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Impact of potting media on growth and yield parameters of *Dendrobium* orchid cv. Sonia Red

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Abstract

Dendrobium orchids, particularly the Sonia Red variety, are highly valued for their vibrant purple to whitish flowers and long-lasting blooms, making them essential in the tropical and subtropical ornamental plant market. The choice of growing media significantly impacts plant growth, flowering, and overall yield, with limited research on different varieties in the unique climate of the Konkan region. The present study was conducted to identify the most cost-effective and readily available potting media for optimal *Dendrobium* growth under shade-net condition at Hi-tech Nursery, College of Horticulture, Dapoli. The study was conducted in randomized block design (RBD) with eight treatments and three replications, with a systematic and accurate assessment of various potting medium on *Dendrobium* cv. Sonia Red. Results indicated that, a combination of coconut husk led to the best plant height (42.74 cm), maximum number of shoots (6.73), with least days to first flower opening (9.39 days), better spike length (40.33 cm), number of florets (7.58) and number of spikes (2.10). This media consistently produced desirable growth, emphasizing the importance of proper moisture retention and aeration for healthy *Dendrobium* orchid cultivation. The study also revealed that plant growth was suboptimal in the media combined of coconut husk and cow dung lumps.

Keywords: *Dendrobium* orchids, Sonia red, vibrant flowers, ornamental plant market, growing media, plant growth, coconut husk, optimal growth, moisture retention, aeration, Konkan region, flower opening

Introduction

Dendrobium orchids are widely grown ornamental plants and very popular in the global flower market. They are appreciated for their beautiful appearance, long-lasting flowers, and adaptability in floral designs. *Dendrobium* orchids, especially the Sonia Red variety, are highly valued in the ornamental plant market for their vibrant purple flowers and long-lasting blooms. Because of their high demand and economic importance, especially in tropical and subtropical areas, improved cultivation methods for *Dendrobium* orchids are essential. In the Konkan region of Maharashtra, the local climate offers both challenges and opportunities for growing these orchids. A key factor in growing *Dendrobium* orchids is choosing the right growing media, which greatly governs plant growth, flowering, and overall yield. However, there is limited research on different *Dendrobium* varieties perform in various growing media under the unique environmental climate of Konkan. This lack of information calls for a detailed study on the impact of different growing media on *Dendrobium* cultivation in shaded conditions in the Konkan area. Therefore, study was planned to evaluate different growing media for their performance under shade- net conditions to find the best options for the Konkan region. *Dendrobium* orchids need well-draining media that can also hold enough moisture for continuous growth. The choice of potting media greatly impacts various growth factors, including plant growth, leaf count, number of flower spikes, and flower quality, making it a vital area for research. The aim of present study is to identify the most best potting media which is cost-effective and readily available medium for *Dendrobium* growth. Paul and Rajeevan, 1992 reported that *Dendrobium* hybrid Sonia-17 in the combination of charcoal, brick and cocopeat (1:1:1) showed good results in plant height, leaf size, new growth and root length. Saravanan, (2001) ^[6] found best growth of *Dendrobium* orchid hybrid Sonia-17 in coconut dust with a plant height of 37.17 cm. Arumugam and Jawaharlal, (2004) ^[1] observed earliest flowering within 177 days, the longest spike length of 44.56 cm and the highest number of florets per spike of 10.00 in coconut fiber in *Dendrobium* hybrid Sonia-17.

Gufran *et al.* (2014) ^[3] put forth that *Dendrobium* orchid cv. Emma White in 10:30:30 NPK mix at 0.3 percent with brick pieces, gravel and poultry manure resulted the tallest plant at 32.25 cm with 5.25 new shoots per plant, with highest average number of florets per spike (12.58) and highest total spike yield per plant (5.69) in treatment. In *Dendrobium*, Banarjee, (2019) recorded a maximum of 6.0 florets per spike and the largest spike length of 45.16 cm in charcoal medium. *Dendrobium nobile* findings indicated that the media treatment of Cow-dung + Vermicompost was the most successful for first flowering, requiring 38.33 days to blossom, with the tallest spike (18.40) and the largest number of spikes yield of 2.06 (Ratre, 2021) ^[5].

Materials and Method

The research was conducted at Hi-tech Nursery, College of Horticulture, Dapoli, during 2021- 2022 and 2022-2023, to search out the influence of different growing medias on the vegetative growth and flowering in *Dendrobium* orchid cv. Sonia Red variety, under shade-net condition. The research trial was planted in a Randomized Block Design (RBD) with eight different media combinations within three replications. The media combinations included: T₁: Coconut husk T₂: Coconut husk + Charcoal (1:2) T₃: Coconut husk + Brick pieces (1:2) T₄: Coconut husk + Cow-dung clumps (1:2) T₅: Coconut husk + Charcoal + Brick pieces (2:1:1) T₆: Coconut husk + Brick pieces + Cow-dung clumps (2:1:1) T₇: Coconut husk + Charcoal + Cow-dung clumps (2:1:1) T₈: Coconut husk + Charcoal + Brick pieces + Cow-dung clumps (1:1:1:1). Before planting, the seedlings were treated with a 0.1% Bavistin solution, and the media was disinfected with a 50% w/p Copper oxychloride fungicide solution for 5 minutes before filling the pots. The various

media components were broken into small pieces and filled in 8-inch diameter and 5.5-inch height pots for planting. Environmental parameters like as temperature and humidity were controlled and regular nutrient supply was carried out.

