loss (%) of different barks

Method of drying	T1	T2	T3	T4	T5	Mean
D1 (Air drying)	21.00 *(27.26)	12.67 (20.80)	42.67 (40.76)	12.33 (20.53)	52.33 (46.32)	**28.20** (31.13)
D2 (Sun drying)	20.00 (26.55)	8.33 (16.75)	19.33 (26.03)	7.67 (15.80)	60.33 (50.95)	**23.13** (27.22)
D3 (Silica gel drying)	17.33 (24.59)	8.33 (16.75)	20.33 (26.79)	3.33 (10.34)	60.67 (51.14)	**22.00** (25.09)
D4 (Hot air oven)	32.00 (34.12)	15.67 (23.29)	20.00 (26.18)	8.33 (16.77)	87.00 (68.84)	**32.60** (33.90)
D5 (Microwave oven)	13.67 (21.68)	6.00 (14.14)	4.00 (11.14)	3.00 (9.88)	54.00 (47.28)	**16.13** (20.89)
Mean	**20.80** (26.90)	**10.20** (18.44)	**21.27** (26.23)	**6.93** (14.66)	**62.87** (52.91)	

	SED	SE m±	CD at 5%
Treatments	0.55	0.78	1.56
Drying methods	0.55	0.78	1.56
Interaction	1.23	1.74	3.49
CV (%)	7.64		

T1 : Eucalyptus bark
T2 : Guava bark
T3 : Royal palm leaf sheath
T4 : Tamarind bark
T5 : Coconut spathe
*Figures in parenthesis are the angular transformed values

Time taken for drying (days/hours/minutes)

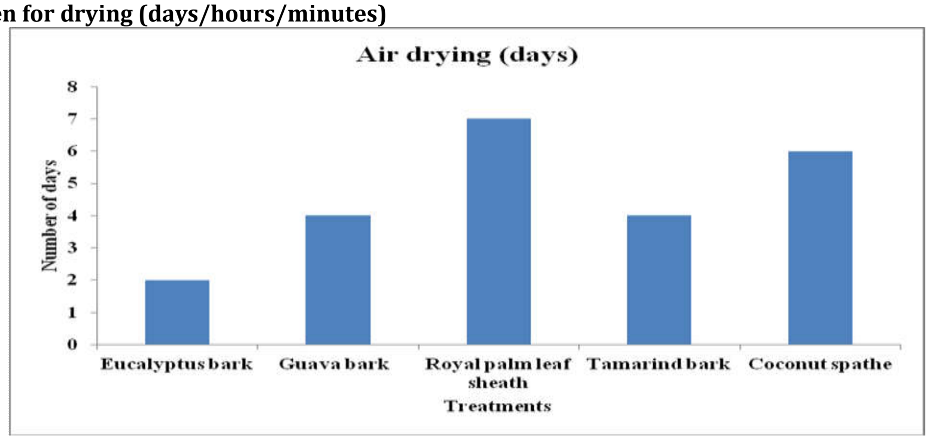

Fig. 4.1. Influence of air drying on time taken to dry different plant material for making pot pourris

