Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 7 [SPL 1] 2018 : 134-140

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
Global Impact Factor 0.876
Universal Impact Factor 0.9804
NAAS Rating 4.95

ORIGINAL ARTICLE **OPEN ACCESS**

Standardization of Drying Technique For Different Pods And Seed Materials For Making Potpourris

G. Sunil Kumar, R. Nagaraju, K. Swarajyalakshmi, P. Latha and M. Balakrishna
College of Horticulture, Anantharajupeta, Dr. YSR Horticultural University, Andhra Pradesh. Email for correspondence – sunilkumarpht.13@gmail.com

ABSTRACT
The present study entitled Standardization of drying technique for different pods and seed 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 pods and seeds were used viz., T_1 (Coconut buttons), T_2 (Red sander seed), T_3 (Asoka seeds), T_4 (Leucaena leucocepha pods), T_5 (Prosopis pods) 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. Lowest dry weight of pods and seeds was recorded in treatment combinations D_4T_4 (21.67 g), whereas highest dry weight was recorded in D_3T_2 (97.00 g), which was statistically on par with D_3T_2 (96.00 g).With respect to pods and seeds, highest moisture loss was recorded in D_4T_4 (hot air oven + Leucaena leucocepha pods) (78.33%) which was statistically on par with D_2T_4 (sun drying + Leucaena leucocepha pods) (76.33%), whereas, minimum moisture loss was recorded in D_5T_2 (microwave oven + red sander seed) (3.00%), which was statistically on par with D_3T_2 (silica gel drying + red sander seeds) (4.00%). The time taken to drying of pods and seeds under air drying is less than 4 days for Red sander and Asoka seeds. In sun drying method time taken to dry is of 1 day recorded for red sander seeds. Red sander seeds dried in silica gel drying took one day, while maximum time (21 days) taken by coconut buttons. Drying temperature influenced significantly to dry different pods & seeds in hot air oven and Leucaena leucocepha pods dried quickly in 6 hours time, while more time was taken (60 hours) for coconut buttons. Microwave oven drying took least time to dry red sander seeds (4 minutes).Mixture of all dried pods and seed materials etc. with additional natural flavours can be made into potpourris.
Keywords – *pods, seeds, dehydration, air drying, sun drying, silica gel drying, hot air oven, microwave drying, coconut buttons, Asoka seeds,potpourri.*

Received 12.05.2018 Revised 29.05.2018 Accepted 11.07.2018

INTRODUCTION

Drying is a method to remove moisture from the pods, seeds, 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, pods, fruit peel, fruits, cones, seeds, foliage, bracts, thorns, barks, lichens, fleshy fungi, mosses and selaginella (Deshraj, 2001). Drying is a method to remove moisture from the flowers and other plant parts or method of preserving of flowers and other plant parts. Drying and preserving flowers and plant materials is a form of artistic expression that was very popular during the Victorian age. Dried and preserved ornamental products offer a wide range of qualities like novelty, longevity, aesthetic properties, flexibility and year round availability (Joyce, 1998). Dried flowers and foliage are used for making decorative floral segments like wall hangings, landscapecalenders , 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 Indiaindustry 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.

MATERIALS AND METHODS

The present study entitled Standardization of drying technique for different pods and seed materials for making potpourris was conducted at Postharvest Technology Laboratory, College of Horticulture, Anantharajupeta during 2016- 17. For the present experiment five different pods and seeds were used *viz.,* T_1 (Coconut buttons), T_2 (Red sander seed), T_3 (Asoka seeds), T_4 (*Leucaena leucocepha* pods), T_5 (Prosopis pods). Drying of pods and seed 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 pods and seed 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.

AIR DRYING

The clean, pods and seeds collected in cloth bags were carried to the laboratory and weighed on electronic balance for fresh weight purpose. These materials were transferred to plastic trays containing open ventilation on both sides.Every day readings were taken at regular intervals to record the dry weight and moisture content of the Pods and seeds.

SUN DRYING

Plant materials like seeds and pods were exposed to the sun daily pm 4 -am 9from by keeping them in plastic trays. The trays are shifted to laboratory during evening hours and again the next morning they were kept under the sun. This practice was followed till the material dried up completely. The readings were taken at regular intervals to record the moi sture contenttill the moisture % is same, indicating that the drying process is completed.