Result and Discussion

1. Plant height: The data on plant height for *Dendrobium* cv. Sonia Red especially at different growth periods, viz., at 4, 8, 12, 16, and 20 months after planting is interpreted in Table 1 and Fig. 1. The treatment of media combination Coconut husk + Brick pieces + Cow-dung lumps gave the highest plant height at 4 months after planting, followed by T₅ and T₈. T₁ had the highest plant height at 8, 12, and 16 months, with maximum height at 20 months (42.74 cm) and was at par with T₅ (40.11 cm), T₃ (39.58 cm), and T₈ (39.26 cm). T₄ of Coconut husk + Cow-dung lumps had the lowest height throughout the growth period with 37.94 cm at 20 MAP. This study showed that coconut husk could be a great growing medium for *Dendrobium* cv. Sonia Red likely because of a good mix of moisture, air, and nutrients. However, the mix of coconut husk with cow dung lumps led to shorter plants, probably may be due to its poor water retention and drainage issues. This shortcoming made the combination not suitable for growing *Dendrobium*, showing the importance of a medium that can retain enough moisture for healthy plant growth. Saravanan (2001) ^[6] found that *Dendrobium* cv. Sonia-17 grew tallest in coconut dust media. Gufran *et al.* (2014) ^[3] observed similar results, achieving the tallest plants with a 10:30:30 NPK solution at 0.3 percent combined with brick pieces, gravel, and poultry manure. Additionally, Banarjee (2019) identified charcoal as the best media for growing orchids.

Table 1: Effect of various growing media on plant height (cm) of *Dendrobium* under shade-net condition cv. Sonia Red

Tr. No.	Treatment details	Plant height (cm)				
		4 MAP	8 MAP	12 MAP	16 MAP	20 MAP
T ₁	Coconut husk	14.66	31.24	38.42	41.96	42.74
T ₂	Coconut husk + Charcoal	14.81	28.37	36.49	37.86	38.56
T ₃	Coconut husk + Brick pieces	14.89	30.39	37.03	38.82	39.58
T ₄	Coconut husk + Cow-dung lumps	14.47	27.94	35.90	37.49	37.94
T ₅	Coconut husk + Charcoal + Brick pieces	14.93	28.75	38.20	39.34	40.11
T ₆	Coconut husk + Brick pieces + Cow-dung lumps	14.96	28.93	38.06	38.56	38.84
T ₇	Coconut husk + Charcoal + Cow-dung lumps	14.85	29.31	37.78	38.35	38.71
T ₈	Coconut husk + Charcoal + Brick pieces + Cow-dung lumps	14.90	30.14	37.46	39.03	39.26
	Mean	14.80	29.38	37.41	38.92	39.46
	F-Test	NS	Sig.	Sig.	Sig.	Sig.
	S.Em ±	0.15	0.77	0.35	1.03	1.15
	CD (p = 0.05)	NS	2.35	1.06	3.17	3.51

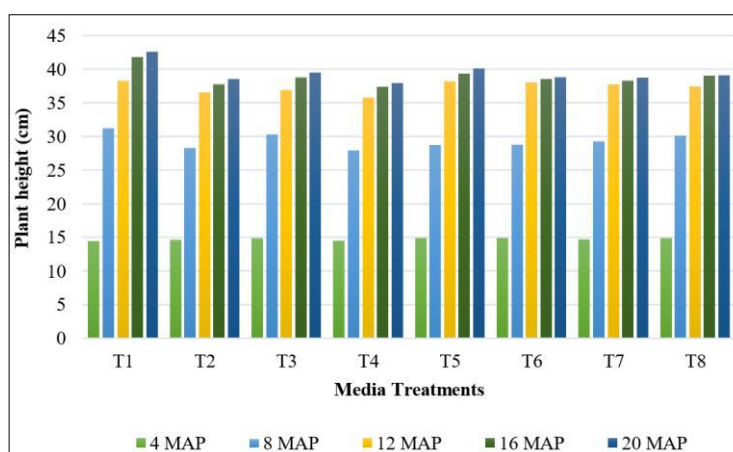


Fig 1: Effect of various growing media on plant height (cm) of *Dendrobium* under shade-net condition cv. Sonia Red

2. Number of shoots

The impact of various growth media on the number of shoots in respect of *Dendrobium* cv. Sonia Red is presented in Table 2 and illustrated in Fig. 2. Four months after planting, the combination of Coconut husk and Brick pieces (T₃) gave more shoots, followed by Coconut husk + Charcoal + Cow-dung lumps (T₇) and Coconut husk + Charcoal + Brick pieces + Cow-dung lumps (T₈), each showing 2.06 shoots. By eight months, T₅ - Coconut husk + Charcoal + Brick pieces, resulted maximum with an average of 4.00 shoots, and at par with T₁ (Coconut husk) recording 3.80 and T₇ recording 3.73 shoots. At twelve months, T₅ yielded 5.90 shoots, while T₂ (Coconut husk + Charcoal) had the fewest at 4.53.

