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STORAGE STUDIES ON GLADIOLUS CORMS

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ABSTRACT

The present investigation was carried out at Laboratory, Department of Floriculture and landscaping, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during the year 2023. Experiment was laid out in Factorial Randomized Block Design (FRBD) with two factors Factor 'A' four storage structures *viz.,* Wooden box, Thermacol box, Corruagated box and Earthen pot and Factor 'B' five storage media *viz.,* Rice husk, Sand, Cocopeat, Saw dust and Without media. Various corm parameters of gladiolus were measured before storage to calculate parameters after storage period. Amongst all the treatments.

The storage of gladiolus corms highlights the superior performance of earthen pots as storage structure and rice husk as storage media. Earthen pots (S_4) emerged as the most effective structure, achieving the highest final corm diameter at 4.88 cm and the lowest reduction rate of 9.12%. Similarly, rice husk (M_1) as a storage medium yielded comparable result with a maximum final diameter of 4.88 cm, also minimizing diameter reduction. The combination of earthen pot and rice husk (S_4M_1) further amplified these benefits, with corms reaching an impressive final diameter of 4.94 cm. In terms of corm weight, earthen pots recorded the highest final weight of 21.05 g and the lowest physiological weight loss at 36.03%. Rice husk showed similar efficacy, reaching a final weight of 21.22 g with the lowest weight loss at 35.53%. The combination of earthen pot and rice husk (S_4M_1) achieved the maximum weight at 21.47 g, effectively reducing weight loss and enhancing overall corm quality. Rotting rates were notably minimized, with earthen pots recording the lowest at 34.00% and rice husk reducing rotting further to 25.50%. The S_4M_1 combination excelled, achieving an exceptionally low rotting percentage of 15.00%, demonstrating superior preservation. Sprouting rates also peaked with the S_4M_1 combination, reaching an impressive 85.00%, compared to 66.00% in earthen pots and 74.50% in rice husk alone. Additionally, corms stored in earthen pots required the longest time to sprout, averaging 128.50 days, with rice husk extending this period to 136.50 days. The S_4M_1 combination achieved a maximum sprouting delay of 139.00 days, providing growers flexibility in planting schedules. These findings underscore the effectiveness of earthen pots and rice husk as a combined storage solution, enhancing corm preservation, quality, and sprouting control, ultimately offering an economical and efficient storage strategy for gladiolus growers.

***Keywords* :** Gladiolus, Corms, Media, Storage study, Low cost.

Introduction

Floriculture in India has ancient roots, dating back to the Indus civilization (2500–1750 B.C.), where flowers held aesthetic and spiritual significance. Over centuries, flowers and gardens were deeply integrated into Indian culture, from Aryan times through the Mughal and British eras, each influencing floriculture practices. The Mughals, for instance, were renowned for their elaborate gardens, which featured a rich diversity of flowering plants and geometric designs. British colonization further advanced floriculture by establishing botanical gardens, which helped preserve and enrich floral biodiversity.

Gladiolus is a genus of bulbous flowering plants belongs to the family Iridaceae which is circulated in Mediterranean Europe, Asia, Tropical Africa and

