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Studies on microwave oven drying technique for dehydrating ornamental flowers and foliage

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Abstract
Dried flowers are an important product of modern floriculture. The study was carried out for standardising microwave oven drying technology for the dehydration of different ornamental flowers and foliages. The experiment was carried out with the factorial concept in a Completely Randomised Design and was repeated three times. It can be concluded that using silica gel as embedding media and microwave oven drying (720 micro power i.e. medium high) for 1 minute found excellent technique for dehydration of ornamental flowers *viz*., *Bougainvillea glabra, Calendula officinalis, Consolida ajacis* and foliage like *Cupressus macrocarpa* and *Bougainvillea spectabilis*, 2 min found ideal for *Helianthus annuus*. Employing river sand as embedding media and microwave drying for 2 min found best suited technique for *Acalypha wilkesiana*. Embedding in borax and microwave oven drying for 2 min found appropriate for foliages like *Codiaeum variegatum* and *Pseuderanthemum carruthersii*, 3 min found finest technique for flowers of *Dendrobium species*.

Keywords: Microwave oven, drying, dehydration, flowers, foliage

Introduction
Flowers play an important role in Indian culture. Dried flowers are eternal flowers that are created by drying suitable plant materials. In modern floriculture, dried flowers are major goods because of their long-lasting quality, availability throughout the year, convenience of handling, low transportation costs, and eco-friendliness. (Perinben *et al*. 2014) [3]. In terms of cost, microwave oven drying (450 wt.) is the most economical method of dehydration. (Raj and Gupta, 2005) [5]. The purpose of the experiment was to standardise microwave oven drying technique for the dehydration of some beautiful flowers and foliages.

Materials and methods
The research was executed at Dry flower laboratory, Department of Floriculture and Landscape Architecture, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.), inception during 2020-21. Fresh matured plant materials, such as flowers and foliage, were collected on the university campus in the early morning hours, free of bruises, pests, and illness, immediately after dewdrops evaporated from the plant surface. In a completely randomised design (factorial concept), the experiment was carried out three times with nine different treatments. The plant samples were embedded in desiccants and then placed in an electrically operated microwave oven at a preset micro power setting (720 watts), medium high, coupled with a tiny cup of water nearby to prevent excessive drying. After drying, setting time of 30 minutes was allotted. For all plant samples, treatments were based on a trial-and-error method. 5 different flowers *viz*., *Bougainvillea glabra, Calendula officinalis, Consolida ajacis, Dendrobium species* and *Helianthus annuus* and 5 different foliages *viz*., *Acalypha wilkesiana, Bougainvillea spectabilis, Codiaeum variegatum, Cupressus macrocarpa*, and *Pseuderanthemum carruthersii* were used in the experiment. The following observations were made during the experiment: fresh weight of sample (g), dry weight of sample (g), moisture content loss (percentage), and dried samples were given subjective scores on a 10-point scale with regard to ornamental values such as colour, texture, brittleness, and appearance. Ranks were assigned based on the cumulative score, and the optimal treatment combinations were determined (Raj and Gupta, 2005) [5].

Results and Discussion
Bougainvillea glabra
The data represented in the Table-1 revealed that Silica gel (M1) showed a greater percentage of moisture loss (62.08%) compared to river sand (M2) (46.60%).

Silica gel (M1) obtained the significantly greatest scores for colour (7.83), texture (7.84), and appearance (7.84). D3 had the highest moisture loss percentage (62.71%), which statistically far compared to D1 (40.41%).

Calendula officinalis

Silica gel (M1) achieved the highest moisture loss percentage (63.85%), which is statistically superior to river sand (M2) (57.93%) (Table-2). Silica gel also topped the quality attribute rankings for colour (8.28), texture (8.27), brittleness (7.53), and appearance (8.27), outperforming borax (M3) (4.28, 4.81, 6.29, and 4.29). Peak moisture loss percent was obtained in D3 (67.95%) which was statistically far with D1 (50.72%).

Consolida ajacis

Table-3 demonstrated that silica gel (M1) has the significantly largest percentage of moisture loss (65.70%). Silica gel (M1) had the highest marks for sensory qualities such as colour (7.55), texture (7.82), and appearance (7.54). Brittleness ranged from 5.80 river sand (M2) to 7.25 borax (M3). D2 recorded the highest moisture loss percentage (65.05%) between drying intervals, which was significantly higher than D1 (56.39%). In terms of sensory attribute scores i.e. for colour, texture, brittleness, and appearance, D1 earned the greatest scores (6.64, 6.93, 6.67, and 6.63), while D3 had the lowest scores (6.63). (6.37, 6.47, 6.14, and 6.38).