After sixteen months and twenty months, T₁ (Coconut husk) had the highest count of 6.40 and 6.73 shoots, and statistically at par with T₅ (6.26 and 6.66, resp.) while T₄ (Coconut husk + Cow-dung lumps) having the least at 5.40 and 5.63 shoots at 16 and 20 MAP, respectively. The increased number of shoots seen in the coconut husk media is likely due to its better ability to hold water which keeps the roots of *Dendrobium* consistently moist and allows for good air flow, promoting healthy root growth leading to more shoots. Gufran *et al.* (2014) [3] noted that applying 10:30:30 NPK at 0.3% along with brick pieces, gravel, and poultry manure produces better results than other treatments for two varieties of *Dendrobium*. Banarjee (2019) reported the highest shoot count in vermicompost media

Table 2: Effect of various growing media on number of shoots in *Dendrobium* under shade-net condition cv. Sonia Red

Tr. No.	Treatment details	Number of shoots				
		4 MAP	8 MAP	12 MAP	16 MAP	20 MAP
T ₁	Coconut husk	1.93	3.80	5.86	6.40	6.73
T ₂	Coconut husk + Charcoal	1.80	3.60	4.53	5.66	5.93
T ₃	Coconut husk + Brick pieces	2.06	3.46	5.06	5.46	5.73
T ₄	Coconut husk + Cow-dung lumps	1.58	3.26	4.86	5.40	5.63
T ₅	Coconut husk + Charcoal + Brick pieces	1.80	4.00	5.90	6.26	6.66
T ₆	Coconut husk + Brick pieces + Cow-dung lumps	1.86	3.40	5.00	5.54	5.73
T ₇	Coconut husk + Charcoal + Cow-dung lumps	2.06	3.73	5.20	5.66	5.93
T ₈	Coconut husk + Charcoal + Brick pieces + Cow-dung lumps	2.06	3.28	5.26	5.73	6.00
	Mean	1.89	3.56	5.20	5.76	6.04
	F-Test	NS	Sig.	Sig.	Sig.	Sig.
	S.Em ±	0.14	0.12	0.22	0.19	0.19
	CD (p = 0.05)	NS	0.36	0.65	0.58	0.57

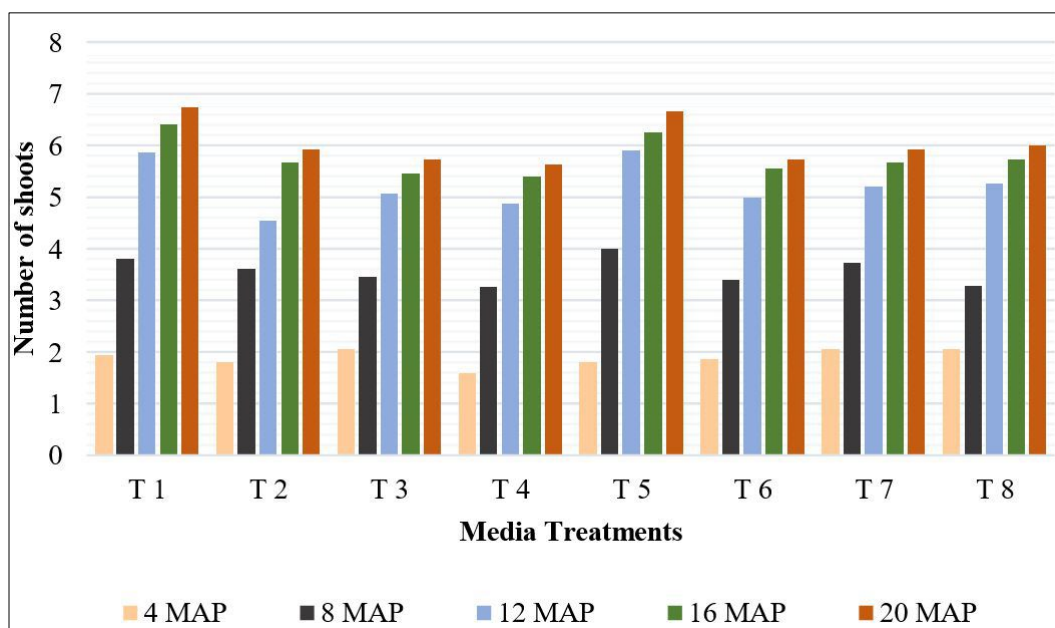


Fig 2: Effect of various growing media on number of shoots in *Dendrobium* under shade-net condition cv. Sonia Red

