Indian Journal of Traditional Knowledge
Vol 25(6), June 2026, pp 533-540
DOI: 10.56042/ijtk.v25i6.25692

Assessment of indigenous seed pre-treatments and GA_3 on Patala (*Stereospermum suaveolens* DC.) development with special reference to beejopachara

Soumya A Goudar[a], Adavesh B Holeyache[a,*], Jagadishchandra Hiremath[b], Pooja Kumari[c] & Impa H R[d]

[a]Department of Dravyaguna Vigyan, KAHER's Shri B M Kankanawadi Ayurveda Mahavidhyalaya, Shahapur, Belagavi 590 003, Karnataka
[b]Department of Plantation, Spices, Medicinal and Aromatic crops, University of Horticultural Sciences, Bagalkot 587 104, Karnataka, India
[c]Department of Dravyaguna Vigyan, Shiv shakti ayurvedic medical College and hospital, Bhikhi Mansa, Punjab 151 504
[d]Department of Vegetable Science, College of Horticulture, University of Horticultural Sciences, Bagalkot 587 104, Karnataka, India
[*]E-mail: ayuradavesh@gmail.com

Received 06 December 2025; revised 04 May 2026; accepted 01 June 2026

The ancient Indian science of plant life, Vrikshayurveda, recommends herbal and natural remedies to enhance plant growth and seed vitality. Ayurvedic species *Stereospermum suaveolens* is categorised as vulnerable. The purpose of this study was to compare the efficiency of gibberellic acid (GA_3) therapy with Vrikshayurveda-based seed pre-treatments in enhancing *S. suaveolens* germination and early seedling growth. Five treatments were applied to seeds: control (T_1), GA_3 standard (T_2), and three Vrikshayurveda-based formulations (T_3–T_5) containing cow milk, ghee, cow dung, honey and powdered herbs [Brihati (*Solanum indicum*), Tila (*Sesamum indicum*), Kamala Nala (hollow stalk of *Nelumbo nucifera*), Vidanga (*Embelia ribes*)]. A soil-sand-vermicompost-cocopeat medium (1:2:2:1) was used to sow the seeds. On the 30th and 60th days following sowing, growth metrics were measured. The Vrikshayurveda T_3 group, *i.e.*, Overnight soaking with cow milk followed by fumigation of Ghrita (cow ghee) and Vidanga (*Embelia ribes*), produced the highest seedling weight (1.188 g) and root girth (3.58 mm), while GA_3 (T_2) displayed the greatest shoot elongation (22.69 cm at 60 days). T_4 had better root volume and length. Experimental reliability was confirmed by statistical analysis showing significant differences across treatments with low coefficients of variation. Seed treatments based on Vrikshayurveda greatly improved root morphology and seedling vigour, showing benefits that were either equal to or better than those of GA_3. These environmentally friendly compositions validate traditional Vrikshayurveda principles as sustainable options for enhancing germination and growth in medicinal tree species.

Keywords: Germination, Gibberellic acid, *Stereospermum suaveolens*, Vrikshayurveda

IPC Code: Int Cl.[26]: A01C 1/06, A01C 1/08

Ayurvedic writings encourage the use of well-known and thoroughly researched pharmaceuticals and stress upon use of suitable, well-understood substances as medicine. Nearly 90% of Ayurvedic treatments are based on plants, which should be used carefully because they have a greater capacity to restore doshic balance than food or spices[1]. In order to address the growing demand for phytotherapeutic compounds worldwide, cultivating medicinal plants is crucial for protecting wild plant resources and guaranteeing sustainable use[2]. Successful cultivation depends on efficient seed germination, which is controlled by both internal and external influences[3].

To overcome dormancy and encourage seed germination, inorganic preparation is used[4]. There is a demand for environmentally friendly alternatives that provide more productivity and quality. Examples of such farming methods can be found in ancient Indian literature, especially Vrikshayurveda[5,6]. "Vrikshayurveda" is an ancient plant science that emphasizes plant health and productivity. It is a long-standing agricultural technique that is still highly significant in today's horticultural and agricultural domains. It addresses plant propagation, germination, seed conservation, planting, fertilizing, and other facets of controlling plant pests and diseases[7].

Patala, botanically known as *Stereospermum suaveolens* DC. of Bignoniaceae family is an important medicinal plant[8]. It is a medicinally valuable tree species with an annual demand of 1000-2000 MT that is currently considered vulnerable due to overexploitation[9,10]. It is a large deciduous tree found throughout the moist parts of India. Primarily found in the sub-Himalayan region. It has low seed germination[11].

