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Sacred sounds & sprouting seeds: The effect of mantra vibrations on wheat germination

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Abstract
This research explores the influence of sound vibrations generated by sacred mantras on seed germination and key physiological parameters in wheat (*Triticum aestivum*). The experiment involved three groups: Seeds exposed to the Gayatri Mantra, the Shiv Tandav Stotram, and a control group with no sound exposure. Mantras were played daily for fixed durations under controlled conditions during the germination period. Parameters analyzed included germination percentage, Radicle Length, Plumule Length, Fresh weight and Dry weight in seedlings. The results revealed a significant enhancement in germination rate and metabolic activity in the mantra treated groups compared to the control. Seeds exposed to the Gayatri Mantra exhibited the most pronounced improvements. The Shiv Tandav Stotram group also showed positive effects, though to a lesser degree. These findings suggest that specific mantra vibrations can act as biophysical stimuli, potentially serving as eco-friendly enhancers of seed vigor and early plant development in sustainable agriculture.

Keywords: *Triticum aestivum*, Seed germination, Mantra, Gayatri Mantra, Shiv Tandav Stotram.

Introduction
Musical sound, a part of audible sound, includes organized patterns that shape ongoing compositions (Das & Ghosh, 2022 [10]; Chowdhury & Gupta, 2015) [7]. The positive impact of music on humans and animals, even plants, has been known for decades, especially in music therapy. Sir Jagdish Chandra Bose was one of the first persons to investigate the response of plants to different stimuli as well as different environmental factors (Bose, 1902, 1906 [2, 3]; White, 2015 [19]; Chandrakala & Trivedi, 2019 [6]; Chandrakala, 2020) [5]. Studies suggest that multicellular organisms (Benford, 2002 [1]; Dossey, 2001 [11]; Kristen, 1997) [16] react to vibrations of sound (Braam & Davis, 1990) [4].
Previously, scientists thought that plants are unable to hear and receive sound wave since plants lack structural organs through which they can perceive sound. But it is known today that plants can sense the vibration produced by sounds, and such vibrations serve as a stimulus to plants (Jung, *et al*., 2018) [15]. Not just that, plants have also been found to be capable of communicating through acoustic vibration (Gagliano et al., 2012 [13]; Mishra et al., 2016) [17].
Need & Importance of the Study:
In the search for sustainable and holistic methods of agriculture, scientists have increasingly started investigating the subtle effects of environmental and energetic forces on plant development. One of the areas of interest in this direction is the possible effect of sound vibrations, specifically produced by sacred mantras or chants, on biological systems. The age-old wisdom contained within much spiritual tradition indicates that sound can shape matter, a concept now being revisited using the tools of contemporary science.
Mantras, as employed in spiritual practices, consist of repetitive sound patterns presumed to create specific vibrational frequencies. These vibrations can affect living organisms through a change in energy levels, cellular behaviour, or resonance patterns in biological tissues. Recent research indicates that specific frequencies have the capability to act beneficially upon plant growth factors like seed germination rate, root length, and accumulation of biomass. The Gayatri mantra is considered to be the most potent mantra and encompasses the essence of all mantras in Vedanta teaching and scripture (Yadav & Panday, 2023) [20]. Shiv Tandav Stotra is also among the potent vibrational rhythmic hymn.

Germination is a key period in the plant life cycle that controls seedling establishment, vigor, and overall crop success. It is a series of biochemical and physiological processes initiated by the absorption of water, the activation of enzymes, and mobilization of reserve materials.

The function of sound in the form of rhythmic, deliberate vibrations such as mantras is currently a relatively less-studied but promising area.

Wheat (*Triticum aestivum*), the world's most important staple crop, provides the perfect model to study such influences because of its agronomic significance, rapid germination and well-documented physiology. Exploring if mantra-driven sound vibrations can promote wheat seed germination can create new opportunities for converging traditional systems of knowledge with conventional agricultural methods.

