A novel approach to supplement plant growth with devotional music: An experimental research on Mung Bean (*Vigna radiata* L.)

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ABSTRACT

Food is the primary and ever-challenging necessity for human beings. The quest for alternate and environmentally safe ways to healthy crop production is a crucial concern for sustainable food security before modern civilization. Bioacoustics research has revealed that music has a positive impact on plants. The present research was conducted to find the impact of music with a qualitative change in the form of devotional music. The Mung bean (*Vigna radiata* L.) crop was exposed to varied strengths of devotional music during the kharif season. A comparative evaluation of germination, vegetative, and reproductive growth parameters revealed significant improvement when exposed to devotional music. It was observed that the radical development and seed vigour index in the germinating seeds could be upregulated to the extent of 37.5% and 42.56%, respectively, with the application of devotional music in a range of 70–100 dB for 1–3 hours per day. Plant shoot length, root length, leaf count, green weight, and dry weight could be enhanced by 19.11%, 36.37%, 32.43 %, 52.19%, and 33.91%, respectively, with the application of devotional music at 85±5 dB for 3 hours per day. The crop yield measured in the number of seeds produced and the total weight of the seeds produced increased by 131.25% and 159.46%, respectively, when treated with devotional music at 85±5 dB for 3 hours per day. It was found that exposure of the plants to devotional music could enhance their metabolic activities, resulting in higher growth and yield.

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1. INTRODUCTION

The world will need to produce 60 percent more food for a burgeoning population of 9.3 billion by 2050 (FAO, 2015). Modern-day agricultural practice is already heavily loaded with chemical inputs, and meeting the increasing needs with further doses of synthetic inputs will mean a dreadful blow to the ecological semblance, and it will remain a major concern (Nations, n.d.; WHO, 2018). Alternate and safe ways to enhance food production are ardent calls of the time. The beneficial impact of music on human health is a well-established fact, with numerous health benefits resulting from musical therapy in cerebral function and therapeutic impact on other parts of human physiology (Goyal et al., 2012; MD, 2020). However, in the field of plant or crop science, researchers and reviewers have stated that though much attention has been given to studying the growth of crops concerning natural factors like air, water, light, temperature, and nutrients, a genuine focus on interaction of the plants to the sound factor has never been prioritized (Mishra et al., 2016). However limited, the research findings have established that plants are equally sensitive to sound and music (Gagliano et al.,

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2012; Van Loon, 2016). Sound has been associated with plant signaling pathways beyond chemical tigers, which confers plants with an adaptive advantage in their growth and protection from unfavourable conditions (Jung et al., 2018). It is also perceived that plants prefer qualitative aspects of sound stimulation, and music is a preferred sound stimulus for plant growth (Abd El-Rahman, 2017; Massoumi et al., 2018). It has been reported that plants exposed to Vedic chants or Indian classical music promoted higher growth compared to the control group or those exposed to Western classical or Rock music. The stimulating or dissimulating effect of sound depends on the kind of music being played (Chivukula and Ramaswamy, 2014). Seed germination and growth of Seedlings have been reported to be affected by watering them with meditative intents, thus showing that the meditative intent behind an action affects the outcome and that human interaction via ceremony and rituals can affect the natural world (Haid and Huprikar, 2001). Contemplative singing of the divine name of God is given much importance in Indian spiritual science. Hence, in the present study, an effort was made to combine the qualitative essence of soft music, meditation, and chanting in one stimulus in devotional music. The mung bean crop was exposed to devotional music in a scheduled manner, and its impact was measured through experimental research.