Dendrobium species

Table-4 revealed that silica gel (M1) exhibited the maximum moisture loss (75.64%) compared to river sand (M2) (63.84%) and borax (M3) (71.11%). Silica gel (M1) rated the highest for sensory measures such as colour (8.00), texture (8.44), and look (7.99), and the lowest for brittleness (6.79).There is a substantial difference between D1 and D3 in terms of moisture loss (77.24%) (63.07%). When it comes to sensory parameters such as colour (7.99), texture (8.36), and appearance (8.00), the highest score was given to D3.

Helianthus annuus

Table-5 demonstrated that silica gel (M1) has the largest percentage of moisture loss (59.28%), which is significantly higher than river sand (M2) (51.75%) and borax (M3) (53.14%). River sand (M2) had the highest brittleness score (6.64), while borax (M3) had the lowest (3.81). Between drying durations, D3 (65.17%) had significantly the highest score for percent moisture loss, followed by D2 (56.16%) and D1 (42.84%). D1 earned the highest grades for colour (5.99), brittleness (5.81), and appearance (5.99).

Acalypha wilkesiana

According to Table-6, silica gel (M1) demonstrated high moisture loss (69.51%) compared to river sand (M2) (60.23%). It was determined that river sand (M2) has significant scores for colour (7.83), texture (7.98), brittleness (5.27) and appearance (7.84).A considerable difference was noted between the drying phases, with the greatest percent moisture loss reported at D3 (71.69%), which was significantly higher than D1 (58.43%). As far as Brittleness is concerned, D3 scored 4.40 and D1 scored 5.15, with D3 scoring the highest in both colour (7.86) and appearance (7.87).

Bougainvillea spectabilis

Table-7 showed that borax (M3) has the highest moisture loss (76.57%), which is significantly higher than sand (M2) (75.05%). Silica gel (M1) received the highest possible score for quality attributes, including colour (8.65), texture (8.34), and appearance (8.64). Among drying durations, D2 (78.60%) has the highest percent moisture loss as compared to D1 (72.76%). D1 had a high brittleness score (7.41).

Codiaeum variegatum

River sand (M2) scored best for texture (8.47) and brittleness (6.80) in Table-8, whereas borax (M3) scored highest for colour (8.52) and appearance (8.53). D2 (78.05%) had the largest moisture loss of all the drying durations, which is statistically far with D1 (64.15%).Colour (8.34), texture (8.48), and appearance (8.35) received the highest grades in D2, while D1 received the lowest (8.13, 7.77, and 8.12). From 4.36 (M1) to 6.80, the brittleness scores ranged (M2).

Cupressus macrocarpa

Table-9 showed that silica gel (M1) has the maximum moisture loss (65.39%), which is statistically far with sand (M2) (47.95%) and borax (M3) (46.11%). In terms of colour (8.28), texture (7.84), and appearance (8.27), silica gel (M1) had the highest scores, whereas river sand (M2) had the highest score for brittleness (6.25). D3 had the highest percentage of moisture loss (61.89%), which was significantly higher than D1 (39.40%). Top scores in D1 were found when it came to colour, texture, strength, and appearance (8.38, 7.56, 6.26 and 8.37).

Pseuderanthemum carruthersii var. atropurpureum 'variegatum'

Moisture loss (79.29%) was observed to be significantly higher in silica gel (M1) (Table-10). Borax (M3) scored the highest in terms of colour (8.11), texture (8.02), brittleness (4.79), and appearance (8.12), among the quality parameters. Significant moisture loss was seen in D3 (78.57%). There was a considerable significant difference in texture and brittleness between drying intervals.