[*]Corresponding author

The fruit reaches full size in the winter but is still unripe; it nearly dehisces until March or May. The seed is pale yellow-brown in hue and has a 0.3–0.4-inch central bony axis. It has wings on both sides of the axis and is 1 to 1.5 inches wide. The capsules are occasionally levelled on the ground. Typically, the capsule gradually dehisces on the tree, causing the light-winged seeds to fly away. After a year, the seeds entirely lose their vitality and have a poor germination rate. The seeds are harvested by removing the capsules from trees before they dehisce. Seeds primarily propagate this species, and as their pericarps are winged, gathering them becomes a tedious task[11,12]. *S. suaveolens* is one of the ingredients of the classical Ayurvedic preparation Dashamularishta. Additionally, traditional healers, rural communities, and pharmaceutical firms employ the bark, flowers, roots, and leaves of *S. suaveolens* to treat vomiting, eructation, piles, acidity, diarrhoea, gonorrhoea, loss of taste, malaria and other fevers. Root decoction for puerperal and intermittent fevers. Stem bark has tonic and diuretic properties. *S. suaveolens* contains naphthaquinone and lapachol, root bark contains β-sitosterol, *n*-triacontanol, root heart wood contains lapachol, dehydro-α-lapachone and dehydrotectol[13].

Optimising planting surfaces and using efficient seed pretreatments are necessary to improve germination and seedling growth. There are no previously reported studies on the germination of seeds of Patala using vrikshayurveda methods. Hence, a study was planned to evaluate the effectiveness of Vrikshayurveda treatments, in enhancing the germination of *Stereospermum suaveolens* seeds.

Methodology

The experiment was conducted in a shaded nursery at the KAHER's Shri B M Kankanawadi Ayurveda Mahavidyalaya, Belagavi, Karnataka, India (Coordinates: 15.86 N, 74.51 E). Situated in the foothills of Western Ghats, receives annual rain fall 550-1025 mm, with 60-70% humidity, with an average annual temperature 24ºC.

Seeds of *S. suaveolens* were collected from Uttarakhand, authenticated in K.L.E.U.'s Shri. B.M.K Ayurvedic college, Central Research Facility (Ayush Approved Drug Testing Laboratory for ASU Drugs), Belagavi. For the study, five distinct seed treatments in five replications were carried out in a Complete Randomised Design (CRD).

Materials and Methods

The growing media comprised soil, sand, vermicompost and Cocopeat in a 1:2:2:1 ratio. The raw materials of Brihati (*Solanum indicum*), Kamala Nala (*Nelumbo nucifera*), Tila (*Sesamum indicum*) and Vidanga (*Embelia ribes*) were procured from KLE Ayurveda pharmacy, Khasbhag, Belagavi. The seeds were first stripped of their wings and immersed in water; those that sank to the bottom were chosen for further study. To ensure sufficient sample representation and statistical reliability, a total of 210 seeds were used for each treatment group, with 42 seeds per replication.

Milk was used as a natural pretreatment medium to assess the seed germination by supplying organic nutrients and growth-promoting substances; the complete procedure is explained in (Fig. 1).

Seed pretreatment

Each batch of seeds was removed from its individual solutions after a 24-h soak and allowed to air dry in the shade for five days to remove any remaining moisture. The control group (T_1) received no pretreatment, while the standard group (T_2) was treated with gibberellic acid (GA_3) and stored in airtight polythene bags after drying until sowing. The Vrikshayurveda-based seed therapies were administered to the remaining groups (T_3, T_4 and T_5). T_3 (Lepa treatment) group seeds were treated for a full day with a paste composed of equal parts powdered Kamala Nala (*Nelumbo nucifera*), Tila (*Sesamum indicum*), and Brihati (*Solanum indicum*). Vidanga (*Embelia ribes*) and cow ghee (Go-Ghrita) were used to fumigate seeds for 20 min in T_4 (Dhupana treatment); in T_5 (Cow dung and herbal lepa treatment), seeds were rubbed with fresh cow dung and covered for 24 h with a mixture of honey and Vidanga beejachurna (powdered *Embelia ribes* seeds) (Table 1 & Fig. 2). All treated seeds were stored in airtight