3. Days taken for the first flower opening to harvest

The current study, as detailed in Table 3 and depicted in Figure 3, recorded the duration in days from the initial flowering to harvest. In the first year of the study, the time taken for the first flower to harvest was shortest in treatment T₁ - Coconut husk at 9.73 days, and was at par with treatments T₃ - Coconut husk + Brick pieces at 10.06 days, T₅ - Coconut husk + Charcoal + Brick pieces at 10.33 days and T₂ - Coconut husk + Charcoal at 10.60 days, while in Treatment T₄ - Coconut husk + Cow-dung lumps had a longer harvesting time at 13.20 days. Similarly, in the

second year, treatment T₁ with Coconut husk showed early harvesting at 9.06 days, superior over treatments T₃, T₅ and T₂. Treatment T₄ had delayed harvesting at 12.00 days. The pooled data from both years, revealed that treatment T₁ - Coconut husk, achieved early harvesting at 9.73 days. This was statistically at par with treatments T₃ (10.06 days), T₅ (10.33 days), and T₂ (10.60 days). In contrast, treatment T₄ - Coconut husk and Cow-dung lumps, had a significantly delayed harvesting time of 13.20 days as compared to the other treatments. Arumugam and Jawaharlal, (2004) [1] observed and reported earliest flowering of *Dendrobium*

orchid variety Sonia-17 in media coconut fiber. Ratre, (2021) ^[5] reported first flowering in Cow-dung +

Vermicompost of *Dendrobium* orchid.

Table 3: Effect of various growing media on days taken for the first flower opening to harvest in *Dendrobium* orchid under shade-net condition cv. Sonia Red

Tr. No.	Treatment details	Days taken for the first flower opening to harvest		
		Year 1 (2021-22)	Year 2 (2022-23)	Pooled
T ₁	Coconut husk	9.73	9.06	9.39
T ₂	Coconut husk + Charcoal	10.60	9.73	10.16
T ₃	Coconut husk + Brick pieces	10.06	9.33	9.69
T ₄	Coconut husk + Cow-dung lumps	13.20	12.00	12.60
T ₅	Coconut husk + Charcoal + Brick pieces	10.33	9.53	9.93
T ₆	Coconut husk + Brick pieces + Cow-dung lumps	12.73	11.13	11.93
T ₇	Coconut husk + Charcoal + Cow-dung lumps	12.33	11.13	11.73
T ₈	Coconut husk + Charcoal + Brick pieces + Cow-dung lumps	11.73	11.00	11.36
	Mean	11.33	10.36	10.84
	F-Test	Sig.	Sig.	Sig.
	S.E.m ±	0.28	0.30	0.41
	CD (p = 0.05)	0.85	0.92	1.24

