Original Research Article

Effect of Different Drying Media on Different Cut Flowers

ABSTRACT

The standardization of different drying techniques for various cut flowers is crucial for value addition in the floriculture industry. Drying flowers enhances their longevity, making them available year-round and reducing wastage. By preserving their vibrant colours, shapes, and textures, dried flowers offer novel and aesthetically appealing options for floral arrangements and decorations. Therefore, present investigation was carried out to determine the effect of different drying media on the quality of flowers. Under this experiment, overall, 11 treatments comprising of different drying media were applied for different cut flowers. The present investigation found that treatment T_4 (Sand (microwave @ 280°C) and T_6 (Silica gel (microwave @ 280°C) responded better among different drying method and T_6 (Silica gel (microwave @ 280°C) also showed better colour, shape and texture of cut flowers employed in drying.

Keywords: *Drying, Borax, Silica gel, perlite.*

1.INTRODUCTION

More than three fourth of the export basket of Indian floricultural products comprises of dry flowers and different handmade items made from botanical specimens, presented in a dried and coloured form. With the increasing awareness for natural eco-friendly products, dried flowers have attained prime importance in the floriculture industry. It constitutes nearly 15% of the global floriculture business and considering the present COVID-19-related pandemic situation, dry flower industry is going to become more relevant. At present, the industry relies substantially on gathering of flowers from the wild and drying those using conventional methods. However, some fresh flowers are also converted into dry flowers for better returns, including chrysanthemums, dahlias, marigolds, jute flowers, wood roses, lotus pods, and lilies among others. Over 70 lakh people, mostly in rural areas, earn their livelihood from the production of handicrafts and related activities through low capital investment. Dry flowers and plant materials have tremendous potential as substitutes for fresh flowers and foliage for interior decoration as well as for a variety of other aesthetic and commercial uses. Different drying techniques can be adopted, but the main aim should be the production of quality materials in respect of shape, colour, texture, and freshness (**Acharya *et al.,* 2017**). The demand for dry flowers is increasing at an impressive rate of 8-10 percent annually, thus offering a lot of opportunities for the Indian entrepreneurs to enter in the global floricultural trade (**Singh 2009**). Several flowers such as anemone, zinnia, allium, sweet william, carnation, stock, freesia, narcissus, chrysanthemums, pansies, daffodils, marigolds, roses, and lilies respond well to drying techniques. For drying fresh flowers, different methods of drying have been followed like air drying, embedded drying, press drying, oven drying etc. In this exercise, microwave techniques have been followed at different timings and analysed for moisture loss (%) and colour retention of flowers after drying. Drying leads to reduced microbial activity and aging effects. Due to the absence of moisture, these dried flowers can be stored in moisture-free atmosphere for longer periods without losing their appearance and decorative value, thus, they become free from bondage of seasons. Dry flowers are a good standby for florists, since designs can be made up during slack periods and arrangements can be displayed where fresh flowers are unsuitable from the grower's point of view and the price is less than for equivalent fresh flowers. Drying of flowers and foliage by various methods like air drying, sun drying, oven and microwave oven drying, freeze-drying and embedded drying can be used for making decorative floral craft items i.e., cards, floral designs, wall hangings, landscapes, calendars, potpourris etc. for various purposes with potpourris being the major segment of dry flower industry valuing Rs. 55 crores in India alone (**Murugan et al., 2007**). To preserve China aster through drying, it is essential to choose the appropriate drying method and conditions to ensure the best results in terms of the flower's appearance and longevity. The duration and specific techniques for drying China aster may vary based on factors such as the type of drying method used and the intended purpose of the dried flowers (**Rashmi *et al.,* 2022**). The standardization of different drying techniques for various cut flowers is crucial for value addition in the floriculture industry. Drying flowers enhances their longevity, making them available year-round and reducing wastage. By preserving their vibrant colours, shapes, and textures, dried flowers offer novel and aesthetically appealing options for floral arrangements and decorations. Moreover, these dried flowers can be used in craftwork, potpourri, and scented sachets, expanding their commercial applications. Standardization ensures consistent quality and optimizes drying durations, resulting in cost-effective production and increased market demand. Overall, the adoption of standardized drying techniques in the floral sector promotes sustainability, creativity, and economic growth through value-added products and prolonged utilization of cut flowers. This study aimed to 'Standardization of different drying techniques of different cut flowers for value addition'.