Table 1 — Treatment Group Overview[6]

Treatment	Treatment Details
T1	Control: Without treatment
T2	Standard: Soaking seeds in GA3
T3	Overnight soaking with cow milk followed by fumigation of Ghrita (cow ghee) and Vidanga (*Embelia ribes*)
T4	Overnight soaking in cow milk, dried well in shade and rolled in powder of Brihati (*Solanum indicum*), Tila (*Sesamum indicum*) and Kamal naala (hollow stalk of *Nelumbo nucifera*)
T5	Overnight soaking in cow milk + rubbed with cow dung, placed in a paste of Vidanga (*Embelia ribes*) & honey

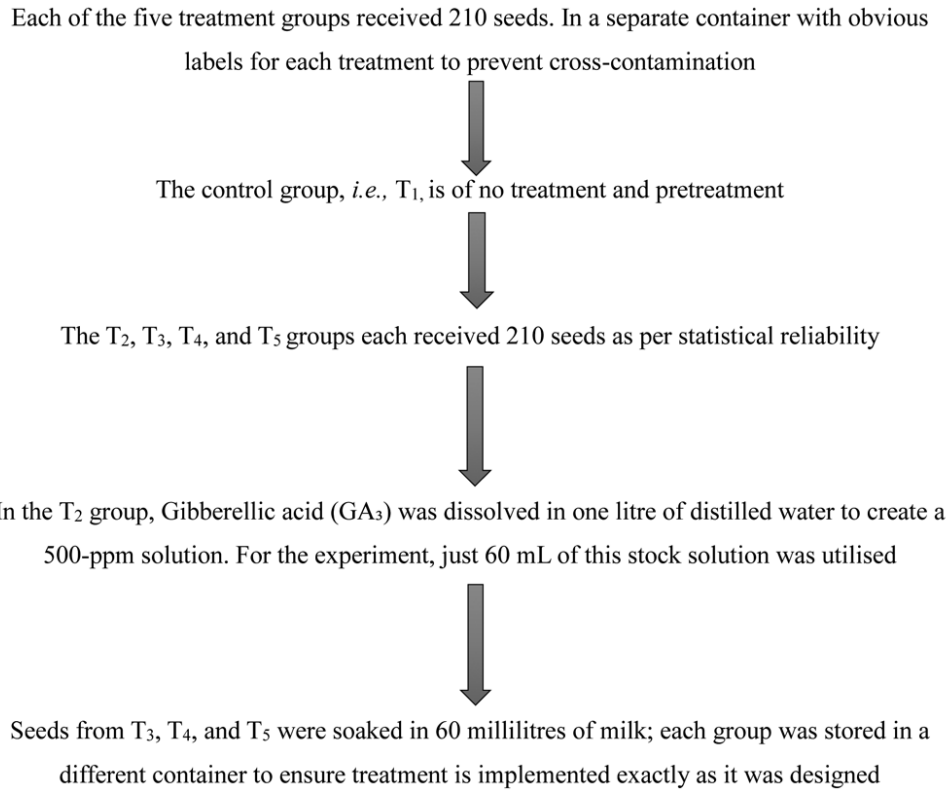

Fig. 1 — Flow chart of the milk as pre-treatment

Fig. 2 — Different treatment groups

polythene bags after being washed and left to air dry as needed. On the seventh day, seeds from each of the five groups were put in 70-cell seedling trays to assess germination performance and early seedling development[14]. The average illuminance measured using a lux light meter over the 60 days was 3730.98 lx. The weather during June and July of 2025 in the greenhouse was 28.5°C, with a minimum temperature of 23.5°C and an average relative humidity of approximately 85-87%.

Results and Discussion

30th day observation

The observations were recorded on the 30th day for various seedling growth parameters under different treatments and are presented in (Table 2). The data revealed significant variations ($p<0.01$) among the five treatments for the evaluated parameters. Shoot length varied significantly between treatments, with T_2 (500-ppm concentration) recording the significantly ($p<0.01$) highest mean value of 10.94 cm (Fig. 3 & Fig. 4). A previous study also mentioned the highest shoot length in garlic treatment with 500 ppm GA_3[15]. T_4, *i.e.*, Overnight soaking in cow milk, dried well in shade and wrapped in powder of Brihati (*Solanum indicum*), Tila (*Sesamum indicum*) and Kamal naala (hollow stalk of *Nelumbo nucifera*) had the shortest mean shoot length (4.446 cm). Significant