Statement of problem

Although scarce literature exists on how plants react to music may make plants undergo changes in plant metabolism, influencing the growth of plants (Creath & Schwartz, 2004 [9]; Ramekar & Gurjar, 2016) [18], little scientific research examines how sound stimuli can affect physiological processes during germination. That gap offers a chance to delve into the confluence of everyday sound practices and plant science. The absence of empirical information regarding the influence of mantra vibrations on seed germination, and especially in economically valuable crops such as wheat (*Triticum aestivum*), necessitates concerted research to ascertain if such vibrations can be exploited as a natural stimulant of seed vigor and early plant growth.

Aims and Objectives: The current investigation is designed to assess the impact of exposure to strong mantras like Gayatri Mantra and Shiv Tandav Stotram on wheat seed germination behavior through the evaluation of germination rate and seedling growth. The findings could contribute to a deeper understanding of the subtle interactions between sound energy and plant biology, potentially leading to innovative, non-invasive techniques to promote crop health and vitality.

Materials and Methods

Seed Material and Experimental Setup: Healthy seeds of *Triticum aestivum* (wheat) were selected for the study. A total of 50 seeds were used, divided equally among five sterile, clean Petri dishes (10 seeds per dish), each lined with Whatman No 1 filter paper. The filter papers were moistened with distilled water to provide the necessary moisture for germination.

Three experimental sets were prepared:

- Set I (Gayatri Mantra Exposure).
- Set II (Tandav Stotra Exposure)
- Set III (Control in Silence)

Each set comprised several Petri dishes set under laboratory conditions at ambient room temperature. When each set was subjected to the daily sound exposure, each set was set in distinct acoustically isolated parts of the lab to avoid cross-contamination of sound vibrations.

Sound Treatment

Mantra exposure was conducted for 1.5 hours daily, from 7:00 AM to 8:30 AM:

- Set I was exposed to a continuous recording of the *Gayatri Mantra*.
- Set II was exposed to a continuous recording of the *Tandav Stotra*.
- Set III (Control) was kept in silence under identical environmental conditions.

Germination and Growth Conditions

Seeds were allowed to germinate under room temperature with regular monitoring. Distilled water was added daily to maintain adequate moisture levels, ensuring the filter papers remained damp but not waterlogged. Lids of the Petri dishes were opened every day for a short duration to allow proper aeration and avoid fungal growth.

Data Collection and Observations

Observations were recorded daily for six consecutive days. The following parameters were measured:

- Radicle length (cm)
- Plumule length (cm)
- Fresh weight (g)

For dry weight, seedlings were collected and dried in a hot air oven at 80°C until a constant dry weight was achieved, which was then recorded.

Experimental Replication and Data Analysis

The entire experiment was repeated three times to ensure reliability and reproducibility. Average values for each parameter were calculated, and standard error (SE) was computed to assess the variability among replicates.

Results

(A). Seed Germination Percentage

The germination percentage of *Triticum aestivum* seeds was recorded daily for a period of eight days across three treatment groups: Control (Silence), Gayatri Mantra, and Shiv Tandav Stotram. The results are summarized in Table 1.

Table 1: Germination percentage over 8 days in different treatment conditions

Days	1	2	3	4	5	6	7	8
Control	0%	25%	40%	52%	67%	78%	85%	90%
Gayatri Mantra	0%	55%	60%	68%	75%	89%	95%	100%
Shiv Tandav Strotram	0%	50%	70%	79%	87%	91%	95%	100%

Control $_{group}$ was found to have a slow increase in germination, i.e., 90% by Day 8. Seeds treated with Gayatri Mantra had increased germination, where 55% germinated by Day 2 and 100% by Day 8. Shiv Tandav Stotram group also had improved germination over the control, where 50% germinated by Day 2 and 100% germination was achieved by Day 8. Both the sound treatments boosted the germination rate more than the silent control, with the Gayatri Mantra group having slightly higher early-stage germination compared to the Shiv Tandav group.