2. MATERIAL AND METHODS

The experiment was conducted in the Kharif season between July and October 2022 at the Centre for Studies and Research of Eternal Rhythms on Environment, Braj Gopika Seva Misson, Tangi, Odisha, with technical support from the Sambalpur University, Odisha. Mung bean (*Vigna radiata* L.) was selected purposively for the present study as an essential legume crop, with a short duration and cultivable over all the seasons. The quality seeds of the Mung bean crop, variety PDM 139 (Samrat), were procured from the market and were uniformly treated with the organic fungicide *Trichoderma viridi*. The seed germination test was conducted in Petri plates with seed germination papers containing 25 seeds arranged in a 5x5 matrix. Vegetative and reproductive growth studies were conducted in earthen pots with organic substrate. Six devotional songs were manipulated over three Sound Pressure Levels (SPL), 75±5 dB, 85±5 dB, and 95±5 dB, and three Durations of Exposure (DOE)- one, two, and three hours per day to make nine numbers of experimental treatment levels. A control group was maintained with no exposure to devotional music. Soundproof acoustic growth chambers were specially designed to execute the musical treatments. Growth chambers were hosted in a polyhouse constructed to maintain controlled and uniform agroclimatic conditions. The soundproof growth chambers were fitted with a 60-watt speaker from the top and connected to a control panel to dispense the required musical treatments (Fig. 1). The devotional music treatment was administered thrice daily, once in the dawn, once in the daytime, and once in the evening, for the entire growth period from seed sowing to harvesting of the crop. Details of the treatment levels and their administration are presented in Table 1.

A Completely Randomized Design (CRD) was employed with ten treatment levels and four replications each. Data on seed germination parameters were recorded at every 12th hour of the germination test and continued till completion of germination; data on physiological growth and development was recorded through observation on a day-to-day basis and finally on crop harvesting. Seed Germination Index (GI) was calculated using the formula Σ Gt / Dt (where Gt is the number of germinated seeds on day t and Dt is the time corresponding to Gt in days) (Andrew et al., 2021). Seed vigour index (SVI) was calculated with a formula S $\times$ Σ (Gt / Dt) (where S is the seedling length that is Root length + Shoot length and Σ (Gt / Dt) is the germination index (Zhu et al., 2010). Chlorophyll, Protein, and Carbohydrate synthesis in seed and plant were studied following the Arnon, Lowry, and Anthrone methods, respectively (Sadasivam and Manickam, 1996). Total phenol content was estimated using the Folin-Ciocalteu reagent (Sadasivam and Manickam, 1996). One-way Analysis of variance (ANOVA) and the Dunnett test were used for statistical interpretation of data.

3. RESULTS

3.1. Effect of devotional music on Mung bean seed germination

The impact of devotional music on Mung bean seed germination observed through five different parameters revealed relative differences in the mean values among the different treatment levels.

Fig. 1. Photographs of Acoustic Growth Chambers hosted in a polyhouse fitted with speakers and connected to a control panel to dispense musical treatment to plants.

Table 1. Detailed specification of Treatment Levels and their execution time and durations.

Treatment Groups	Treatment Levels	Treatment specification		Execution Time distribution and duration		
		SPL (dB)	DOE (hr/s)	Dawn (5–6 AM)	Daytime (8–9 AM)	Dusk (4–5 PM)
CONTROL	T0 (CON)	Nil	Nil	Nil	Nil	Nil
EXPERIMENTAL	T1 (75±5, 1)	75±5	1	20 mins	20 mins	20 mins
	T2 (75±5, 2)	75±5	2	40 mins	40 mins	40 mins
	T3 (75±5, 3)	75±5	3	60 mins	60 mins	60 mins
	T4 (85±5, 1)	85±5	1	20 mins	20 mins	20 mins
	T5 (85±5, 2)	85±5	2	40 mins	40 mins	40 mins
	T6 (85±5, 3)	85±5	3	60 mins	60 mins	60 mins
	T7 (95±5, 1)	95±5	1	20 mins	20 mins	20 mins
	T8 (95±5, 2)	95±5	2	40 mins	40 mins	40 mins
	T9 (95±5, 3)	95±5	3	60 mins	60 mins	60 mins

SPL: Sound Pressure Level; dB: Decibel; DOE: Duration of Exposure; hr/s: hour/ hours; min: minutes.

Table 2. Effect of Devotional Music on Final Germination Percentage (FGP), Mean Germination Rate (MGR), Germination Index (GI), Radicle Length (RDL) and Seed Vigour Index (SVI).