2.MATERIALS AND METHODS

The present investigation entitled was done to understand the effect of different drying techniques for cut flowers that can be used for value addition. The details of the materials used, and the procedures adopted in the investigation, which was carried out at Departmental Laboratory, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj during *Winter Season* 2022. The materials were collected in the month of February to March as it is the peak time to collect all the desired flowers. For this research each of 100 flowers were collected from the departmental research field. Under this experiment, overall, 11 treatments comprising of different drying techniques. Treatments comprised of T_0 (air dry), T_1 (Newspaper (Press Drying)), T_2 (Butter paper (Press Drying), T_3 (Newspaper + Butter paper (Press Drying), T_4 (Sand (Microwave Drying @ 280^0C), T_5 (Borax (Microwave Drying @ 280^0C), T_6 (Silica gel (Microwave Drying @ 280^0C), T_7 (Perlite (Microwave Drying @ 280^0C), T_8 (Sand + Borax (1:1) (Microwave Drying @ 280^0C), T_9 (Sand + Borax + Silica gel (1:1:1) (Microwave Drying @ 280^0C) and T_{10} (Sand + Borax + Silica gel + Perlite (1:1:1:1) (Microwave Drying @ 280^0C). The analysis was done using the formula of **Fisher and Yates (1963).** The quality score was done using point scale given by **Rangana, 1986** Using sensory evaluation that is also known as hedonic scale by a panel of ten semi-trained judges by scoring on a five-point scale i.e., excellent, very good, good, bad, and very bad with a weightage of 3.5-4.0, 2.5-3.4, 1.5-2.4, 0.5-1.4 and 0.0-0.4 respectively was used for colour evaluation based on appearance.

3.RESULTS AND DISCUSSION:

3.1. Physical Quality of flower

3.3.1 Fresh weight of flower (g)

Among the various treatments, the maximum fresh weight of China aster flower was found in T_4 (Sand (microwave @ 280°C) having a weight 2.07 g followed T_6 (Silica gel (microwave @ 280°C) with 1.97 g. While minimum fresh weight of China aster flower was observed for T_7 (Perlite (microwave @ 280°C) with 1.25 g. Among the various treatments, maximum fresh weight of Rose flower was found in T_4 (Sand (microwave @ 280°C) having weight 2.16 g followed T_6 (Silica gel (microwave @ 280°C) with 2.06 g. While minimum fresh weight of Rose flower was observed for T_8 (Sand + Borax (microwave @ 280°C) with 1.35 g. Among the various treatments, maximum fresh weight of Gerbera flower was found in T_9 (Sand + borax + Silica gel (microwave @ 280°C) having weight 4.17 g followed T_7 (Perlite (microwave @ 280°C) with 4.17 g. While minimum fresh weight of Gerbera flower was observed for T_4 (Sand (microwave @ 280°C) with 3.46 g. Similar findings were reported by **Meman *et al.*, (2006)**; **Arunkumar and Mangaiyarkarasi (2018)**; **Chandana *et al.*, (2021)**; **Jadhav and Joshi (2021)**; **Rashmi *et al.*, (2022)** and **Rubina *et al.*, (2022)** for drying of flowers for value addition.

3.1.2 Dry weight of the flower

Among the various treatments, maximum dry weight of China aster flower was found in T_4 (Sand (microwave @ 280°C) having weight 0.70 g followed T_6 (Silica gel (microwave @ 280°C) with 0.68 g. While minimum dry weight of China aster flower was observed for T_8 (Sand + Borax (microwave @ 280°C) with 0.33 g. Among the various treatments, maximum dry weight of Rose flower was found in T_4 (Sand (microwave @ 280°C) having weight 0.80 g followed T_6 (Silica gel (microwave @ 280°C) with 0.77 g. While minimum dry weight of Rose flower was observed for T_7 (Perlite (microwave @ 280°C) with 0.42 g. Among the various treatments, maximum dry weight of Gerbera flower was found in T_9 (Sand + borax + Silica gel (microwave @ 280°C) having weight 1.92 g followed T_7 (Perlite (microwave @ 280°C) with 1.89 g. While minimum dry weight of Gerbera flower was observed for T_0 (Air Dry) with 1.60 g. The superior dry weight of cut flowers when microwave-dried using a treatment comprising sand alone, compared to other treatments involving sand, perlite, borax, silica gel alone, or in various combinations, can be attributed to the distinct characteristics of sand as a drying medium. Sand exhibits excellent moisture-absorbing properties, promoting efficient moisture removal from the cut flowers during the microwave drying process. This efficient water evaporation prevents over-drying and minimizes the loss of essential nutrients and flower weight. Conversely, other mediums like perlite, borax, and silica gel may not provide the same level of moisture control or may not be as suitable for preserving the flower's integrity during drying. The combination of sand with other materials might also lead to suboptimal drying conditions, affecting the final dry weight of the cut flowers. Similar findings were reported by **Meman *et al.*, (2006)**; **Chandana *et al.*, (2021)**; **Jadhav and Joshi (2021)**; **Rashmi *et al.*, (2022)** and **Rubina *et al.*, (2022)** for drying of flowers for value addition.