Table 2 — Effect of seed treatments on Patala (*Stereospermum suaveolens*) seedling growth after30 days

Treatment	Shoot length (cm)	Root length (cm)	Seedling length (cm)	Seedling weight (g)	Root weight (g)	Root volume (cc)	Root girth (mm)	Number of leaves
T_1	4.756	2.146	6.938	0.232	0.026	0.086	0.329	5.000
T_2	10.944	1.988	14.938	0.232	0.007	0.83	0.496	6.000
T_3	7.54	1.988	9.978	0.335	0.011	0.128	0.322	5.000
T_4	4.446	1.808	6.072	0.245	0.011	0.069	0.749	2.940
T_5	5.440	1.790	7.416	0.014	0.014	0.072	0.553	4.000
C.D	0.232	Nil	2.602	0.032	0.005	0.021	0.048	1.371
SE (m)	0.078	0.101	0.876	0.011	0.002	0.007	0.016	0.462
SE (d)	0.111	0.143	1.239	0.015	0.002	0.010	0.023	0.653
C.V.	2.606	11.595	21.595	11.510	27.196	17.813	7.451	22.500

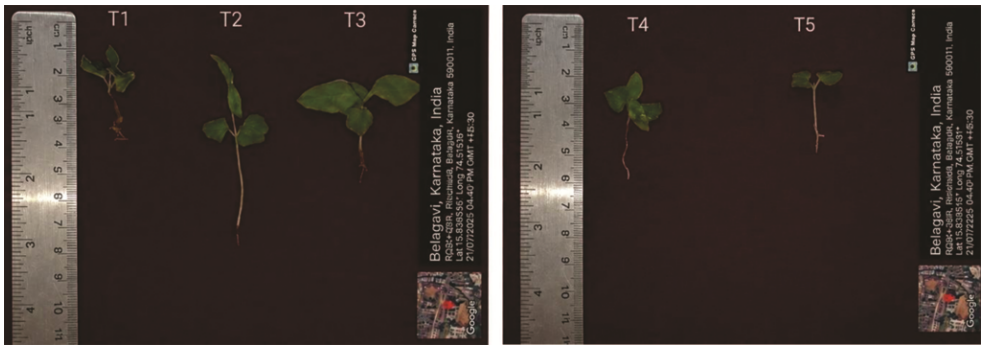

Fig. 3 — Sampling under different treatments on 30th day

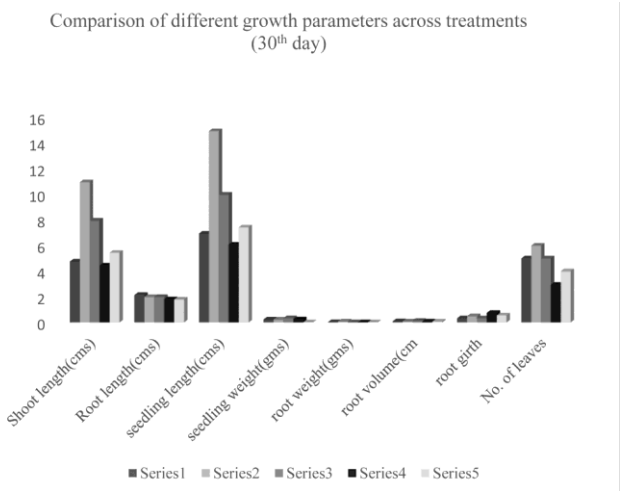

Fig. 4 — Comparison of different growth parameters across treatments (30th day)

and consistent differences across treatments are indicated by the critical difference (0.232).

The average root length varied from 1.790 cm (T_5) to 2.146 cm (T_1). Since no C.D. value was calculated for this parameter, the moderate variability (C.V. = 11.595%) indicates slight but non-significant deviations. In the earlier study of *Allium sativum*, the smallest root length, 1.49 cm, was recorded in GA3 500 ppm for 24 h[15]. And in the previous study on custard apple, the maximum height of plants was treatment G3 recorded as 4.24 cm, according to data collected 30 days after sowing[16]and it showed 17.66 cm at GA3 700 ppm in the *Cassia fistula*[17], followed by patala seedling length T_3 (9.978 cm), while the minimum was recorded in T_4 (6.072 cm). The statistical significance of the discrepancies was confirmed by the C.D. (2.602).