Among factorial interactions, embedding in silica gel and microwave oven drying for 1 minute (M1D1) found significant technique for dehydration of flowers like *Bougainvillea glabra* with moisture loss (56.52%) and sensory scores i.e. for colour (8.06), texture (8.03), brittleness (6.52) and appearance (8.05), *Calendula officinalis* with moisture loss (53.45%) and sensory scores for colour (8.54), texture (8.53), brittleness (7.98), and appearance (8.53), *Consolida ajacis* with moisture loss (59.55%) and sensory scores for colour (7.82), texture (8.04), brittleness (6.48), and appearance (7.81), and foliages like *Bougainvillea spectabilis* with moisture loss (76.50%) and sensory scores for colour (8.86), texture (8.42), brittleness (6.81), and appearance (8.85) and *Cupressus macrocarpa* with moisture loss (62.25%) and sensory scores for colour (8.53), texture (8.12), brittleness (6.06), and appearance (8.52) respectively. For dehydration of *Helianthus annuus* flowers, embedding in silica gel and microwave oven drying for 2 minutes (M1D2) shown to be significant approach, with moisture loss (60.21 percent) and sensory ratings of 8.64, 8.44, 6.34, and 8.64, respectively. These results are supported by Lourdusamy *et al.* (2003) [1]. Employing river sand as a drying agent and a microwave oven drying for 3 minutes (M2D3), found suitable technique with (68.86%) moisture loss and sensory scores of 8.33, 8.53, 5.02, and 8.34 for the *Acalypha wilkesiana* leaves. Embedding in borax and microwaving at 2 min (M3D2), best suited for

leaves like *Codiaeum variegatum* and *Pseuderanthemum carruthersii* with percent moisture loss of (76.44%, 76.27%) and sensory scores for colour (8.73, 8.46), texture (8.45, 8.24), brittleness (6.74, 4.82), and appearance (8.74, 8.47), respectively and 3 min (M3D3) found ideal for flowers of *Dendrobium species* with percent moisture loss of (77.42%) and sensory scores of 8.50, 8.84, 7.52, 8.51, and 8.51, respectively. These results finding were supported by Malakar *et al*. (2016) [2], Shailza *et al.* (2018) [6] and Raghupathi b *et al*. (2020) [4].

Table 1: Effect of drying media (M), duration (D) and their interaction on microwave oven dried floral bracts of *Bougainvillea glabra*

Treatment	Fresh weight (g)	Dry weight (g)	Moisture loss (%)	Colour	Texture	Brittleness	Appearance
M1	0.43	0.16	62.08	7.83	7.84	6.26	7.84
M2	0.39	0.21	46.60	7.58	6.84	7.65	7.57
M3	0.31	0.15	54.75	7.24	6.83	7.51	7.25
S.Em (±)	0.04	0.02	0.13	0.00	0.00	0.00	0.00
CD at 5%	0.12	0.06	0.38	0.01	0.01	0.01	0.01
D1	0.41	0.24	40.41	7.69	7.42	7.34	7.68
D2	0.37	0.15	60.30	7.50	7.18	7.14	7.51
D3	0.35	0.13	62.71	7.47	6.91	6.94	7.48
S.Em (±)	0.04	0.02	0.13	0.00	0.00	0.00	0.00
CD at 5%	0.12	0.06	0.38	0.01	0.01	0.01	0.01
M1D1	0.46	0.20	56.52	8.06	8.03	6.52	8.05
M1D2	0.44	0.20	69.28	7.85	7.86	6.25	7.86
M1D3	0.40	0.14	60.43	7.61	7.64	6.02	7.62
M2D1	0.41	0.16	29.17	7.56	7.03	7.85	7.55
M2D2	0.38	0.29	48.23	7.34	6.86	7.65	7.35
M2D3	0.38	0.19	62.41	7.82	6.65	7.46	7.81
M3D1	0.36	0.14	35.55	7.44	7.21	7.66	7.43
M3D2	0.30	0.23	63.40	7.31	6.83	7.52	7.32
M3D3	0.27	0.11	65.30	7.01	6.45	7.35	7.01
S.Em (±)	0.07	0.03	0.22	0.01	0.01	0.01	0.01
CD at 5%	0.21	0.08	0.66	0.02	0.02	0.02	0.02

(M1- Silica gel, M2- River sand, M3- Borax, D1- 1 min, D2- 2 min, D3- 3min)

Table 2: Effect of drying media (M), duration (D) and their interaction on microwave oven dried flowers of *Calendula officinalis*