SILICA GEL DRYING

The plastic trays which were selected for drying to dry the materials was filled evenly with the silica gel media up to two inches of height. Depressions were made to insert the selected pods and seeds into the silica gel medium. After inserting the pods and seeds, it was covered with silica gel again the media was evenly distributed so as to equalize the pressure on all sides of the plant parts. After drying, the embedded pods and seeds were taken out carefully by tilting the containers. plant parts were also gently brushed with soft camel hair brush to remove the desiccant completely so that the original colour of the dried pods and seeds could be seen. Standard setting time of 3 hours was maintained.

HOT AIR OVEN DRYING

The pods and seeds were kept in their on trays and placed in an electrically operated hot air oven at two specified temperatures and duration no of hours for drying at (40°C) respectively.

MICROWAVE OVEN DRYING

Beakers selected for drying were filled evenly with the media up to 2 inches of height. Depressions were made to insert the pods and seeds into the silica gel medium. After inserting itwas covered with silica gel. The media was evenly distributed so as to equalize the pressure on plant parts.The plant parts were kept in beaker in upright position and they were dried in microwave oven at different time levels (viz., 30 Sec, 1 minute, 2 minutes, 2.5 minutes and 3 minutes). After drying, the embedded peels were taken out carefully by tilting the containers. The peels were rolled down and were collected,plant parts were also gently brushed with soft camel hair brush to remove the desiccant completely so that the original colour of the dried pods and seeds could be seen.

OBSERVATIONS TO BE RECORDED

RESULTS AND DISCUSSION

DRY WEIGHT (G)

Dry weight of the plant parts like pods and seeds was recorded during course of study till the moisture completed and expressed in grams. These materials are used for the potpourri preparation.

MOISTURE LOSS (%)

The difference between the fresh weight and dry weight gives the actual moisture content of the flowers and other plant parts or loss of moisture. Moisture/ weight loss was calculated as per the given formula (Gupta, 1999; Marousky, 1973 and Parups and Chan, .(1973

$$\text{Per cent moisture loss} = \frac{FW - DW}{FW} \times 100$$

Where,
FW= Fresh weight of plant materials
DW= Dry weight of plant materials

RESULTS AND DISCUSSION

DRY WEIGHT (G)

There were significant differences among the plant materials with respect to dry weight of pods and seeds (Table 1). Among the different pods and seeds tried T_4 (*Leucaena leucocepha* pods) lost maximum fresh weight and retained 28.00 g weight. While T_2 (Red sander seeds) retained maximum weight (92.53 g) followed by T_3 (*Polyalthea longifolia* seeds) (87.00 g). Significant difference was observed among the different drying methods, where minimum dry weight was recorded in D_4 (Hot air oven drying) (51.13 g), while maximum dry weight was noticed in D_3 (Silica gel drying) (58.67 g) followed by D_5 (Microwave oven drying) (53.33 g). The interaction effects of pods & seed and drying methods were found to be significant (Table 1). Lowest dry weight of pods and seeds was recorded in treatment combinations D_4T_4 (21.67 g), whereas highest dry weight was recorded in D_3T_2 (97.00 g), which was statistically on par with D_3T_2 (96.00 g).

Table 1: Dry weight (g) of pods and seeds as influenced by different methods of drying

Method of drying	T1	T2	T3	T4	T5	Mean
D1 (Air drying)	24.33	90.33	86.67	26.00	33.00	**52.07**
D2 (Sun drying)	33.33	92.00	81.67	23.67	25.67	**51.27**
D3 (Silica geldrying)	32.33	96.00	95.00	40.67	29.33	**58.67**
D4 (Hot air oven)	27.67	87.33	89.67	21.67	29.33	**51.13**
D5 (Microwave oven)	31.67	97.00	82.00	28.00	28.00	**53.33**
Mean	**29.87**	**92.53**	**87.00**	**28.00**	**29.07**	

	SED	SE m±	CD at 5%
Treatments	0.37	0.53	1.06
Drying methods	0.37	0.53	1.06
Interaction	0.84	1.18	2.37
CV (%)	2.71		

T1 : coconut buttons
T2 : Red sander seed
T3 : Asoka seed
T4 : Cassia pods
T5 : Prosopis pods

MOISTURE LOSS (%)