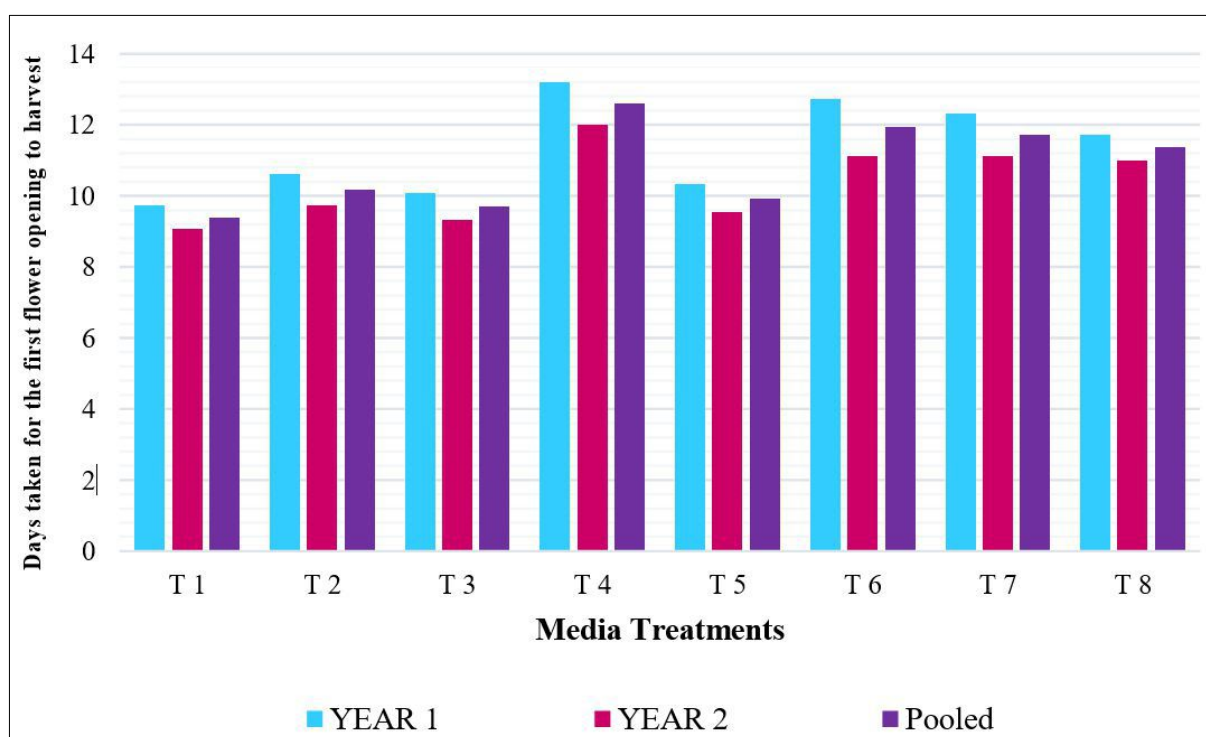


Fig 3: Effect of various growing media on days taken for the first flower opening to harvest in *Dendrobium* orchid under shade-net condition cv. Sonia Red

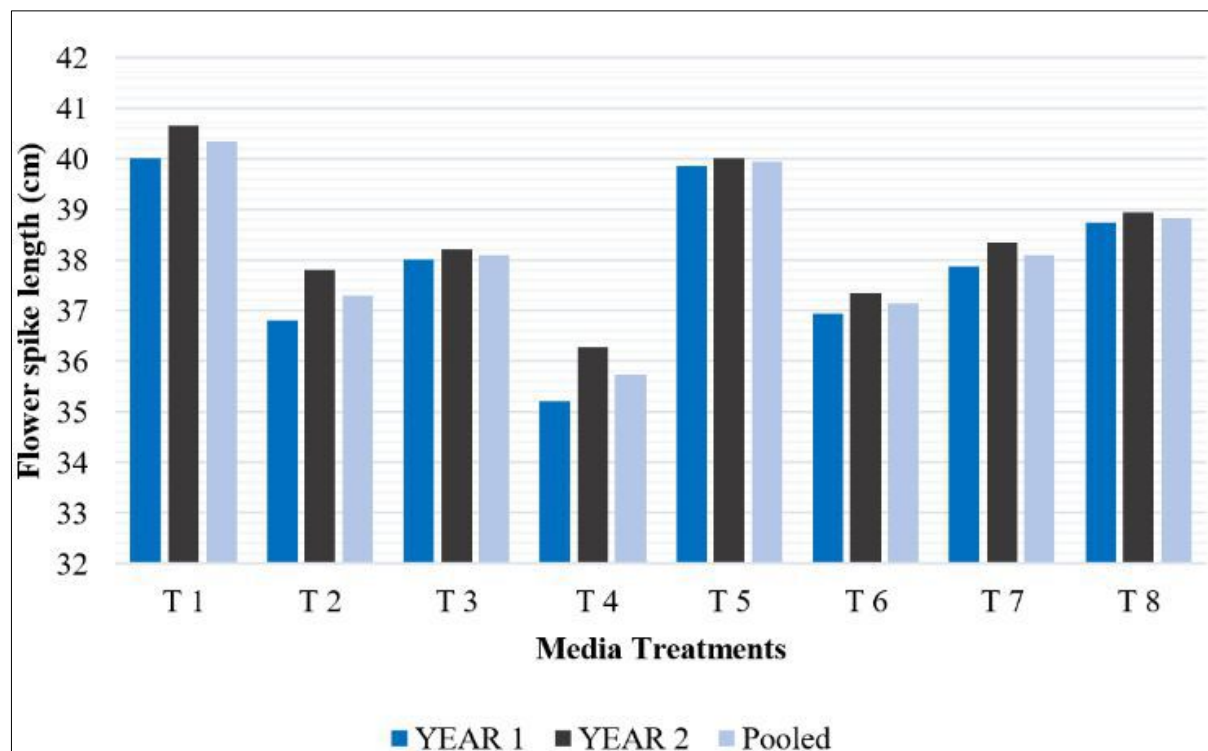
4. Spike length

The lengths of spikes of each plant, as shown in Table 4 and depicted in Figure 4, demonstrated that differing growth media shows substantial impact on spike length. In first year, the treatment T₁ - Coconut husk had the longest flower spike length of 40.00 cm and was on par with treatment T₅ - Coconut husk + Charcoal + Brick pieces, measuring 39.86 cm. The shortest spike length was found in treatment T₄ - Coconut husk and Cow-dung lumps, of 35.20 cm. During second year, same treatment i.e. T₁ again expressed longest spike length upto 40.66 cm, and was superior over treatment T₅ of 40.00 cm. The shortest spike length was still noticed in treatment T₄, which measured 36.26 cm. Overall, the pooled data showed that treatment T₁ consistently produced the longest spike length over both years, averaging 40.33 cm,