Treatment	Fresh weight (g)	Dry weight (g)	Moisture loss (%)	Colour	Texture	Brittleness	Appearance
M1	2.13	0.76	63.85	8.28	8.27	7.53	8.27
M2	2.07	0.88	57.93	7.56	7.16	6.72	7.55
M3	1.95	0.82	58.54	4.28	4.81	6.29	4.29
S.Em (±)	0.15	0.07	0.57	0.01	0.01	0.01	0.01
CD at 5%	0.45	0.20	1.70	0.02	0.03	0.02	0.02
D1	2.09	1.03	50.72	6.99	7.04	7.15	6.98
D2	2.10	0.80	61.65	6.67	6.72	6.85	6.68
D3	1.96	0.63	67.95	6.44	6.48	6.55	6.45
S.Em (±)	0.15	0.07	0.57	0.01	0.01	0.01	0.01
CD at 5%	0.45	0.20	1.70	0.02	0.03	0.02	0.02
M1D1	1.87	0.87	53.45	8.54	8.53	7.98	8.53
M1D2	2.46	0.84	65.95	8.25	8.24	7.56	8.25
M1D3	2.07	0.58	72.15	8.03	8.04	7.06	8.04
M2D1	2.24	1.15	48.70	7.87	7.56	6.90	7.86
M2D2	1.97	0.80	59.10	7.54	7.06	6.75	7.54
M2D3	1.99	0.68	65.99	7.23	6.85	6.53	7.24
M3D1	2.15	1.07	50.00	4.55	5.03	6.57	4.54
M3D2	1.87	0.75	59.91	4.26	4.85	6.25	4.26
M3D3	1.83	0.63	65.70	4.05	4.55	6.06	4.06
S.Em (±)	0.26	0.12	0.99	0.01	0.01	0.01	0.01
CD at 5%	0.78	0.35	2.94	0.04	0.04	0.04	0.04

(M1- Silica gel, M2- River sand, M3- Borax, D1- 1 min, D2- 2 min, D3- 3min)

Table 3: Effect of drying media (M), duration (D) and their interaction on microwave oven dried flower spikes of *Consolida ajacis*

Treatment	Fresh weight (g)	Dry weight (g)	Moisture loss (%)	Colour	Texture	Brittleness	Appearance
M1	0.74	0.25	65.70	7.55	7.82	6.12	7.54
M2	0.42	0.15	62.76	6.81	7.04	5.80	6.81
M3	0.62	0.27	55.75	5.17	5.27	7.25	5.18
S.Em (±)	0.01	0.00	0.09	0.01	0.01	0.01	0.01
CD at 5%	0.03	0.01	0.26	0.03	0.03	0.03	0.03
D1	0.63	0.28	56.39	6.64	6.93	6.67	6.63
D2	0.54	0.19	65.05	6.51	6.72	6.37	6.51
/-+aD3	0.60	0.22	62.77	6.37	6.47	6.14	6.38

S.E`122 (±)	0.01	0.00	0.09	0.01	0.01	0.01	0.01
CD at 5%	0.03	0.01	0.26	0.03	0.03	0.03	0.03
M1D1	0.74	0.30	59.55	7.82	8.04	6.48	7.81
M1D2	0.65	0.21	67.29	7.55	7.85	6.04	7.55
M1D3	0.83	0.25	70.25	7.25	7.56	5.84	7.26
M2D1	0.34	0.15	56.29	7.06	7.26	6.03	7.05
M2D2	0.44	0.16	63.41	6.83	7.06	5.83	6.83
M2D3	0.48	0.15	68.58	6.54	6.82	5.53	6.55
M3D1	0.81	0.38	53.33	5.04	5.50	7.50	5.03
M3D2	0.53	0.19	64.44	5.16	5.26	7.22	5.16
M3D3	0.50	0.25	49.47	5.33	5.04	7.03	5.34
S.Em (±)	0.02	0.01	0.15	0.02	0.02	0.02	0.02
CD at 5%	0.06	0.02	0.45	0.05	0.05	0.05	0.05

(M1- Silica gel, M2- River sand, M3- Borax, D1- 1 min, D2- 2 min, D3- 3min)

Table 4: Effect of drying media (M), duration (D) and their -+ QW6 interaction on microwave oven dried flowers of *Dendrobium species*