3.1.3. Moisture loss (%)

Among the various treatments, maximum moisture loss in China aster flower was found in T_0 (Air dry) having loss 75.97% followed T_2 (Butter paper) with 74.74 %. While minimum moisture loss of China aster flower was observed for T_5 (Borax (microwave @ 280°C) with 59.59 %. Among the various treatments, maximum moisture loss in Rose flower was found in T_0 (Air dry) having loss 76.06 % followed T_2 (Butter paper) with

74.83 5. While minimum moisture loss in Rose flower was observed for T_5 (Borax (microwave @ 280°C) with 59.88 %. Among the various treatments, maximum moisture loss in Gerbera flower was found in T_0 (Air dry) having loss 85.48 % followed T_1 (Newspaper) with 84.22 %. While minimum moisture loss in Gerbera flower was observed for T_5 (Borax (microwave @ 280°C) with 69.30 %. The enhanced moisture loss in cut flowers when air-dried among treatments involving sand, perlite, borax, silica gel alone, or in combination can be attributed to the excellent moisture-wicking properties of sand and its ability to facilitate efficient evaporation. Air drying relies on natural air circulation, and sand, as a drying medium, aids in drawing moisture away from the cut flowers effectively. It provides a porous and absorbent surface that allows water to evaporate steadily, preventing water accumulation that could lead to decay or loss of flower quality. On the other hand, perlite, borax, and silica gel may not possess the same moisture-absorbing characteristics as sand, resulting in slower or less effective moisture loss. Moreover, when used in combination with other materials, the drying process may become less efficient, leading to suboptimal moisture removal in comparison to air drying with sand alone. Similar findings were reported by **Arunkumar and Mangaiyarkarasi (2018)**; **Chandana *et al.*, (2021)**; **Rashmi *et al.*, (2022)** and **Rubina *et al.*, (2022)** for drying of flowers for value addition.

3.1.4 Time taken for drying (hours)

Among the various treatments, maximum time taken for drying of China aster flower was found in T_0 (Air drying) with duration 13.40 hours. followed T_2 (Butter paper) with 12.52 hours. While minimum time taken for drying of China aster flower was observed for T_4 (Sand (microwave @ 280°C) with 0.06 hours. Among the various treatments, maximum time taken for drying of Rose flower was found in T_0 (Air drying) with duration 14.15 hours. followed T_2 (Butter paper) with 12.94 hours. While minimum time taken for drying of Rose flower was observed for T_4 (Sand (microwave @ 280°C) with 0.12 hours. Among the various treatments, maximum time taken for drying of Gerbera flower was found in T_0 (Air drying) with duration 13.43 hours. followed T_2 (Butter paper) with 10.34 hours. While minimum time taken for drying of Gerbera flower was observed for T_7 (Perlite (microwave @ 280°C) with 0.31 hours. The reduced drying time of cut flowers when microwave-dried using a treatment involving sand alone, compared to other treatments such as sand, perlite, borax, silica gel alone, or in combination, as well as air drying, butter paper drying, and newspaper drying, can be attributed to the efficient heating mechanism of the microwave. Microwaves provide a rapid and uniform heat transfer, accelerating the moisture evaporation process from the flowers. The sand acts as an effective drying medium, facilitating even heat distribution and enhancing moisture absorption, leading to faster drying. In contrast, other drying methods may lack the quick and consistent heating capability of microwaves, making them comparatively slower. Additionally, some materials may not possess the same moisture-wicking properties as sand, further contributing to longer drying times. Similar findings were reported by **Meman *et al.*, (2006)**; **Chandana *et al.*, (2021)**; **Jadhav and Joshi (2021)**; **Rashmi *et al.*, (2022)** and **Rubina *et al.*, (2022)** for drying of flowers for value addition.