and was at par with treatments T₅ at 39.93 cm and T₈, - Coconut husk + Charcoal + Brick pieces + Cow-dung lumps, of 38.83 cm, while shortest spike length remained in treatment T₄ at 35.73 cm. The research revealed that the tallest flower spikes thrived in potting media containing coconut husk, which is well known for holding water well, keeping moisture, and allowing good air flow, which helps roots grow better and leads to longer spike length. The findings are confirmatory with the work of Saravanan (2001) ^[6] and Arumugam and Jawaharlal (2004) ^[1] who indicated that coconut dust was the most effective media, resulting in the longest spike length. While, Banarjee, (2019) noted longest spike length of 45.16 cm in charcoal media. Ratre, (2021) ^[5] noted maximum spike length of *Dendrobium* orchid in Cow-dung + Vermicompost.

Table 4: Effect of various growing media on flower spike length (cm) in *Dendrobium* under shade-net condition cv. Sonia Red

Tr. No.	Treatment details	Flower spike length (cm)		
		Year 1 (2021-22)	Year 2 (2022-23)	Pooled
T ₁	Coconut husk	40.00	40.66	40.33
T ₂	Coconut husk + Charcoal	36.80	37.80	37.30
T ₃	Coconut husk + Brick pieces	38.00	38.20	38.10
T ₄	Coconut husk + Cow-dung lumps	35.20	36.26	35.73
T ₅	Coconut husk + Charcoal + Brick pieces	39.86	40.00	39.93
T ₆	Coconut husk + Brick pieces + Cow-dung lumps	36.93	37.33	37.13
T ₇	Coconut husk + Charcoal + Cow-dung lumps	37.86	38.33	38.09
T ₈	Coconut husk + Charcoal + Brick pieces + Cow-dung lumps	38.73	38.93	38.83
	Mean	37.92	38.43	38.18
	F-Test	Sig.	Sig.	Sig.
	S.E.m ±	0.23	0.26	0.51
	CD (p = 0.05)	0.69	0.80	1.56

**Fig 4:** Effect of various growing media on flower spike length (cm) in *Dendrobium* under shade-net condition cv. Sonia red