Treatment	Fresh weight (g)	Dry weight (g)	Moisture loss (%)	Colour	Texture	Brittleness	Appearance
M1	2.31	0.56	75.64	8.00	8.44	6.79	7.99
M2	2.58	0.93	63.84	7.22	7.53	7.80	7.23
M3	2.52	0.72	71.11	7.18	7.97	7.82	7.19
S.Em (±)	0.10	0.04	0.15	0.00	0.01	0.00	0.00
CD at 5%	0.29	0.10	0.45	0.01	0.02	0.01	0.01
D1	2.42	0.89	63.07	6.74	7.41	7.72	6.73
D2	2.48	0.74	70.29	7.69	8.18	7.49	7.69
D3	2.50	0.57	77.24	7.99	8.36	7.19	8.00
S.Em (±)	0.10	0.04	0.15	0.00	0.01	0.00	0.00
CD at 5%	0.29	0.10	0.45	0.01	0.02	0.01	0.01
M1D1	2.35	0.67	71.51	8.32	8.65	7.02	8.31
M1D2	2.22	0.58	73.71	8.03	8.45	6.82	8.03
M1D3	2.36	0.43	81.71	7.63	8.23	6.53	7.64
M2D1	2.44	1.19	51.38	6.84	7.04	8.01	6.83
M2D2	2.83	0.92	67.56	7.02	7.54	7.85	7.02
M2D3	2.47	0.68	72.58	7.83	8.00	7.53	7.84
M3D1	2.47	0.83	66.33	5.05	6.53	8.12	5.04
M3D2	2.41	0.73	69.59	8.02	8.54	7.81	8.02
M3D3	2.68	0.60	77.42	8.50	8.84	7.52	8.51
S.Em (±)	0.17	0.06	0.26	0.01	0.01	0.01	0.01
CD at 5%	0.50	0.18	0.78	0.02	0.03	0.02	0.02

Table 5: Effect of drying media (M), duration (D) and their interaction on microwave oven dried flowers of *Helianthus annuus*

Treatment	Fresh weight (g)	Dry weight (g)	Moisture loss (%)	Colour	Texture	Brittleness	Appearance
M1	1.44	0.59	59.28	8.67	8.43	6.29	8.66
M2	1.50	0.73	51.75	4.62	6.97	6.64	4.62
M3	1.44	0.68	53.14	4.12	7.12	3.81	4.13
S.Em (±)	0.09	0.04	0.11	0.01	0.01	0.00	0.01
CD at 5%	0.27	0.13	0.32	0.02	0.03	0.01	0.02
D1	1.45	0.83	42.84	5.99	7.47	5.81	5.99
D2	1.59	0.70	56.16	5.80	7.52	5.60	5.81
D3	1.34	0.47	65.17	5.59	7.53	5.33	5.60
S.Em (±)	0.09	0.04	0.11	0.01	0.01	0.00	0.01
CD at 5%	0.27	0.13	0.32	0.02	0.03	0.01	0.02
M1D1	1.35	0.66	51.40	8.88	8.65	6.52	8.87
M1D2	1.73	0.66	60.21	8.64	8.44	6.34	8.64
M1D3	1.24	0.69	66.23	8.44	8.22	6.02	8.45
M2D1	1.61	0.42	35.55	4.98	6.83	6.85	4.97
M2D2	1.45	1.04	55.55	4.54	7.02	6.65	4.54
M2D3	1.44	0.64	64.14	4.33	7.07	6.42	4.34
M3D1	1.38	0.52	41.55	4.13	6.93	4.05	4.12
M3D2	1.61	0.80	52.71	4.25	7.11	3.83	4.25
M3D3	1.34	0.76	65.14	4.01	7.31	3.55	4.02
S.Em (±)	0.16	0.07	0.19	0.01	0.02	0.01	0.01
CD at 5%	0.46	0.22	0.56	0.03	0.05	0.02	0.03

(M1- Silica gel, M2- River sand, M3- Borax, D1- 1 min, D2- 2 min, D3- 3min

Table 6: Effect of drying media (M), duration (D) and their interaction on microwave oven dried leaves of *Acalypha wilkesiana*

Treatment	Fresh weight (g)	Dry weight (g)	Moisture loss (%)	Colour	Texture	Brittleness	Appearance
M1	0.66	0.20	69.51	7.60	7.88	4.50	7.59