T_3 showed the significantly highest ($p<0.01$) mean seedling weight of 0.335 g, followed by T_4 (0.245 g). Previous study on papaya reported 6.33g of GA3 at 200 ppm[18]. In the present patala study, significant variance between treatments was confirmed by the mean differences exceeding the C.D. (0.032). Root weight ranged from 0.007 g to 0.026 g, with T_1 exhibiting the highest value. Prior studies of papaya, a high C.V. (27.196%), suggest that this characteristic is very variable. Also, papaya roots in GA3 200 ppm weighed 2.43 g[19].

In comparison to the other treatments, the T_3 recorded was significantly greater ($p<0.01$) mean root volume of 0.128 cm^3. A substantial difference with moderate variability (C.V. = 17.813%) is indicated by the C.D. (0.021). T_4 had the significantly highest ($p<0.01$) mean value for root girth (0.749 cm), followed by T_5 (0.553 cm) and T_3 (0.322 cm). With a low C.V. = 7.451%, indicating experimental precision, the differences were significant (C.D. =

0.048). The study revealed distinct differences between the treatments in terms of the quantity of leaves. T_2 had the significantly highest ($p<0.01$) mean value (6.000), while T_4 had the lowest mean (2.940), indicating a relatively weak response. Previous study on custard apples showed remarkable performance, with a significant 3.99 on the 30th day[16]. The coefficient of variation (C.V. = 22.50%) indicated a moderate degree of variability, suggesting sufficient experimental precision and dependability of the acquired data.

60th Day observation

Significant variations between the treatments were found by statistical analysis of several growth characteristics (Table 3). The impact of both synthetic and herbal growth promoters was confirmed by the different impacts on seedling morphology induced by the Gibberellic acid treatment (T_2) and the Vrikshayurveda-based treatments (T_3–T_5).

Shoot Length: The Gibberellic acid treatment (T_2) exhibited the longest mean shoot length (17.700 cm) when compared to the control and Vrikshayurveda groups (C.D. = 0.646; C.V. = 4.305%). Among the Vrikshayurveda treatments, T_3 (12.481 cm) performed better than T_4 (9.000 cm) and T_5 (8.808 cm). This confirms the known capacity of GA_3 to promote cell elongation. However, the response in T_3 indicates that traditional herbal medicines might potentially be able to stimulate growth. T_1 had the longest roots (8.314 cm), followed by T_5 (6.528 cm) and T_3 (6.474 cm), all of which were longer than T_2 (5.241 cm). The difference (C.D. = 0.607; C.V. = 6.694%) was statistically significant ($p<0.01$) (Fig. 5).

Because the herbal formulations contain bioactive substances, the increased root elongation under Vrikshayurveda therapies indicated better root health and soil penetration[20]. Gibberellic acid produced the longest seedlings overall (T_2 = 22.694 cm) (Fig. 5 & Fig. 6), study conducted showed while custard apples were found to possess the data collected 60 days after sowing revealed a statistically significant ($p<0.01$) mean plant height of 5.64 cm under treatment G3. Further, in the present patala study, followed by T_3= 18.236 cm and T_4 = 17.590 cm (C.D. = 0.838). This suggests that Vrikshayurveda formulations produce competitive growth while preserving better structural balance between shoot and root systems, even if GA_3 stimulates maximal elongation. Even GA_3, T_2 = 0.863 g and T_4 = 0.909 g (C.D. = 0.159; C.V. = 14.408%)

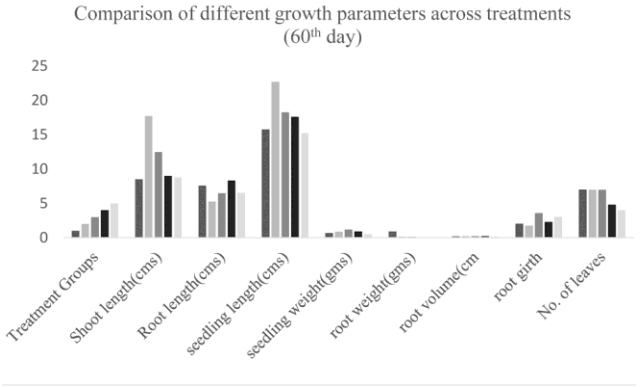

Fig. 5 — Comparison of different growth parameters across treatments (60th day)