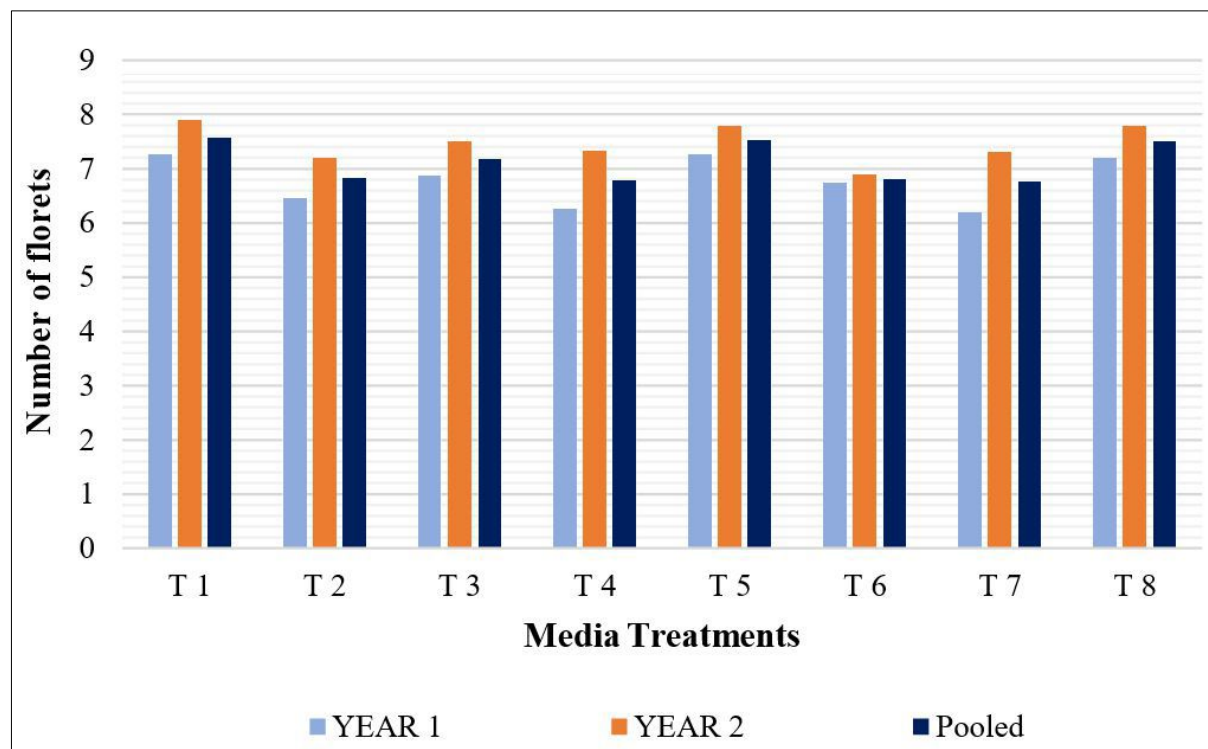
5. Number of flowers

The data in presented Table 5 and visually illustrated in Fig. 5 on number of florets indicate that the variability was influence by the type of potting media used. In the initial year of the experimental study, a variation was observed in the floret count per spike across different treatments. Treatment T₁ - Coconut husk, recorded the highest average of 2.27 florets, and at par with T₅ - Coconut husk + Charcoal + Brick pieces (7.20), T₈ - Coconut husk + Charcoal + Brick pieces + Cow-dung lumps (7.26) and T₃ - Coconut husk + Brick pieces (6.86). Conversely, treatment T₄ - Coconut husk + Cow dung lumps exhibited a lower floret count of 6.20 per spike as compared to the other treatments. During second year of the trial, same treatment T₁ of Coconut husk gave maximum floret count of 7.90, and was statistically comparable to T₅ (7.80), T₈ (7.80), and T₃ (7.50). However, as usual treatment T₆ - Coconut husk + Brick pieces + Cow

dung lumps, yielded a lower average of 6.90 florets per spike. Thus, the pooled data revealed that the treatment T₁ having Coconut husk resulted in an average of 7.58 florets, and was on par with T₅ (7.50), T₈ (7.80) and T₃ (7.18). In contrast, treatment T₇ - Coconut husk + Charcoal + Cow-dung lumps, recorded the lowest average of 6.75 florets. This variance emphasizes the importance of growth media in determining the duration of blooming and the date of harvest. Sonia Red responded well to its ability to store and absorb water, as well as to aerate. Similar results are reported by, Arumugam and Jawaharlal (2004) ^[1] wherein they found that the *Dendrobium* orchid cultivar Sonia-17 produced the most florets when grown in coconut fiber media. In contrast, Gufran *et al.* (2014) ^[3] observed the highest number of florets with a mix of brick pieces, gravel, and poultry manure, while the lowest was seen with rice husk, leaf mold, and gravel.

Table 5: Effect of various growing media on number of florets in *Dendrobium* under shade-net condition cv. Sonia Red

Tr. No.	Treatment details	Number of florets		
		Year 1 (2021-22)	Year 2 (2022-23)	Pooled
T ₁	Coconut husk	7.27	7.90	7.58
T ₂	Coconut husk + Charcoal	6.46	7.20	6.83
T ₃	Coconut husk + Brick pieces	6.86	7.50	7.18
T ₄	Coconut husk + Cow-dung lumps	6.26	7.33	6.79
T ₅	Coconut husk + Charcoal + Brick pieces	7.26	7.80	7.53
T ₆	Coconut husk + Brick pieces + Cow-dung lumps	6.73	6.90	6.81
T ₇	Coconut husk + Charcoal + Cow-dung lumps	6.20	7.30	6.75
T ₈	Coconut husk + Charcoal + Brick pieces + Cow-dung lumps	7.20	7.80	7.50
	Mean	6.78	7.46	7.12
	F-Test	Sig.	Sig.	Sig.
	S.Em ±	0.17	0.13	0.15
	CD (p = 0.05)	0.50	0.40	0.45