M2	0.61	0.24	60.23	7.83	7.98	5.27	7.84
M3	0.65	0.21	68.01	7.61	7.76	4.56	7.62
S.Em (±)	0.05	0.02	0.09	0.00	0.00	0.00	0.00
CD at 5%	0.15	0.05	0.28	0.01	0.01	0.01	0.01
D1	0.67	0.27	58.43	7.35	7.59	5.15	7.34
D2	0.60	0.19	67.62	7.84	8.12	4.78	7.85
D3	0.66	0.19	71.69	7.86	7.91	4.40	7.87
S.Em (±)	0.05	0.02	0.09	0.00	0.00	0.00	0.00
CD at 5%	0.15	0.05	0.28	0.01	0.01	0.01	0.01
M1D1	0.68	0.24	64.39	7.96	8.15	4.82	7.95
M1D2	0.64	0.19	70.34	7.57	7.85	4.55	7.57
M1D3	0.66	0.17	73.79	7.24	7.65	4.12	7.25
M2D1	0.62	0.31	50.50	7.07	7.05	5.55	7.06
M2D2	0.56	0.22	61.32	8.13	8.35	5.25	8.13
M2D3	0.65	0.20	68.86	8.33	8.53	5.02	8.34
M3D1	0.69	0.27	60.41	7.01	7.58	5.08	7.02
M3D2	0.60	0.17	71.20	7.84	8.15	4.55	7.84
M3D3	0.66	0.18	72.43	8.00	7.55	4.05	8.01
S.Em (±)	0.09	0.03	0.16	0.01	0.01	0.01	0.01
CD at 5%	0.26	0.09	0.48	0.02	0.02	0.02	0.02

(M1- Silica gel, M2- River sand, M3- Borax, D1- 1 min, D2- 2 min, D3- 3min)

Table 7: Effect of drying media (M), duration (D) and their interaction on microwave oven dried leaves of *Bougainvillea spectabilis*

Treatment	Fresh weight (g)	Dry weight (g)	Moisture loss (%)	Colour	Texture	Brittleness	Appearance
M1	0.32	0.07	76.22	8.65	8.34	6.62	8.64
M2	0.29	0.07	75.05	7.71	7.59	7.04	7.71
M3	0.29	0.07	76.57	7.77	7.52	6.91	7.78
S.Em (±)	0.02	0.01	0.12	0.00	0.00	0.00	0.00
CD at 5%	0.06	0.02	0.35	0.01	0.01	0.01	0.01
D1	0.30	0.08	72.76	7.86	7.57	7.31	7.85
D2	0.31	0.07	78.60	8.31	8.07	7.05	8.31
D3	0.29	0.07	76.47	7.97	7.79	6.22	7.98
S.Em (±)	0.02	0.01	0.12	0.00	0.00	0.00	0.00
CD at 5%	0.06	0.02	0.35	0.01	0.01	0.01	0.01
M1D1	0.33	0.08	76.50	8.86	8.42	6.81	8.85
M1D2	0.31	0.07	78.71	8.63	8.32	6.65	8.63
M1D3	0.30	0.08	73.44	8.43	8.27	6.41	8.44
M2D1	0.29	0.09	67.32	7.26	7.05	7.66	7.25
M2D2	0.28	0.06	77.52	8.25	8.05	7.25	8.25
M2D3	0.29	0.06	80.31	7.63	7.66	6.22	7.64
M3D1	0.28	0.07	74.47	7.45	7.25	7.45	7.44
M3D2	0.32	0.07	79.57	8.05	7.85	7.25	8.05
M3D3	0.27	0.07	75.67	7.84	7.45	6.04	7.85
S.Em (±)	0.04	0.01	0.21	0.01	0.01	0.01	0.01
CD at 5%	0.10	0.03	0.61	0.02	0.02	0.02	0.02

(M1- Silica gel, M2- River sand, M3- Borax, D1- 1 min, D2- 2 min, D3- 3min)

Table 8: Effect of drying media (M), duration (D) and their interaction on microwave oven dried leaves of *Codiaeum variegatum*