Treatment Levels	FGP	MGR	GI	RDL	SVI
T0 (CON)	96±1.63	1.27±0.02	34.59±0.81	1.6±0.09	55.43±3.9
T1 (75±5,1)	96±2.31	1.35±0.08	36.34±1.5	2.17±0.05***	79.02±3.54***
T2 (75±5,2)	97±1.91	1.29±0.04	35.17±1.64	2.2±0.04***	77.27±3.22***
T3 (75±5,3)	98±1.15	1.36±0.03	37.84±1.11	2±0.04***	75.78±3.52***
T4 (85±5,1)	99±1	1.32±0.01	36.92±0.67	1.85±0.06*	68.22±2.03*
T5 (85±5,2)	98±1.15	1.27±0.02	36±0.65	1.98±0.09***	71.07±3.11*
T6 (85±5,3)	95±1.91	1.25±0.03	33.84±0.35	1.82±0.05	61.79±2.2
T7 (95±5,1)	99±1	1.33±0.03	37.5±1.08	1.6±0.04	59.99±2.2
T8 (95±5,2)	97±1.91	1.29±0.03	35.67±1.46	1.93±0.05**	68.86±4.44*
T9 (95±5,3)	99±1	1.3±0.02	36.75±0.82	2.13±0.05***	78.08±2.41***

Table 2 shows Mean ± SE (n=4); Mean values of germination parameters in the experimental groups with an asterisk (* $p < .05$, ** $p < .01$, *** $p < .001$) were significantly different from the control group mean.

It is observed from Table 2 that the mean values for final germination percentage (FGP), mean germination rate (MGR), germination index (GI), radicle length (RDL) and seed vigour index (SVI) were the lowest or one of the lowest in the control group that is the group where plants were not exposed to the devotional music. Marginal increases in the mean values of Final Germination Percentage, Mean Germination Rate, and Germination Index were found in all or most of the means in the experimental groups (T1 to T9) compared to the control group (T0). The Germination Index, a consolidated measure of the germina-

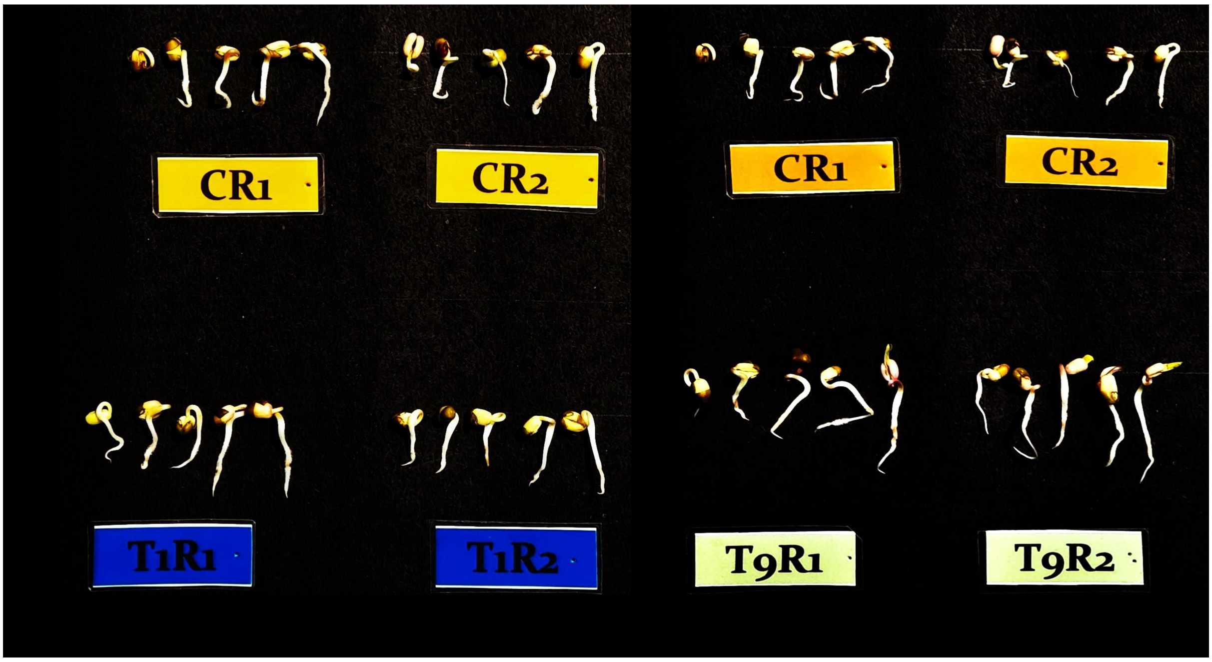

Fig. 2. shows a contrasting difference in the radicle length and vigour of the germinating seeds under treatment level 1 (T1R1 & T1R2) and treatment level 9 (T9R1 & T9R2) in comparison to the control group (CR1 & CR2).