South Africa. Gladiolus (*Gladiolus grandiflorus*), known for its striking flower spikes is a popular cut flower in India and globally. Gladiolus cultivation is supported by India's agro-climatic conditions, with approximately 1,500 hectares under cultivation. Pusa Dhanvantari cultivars of gladiolus attain height from 94.58cm, days require for sprouting 9-12 days. The mean spike length is 82.39cm with 11-14 florets and days required for spike initiation is 45-55. (Kadam *et al*., 2020). The variety Pusa Dhanvantari is late to flower, taking 80 to 100 days from planting to flowering. The florets are a solid orange with a yellow-coloured throat. Moreover, the corm size of this variety is small to medium (2.33 cm) with a propagation coefficient of 250.00% (Kumar and Yadav, 2005). A "corm" is an underground stem that stores nourishment and is used for propagation of gladiolus. After their dormancy ends, the gladiolus corms start to sprout; however, because of undesirable circumstances, they start to rot and cannot be stored without storage. The main obstacles to the commercial production of gladiolus are the short lifespan and subsequent losses of corms during storage. Having the suitable soil and climate in Maharashtra, there is a lot of potential for gladiolus cultivation to grow there. However, the most frequent issue with gladiolus is the storage of corms throughout the approximately six-month dormancy phase. Gladiolus corms are kept in cold storage at 4-5 °C, although this technique raises growing costs, making it unaffordable for small growers. Because of these reasons, several simple, low-cost traditional methods are being followed by different parts of the world to store different root and tuber crops in the fresh state (Ravi *et al*., 1996) For that some media used such as paddy straw, dried grass, rice husk, cocopeat, coir fibre, sawdust, river sand, wood ash, peat moss, vermiculite, newspapers, dry sugar cane leaves, raffia palm leaves, leaves of Stychnos nux-vomica (Rinkal Dudhat,2021), etc. Out of them rice husk, sand, cocopeat, sawdust were selected as storage media for this study and wooden box, thermacol box, corrugated box and earthen pot selected as storage structure for this study.

This study aims to identify low-cost storage solutions that can extend corm viability, minimize post-harvest losses and enhance yield quality. By developing cost-effective storage structures, we can support farmers in reducing storage expenses and increasing profitability.

Material and Methods

The experiment was conducted in the Laboratory, Department of Floriculture and Landscaping, Dr. Panjabrao Deshmukh Agricultural University, Akola, Maharashtra during year 2023. The experiment included twenty treatment combinations.

Table 1 : Treatment Combinations

Sr. No.	Treatment combination	Treatment name	Sr. No.	Treatment combination	Treatment name
1	S_1M_1	Wooden box + Rice husk.	11	S_3M_1	Corrugated box + Rice husk.
2	S_1M_2	Wooden box + Sand.	12	S_3M_2	Corrugated box + Sand.
3	S_1M_3	Wooden box + Coco peat.	13	S_3M_3	Corrugated box + Coco peat
4	S_1M_4	Wooden box + Saw dust.	14	S_3M_4	Corrugated box + Saw dust.
5	S_1M_5	Wooden box + Without media	15	S_3M_5	Corrugated box + Without media
6	S_2M_1	Thermocol box + Rice husk.	16	S_4M_1	Earthen Pot + Rice husk.
7	S_2M_2	Thermocol box + Sand.	17	S_4M_2	Earthen Pot + Sand.
8	S_2M_3	Thermocol box + Coco peat.	18	S_4M_3	Earthen Pot + Coco peat
9	S_2M_4	Thermocol box + Saw dust.	19	S_4M_4	Earthen Pot + Saw dust.
10	S_2M_5	Thermocol box + Without media	20	S_4M_5	Earthen Pot + Without media

The experiment was laid out in a Factorial Randomized Block Design (FRBD) with two replications. Equal-sized corms of gladiolus *var*. Pusa Dhanvantari were obtained from the Floriculture Research Farm, Department of Floriculture and Landscaping, Dr. PDKV, Akola. The Pusa Dhanvantari gladiolus cultivar is renowned for its superior growth and yield potential in cut flower and corm production. It grows to 115.83 cm with 60.00 cm long leaves, a 90.33 cm spike length and a corm equatorial diameter of 2.23 cm. Its propagation coefficient of 250.00% indicates high multiplication potential. Though late-flowering, its excellent corm quality and high yield make it ideal for commercial cultivation (Kumar and Yadav, 2005). The corms were lifted from the field and cured in shade for 2 to 3 days. They were treated with SAAF fungicide (carbendazim 12% and mancozeb 63% WP) at 1g to each corm from both sides. After treatment, the corms were stored in the designated structures and media. The weight and diameter of the corms were recorded prior to storage. Four storage structure (Wooden box, Thermocol box, Corrugated box and earthen pot) had a capacity of 20 litters and five storage media were used: rice husk (2.1 kg), cocopeat (7.3 kg), sawdust (5.3 kg) sand (36.6 kg) and without media with quantities adjusted to fit the volume of each structure. as per treatment combinations corms were stored in media by placing a 4-5 cm layer of media followed by layer of 10 corms and again it was covered with 4-5 cm layer of media and repeated it three times. After that the stored corms in various structures are kept in ambient temperature. While corms wrapped in paper are stored by adding a layer of 2-3 newspaper sheets followed by 10 wrapped corms and repeated it three times and kept in ambient condition as absolute control. In the second week of October, the corms were removed from the storage media and various parameters were recorded to study changes in the quality of the corms. The data was analysed using the standard procedure for analysis of variance appropriate to the Factorial Randomized Block Design (FRBD) as described by Panse and Sukhatme (1985)