The study demonstrated that exposure to spiritual chants, specifically the Shiv Tandav Strotra and Gayatri Mantra, positively influences seed germination. Seeds treated with these mantras showed faster and higher germination rates

compared to the control group. Among them, the Shiv Tandav Strotram had the most significant impact, reaching 100% germination by Day 8. This suggests that sound vibrations may enhance physiological processes in seeds, potentially offering a natural and effective method to boost germination in agricultural practices.

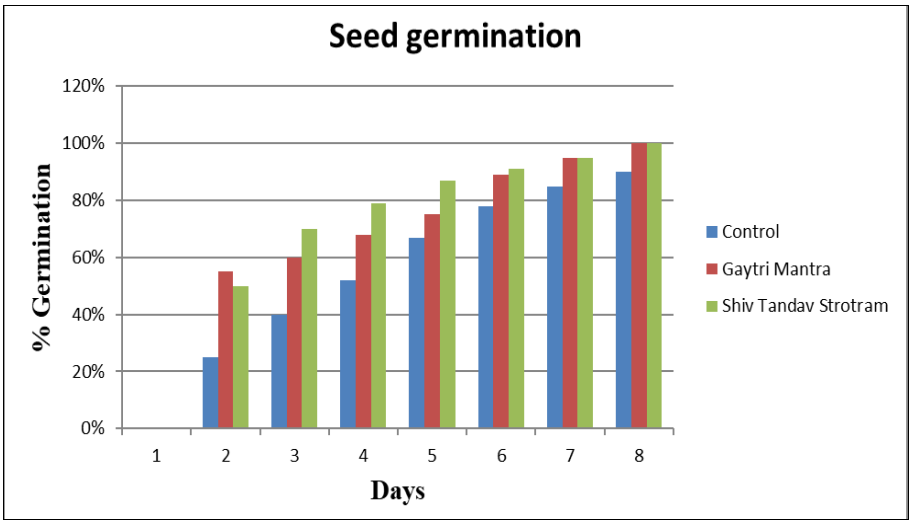

Fig 1: Shows% germination for wheat under different effects of mantras.

(B). Radicle Length

The effect of mantra vibrations on radicle length of *Triticum aestivum* seedlings was measured over six days after placing the set. Results are shown in Table 2, with values expressed as mean ± standard error (SE).

As shown, all treatment groups had progressively increasing radicle length with time, but rate and magnitude of growth were largely dissimilar across groups. Shiv Tandav Stotram demonstrated greatest root length by Day 6 (4.207 cm), which was nearly twice that of the control. The control group had consistent and gradual increase, culminating in 2.383 cm. The Gayatri Mantra group showed early brisk growth, reaching a peak on Day 3 (1.747 cm), but subsequent root development was slow, finishing at 1.854 cm on Day 6.

Table 2: shows Root length (in cm) for Wheat grain under different effect of mantras.

	Days					
Set	**1**	**2**	**3**	**4**	**5**	**6**
Control	0	0.435±0.05	0.735±0.05	1.091±0.2	1.535±0.05	2.383±0.4
Gayatri Mantra	0	0.571±0.1	1.747±0.35	1.571±0.1	1.135±0.05	1.854±0.5
Shiv Tandav Strotra	0	0.841±0.2	1.177±0.25	1.485±0.05	2.354±0.5	4.207±1