The fresh and dry weights of different pods 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 pods and seed materials, drying methods and their interactions on per cent loss of moisture (Table 2). Significant difference were observed under study with reference to moisture loss, Highest moisture loss was noticed in T_4 (*Leucaena leucocepha* pods) (72.00%) followed by T_5 (Prosopis pods) (70.93%), while minimum moisture loss was observed in T_2 (Red sander seeds) (7.00%) followed by T_3 (Asoka seeds) (14.53%) with respect to pods and seeds. Among the different drying methods, significant highest moisture loss was noticed in D_2 (Sun drying) (48.73%**)** followed by D_1 (Air drying) (47.93%), while Hot air oven drying (D_4) (38.00%) given minimum moisture loss followed by D_3 (Silica gel drying) (41.33%).The difference observed with respect to moisture loss interaction effects of pods and seeds**,** drying methods were found to be significant (Table 2). Highest moisture loss was recorded in combination D_4T_4 (78.33%) which was statistically on par with treatment combination D_2T_4 (76.33%), whereas minimum was received D_5T_2 (3.00%), which was statistically on par with D_3T_2 (4.00%).

Table 2: Influence of drying methods on moisture loss (%) of different pods and seeds

Method of drying	T1	T2	T3	T4	T5	Mean
D1 (Air drying)	75.67 (60.45)	9.67 (18.07)	13.33 (21.37)	74.00 (59.33)	67.00 (54.92)	**47.93** (42.83)
D2 (Sun drying)	66.67 (54.72)	8.00 (16.40)	18.33 (25.33)	76.33 (60.87)	74.33 (59.44)	**48.73** (43.37)
D3 (Silica geldrying)	67.67 (55.32)	4.00 (11.47)	5.00 (12.87)	59.33 (50.36)	70.67 (57.19)	**41.33** (37.44)
D4 (Hot air oven)	12.67 (20.71)	10.33 (18.74)	18.00 (25.09)	78.33 (63.04)	70.67 (57.19)	**38.00** (36.79)
D5 (Microwave oven)	68.33 (55.74)	3.00 (9.97)	18.00 (25.09)	72.00 (58.03)	72.00 (50.03)	**46.67** (41.37)
Mean	**58.20** (49.39)	**7.00** (14.93)	**14.53** (21.95)	**72.00** (58.16)	**70.93** (57.37)	
	SED		**SE m±**		**CD at 5%**	
Treatments	0.29		0.41		0.83	
Drying methods	0.29		0.41		0.83	
Interaction	0.65		0.92		1.85	
CV (%)	2.80					

T1 : coconut buttons
T2 : Red sander seed
T3 : Asoka seed
T4 : Cassia pods
T5 : Prosopis pods

*Figures in parenthesis are the angular transformed values

TIME TAKEN FOR DRYING (DAYS/HOURS/MINUTES)

The time taken to drying of pods and seeds under air drying (Fig. 1) is less than 4 days for Red sander and Asoka seeds. While, maximum for coconut buttons taken drying (24 days), followed by *Leucaena leucocepha* pods (7 days), prosopis pods (6 days). In sun drying method (Fig. 2) time taken to dry is of 1 day recorded for red sander seeds, while maximum time (11 days) was noticed for coconut buttons followed 6 days for asoka seed , 4 days taken by *Leucaena leucocepha* pods and 3 days taken by prosopis pods. Red sander seeds dried in silica gel drying (Fig. 3) took one day, while maximum time (21 days) taken by coconut buttons followed by 7 days for *Leucaena leucocepha* pods, 6 days prosopis pods, and 2 days asoka seed for drying. Drying temperature influenced significantly to dry different pods & seeds in hot air oven (Fig. 4) and *Leucaena leucocepha* pods dried quickly in 6 hours time, while more time was taken (60 hours) for coconut buttons followed by asoka seed (18 hours), red sander seeds (14 hours) and prosopis pods (11 hours). Microwave oven drying took least time to dry red sander seeds (4 minutes) while maximum time taken (17.30 minutes) for coconut buttons followed by 7 minutes for Asoka seed and *Leucaena leucocepha* pods, 9 minutes taken by prosopis pods in microwave oven drying (Fig. 5).