Results and Discussion

Before storage

The data given in Table 2 and 3 showed non-significant differences for diameter and weight of gladiolus corms var. Pusa Dhanvantari before storage in media. Non-significant results obtained because corms of uniform size were procured to kept in different treatments and similar observations on weight and diameter of corms were further used to calculate physiological weight loss as well as diameter reduction of corms. Similar finding is found in Rinkal dudhat *et al*. (2021).

Table 2 : Effect of different storage structures and media on Initial diameter of gladiolus corms

Treatment		Initial diameter (cm)					
Factor 'A' Storage Structure		Factor 'B' Storage media					
		M_1 (Rice husk)	M_2 (Sand)	M_3 (Coco Peat)	M_4 (Saw dust)	M_5 (No media)	Mean
	S_1 (Wooden box)	5.370	5.375	5.365	5.380	5.365	5.371
	S_2 (Thermocol box)	5.355	5.360	5.355	5.380	5.360	5.362
	S_3 (Corrugated box)	5.380	5.355	5.360	5.360	5.380	5.367
	S_4 (Earthen pot)	5.380	5.365	5.380	5.360	5.370	5.371
	Mean	5.371	5.364	5.365	5.370	5.369	

	S	M	SxM
F test	NS	NS	NS
SE (m) ±	0.016	0.018	0.036
CD at 5%	0.048	0.054	0.108

Table 3 : Effect of different storage structures and media on initial weight of gladiolus corms

Treatment		Initial Weight (g)					
Factor 'A' Storage Structure		Factor 'B' Storage media					
		M_1 (Rice husk)	M_2 (Sand)	M_3 (Coco peat)	M_4 (Saw dust)	M_5 (No media)	Mean
	S_1 (Wooden box)	32.91	32.93	32.87	32.98	32.88	32.91
	S_2 (Thermocol box)	32.84	32.87	32.81	32.97	32.84	32.87
	S_3 (Corrugated box)	32.97	32.82	32.88	32.84	32.97	32.90
	S_4 (Earthen pot)	32.95	32.89	32.98	32.84	32.89	32.91
	Mean	32.92	32.88	32.88	32.91	32.90	

	S	M	SxM
F test	NS	NS	NS
SE (m) ±	0.099	0.110	0.221
CD at 5%	0.292	0.327	0.654

After Storage

The data showed significant variation for final diameter of corms, reduction in diameter of corm, final weight of corms, physiological loss of weight, rotting percentage, days required for sprouting and sprouting percentage.

Final Diameter of corm

Effect of storage structure

Different storage structure had significant effect on final diameter of corm. Maximum final corm diameter was recorded in treatment S_4 i.e. 4.88cm where corms were stored in Earthen pot. This treatment was followed by S_2 where corms were stored in thermocol box which recorded final corms diameter of 4.86cm.