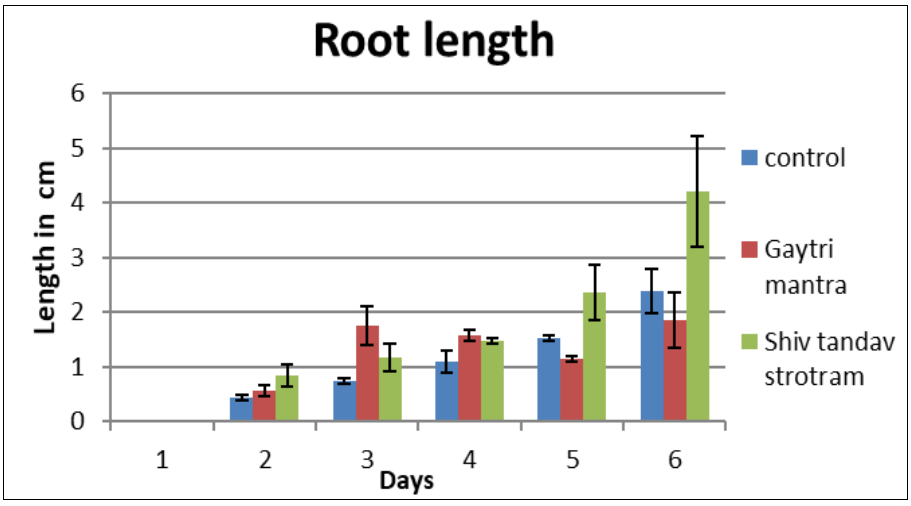

Fig 2: Represent Root length (in cm) in Wheat under the effect of different Mantras.

The graph shows that Shiv Tandav Stotra can have a positive effect on root growth possibly because of its vibration or sound frequency. On the other hand, the Gayatri Mantra had negative or weak inhibitory effects. The results identify the possibility of stimulation of plant development through sound. The results indicate that sound vibration can have an effect on root development. In general, certain sounds such as Shiv Tandav can stimulate plant growth more effectively than others.

(C). Shoot Length

The data in Table 3 and graph shows shoot length over six days under three conditions, Control, Gayatri Mantra and Shiv Tandav Strotra. Among these, the Shiv Tandav Strotra group exhibited the highest shoot growth, reaching around 5.5 cm on Day 6. The Gayatri Mantra group showed moderate growth, while the Control group had the least. This indicates that Shiv Tandav Strotra significantly promotes shoot elongation compared to the other conditions.

Table 3: Shows Shoot length (in cm) for Wheat grain under different effect of mantras.

	Days					
Set	**1**	**2**	**3**	**4**	**5**	**6**
Control	0	0.235±0.05	0.485±0.05	0.671±0.1	1.521±0.1	1.485±0.05
Gayatri Mantra	0	0.685±0.05	0.785±0.05	1.291±0.2	1.512±0.3	2.347±0.35
Shiv Tandav Strotram	0	0.835±0.05	0.706±0.15	1.485±0.05	2.356±0.15	4.884±1.25

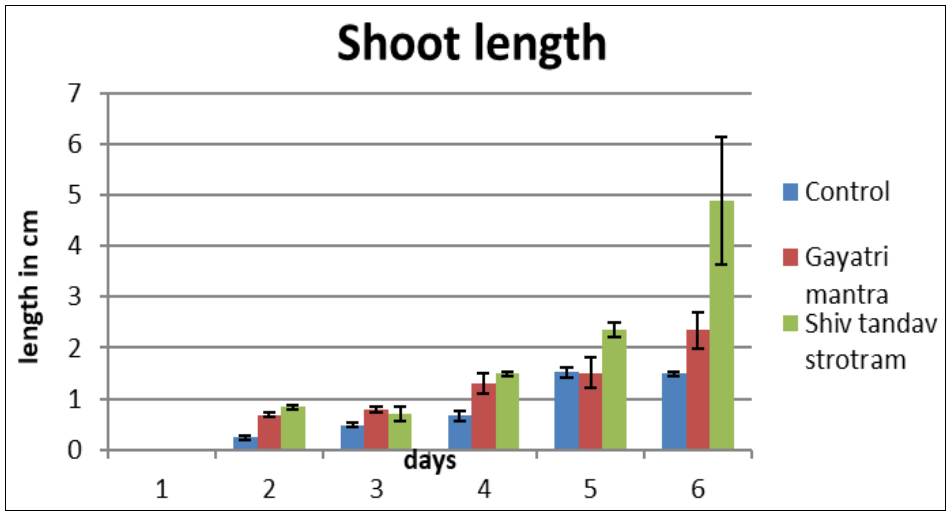

Fig 3: Represent Shoot length (in cm) in Wheat under the effect of different Mantras.