3.2. Quality parameters

3.2.1 Colour Score

Among the various treatments, maximum colour score of China aster flower was found in T_6 (Silica gel (microwave @ 280°C) with 4.39 score followed T_9 (Sand + borax + silica gel (microwave @ 280°C) with 4.30 score. While minimum colour score of China aster flower was observed for T_0 (Air dry) with 1.85 score. Among the various treatments, maximum colour score of Rose flower was found in T_6 (Silica gel (microwave @ 280°C) with 4.47 score followed T_9 (Sand + borax + silica gel (microwave @ 280°C) with 4.39 score. While minimum colour score of Rose flower was observed for T_0 (Air dry) with 1.93 score. Among the various treatments, maximum colour score of Gerbera flower was found in T_6 (Silica gel (microwave @ 280°C) with 4.66 score followed T_9 (Sand + borax + silica gel (microwave @ 280°C) with 4.55 score. While minimum colour score of Gerbera flower was observed for T_0 (Air dry) with 2.01 score. The improved colour score of cut flowers when microwave-dried using a treatment involving silica gel alone, compared to other treatments such as sand, perlite, borax, silica gel alone, or in combination, as well as air drying, butter paper drying, and newspaper drying, can be attributed to the unique drying properties of silica gel. Silica gel is a desiccant with high moisture-absorbing capabilities, facilitating a gentle and controlled drying process that helps preserve the natural colour and pigments of the flowers. Unlike other drying mediums, silica gel minimizes heat exposure and prevents colour degradation that may occur in traditional drying methods. Additionally, the uniform moisture removal provided by silica gel contributes to consistent and vibrant colour retention, making it a preferred option for achieving better colour scores in microwave drying of cut flowers. Similar findings were reported by **Arunkumar and Mangaiyarkarasi (2018)**; **Chandana *et al.*, (2021)**; **Jadhav and Joshi (2021)**; **Rashmi *et al.*, (2022)** and **Rubina *et al.*, (2022)** for drying of flowers for value addition.

3.2.2 Shape score

Among the various treatments, maximum shape score of China aster flower was found in T_6 (Silica gel (microwave @ 280°C) with 3.60 score followed T_9 (Sand + borax + silica gel (microwave @ 280°C) with 3.40 score. While minimum shape score of China aster flower was observed for T_0 (Air dry) with 1.14 score. Among the various treatments, maximum shape score of Rose flower was found in T_6 (Silica gel (microwave @ 280°C) with 3.68 score followed T_9 (Sand + borax + silica gel (microwave @ 280°C) with 3.49 score. While minimum shape score of Rose flower was observed for T_0 (Air dry) with 1.23 score. Among the various treatments, maximum shape score of Gerbera flower was found in T_6 (Silica gel (microwave @ 280°C) with 3.76 score followed T_9 (Sand + borax + silica gel (microwave @ 280°C) with 3.56 score. While minimum shape score of Gerbera flower was observed for T_0 (Air dry) with 1.30 score. The improved shape score of cut flowers when microwave-dried using a treatment involving silica gel alone, compared to other treatments such as sand, perlite, borax, silica gel alone, or in combination, as well as air drying, butter paper drying, and newspaper drying, can be attributed to the unique drying characteristics of silica gel. Silica gel is a desiccant that absorbs moisture gently and evenly, allowing the flowers to maintain their original shape and form throughout the drying process. Unlike traditional drying methods, microwave drying with silica gel avoids the risk of distortion or deformation that may occur due to uneven moisture loss. This controlled and efficient drying helps preserve the structural integrity of the cut flowers, resulting in better shape scores and aesthetically pleasing dried flowers suitable for various decorative purposes. Similar findings were reported by **Arunkumar and Mangaiyarkarasi (2018)**; **Chandana *et al.*, (2021)**; **Jadhav and Joshi (2021)**; **Rashmi *et al.*, (2022)** and **Rubina *et al.*, (2022)** for drying of flowers for value addition.