Effect of storage media

Different storage media had significant effect on final diameter of corm. Maximum final corm diameter was recorded in treatment M_1 i.e. 4.88cm where corms were stored in rice husk. This treatment was followed by M3 where corms were stored in coco-peat which recorded final corms diameter of 4.85cm

Interaction effect of storage structure and media

Different combinations of storage structures and media had significant effect on final diameter of corm. Maximum final corm diameter was recorded in treatment combination S_4M_1 i.e. 4.94cm where corms were stored in Earthen pot as a structure and rice husk as a media. This treatment was statistically similar to treatment combination S_4M_3 i.e. 4.92cm and S_2M_1 i.e. 4.92cm where corms were stored in earthen pot + coco peat and thermocol box + rice husk, respectively

Table 4 : Effect of different storage structures and media on final diameter of gladiolus corms

Treatment		Final diameter (cm)					
Factor 'A' Storage structure		Factor 'B' Storage media					
		M_1 (Rice husk)	M_2 (Sand)	M_3 (Coco peat)	M_4 (Saw dust)	M_5 (No media)	Mean
	S_1 (Wooden box)	4.79	4.71	4.76	4.74	4.68	4.73
	S_2 (Thermocol box)	4.92	4.83	4.90	4.87	4.80	4.86
	S_3 (Corrugated box)	4.87	4.75	4.83	4.79	4.72	4.79
	S_4 (Earthen pot)	4.94	4.85	4.92	4.89	4.82	4.88
	Mean	**4.88**	4.78	**4.85**	4.82	4.75	

	S	M	SxM
F test	SIG	SIG	SIG
SE (m) ±	0.004	0.005	0.009
CD at 5%	0.012	0.013	0.027

The study revealed that storage structures and media significantly affect the final diameter of gladiolus corms. Earthen pots (4.88 cm) and thermocol boxes (4.86 cm) provided superior insulation and moisture retention, while wooden boxes (4.73 cm) performed the worst. Among media, rice husk (4.88 cm) and coco peat (4.85 cm) were most effective due to their aeration and moisture-holding properties, whereas no media (4.75 cm) led to the smallest diameters. The best results were achieved with earthen pots and rice husk (4.94 cm), emphasizing the importance of combining suitable storage structures and media for optimal corm preservation and reduced post-harvest losses.

Joshi *et al.* (2011) reported that larger corms (5–6 cm) perform better in terms of daughter corm and cormel production, as well as postharvest traits like the number of florets opened per spike and delayed floret withering. These findings align with the current study, emphasizing the importance of optimal corm size and storage conditions for improved performance.

Reduction in diameter of corm

Effect of storage structure

Different storage structure had significant effect on reduction percentage of corm diameter. Minimum reduction percentage of corm diameter was recorded in treatment S4 i.e. 9.12% where corms were stored in earthen pot. This treatment was followed by S2 where corms were stored in thermocol box which recorded reduction percentage of corms diameter of 9.38%.

Effect of storage media

Different storage media had significant effect on reduction percentage of corm diameter. Minimum reduction percentage of corm diameter was recorded in treatment M1 i.e. 9.24% where corms were stored in rice husk. This treatment was significantly superior over all of the other treatment

Interaction effect of storage structure and media

The interaction between storage structures and media (S × M) also showed no significant impact on reduction percentage of corm diameter, non-significant difference was recorded in respect of interaction of stored structure and storage media

The study highlights the significant impact of storage structures and media on reducing the percentage loss in gladiolus corm diameter during storage. Earthen pots (9.12%) and thermocol boxes (9.38%) showed the least reduction due to their insulation and moisture-retention properties, with earthen pots performing best. Wooden boxes had the highest reduction (11.87%) due to poor insulation. Among media, rice husk (9.24%) was most effective, followed by coco peat (9.61%), while no media (11.46%) led to the highest losses. The interaction between structure and media was not statistically significant. Overall, earthen pots and rice husk are recommended for corm storage to minimize diameter reduction.

Rinkal Dudhat *et al.* (2023) also observed that coco peat media minimized the reduction in corm diameter, recording a maximum diameter of 2.70 cm with a minimal reduction of 0.10 cm. This corroborates the present findings, highlighting the effectiveness of coco peat in reducing weight loss and maintaining corm size.