Time taken for drying (days/hours/minutes)

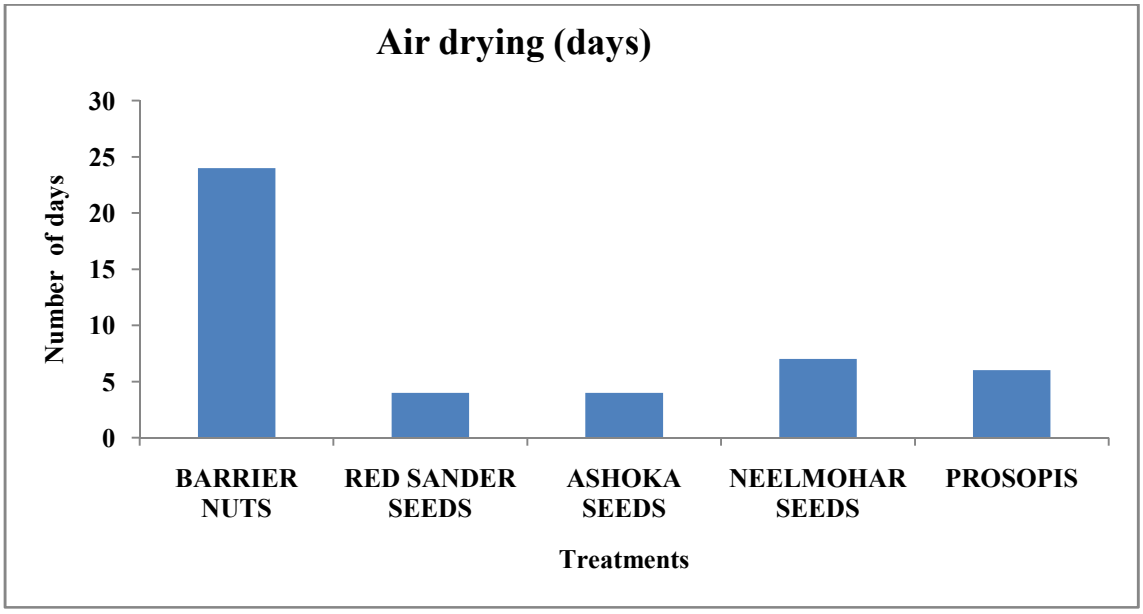

Fig.1: Influence of air drying on time taken to dry different pods and seeds for making potpourris

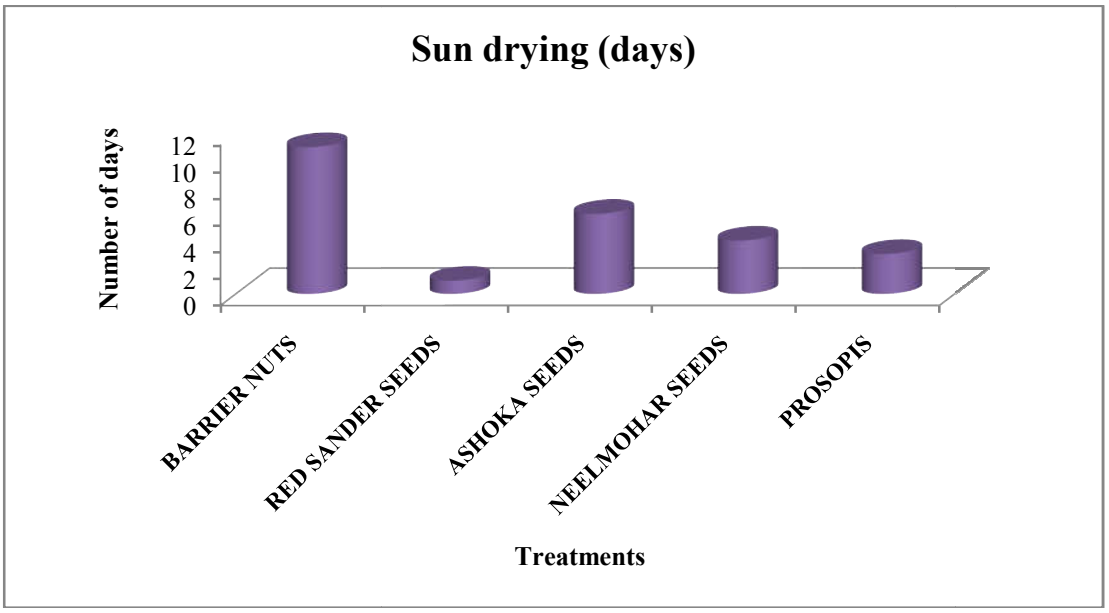

Fig 2: Influence of sun drying on time taken to dry different pods and seeds for making potpourris