Fig. 6 — Sampling under different treatments on 60th day

Table 3 — Effect of seed treatments on Patala (*Stereospermum suaveolens*) seedling growth after 60 days

Treatment	Shoot length (cm)	Root length (cm)	Seedling length (cm)	Seedling weight (g)	Root weight (g)	Root volume (cc)	Root girth (mm)	No of leaves
T_1	8.497	7.562	15.742	0.675	0.902	0.202	2.031	7.000
T_2	17.700	5.241	22.694	0.863	0.145	0.202	1.745	6.960
T_3	12.481	6.474	18.236	1.188	0.143	0.236	3.580	6.960
T_4	9.000	8.314	17.590	0.909	0.062	0.240	2.285	4.800
T_5	8.808	6.528	15.210	0.527	0.074	0.165	3.072	4.000
C.D	0.646	0.607	0.838	0.159	0.098	Nil	0.243	0.492
SE(m)	0.218	0.204	0.282	0.054	0.033	0.026	0.082	0.166
SE(d)	0.308	0.289	0.399	0.076	0.047	0.037	0.116	0.234
C.V.	4.305	6.694	3.523	14.408	27.813	28.181	7.206	6.232

were not as heavy as T_3 (1.188 g). Increased metabolic efficiency is seen in T_3 better biomass buildup, which may be the result of enzymatic activation and nutrient mobilisation brought on by herbal biostimulants resulting from Vidanga (*Embelia ribes*), a medicinal plant rich in bioactive compounds, namely embelin, phenolics, flavonoids and glycosides, which add to its function likely as a natural biostimulant and organic input. It's susceptibility to auxin-mediated root induction, indicating its capacity to enhance root growth as an enabling factor. Additionally, its phytochemical composition is well-suited for a specific purpose, as an organic fertilizer able to improve soil microbial action and nutrient uptake. The presence of antioxidant compounds substantiates its function as a biostimulant, promoting plant growth, adaptability and root development[21]. There was a large variation in root weight (C.D. = 0.098; C.V. = 27.813%), with the control group (T_1 = 0.902 g) exhibiting the statistically significance ($p<0.01$) highest mean. In contrast to GA_3, which promoted shoot elongation, Vrikshayurveda therapies preserved balanced shoot-root proportions. T_1 = 0.240 cm^3 had the largest root volume, closely followed by T_3 = 0.236 cm^3, both of which were greater than GA_3 (T_2 = 0.202 cm^3). These results show that rhizosphere establishment and root density were improved by herbal treatments.

Root girth showed notable variations (C.D. = 0.243; C.V. = 7.206%). Compared to GA_3 (1.745 mm), the Vrikshayurveda treatments T_3 (3.580 mm) and T_5 (3.072 mm) showed larger girth, suggesting better secondary thickening and mechanical strength of the root system (Fig. 7). The data showed that there were substantial differences in the number of leaves between the treatments, in contrast to the custard apple study, where the mean value was 4.55, which was significant. T_1 had the greatest mean value (7.000), closely followed by T_2 and T_3 (6.960 each), suggesting that their performance was superior and statistically equivalent. T_4 (4.800) and T_5 (4.000) had considerably lower mean outcomes. The calculated critical difference (C.D. = 0.492) showed that T_1, T_2, and T_3 were statistically at par significantly superior to T_4 and T_5. The coefficient of variation (C.V. = 6.23%) indicated low experimental variability, indicating very reliable and accurate experimental results.

Classical literature by Surapala's Vrikshayurveda, which advises seed anointment (Abhyanjana) or soaking, is supported by the improved root development

Fig. 7 — The maximum root girth was observed in the T3 group

and balanced growth pattern under Vrikshayurveda therapies. Using herbal pastes to boost the life and vigour of seeds. Brihati (*Solanum indicum* L.), Tila (*Sesamum indicum* L.), and Kamala Nala (*Nelumbo nucifera* Gaertn.) make up the T_3 formulation, which is rich in phytohormone-like substances, saponins, and antioxidants[22-24] that promote germination and root growth. The Ayurveda idea of preserving samyavastha (equilibrium) in plant physiology—improving both moola vruddhi (root growth) and sakhavruddhi (shoot growth)—is supported by the balanced response shown in T_3 (Overnight soaking with cow milk followed by fumigation of Ghrita (cow ghee) and Vidanga (*Embelia ribes*)) and T_4 (Overnight soaking in cow milk, dried well in shade and enclosed in powder of Brihati (*Solanum indicum*), Tila (*Sesamum indicum*) and Kamal naala (hollow stalk of *Nelumbo nucifera*).