Final weight of corms

Effect of storage structure

Different storage structure had significant effect on final weight of corm. Maximum final corm weight was recorded in treatment S4 i.e. 21.05g where corms were stored in earthen pot. This treatment was followed by S2 where corms were stored in thermocol box which recorded final corms weight of 20.95g.

Effect of storage media

Different storage media had significant effect on final weight of corm. Maximum final corm weight was recorded in treatment M1 i.e. 21.22g where corms were stored in rice husk. This treatment was followed by M3 where corms were stored in coco-peat which recorded final corms weight of 21.10g.

Interaction effect of storage structure and media

Different combinations of storage structures and media had significant effect on final weight of corm. Maximum final corm weight was recorded in treatment combination S4M1 i.e. 21.47g where corms were stored in earthen pot as a structure and rice husk as a media. This treatment was statistically similar to treatment combination S4M3 i.e. 21.43g and S2M1 i.e. 21.39g where corms were stored in earthen pot + coco peat and thermocol box + rice husk, respectively.

The study highlights the importance of storage structures and media in preserving the final weight of gladiolus corms. Earthen pots (21.05 g) were the most effective, providing a cooler microclimate and better aeration to minimize moisture loss, while wooden boxes showed the lowest weight (20.35 g) due to higher evaporation. Among media, rice husk (21.22 g) and coco peat (21.10 g) performed best, with coco peat's porosity aiding aeration and temperature control, reducing physiological weight loss. The combination of earthen pots and rice husk (21.47 g) yielded the best results, demonstrating their synergistic effect. Lauritzen (1934) attributed weight loss to evaporation and respiration, while Maalekuu *et al.* (2014) linked it to transpiration, respiration, and sprouting. These findings underscore the role of proper storage conditions in minimizing weight loss and maintaining corm quality.

Physiological loss of weight

Effect of storage structure

Different storage structure had significant effect on physiological loss of weight (%) of corm. Minimum physiological loss in weight (%) of corm was recorded in treatment S4 i.e. 36.03% where corms were stored in Earthen pot. This treatment was followed by S2 where corms were stored in thermocol box which recorded physiological loss in weight of corms of 36.25%

Effect of storage media

Different storage media had significant effect on physiological loss in weight of corm. Minimum physiological loss in weight (%) was recorded in treatment M1 i.e. 35.53% where corms were stored in rice husk. This treatment was followed by M3 where corms were stored in coco-peat which recorded physiological loss in weight (%) of 35.84%

Interaction effect of storage structure and media

The interaction between storage structures and media (S × M) also showed no significant impact on physiological loss in weight of corm, non-significant difference were recorded in respect of interaction of stored structure and storage media.

The study highlights that physiological loss in weight (PLW) of gladiolus corms during storage varies significantly with storage structures and media. Earthen pots (36.03%) and thermocol boxes (36.25%) minimized PLW due to their cooling and moisture-retentive properties, while wooden boxes showed the highest PLW (38.15%) due to poor insulation. Among media, rice husk (35.53%) was most effective, followed by coco peat (35.84%), both reducing moisture loss. Corms stored without media (38.58%) had the highest PLW. Although the interaction between storage structures and media was not significant, earthen pots combined with rice husk proved optimal for minimizing PLW, offering practical storage solutions for growers.

Maalekuu *et al.* (2014) about weight loss in white yam corm and stated that the respiration, transpiration and sprouting are the main factors responsible for weight loss. More weight loss usually occurs as a result of more respiration of stored corms so more moisture loss which can be facilitated by high temperatures and this has direct impact on the quality of the stored produce (Ezeocha and Ironkwe, 2017).