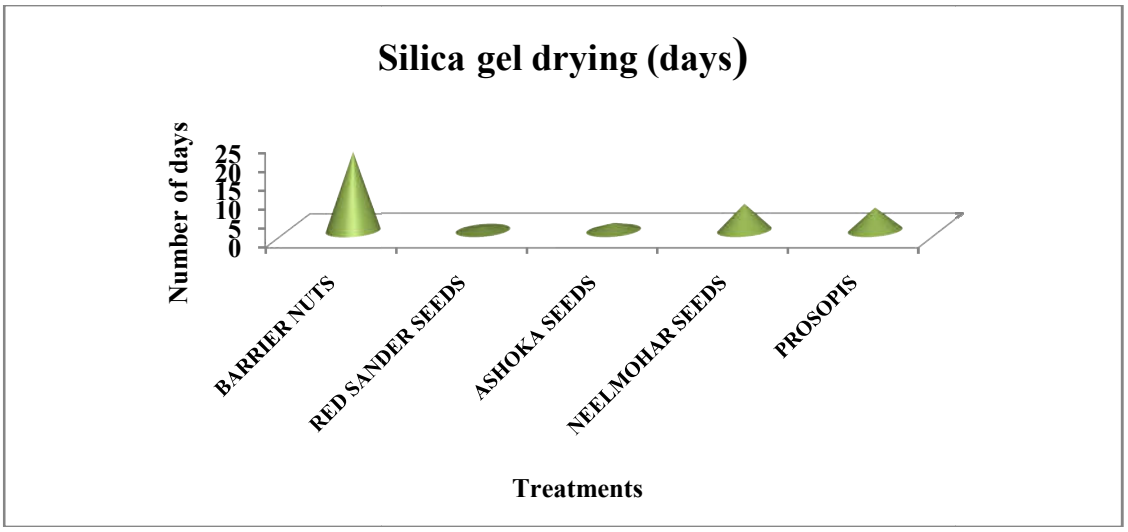

Fig 3: Influence of silica gel drying on time taken to dry different pods and seeds for making potpourris

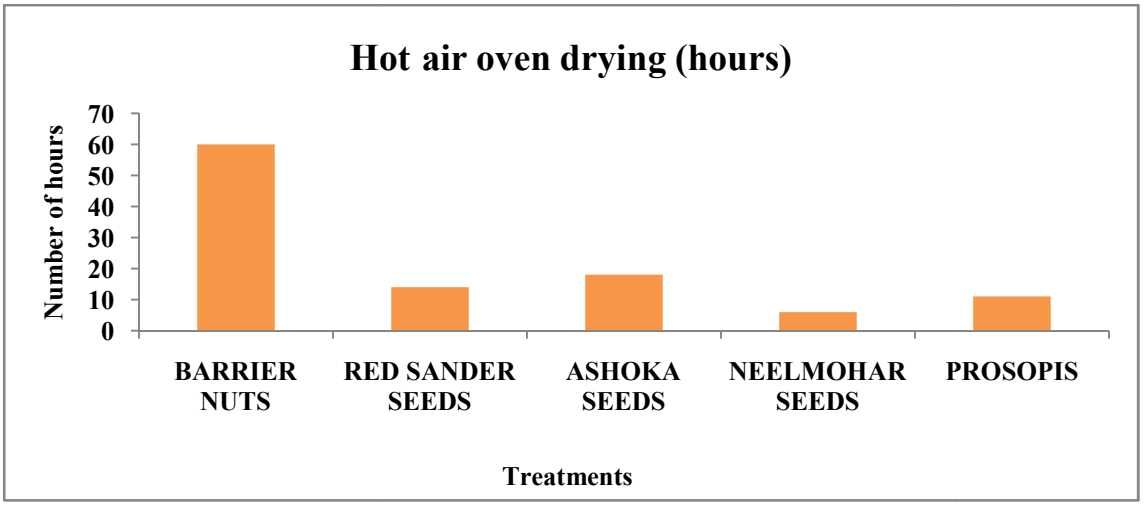

Fig 4: Influence of hot air oven drying on time taken to dry different pods and seeds for making potpourris