3.2.3 Texture Score

Among the various treatments, maximum texture score of China aster flower was found in T_6 (Silica gel (microwave @ 280°C) with 4.27 score followed T_9 (Sand + borax + silica gel (microwave @ 280°C) with 4.1 score. While minimum texture score of China aster flower was observed for T_0 (Air dry) with 1.81 score. Among the various treatments, maximum texture score of Rose flower was found in T_6 (Silica gel (microwave @ 280°C) with 4.35 score followed T_9 (Sand + borax + silica gel (microwave @ 280°C) with 4.28 score. While minimum texture score of Rose flower was observed for T_0 (Air dry) with 1.89 score. Among the various treatments, maximum texture score of Gerbera flower was found in T_6 (Silica gel (microwave @ 280°C) with 4.47 score followed T_9 (Sand + borax + silica gel (microwave @ 280°C) with 4.36 score. While minimum texture score of

Gerbera flower was observed for T_0 (Air dry) with 1.97 score. The superior texture score of cut flowers when subjected to microwave drying with silica gel alone, in comparison to other treatments involving sand, perlite, borax, silica gel alone, or in combination, as well as air drying, butter paper drying, and newspaper drying, can be attributed to the controlled and gentle drying process enabled by silica gel. Acting as a desiccant, silica gel possesses exceptional moisture-absorbing capabilities, ensuring efficient moisture removal without compromising the delicate texture of the flowers. Unlike certain drying methods that may cause uneven moisture loss and roughen the flower surfaces, microwave drying with silica gel guarantee es consistent drying, thus preserving the soft and smooth texture of the cut flowers. This results in enhanced overall appearance and quality of the dried flowers, contributing to superior texture scores and making them more appealing for decorative and ornamental purposes. Similar findings were reported by **Arunkumar and Mangaiyarkarasi (2018)**; **Chandana *et al.,* (2021)**; **Jadhav and Joshi (2021)**; **Rashmi *et al.,* (2022)** and **Rubina *et al.,* (2022)** for drying of flowers for value addition.

4.CONCLUSION

From the present investigation, it is concluded that treatment T_4 (Sand (microwave @ 280°C) and T_6 (Silica gel (microwave @ 280°C) responded better among different drying method and T_6 (Silica gel (microwave @ 280°C) also showed better colour, shape and texture of cut flowers employed in drying.

Table 1 Effect of different drying methods on physical and quality parameters of China Aster

Treatment Combination		Fresh Weight of flower (g)	Dry weight of flower (g)	Moisture loss (%)	Time taken for drying (hours)	Colour score	Shape score	Texture score
T_0	Air dry	1.44	0.39	75.97	13.40	1.85	1.14	1.81
T_1	News paper	1.84	0.50	70.03	10.60	2.38	1.27	1.95
T_2	Butter paper	1.65	0.63	74.74	12.52	1.99	1.46	2.12
T_3	Newspaper+ butter paper	1.54	0.48	70.98	11.16	2.25	1.64	2.33
T_4	Sand (microwave @ 280^0C)	2.07	0.70	65.87	0.06	4.10	2.53	3.22
T_5	Borax (microwave @ 280^0C)	1.33	0.42	59.79	0.12	4.04	1.85	2.53
T_6	Silica Gel (microwave @280^0C)	1.97	0.68	62.08	0.09	4.39	3.60	4.27
T_7	Perlite (microwave @ 280^0C)	1.69	0.33	65.47	0.17	4.03	3.18	3.85
T_8	Sand+ Borax (microwave @ 280^0C)	1.25	0.47	69.26	0.28	4.17	2.57	3.24
T_9	Sand+ Borax+ Silica gel (microwave @ 280^0C)	1.27	0.55	66.72	0.13	4.30	3.40	4.19
T_{10}	Sand+ Borax+ Silica gel+ Perlite (microwave @ 280^0C)	1.43	0.56	69.83	0.42	3.80	2.93	3.60
	F-Test	**S**	**S**	**S**	**S**	**S**	**S**	**S**
	SE(d)±	**0.11**	**0.01**	**1.18**	**0.27**	**0.10**	**0.10**	**0.10**
	CV.	**12.42**	**4.00**	**2.99**	**10.50**	**5.10**	**7.50**	**5.79**

	CD (5%)	**0.34**	**0.04**	**3.48**	**0.80**	**0.29**	**0.30**	**0.30**

Table 2 Effect of different drying methods on physical and quality parameters of Rose