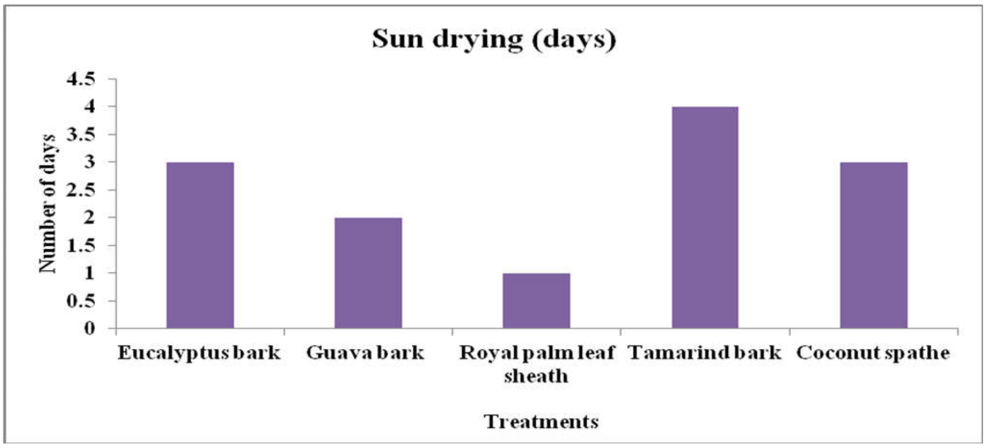

Fig. 4.2. Influence of sun drying on time taken to dry different plant material for making pot pourris

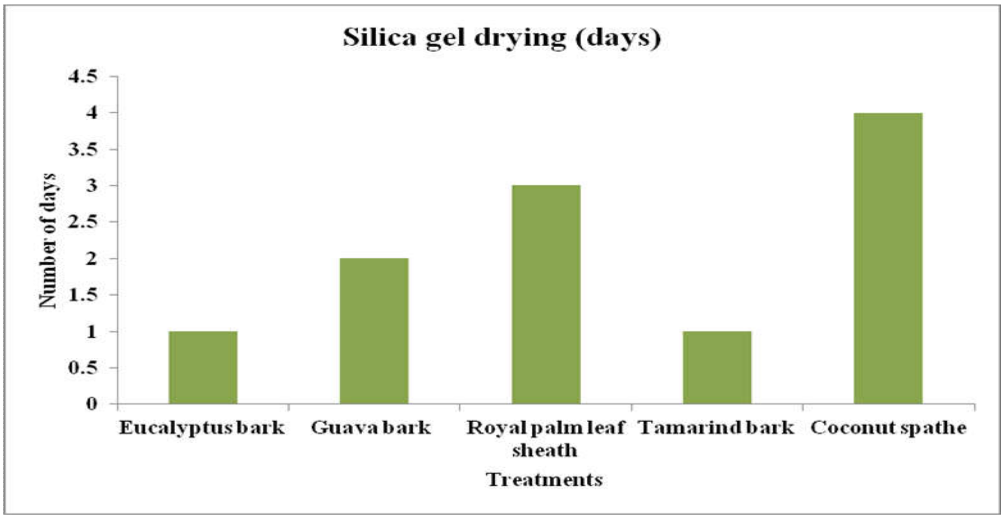

Fig. 4.3. Influence of silica gel drying on time taken to dry different plant material for making pot pourris