The findings indicate that vibration in sound, especially from Shiv Tandav Stotra, can stimulate growth of the plumule in seedlings. Its robust rhythm and frequency may trigger hormonal activity or cellular processes favouring elongation. The Gayatri Mantra was less effective, and the control recorded little growth. These results validate the use of specific sound frequencies in advancing plant growth.

(D). Fresh weight: The fresh weight of the samples increased gradually over a period of six days, with Tandav Stotra group having the maximum increase, reaching around 0.165 gm on Day 6. The Gayatri Mantra group had moderate increase (0.106 gm), and the Control group had minimum fresh weight (0.055 gm). These findings imply that sound treatments, particularly the Tandav Stotra can augment plant biomass accumulation more efficiently than standard conditions, suggesting a role of sound vibrations in plant growth promotion.

Table 4: Shows fresh weight (in gm) for wheat grain under different effect of mantras

	Days					
Set	**1**	**2**	**3**	**4**	**5**	**6**
Control	0.033±0.002	0.041±0.008	0.042±0.001	0.042±0.006	0.047±0.005	0.055±0.003
Gayatri Mantra	0.032±0.0005	0.048±0.0025	0.062±0.0065	0.046±0.00	0.049±0.007	0.106±0.007
Shiv Tandav Strotra	0.030±0.0005	0.047±0.0025	0.063±0.0015	0.053±0.0005	0.153±0.0025	0.165±0.007

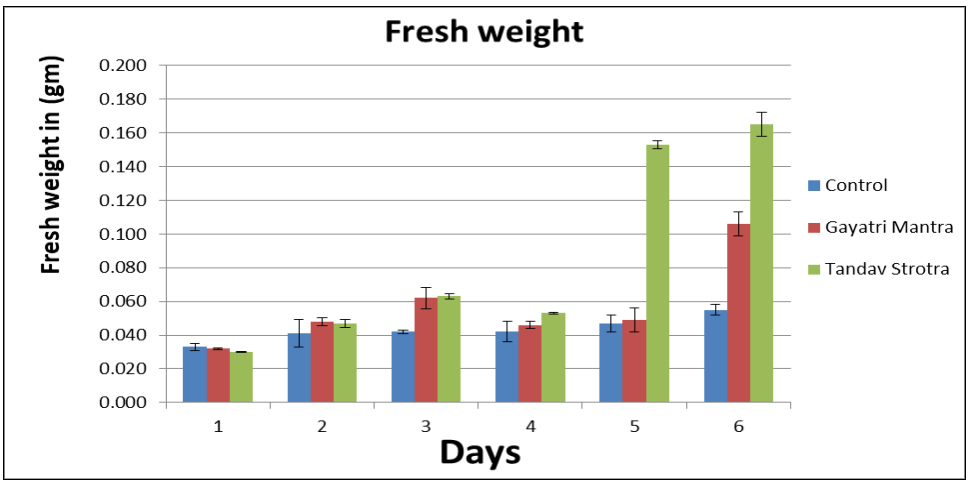

Fig 4: Represent Fresh Weight (in gm) in Wheat under the effect of different Mantras.

(E). Dry weight

The dry weight of all groups increased over six days, with the Tandav Strotra group showing the highest value (0.053 gm) by Day 6, followed by the Gayatri Mantra group (0.048 gm) and the Control group (0.03 gm). While differences were small in the initial days, sound treatments showed a significant impact from Day 3 onwards. These results indicate that sound exposure, particularly to Tandav Strotra, may

enhance dry matter accumulation, potentially boosting plant growth and metabolic activity.