Treatment	Fresh weight (g)	Dry weight (g)	Moisture loss (%)	Colour	Texture	Brittleness	Appearance
M1	0.95	0.23	75.52	7.88	8.04	4.36	7.87
M2	0.90	0.28	69.78	8.24	8.47	6.80	8.24
M3	0.66	0.20	69.87	8.52	8.05	6.73	8.53
S.Em (±)	0.06	0.02	0.08	0.00	0.00	0.01	0.00
CD at 5%	0.17	0.05	0.22	0.01	0.01	0.02	0.01
D1	0.87	0.31	64.15	8.13	7.77	6.18	8.12
D2	0.84	0.18	78.05	8.34	8.48	5.98	8.35
D3	0.80	0.21	72.96	8.18	8.31	5.72	8.17
S.Em (±)	0.06	0.02	0.08	0.00	0.00	0.01	0.00
CD at 5%	0.17	0.05	0.22	0.01	0.01	0.02	0.01
M1D1	0.92	0.24	74.41	8.02	8.12	4.55	8.01
M1D2	0.98	0.21	78.47	7.85	8.05	4.36	7.85
M1D3	0.93	0.25	73.69	7.74	7.94	4.17	7.75
M2D1	1.00	0.46	54.34	8.01	7.75	7.05	8.02
M2D2	0.81	0.17	79.25	8.45	8.93	6.83	8.45
M2D3	0.90	0.22	75.74	8.24	8.74	6.52	8.25
M3D1	0.69	0.25	63.71	8.35	7.45	6.95	8.34
M3D2	0.73	0.17	76.44	8.73	8.45	6.74	8.74

M3D3	0.56	0.17	69.46	8.51	8.24	6.48	8.52
S.Em (±)	0.10	0.03	0.13	0.01	0.01	0.01	0.01
CD at 5%	0.30	0.09	0.39	0.02	0.02	0.03	0.02

(M1- Silica gel, M2- River sand, M3- Borax, D1- 1 min, D2- 2 min, D3- 3min)

Table 9: Effect of drying media (M), duration (D) and their interaction on microwave oven dried foliage of *Cupressus macrocarpa*

Treatment	Fresh weight (g)	Dry weight (g)	Moisture loss (%)	Colour	Texture	Brittleness	Appearance
M1	0.72	0.25	65.39	8.28	7.84	5.55	8.27
M2	0.57	0.29	47.95	8.05	7.04	6.25	8.05
M3	0.53	0.29	46.11	8.11	7.14	6.05	8.12
S.Em (±)	0.05	0.02	0.09	0.01	0.00	0.01	0.01
CD at 5%	0.14	0.06	0.28	0.03	0.01	0.02	0.03
D1	0.59	0.35	39.40	8.38	7.56	6.26	8.37
D2	0.64	0.26	58.17	8.12	7.35	5.94	8.12
D3	0.58	0.22	61.89	7.94	7.11	5.65	7.95
S.Em (±)	0.05	0.02	0.09	0.01	0.00	0.01	0.01
CD at 5%	0.14	0.06	0.28	0.03	0.01	0.02	0.03
M1D1	0.69	0.26	62.25	8.53	8.12	6.06	8.52
M1D2	0.78	0.27	65.46	8.24	7.85	5.53	8.24
M1D3	0.69	0.22	68.46	8.04	7.55	5.05	8.05
M2D1	0.54	0.39	28.34	8.26	7.21	6.46	8.25
M2D2	0.58	0.26	55.67	8.05	7.05	6.24	8.05
M2D3	0.58	0.23	59.83	7.85	6.85	6.05	7.86
M3D1	0.55	0.40	27.59	8.36	7.34	6.26	8.35
M3D2	0.56	0.26	53.37	8.07	7.15	6.05	8.07
M3D3	0.48	0.20	57.37	7.93	6.94	5.84	7.94
S.Em (±)	0.08	0.03	0.16	0.02	0.01	0.01	0.02
CD at 5%	0.24	0.10	0.48	0.05	0.02	0.03	0.05

(M1- Silica gel, M2- River sand, M3- Borax, D1- 1 min, D2- 2 min, D3- 3min)

Table 10: Effect of drying media (M), duration (D) and their interaction on microwave oven dried leaves of *Pseuderanthemum carruthersii*