Table 5 : Effect of different storage structures and media on reduction in diameter (%) of gladiolus corms

Treatment		Reduction in diameter (%)					
Factor 'A' Storage structure		Factor 'B' Storage media					
		M_1 (Rice husk)	**M_2 (Sand)**	**M_3 (Coco peat)**	**M_4 (Saw dust)**	**M_5 (No media)**	**Mean**
	S_1 (Wooden box)	10.94	12.40	11.27	11.97	12.75	11.87
	S_2 (Thermocol box)	8.28	9.96	8.56	9.53	10.55	9.38
	S_3 (Corrugated box)	9.54	11.36	9.97	10.72	12.33	10.78
	S_4 (Earthen pot)	8.19	9.75	8.63	8.84	10.20	9.12
	Mean	9.24	10.87	9.61	10.26	11.46	

	S	M	SxM
F test	SIG	SIG	NS
SE (m) ±	0.280	0.313	0.627
CD at 5%	0.829	0.927	1.855

Table 6 : Effect of different storage structures and media on final weight (g) of gladiolus corms

Treatment		Final weight (g)					
Factor 'A' Storage structure		Factor 'B' Storage media					
		M_1 (Rice husk)	**M_2 (Sand)**	**M_3 (Coco peat)**	**M_4 (Saw dust)**	**M_5 (No media)**	**Mean**
	S_1 (Wooden box)	20.78	20.15	20.65	20.38	19.82	20.35
	S_2 (Thermocol box)	21.39	20.71	21.22	20.94	20.49	20.95
	S_3 (Corrugated box)	21.24	20.40	21.11	20.68	19.99	20.68
	S_4 (Earthen pot)	21.47	20.79	21.43	21.06	20.52	**21.05**
	Mean	**21.22**	20.51	21.10	20.76	20.20	

	S	**M**	**SxM**
F test	SIG	SIG	SIG
SE (m) ±	0.040	0.044	0.088
CD at 5%	0.117	0.131	0.261

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Table 7 : Effect of different storage structures and media on physiological loss of weight (%)) of gladiolus corms

Treatment		Physiological loss of weight (%)					
Factor 'A' Storage structure		Factor 'B' Storage media					
		M_1 (Rice husk)	**M_2 (Sand)**	**M_3 (Coco peat)**	**M_4 (Saw dust)**	**M_5 (No media)**	**Mean**
	S_1 (Wooden box)	36.87	38.80	37.20	38.21	39.70	38.15
	S_2 (Thermocol box)	34.84	36.98	35.32	36.50	37.62	36.25
	S_3 (Corrugated box)	35.58	37.84	35.81	37.03	39.36	37.12
	S_4 (Earthen pot)	34.85	36.78	35.03	35.87	37.63	36.03
	Mean	35.53	37.60	35.84	36.90	38.58	

	S	**M**	**SxM**
F test	SIG	SIG	NS
SE (m) ±	0.223	0.249	0.498
CD at 5%	0.659	0.737	1.473

Rotting percentage

Effect of storage structure

Different storage structure had significant effect on rotting percentage of corm. Minimum corm rotting was recorded in treatment S4 i.e. 34.00% where corms were stored in Earthen pot. This treatment was followed by S2 where corms were stored in thermocol box which recorded 36.20% rotting.

Effect of storage media

Different storage media had significant effect on Rotting Percentage of corm. Minimum rotting percentage was recorded in treatment M1 i.e. 25.50% where corms were stored in rice husk. This treatment was significantly superior over all other treatments, which was followed by treatment M3 where corms were stored in coco peat which recorded rotting upto 31.00%.

Interaction effect of storage structure and media

Different combinations of storage structures and media had significant effect on rotting percentage of corm. Minimum rotting was recorded in treatment combination S4M1 i.e.15.00% where corms were stored in earthen pot as a structure and rice husk as a media. This treatment was followed by S2M1 which record rotting percentage of 22.00%.

The study highlights the significant role of storage structures and media in reducing the rotting percentage of gladiolus corms. Earthen pots (S_4) had the lowest rotting percentage (34.00%) due to their ability to regulate temperature and humidity, while wooden boxes (S_1) showed the highest (50.40%) due to poor insulation. Rice husk (M_1) was the most effective medium (25.50%) because of its moisture-absorbing properties, whereas no media (M_5) resulted in the highest rotting (66.75%). The best combination was earthen pot + rice husk (S_4M_1) with only 15.00% rotting, highlighting the synergistic effect of these conditions. Lauritzen (1934) reported similar trends, linking increased rotting to temperature and humidity fluctuations. Venugopal *et al.* (2017) emphasized bacterial infections as a cause of rotting, while Kaur *et al.* (2018) found reduced spoilage in colocasia corms under controlled storage. Ezeocha and Ironkwe (2017) observed high rotting in livingstone potatoes stored with rice husk, attributed to uneven moisture. These findings confirm that rice husk's effectiveness depends on environmental conditions, aligning with Maalekuu *et al.* (2014) and Booth (1975), who noted varying outcomes based on aeration and humidity.