Table 5: Shows Dry weight (in gm) for wheat grain under different effect of mantras

	Days					
Set	**1**	**2**	**3**	**4**	**5**	**6**
Control	0.021±0.0005	0.021±0.0075	0.023±0.0015	0.030±0.0035	0.031±0.0075	0.030±0.003
Gayatri Mantra	0.021±0.0045	0.021±0.0015	0.023±0.002	0.028±0.001	0.016±0.001	0.048±0.0075
Shiv Tandav Strotra	0.022±0.0005	0.019±0.001	0.033±0.007	0.032±0.004	0.040±0.0005	0.053±0.003

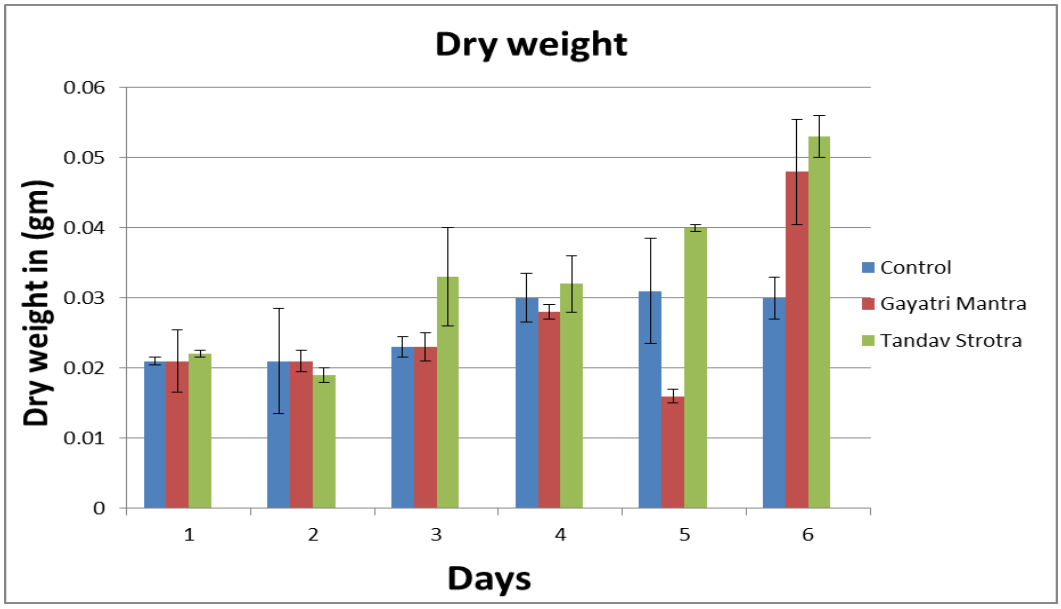

Fig 5: Represent Dry Weight (in gm) in wheat under the effect of different mantras

Discussion

The findings of this study provide compelling evidence that acoustic stimulation through sacred mantras significantly influences the early germination and seedling development of *Triticum aestivum*. Both the Gayatri Mantra and Shiv Tandav Stotram treatments resulted in enhanced germination rates, greater radicle and plumule elongation, and increased fresh biomass compared to the control group maintained in silence.

Germination Dynamics

Seeds treated with sound treatments germinated more quickly and attained greater final germination percentages compared to the control treatment. The Gayatri Mantra treatment induced early and quicker germination, possibly because it contains stable harmonic frequencies that could cause cell structures to resonate, activate enzymes, and contribute to overcoming dormancy. These findings are in line with earlier research that frequencies of sound ranging between 200-1000 Hz have the capability to trigger enzymatic and metabolic activities (Chivukula & Ramaswamy, 2014 [8]; Hassanien *et al*., 2014) [14]. Gadani and Mehta (2011) [12] also found improved seed germination in *Phaseolus aureus* Roxb under music exposure.

Interestingly, the Shiv Tandav Stotram group showed a rapid spike in germination on Day 3, higher than the Gayatri group as well, perhaps because of its strong rhythmic and vibration-based aspect. The high-energy acoustic pattern may mimic a weak abiotic stress state, which under controlled conditions can trigger adaptive metabolic responses and enhance germination.