Conclusion

The comparison study revealed that whereas Vrikshayurveda-based treatments (T_3–T_5) had stronger impacts on root form, seedling weight, and overall vigour compared to Standard group (T_2). Gibberellic acid therapy (T_2) significantly enhanced shoot and total seedling length. T_3 outperformed GA_3 in both seedling weight and root girth, with the highest seedling weight (0.335 g) at 30^{th} days and largest girth (3.580 mm) at 60^{th} days, which encouraged subterranean growth. Unlike GA_3, which elongates quickly, the

vrikshayurveda treatments containing natural compounds keep plant development in balance, this initial thorough analysis of patala seed germination within the frame of vrikshayurveda produced great results. Data reliability was validated by low variance, confirming the sustainability and efficacy of Vrikshayurveda principles as substitutes for artificial growth regulators.

Acknowledgements

Authors gratefully thank the Department of Vrikshayurveda, K.L.E. Shri B.M. Kanakanwadi Ayurveda Mahavidyalaya, Shahapur, Belagavi, for their encouragement and support.

Author Contributions

SAG: Conceptualisation, formal analysis, funding acquisition resources, software, supervision, Roles/writing – original draft, and writing – review & editing. ABH: Conceptualisation, formal analysis, funding acquisition resources, software, supervision, Roles/writing – original draft, and writing- review & editing. JH: Conceptualisation, formal analysis, resources, software, supervision, writing – review & editing. PK: Conceptualisation, resources, supervision and software. IHR: Conceptualisation, formal analysis, software, supervision, Roles/writing – original draft, and writing – review & editing.

Funding

The current study did not get any funding or financial support.

Conflict Of Interest

The authors declare no conflict of interest

Informed Consent

Not Applicable

Ethic Statement

The study is based on the analysis of the seed germination and does not involve human participants, animal subjects or clinical data; therefore, ethical approval was not required.

Use of Artificial Intelligence (AI)

The authors acknowledge that AI-based tools were used for language structuring, drafting and for Background of images by retaining the originality. However, the manuscript has been thoroughly revised, edited and validated by the authors to ensure originality, accuracy and compliance with journal guidelines

Data Availability

All data supporting the findings of this study will be provided by the corresponding author through the email address.

References

1 Kumar S, Dobos G J & Rampp T, The significance of Ayurvedic medicinal plants, *J Evid Based Complementary Altern Med*, 22 (3) (2017) 494-501. DOI: 10.1177/2156587216671392

2 Yuan Q J, Zhang Z Y, Hu J, Guo L P, Shao A J, *et al*., Impacts of recent cultivation on genetic diversity pattern of a medicinal plant, *Scutellaria baicalensis* (Lamiaceae), *BMC Genet*, 11 (1) (2010) 1-13, DOI: 10.1186/1471-2156-11-29

3 Derya Esen, Oktay Yildiz, Murat Sarginci & Kani Isik, Effects of different pretreatments on germination of Prunus serotina seed sources, *J Environ Biol*, 28 (1) (2007) 99-104.

4 Gupta R & Chakrabarty S K, Gibberellic acid in plant: still a mystery unresolved, *Plant Signal Behav*, 8 (9) (2013). DOI: 10.4161/psb.25504

5 Sadhale, Nalini (Tr.), 1996. Surapala's Vrikshayurveda (The Science of Plant Life by Surapala), Agri-History Bulletin No. 1. Asian Agri-History Foundation, Secunderabad 500 009, India. https://share.google/lfYVulnIwPxceZrZe

6 Vyas T M, Sarwal C S, Sharma R K, Rath C, Mahajan B, *et al*., Vrikshayurveda for farmers: basic concepts and techniques, National Medicinal Plants Board, Ministry of Ayush, Government of India, New Delhi, 2023.

7 Ankad G M, Hiremath J, Patil R T, Pramod H J & Hegde H V, Evaluation of Kunapajala and Pancha gavya on plant quality, physiology, biochemistry, yield and growth attributes - A case study of *Withania somnifera* Dun, *J Ayurveda Integr Med*, 8 (4) (2017) 247-251. DOI: 10.1016/j.jaim.2017.01.004.

8 The Wealth of India: A Dictionary of Indian Raw Materials and Industrial Products, Industrial Products—Part I, (1949) 476–7.