**Fig 5:** Effect of various growing media on number of florets in *Dendrobium* under shade-net condition cv. Sonia Red

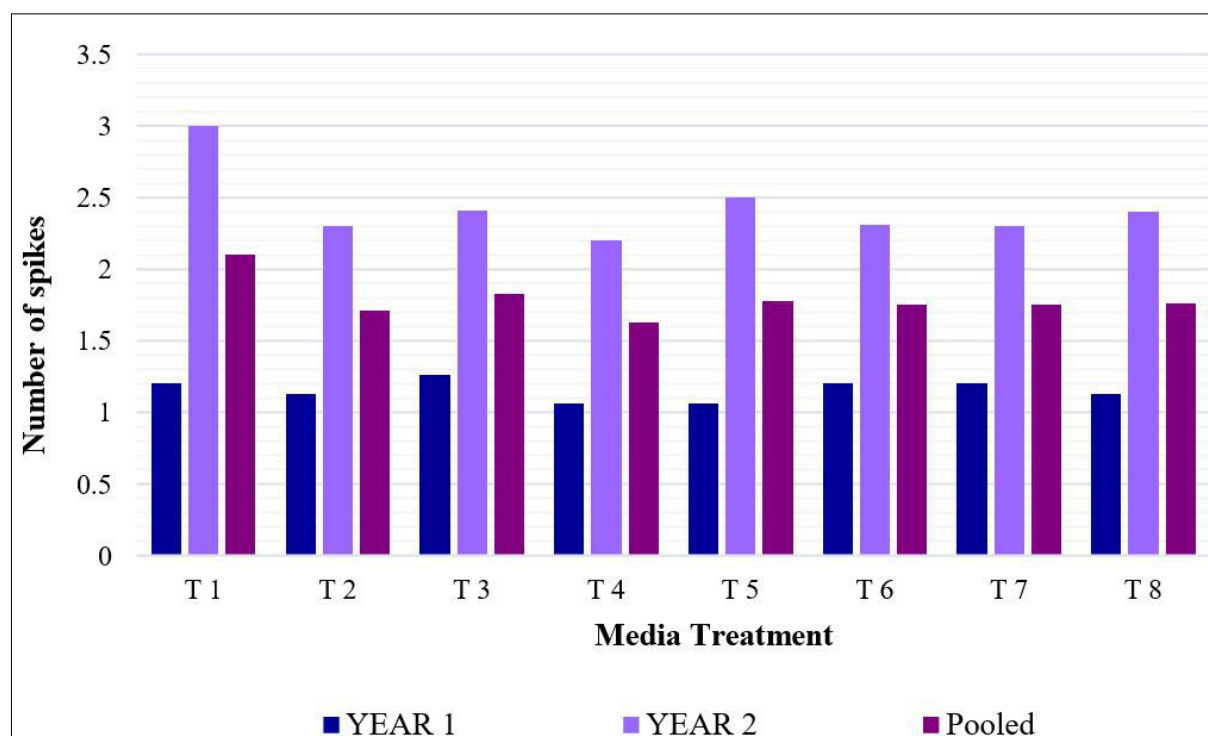
6. Number of spikes

The data presented in Table 6 and graphically shown in Figure 6 indicate that the number of spikes per plant changed significantly across all growing media during the both of the study. During the first year, the data on the number of spikes showed little difference in yield among the varieties, indicating minimal variation. The analysis for this year was statistically insignificant. However, treatment T₃ - Coconut husk + Brick pieces, produced the most spikes (1.26). In the second year, observations revealed significant differences among the media, with treatment T₁ - Coconut husk yielding the highest number of spikes (3.00) and treatment T₄ - Coconut husk and Cow-dung lumps yielded the least (2.20). Statistically, T₁ results were not comparable to any other treatment. The combined data revealed variation among the various media treatments for spikes.

The highest average spikes per plant were in treatment T₁ (2.10) and superior over T₃ (1.83) and T₅ (1.78), while T₄ had the lowest average spikes (1.63). The highest spike production harvested in plants grown in coconut husk media, indicating that coconut husk is a suitable growing medium for this variety as it provides maximum water moisture and aeration to roots which results in better plant growth. These findings align with earlier studies like, Saravanan (2001) ^[6] who noted coconut dust as best growing media for *Dendrobium* orchid hybrid Sonia-17 yield, Gufran *et al.* (2014) ^[3] noticed 10:30:30 NPK mix at 0.3% with brick pieces, gravel and poultry manure resulted maximum spike yield, while Ratre (2019) recorded the largest number of spikes yield of *Dendrobium* in Cow-dung + Vermicompost media treatment.

Table 6: Effect of various growing media on number of spikes per plants in *Dendrobium* under shade-net condition cv. Sonia Red

Tr. No.	Treatment details	Number of spikes		
		Year 1 (2021-22)	Year 2 (2022-23)	Pooled
T ₁	Coconut husk	1.20	3.00	2.10
T ₂	Coconut husk + Charcoal	1.13	2.30	1.71
T ₃	Coconut husk + Brick pieces	1.26	2.41	1.83
T ₄	Coconut husk + Cow-dung lumps	1.06	2.20	1.63
T ₅	Coconut husk + Charcoal + Brick pieces	1.06	2.50	1.78
T ₆	Coconut husk + Brick pieces + Cow- dung lumps	1.20	2.31	1.75
T ₇	Coconut husk + Charcoal + Cow-dung lumps	1.20	2.30	1.75
T ₈	Coconut husk + Charcoal + Brick pieces + Cow-dung lumps	1.13	2.40	1.76
	Mean	1.15	2.41	1.79
	F-Test	NS	Sig.	Sig.
	S.Em ±	0.09	0.08	0.09
	CD (p = 0.05)	NS	0.25	0.26

**Fig 6:** Effect of various growing media on number of spikes per plants in *Dendrobium* under shade-net condition cv. Sonia Red

Conclusion

The two years studies on potting media revealed that the use of coconut husk as a potting medium significantly enhances the growth and flowering characteristics of *Dendrobium* cv. Sonia Red, leading to the highest plant height, flower spike length and floret count as compared to other media combinations. Overall, treatment Coconut husk consistently outperformed over other treatments, indicating its effectiveness in promoting optimal growth and early flowering in Sonia Red orchid variety. On the other hand, the plant development was poor in the medium combination of coconut husk and cow dung lumps.

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