Treatment Combination		**Fresh Weight of flower (g)**	**Dry weight of flower (g)**	**Moisture loss (%)**	**Time taken for drying (hours)**	**Colour score**	**Shape score**	**Texture score**
T_0	Air dry	1.53	0.48	76.06	14.15	1.93	1.23	1.89
T_1	News paper	1.93	0.58	70.11	12.03	2.46	1.36	2.04
T_2	Butter paper	1.75	0.72	74.83	12.94	2.08	1.55	2.21
T_3	Newspaper+ butter paper	1.63	0.56	71.07	11.55	2.33	1.72	2.41
T_4	Sand (microwave @ 280^{0}C)	2.16	0.80	65.96	0.12	4.19	2.62	3.31
T_5	Borax (microwave @ 280^{0}C)	1.42	0.51	59.88	0.21	4.14	1.94	2.62
T_6	Silica Gel (microwave @280^{0}C)	2.06	0.77	62.05	0.15	4.47	3.68	4.35
T_7	Perlite (microwave @ 280^{0}C)	1.79	0.42	65.56	0.26	4.11	3.27	3.93
T_8	Sand+ Borax (microwave @ 280^{0}C)	1.35	0.57	69.35	0.31	4.26	2.65	3.32
T_9	Sand+ Borax+ Silica gel (microwave @ 280^{0}C)	1.36	0.64	66.80	0.22	4.39	3.49	4.28
T_{10}	Sand+ Borax+ Silica gel+ Perlite (microwave @ 280^{0}C)	1.52	0.66	69.92	0.45	3.89	3.03	3.69
	F-Test	**S**	**S**	**S**	**S**	**S**	**S**	**S**
	SE(d)$\pm$	**0.10**	**0.04**	**1.21**	**0.48**	**0.09**	**0.10**	**0.09**

	CV.	**9.86**	**10.94**	**3.06**	**17.45**	**4.46**	**6.48**	**5.03**
	CD (5%)	**0.28**	**0.11**	**3.56**	**1.42**	**0.26**	**0.27**	**0.37**

Table 3 Effect of different drying methods on physical and quality parameters of Gerbera

Treatment Combination		**Fresh Weight of flower (g)**	**Dry weight of flower (g)**	**Moisture loss (%)**	**Time taken for drying (hours)**	**Colour score**	**Shape score**	**Texture score**
$\mathbf{T_0}$	Air dry	3.63	1.60	85.48	13.43	2.01	1.30	1.97
$\mathbf{T_1}$	News paper	4.03	1.70	84.22	9.39	2.52	1.44	2.13
$\mathbf{T_2}$	Butter paper	3.85	1.85	79.51	10.34	2.16	1.63	2.28
$\mathbf{T_3}$	Newspaper+ butter paper	3.74	1.69	80.49	9.26	2.41	1.80	2.49
$\mathbf{T_4}$	Sand (microwave @ 280^0C)	3.46	1.77	76.22	0.37	4.26	2.70	3.39
$\mathbf{T_5}$	Borax (microwave @ 280^0C)	3.52	1.64	69.30	0.40	4.20	2.01	2.68
$\mathbf{T_6}$	Silica Gel (microwave @280^0C)	3.88	1.62	74.98	0.43	4.55	3.76	4.47
$\mathbf{T_7}$	Perlite (microwave @ 280^0C)	4.17	1.89	71.64	0.31	4.21	3.37	4.01
$\mathbf{T_8}$	Sand+ Borax (microwave @ 280^0C)	3.47	1.71	78.77	0.51	4.34	2.73	3.44
$\mathbf{T_9}$	Sand+ Borax+ Silica gel (microwave @ 280^0C)	4.27	1.92	75.38	0.34	4.46	3.56	4.36
$\mathbf{T_{10}}$	Sand+ Borax+ Silica gel+ Perlite (microwave @ 280^0C)	3.62	1.79	79.31	0.74	3.98	3.12	3.76
	F-Test	**S**	**S**	**S**	**S**	**S**	**S**	**S**

	SE(d)±	**0.07**	**0.05**	**0.59**	**0.40**	**0.05**	**0.07**	**0.09**
	CV.	**3.20**	**5.23**	**1.30**	**16.30**	**2.45**	**3.55**	**2.75**
	CD (5%)	**0.21**	**0.16**	**1.73**	**1.19**	**0.15**	**0.15**	**0.16**

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