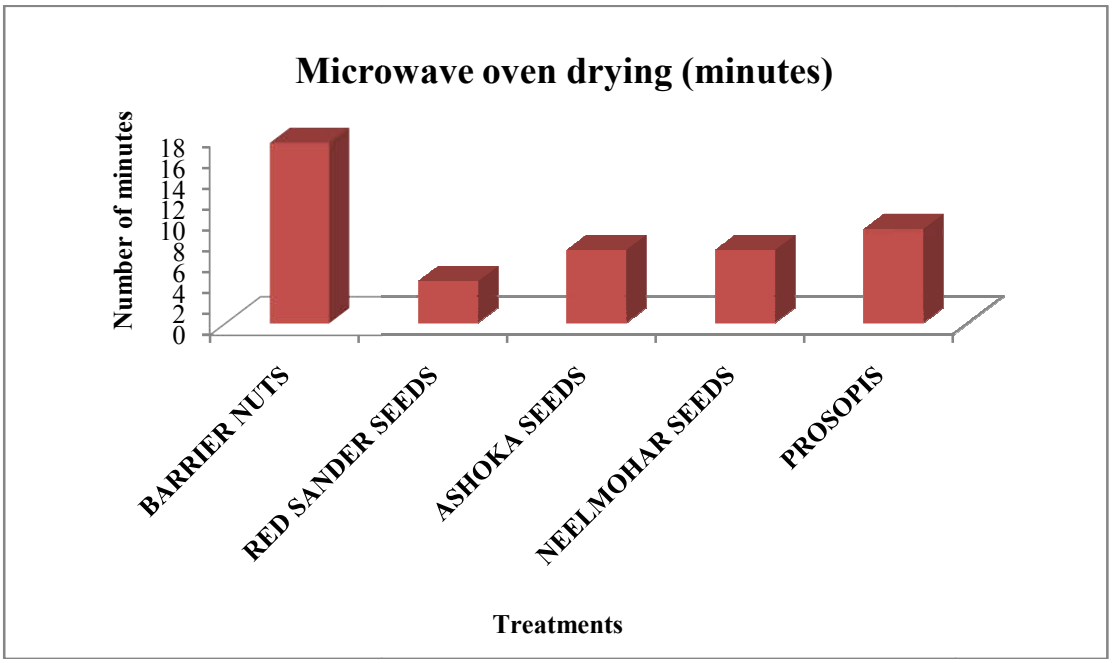

Fig 5: Influence of microwave oven drying on time taken to dry different pods and seeds for making potpourris

COCONUT BUTTONS

REDSANDER SEEDS

ASOKA SEED

CASSIA PODS

PROSOPIS PODS

CONCLUSION

From the investigations it can be concluded that effects of pod and seeds materials and drying methods, significant difference for pods and seeds and drying methods was found. Lowest dry weight of pods and seeds was recorded in D_4T_4 (21.67 g), whereas highest dry weight was noticed D_5T_2 (97.00 g). Significant differences were observed the interaction effect of pods and seeds, drying methods highest moisture loss was recorded in D_4T_4 (78.33%), whereas, minimum moisture loss was recorded in treatment combination D_5T_2 (3.00%).The time taken to dry pods and seeds under air drying is less than 4 days for Red sander and Asoka seeds. In sun drying method time taken to dry is of 1 day for Red sander seeds. Red sander seeds dried in silica gel drying took one day. In Hot air oven Cassia pods dried quickly in 6 hours time. Microwave oven drying took least time to dry red sander seeds (4 minutes). From the results of this study it is understood that even though different methods can be used for drying, certain techniques are suitable only to pods and seeds**.** Of all the methods tried, the method suitable for most off lowers which is economically and commercially Microwave, Hot air oven drying is the best. Red sander seeds are best suitable for present study. The dried in these techniques were used for potpourri**.** Mixture of dry flowers, plant parts and farm plant waste *etc*. with additional natural flavours can be made into potpourris and can generate income out of waste.

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. Nirmala, A., Chandrasekhar, R., Padma, M and Rajkumar, M. 2008. Standardisation of drying techniques of Carnation. *Journal of Ornamental Horticulture.* 11(3): 168-72.
4. Panse, M. and Sukhathme, K. 1985. Statistical methods for agriculture workers. *Indian Council of Agriculture Research Publications.* 48-67.
5. Gupta P.K. 1999. Handbook of soil; fertilizer and manure. *Agro Botanica*, Bikaner.431 p.
6. Marousky F.J. 1973. Recent advances in opening bud cut chrysanthemum flowers. *Horticulture Science* 8(3): 19-20
7. Parups E.V and Chan A.P. 1973. Extension of vase life of cut flowers by use of isoascorbate containing preservative solution. *Journal of American Society for Horticultural Science* 98: 22-26