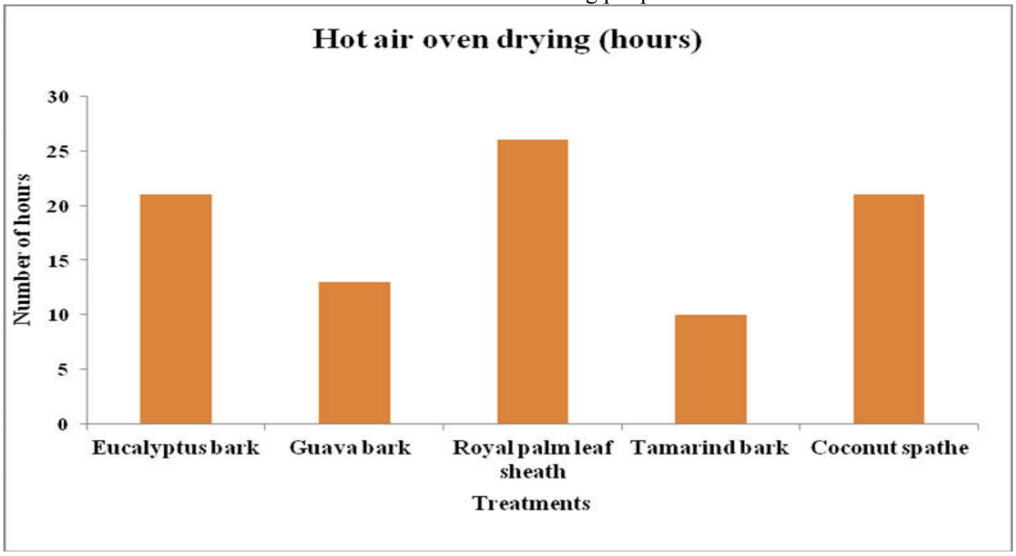

Fig. 4.4. Influence of hot air oven drying on time taken to dry different plant material for making pot pourris

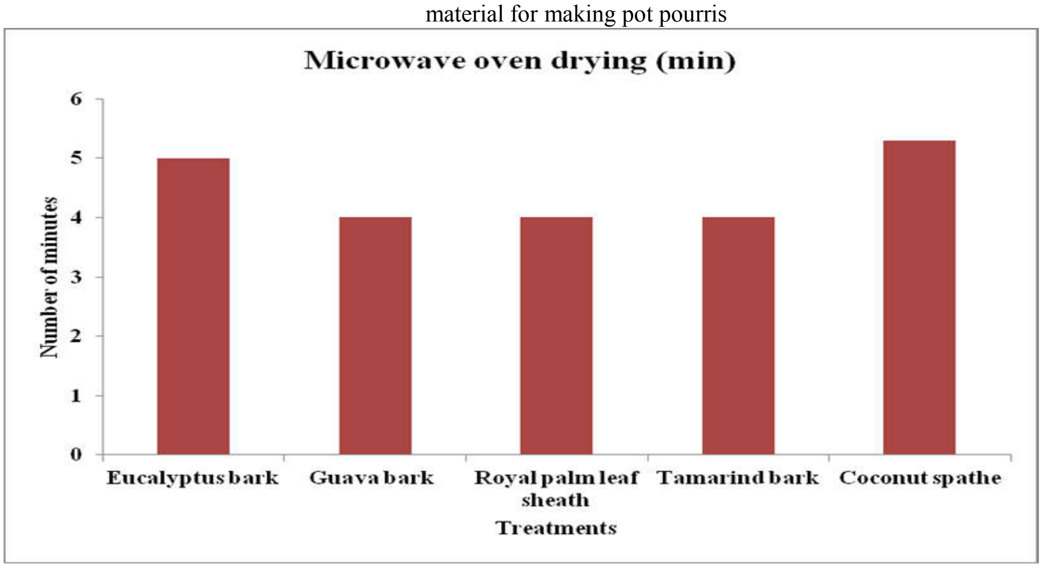

Fig. 4.5. Influence of microwave oven drying on time taken to dry different plant material for making pot pourris

REFERENCES

1. Joyce, D.C. 1998. Dried and preserved ornamental plant material not new, but often overlooked and underrated. *Acta Hortculturae*. 454: 133-45.

2. Deshraj 2001. Making floral crafts from forest product of the Himalayas. *Indian Horticulture*. 45 Oct-Dec: 26-27.
3. Bhutani, J.C. 1990. Capturing nature, a way with flower "everlastings". *Indian Horticulture*. 34(3): 15-18.
4. Nirmala, A., Chandrasekhar, R., Padma, M and Rajkumar, M. 2008. Standardisation of drying techniques of Carnation. *Journal of Ornamental Horticulture.* 11(3): 168-72.
5. Panse, M. and Sukhathme, K. 1985. Statistical methods for agriculture workers. *Indian Council of Agriculture Research Publications.* 48-67.

CITATION OF THIS ARTICLE

G. Sunil Kumar, R. Nagaraju, K. Swarajyalakshmi and M. Balakrishna. Standardization of drying technique for different bark materials for making potpourris. Bull. Env. Pharmacol. Life Sci., Vol 6 Special issue [3] 2017: 40-45