Days required for sprouting

Effect storage structure

Different storage structure had significant effect on days required on sprouting of gladiolus corm. Maximum days required for sprouting was recorded in treatment S_4 i.e. 128.50 days where corms were stored in earthen pot. This treatment was followed by S_3 where corms were stored in corrugated box which recorded 127.50 days and S_2 where corms were stored in thermocol box which recorded 127.10 days.

Effect of storage media

Different storage media had significant effect on sprouting Percentage of corm. Maximum days required for sprouting was recorded in treatment M_1 i.e. 136.50 days where corms were stored in rice husk. This treatment was significantly superior over all other treatments, which was followed by treatment M_3 i.e. 131 days where corms were stored in coco peat.

Interaction effect of storage structure and media

Different combinations of storage structures and media had significant effect on sprouting percentage of corm. Maximum days for sprouting was recorded in treatment combination S_4M_1 i.e.139.00 days where corms were stored in Earthen pot as a structure and rice husk as a media. This treatment was followed by treatment combination S_2M_1, S_3M_1 and S_1M_1 i.e. 136, 136 and 135 days respectively.

The study found that both storage structures and media significantly influenced the sprouting of gladiolus corms. Corms stored in earthen pots (S_4) took the longest to sprout (128.50 days), followed by corrugated boxes (S_3) and thermocol boxes (S_2), while wooden boxes (S_1) sprouted the earliest (125.80 days). Among the media, rice husk (M_1) delayed sprouting the most (136.50 days), while coco peat (M_3) also showed a delayed sprouting time (131.00 days), and no media (M_5) resulted in the fastest sprouting (119.38 days). The combination of earthen pots with rice husk (S_4M_1) recorded the longest sprouting time (139.00 days), whereas wooden boxes with no media (S_1M_5) showed the shortest (118.00 days). These results suggest that storage structure and media play crucial roles in controlling dormancy and sprouting in gladiolus corms.

Osunde and Orhevba (2011) highlighted the role of storage conditions and treatments like neem bark extract on sprouting and weight loss in yam tubers, aligning with the current findings on the impact of storage structure and media on gladiolus corms. Similarly, Amingad *et al.* (2013) demonstrated that low-temperature storage at 4°C reduced sprouting time in gladiolus corms. In the present study, cooler storage conditions, such as earthen pots with rice husk, delayed sprouting, emphasizing the role of temperature in extending sprouting time.

Sprouting percentage

Effect of storage structure

Different storage structure had significant effect on sprouting percentage of corm. Maximum corm sprouting was recorded in treatment S4 i.e. 66.00% where corms were stored in Earthen pot. This treatment was followed by S2 where corms were stored in thermocol box which recorded 63.80% sprouting.

Effect of storage media

Different storage media had significant effect on sprouting Percentage of corm. Maximum sprouting percentage was recorded in treatment M1 i.e. 74.50% where corms were stored in rice husk. This treatment was significantly superior over all other treatments, which was followed by treatment M3 i.e. 69.00% where corms were stored in coco peat.

Interaction effect of storage structure and media

Different combinations of storage structures and media had significant effect on sprouting percentage of corm. Maximum sprouting was recorded in treatment combination S4M1 i.e.85.00% where corms were stored in Earthen pot as a structure and rice husk as a media. This treatment was significantly superior to all other treatment combinations

The storage structure significantly influenced sprouting percentage, with the highest sprouting (66.00%) recorded in earthen pots (S4), followed by thermocol boxes (63.80%). Among storage media, rice husk (M1) resulted in the maximum sprouting (74.50%), outperforming all other media, followed by cocopeat (M3) at 69.00%. The interaction of storage structures and media showed the highest sprouting (85.00%) in earthen pots with rice husk (S4M1), which was significantly superior to all other combinations. These findings underscore the importance of selecting appropriate storage structures and media to enhance corm sprouting.