Root Development (Radicle Length)

Radicle growth was greatly affected by exposure to sound, especially in the Shiv Tandav Stotram group, which had the highest root length increase, most notably from Day 4 onwards. This indicates a cumulative stimulation effect, where rhythmical mechanical energy would have favoured the cell division and elongation of root meristematic tissues.

The Gayatri Mantra group showed more intense root development within the initial germination stage, plateauing somewhat in the subsequent days. This pattern could be indicative of an early reaction to consistent vibrations that either caused saturation or acclimatization by cells in plants over time. The control group, on the other hand, had a linear steady pattern of root development without any external trigger to stimulate root system activity.

Shoot Development (Plumule Length)

Shoot growth patterns also paralleled radicle growth. The Shiv Tandav Stotram group showed the greatest shoot elongation, at 4.884 cm on Day 6, over three times the average of the control group. This suggests that the energetic landscape of the chant is capable of exciting shoot apical meristem activity, potentially through the activation of auxin-mediated pathways or increased nutrient transport.

The Gayatri Mantra treatment group also surpassed the control, facilitating slow and sustained shoot development, in accordance with the harmonic and peaceful nature of the chant. The control group, however, demonstrated slow and steady development, emphasizing the role of vibrational signals in driving above-ground growth.

Biomass Accumulation

Fresh weight, a measure of seedling vigor, water absorption, and metabolic processes, indicated a distinct improvement under good treatments. The Shiv Tandav group especially exhibited an enhanced biomass increase beginning from Day

4, reaching its peak at 0.165g on Day 6. It could be due to increased physiological processes, better hydration of tissues, and maybe the activation of enzymes related to cell expansion.

The Gayatri Mantra group, albeit less intense than the Shiv Tandav group, likewise showed an appreciable rise in biomass over the control. These findings indicate that less intense vibrational stimuli can also improve hormonal signaling and metabolic yield in seedlings.

Mechanistic Considerations

The effects observed in this study likely stem from a combination of physiological responses triggered by acoustic energy. Potential mechanisms include:

- Increased membrane permeability and ion channel activation, aiding nutrient and water uptake.
- Stimulation of growth hormones such as auxins and gibberellins.
- Activation of gene expression and protein synthesis via mechanical or vibrational resonance.
- Biophysical modulation of intracellular processes leading to improved turgor pressure and cell expansion.

These mechanisms are consistent with previous work in the field of plant acoustics and vibrational biology (Gagliano *et al*., 2012 [13]; Hassanien *et al*., 2014 [14]; Mishra *et al*., 2016) [17].

Differential effects of mantras

The contrasting effects of the two mantras reflect how frequency spectrum, rhythm, sound intensity, and vibrational complexity shape biological responses. The Gayatri Mantra, with its soothing, consistent frequency, appears to favour balanced metabolic stimulation, while the Shiv Tandav Stotram, characterized by dynamic, high-energy rhythms, may evoke more aggressive growth stimulation—possibly via mild stress-response pathways.

These observations affirm that not all sound stimuli are equal in their effect, and that sound design and frequency profiling may be important tools in optimizing bioacoustic treatments for agriculture.

Conclusion and Future prospects

This research provides a foundational step toward integrating acoustic bio-stimulation into agricultural practice, using ancient mantra vibrations as innovative tools for improving early plant development. This study opens exciting avenues for eco-friendly, sound-based growth enhancers in agriculture. The significant improvements observed in seedling vigour suggest that mantra-based sound exposure could be harnessed as a non-invasive, sustainable technique to enhance crop performance particularly valuable in organic or low-input farming systems.

Future studies should aim to:-

- Investigate long-term effects on yield and productivity.
- Explore molecular, hormonal pathways and physiological mechanisms involved in sound-induced growth.
- Assess frequency-specific responses using pure tones or synthetic sound profiles.

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