Treatment	Fresh weight (g)	Dry weight (g)	Moisture loss (%)	Colour	Texture	Brittleness	Appearance
M1	0.70	0.14	79.29	7.45	7.03	3.81	7.44
M2	0.63	0.16	74.75	7.97	7.63	4.38	7.97
M3	0.60	0.14	76.19	8.11	8.02	4.79	8.12
S.Em (±)	0.03	0.01	0.21	0.00	0.00	0.01	0.00
CD at 5%	0.10	0.02	0.61	0.01	0.01	0.02	0.01
D1	0.64	0.16	75.11	7.52	7.47	4.53	7.51
D2	0.64	0.15	76.54	8.17	7.70	4.34	8.18
D3	0.66	0.14	78.57	7.84	7.50	4.11	7.85
S.Em (±)	0.03	0.01	0.21	0.00	0.00	0.01	0.00
CD at 5%	0.10	0.02	0.61	0.01	0.01	0.02	0.01
M1D1	0.67	0.14	78.57	7.64	7.21	4.04	7.63
M1D2	0.73	0.14	79.09	7.44	7.05	3.85	7.44
M1D3	0.70	0.15	80.20	7.24	6.84	3.55	7.25
M2D1	0.65	0.14	72.34	7.06	7.44	4.54	7.05
M2D2	0.59	0.18	74.27	8.62	7.81	4.34	8.62
M2D3	0.66	0.15	77.65	8.23	7.63	4.25	8.24
M3D1	0.59	0.15	74.43	7.85	7.76	5.02	7.84
M3D2	0.60	0.15	76.27	8.46	8.24	4.82	8.47
M3D3	0.61	0.14	77.88	8.04	8.04	4.54	8.05
S.Em (±)	0.06	0.01	0.36	0.01	0.01	0.01	0.01
CD at 5%	0.17	0.04	1.06	0.02	0.02	0.03	0.02

(M1- Silica gel, M2- River sand, M3- Borax, D1- 1 min, D2- 2 min, D3- 3min)

Before drying After drying

Fig 1: Embedded in silica gel and microwave oven dried floral bracts of *Bougainvillea glabra*

Before drying After drying

Fig 2: Embedded in silica gel and microwave oven dried flowers of *Calendula officinalis*

Before drying After drying

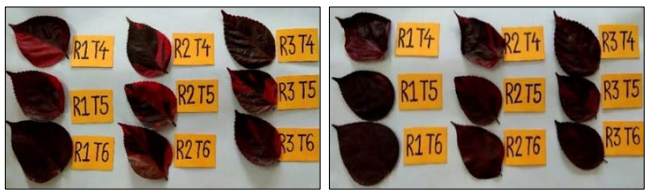
Fig 3: Embedded in silica gel and microwave oven dried flower spikes of *Consolida ajacis*

Before drying After drying

Fig 4: Embedded in borax and microwave oven dried flowers of *Dendrobium species*

Before drying After drying

Fig 5: Embedded in silica gel and microwave oven dried flowers of *Helianthus annuus*

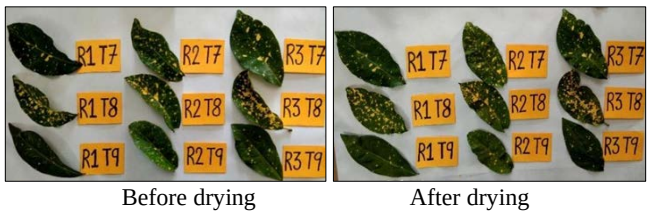


Before drying After drying

Fig 6: Embedded in river sand and microwave oven dried leaves of *Acalypha wilkesiana*

Before drying After drying

Fig 7: Embedded in silica gel and microwave oven dried leaves of *Bougainvillea spectabilis*



Before drying After drying

Fig 8: Embedded in borax and microwave oven dried leaves of *Codiaeum variegatum*

Before drying After drying

Fig 9: Embedded in silica gel and microwave oven dried leaves *Cupressus macrocarpa*

Before drying After drying

Fig 10: Embedded in borax and microwave oven dried leaves of *Pseuderanthemum carruthersii*

Conclusion

It can be concluded that using silica gel as embedding medium and microwave drying for 1 minute found to be acceptable with flowers such as *Bougainvillea glabra*, *Calendula officinalis* and *Consolida ajacis* and leaves such as *Cupressus macrocarpa*, *Bougainvillea spectabilis*, 2 min found ideal for flowers of *Helianthus annuus*. Employing river sand and microwave oven drying for 2 min found best for leaves of *Acalypha wilkesiana*. Embedding in borax and microwave oven drying for 2 min found ideal for foliages like *Codiaeum variegatum* and *Pseuderanthemum carruthersii*, 3 min found suitable technique for flowers of *Dendrobium species*.

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