Osunde and Orhevba (2011) on yam tubers indicated that proper storage conditions, including suitable media, can improve sprouting and reduce physiological damage, similar to the observed trends in gladiolus corms. The interaction between storage structure and media also played a key role, with combinations like earthen pot and rice husk showing superior results compared to combinations with no media or unsuitable structures.

Table 8 : Effect of different storage structures and media on rotting percentage (%) of gladiolus corms

Treatment		**Rotting percentage (%)**					
Factor 'A' Storage structure	**Factor 'B' Storage media**						
		M_1 (Rice husk)	**M_2 (Sand)**	**M_3 (Coco peat)**	**M_4 (Saw dust)**	**M_5 (No media)**	**Mean**
	S_1 (Wooden box)	35.00	55.00	37.00	50.00	75.00	50.40
	S_2 (Thermocol box)	22.00	38.00	27.00	32.00	62.00	36.20
	S_3 (Corrugated box)	30.00	55.00	35.00	45.00	75.00	48.00
	S_4 (Earthen pot)	15.00	40.00	25.00	35.00	55.00	34.00
	Mean	25.50	47.00	31.00	40.50	**66.75**	

	S	M	SxM
F test	SIG	SIG	SIG
SE (m) ±	0.900	1.006	2.012
CD at 5%	2.664	2.978	5.957

Table 9 : Effect of different storage structures and media on days required for sprouting of gladiolus corms

Treatment		**Days required for sprouting**					
Factor 'A' Storage Structure	**Factor 'B' Storage media**						
		M_1 (Rice husk)	**M_2 (Sand)**	**M_3 (Coco peat)**	**M_4 (Saw dust)**	**M_5 (No media)**	**Mean**
	S_1 (Wooden box)	135.00	127.00	127.50	121.50	118.00	125.80
	S_2 (Thermocol box)	136.00	124.00	132.00	124.00	119.50	127.10

	S_3 (Corrugated box)	136.00	123.50	131.00	126.50	120.50	127.50
	S_4 (Earthen pot)	139.00	123.50	133.50	127.00	119.50	128.50
	Mean	136.50	124.50	131.00	124.75	119.38	

	S	M	SxM
F test	SIG	SIG	SIG
SE (m) ±	0.766	0.856	1.713
CD at 5%	2.267	2.535	5.070

Table 10 : Effect of different storage structures and media on sprouting percentage (%) of gladiolus corms

Treatment		**Sprouting percentage (%)**					
Factor 'A' Storage structure		**Factor 'B' Storage media**					
		M_1 (Rice husk)	**M_2 (Sand)**	**M_3 (Coco peat)**	**M_4 (Saw dust)**	**M_5 (No media)**	**Mean**
	S_1 (Wooden box)	65.00	45.00	63.00	50.00	25.00	49.60
	S_2 (Thermocol box)	78.00	62.00	73.00	68.00	38.00	63.80
	S_3 (Corrugated box)	70.00	45.00	65.00	55.00	25.00	52.00
	S_4 (Earthen pot)	85.00	60.00	75.00	65.00	45.00	**66.00**
	Mean	**74.50**	53.00	69.00	59.50	33.25	

	S	M	SxM
F test	SIG	SIG	SIG
SE (m) ±	0.900	1.006	2.012
CD at 5%	2.664	2.978	5.957

Conclusion

- From the present investigation, it can be concluded that among the various treatment, the earthen pot performed best as a storage structure.
- It can be concluded that rice husk and cocopeat are the best media for storing the gladiolus corms.
- Earthen pot as storage structure and rice husk is found to be best combination for storage gladiolus corms.

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