9 https://www.nmpb.nic.in

10 Lade S, Alok S, Nagdev S, Golani P & Agrawal A, A potential role of *Stereospermum suaveolens* DC for multiple diseases: a brief analysis, *Int J Pharm Sci & Res*, 13 (9) (2022) 3486-93. doi: 10.13040/IJPSR.0975-8232.13(9).

11 Trivedi D R & Joshi A G, Studies on seed germination of *Stereospermum suaveolens* with respect to different parameters, *Environ Exp Biol*, 12 (1) (2014) 33-37.

12 Tomar A & Srivastav A, Germination characteristics of less known tree-*Stereospermum suaveolens* (Roxb.) Dc. Lesser Known Plants, (2021) p. 151. https://www.researchgate.net/publication/377780455_Lesser_Known_Plants_Conservation_Management_and_Sustainable_Utilization

13 Wahab Sab B A, Jacob J, Manjunath G G, Singh V K & Mundkinajeedu D, Cycloolivil, a lignan from the roots of *Stereospermum suaveolens*, *Pharmacognosy Res*, 7 (1) (2015) 45-8. doi: 10.4103/0974-8490.147198

14 Aralelimath G T, Nayak S U, Ankad G M, Hegde H V & Shirurmath S S, An experimental study of Vrikshayurveda seed treatments on germination rate and active ingredient of Bakuchi (*Psoralea corylifolia* Linn.) by HPLC method, *Int J Ayur Pharma Res*, 7 (6) (2019) 1-10.

15 Rahman M H, Haque M S, Karim M A & Ahmed M, Effects of gibberellic acid (GA3) on breaking dormancy in garlic (*Allium sativum* L.), *Int J Agri Biol*, 8 (1) (2006) 63-65

16 Pritee Rahangdale, S K Pandey & Jayswal D K, Influence of GA3 and date of sowing on growth and development of custard apple seedlings, *Int J Curr Microbiol App Sci*, 8 (1) (2019) 1813-1821. doi: https://doi.org/10.20546/ijcmas.2019.801.192

17 Rout S, Beura S, Khare N, Patra S S & Nayak S, Effect of seed pre-treatment with different concentrations of gibberellic acid (GA3) on seed germination and seedling growth of *Cassia fistula* L., *J Med Plant Stud*, 5 (6) (2017) 135-138

18 Ramteke V, Paithankar D H, Kamatyanatti M, Baghel M M, Chauhan J, *et al.*, Seed germination and seedling growth of papaya as influenced by GA3 and propagation media, *Int J Farm Sci*, 5 (3) (2015) 74-81.

19 Anjanawe S R, Kanpure R N, Kachouli B K & Mandloi D S, Effect of plant growth regulators and growth media on seed germination and growth vigour of papaya, *Int J Adv Biochem Res*, 8, (2024) 688-691. DOI: https://doi.org/10.33545/26174693.2024.v8.i12i.3262

20 Bajaj K K, Chavhan V, Raut N A & Gurav S, Panchgavya: A precious gift to humankind, *J Ayurveda Integr Med*, 13 (2) (2022)100525. DOI: 10.1016/j.jaim.2021.09.003

21 Raghu A V, Unnikrishnan K, Geetha S P, Martin G & Balachandran I, Plant regeneration and production of embelin from organogenic and embryogenic callus cultures of *Embelia ribes* Burm. f.—a vulnerable medicinal plant, *In Vitro Cell Dev Biol-Plant*, 47 (4) (2011) 506-15.

22 Iqubal M, Sharma S K, Mujahid M & Hussain M S, An updated ethnobotany, phytochemical and pharmacological potential of *Solanum indicum* L., *J Drug Deliv Ther*, 12 (2) (2022) 160-172

23 Hadipour E, Emami S A, Tayarani-Najaran N & Tayarani-Najaran Z, Effects of sesame (*Sesamum indicum* L.) and bioactive compounds (*sesamin* and *sesamolin*) on inflammation and atherosclerosis: A review, *Food Sci Nutr*, 11 (7) (2023) 3729-3757. doi: 10.1002/fsn3.3407

24 Dhanarasu S & Awdah Al-Hazimi, Phytochemistry, pharmacological and therapeutic applications of *Nelumbo nucifera*, *Asian J Phytomed Clin Res*, 1 (2) (2013) 123-136.