tion percentage and germination rate, was higher in all the experimental groups except T6, GI improved up to 6.7% compared to the control group. However, exceptional and most significant results were obtained in the radicle development and the seed vigour index. Radicle length and Seed Vigour Index were upregulated with exposure to devotional music in all the experimental groups. The mean values for RDL and SVI were significantly higher in seven of nine experimental groups, reflecting an intensive sensitivity of germinating tissues to the devotional rhythms and melody. RDL and SVI in the experimental groups were upregulated up to 37.5% and 42.56%, respectively, compared to the control group. Thus, the study's findings strongly advocate that devotional music had an immensely beneficial acoustic impact on mung bean seed germination; seeds exposed to devotional music germinated faster with higher radicle development, resulting in a higher seed vigour index. The differences observed are highlighted through photographs presented in Fig. 2.

3.2. Effect of devotional music on vegetative growth of Mung bean plants

Vegetative growth of the Mung bean plant was measured with five selected physiological parameters, namely plant shoot length (PSL), plant root length (PRL), plant leaf count (PLC), plant green weight (PGW) and plant dry weight (PDW) devoid of the fruiting bodies. Table 3 presents that all the growth parameters had a higher mean value in most or all the groups exposed to devotional music. Differences in root length in T5, T6, and T8 and leaf count in T6 were significantly higher than the control group mean., The highest vegetative growth in shoot length, plant green weight, and plant dry weight were observed in T6. i.e., when the Mung bean plants were exposed to devotional music at 85±5 dB for 3 hours each day from sowing to harvesting the crops, in this experimental group, plant shoot length, root length, leaf count, green weight, and dry weight increased by 19.11%, 36.37%, 32.43 %, 52.19% and 33.91%, respectively, compared to the control group mean. Comparative growth of shoots and roots of Mung bean plants between the control group and the experimental group T6 are highlighted through photographs in Fig. 3.

3.3. Effect of devotional music on reproductive growth of Mung bean plants

Days to Mung bean flowering and fruiting and quantification of seed yield in numbers and weight were the considered parameters to judge the impact of devotional music. Mean values with standard errors (SE) and a comparison of the experimental means with the control group mean are presented in Table 4. The data reveals that exposure of the Mung bean plants to devotional music led to early flowering and fruiting. Flowering and fruiting were found significantly early in T4 and T7. Days to flowering and fruiting in the

Table 3. Effect of Devotional Music on Plant Shoot Length (PSL), Plant Root Length (PRL), Plant Leaf Count (PLC), Plant Green Weight (PGW) and Plant Dry Weight (PDW).

Treatment Levels	PSL (cm)	PRL (cm)	PLC (nos.)	PGW (gm)	PDW (gm)
T0 (CON)	39.25±1.25	13.97±1.01	18.5±1.85	6.38±1.78	1.15±0.25
T1 (75±5,1)	45.5±3.88	15.75±2.06	22.75±1.8	6.9±1.27	1.06±0.24
T2 (75±5,2)	46±3.34	15.25±0.43	21.5±1.19	6.43±0.61	1.29±0.15
T3 (75±5,3)	41.5±1.19	16.18±0.63	21.75±0.75	5.24±0.29	1.12±0.11
T4 (85±5,1)	40.25±0.63	16.57±0.91	22.25±0.85	6.79±0.78	1.31±0.19
T5 (85±5,2)	45±2.74	19.18±0.4*	22±0.41	7.56±1.73	1.35±0.14
T6 (85±5,3)	**46.75±6.9**	**19.05±1.48***	**24.5±1.5****	**9.71±1.7**	**1.54±0.15**
T7 (95±5,1)	39.5±1.55	16.65±1.06	22±0.71	6.36±0.29	1.1±0.06
T8 (95±5,2)	37±2.65	19.7±1.14**	21.25±0.75	5.3±0.72	0.86±0.13
T9 (95±5,3)	42±0.71	16.02±1.03	22.5±0.87	7.53±1.16	1.18±0.15

Table 2 shows Mean ± SE (n=4); Mean values of vegetative growth parameters in the experimental groups with an asterisk (* p < .05, ** p < .01, *** p < .001) were significantly different from the control group mean.

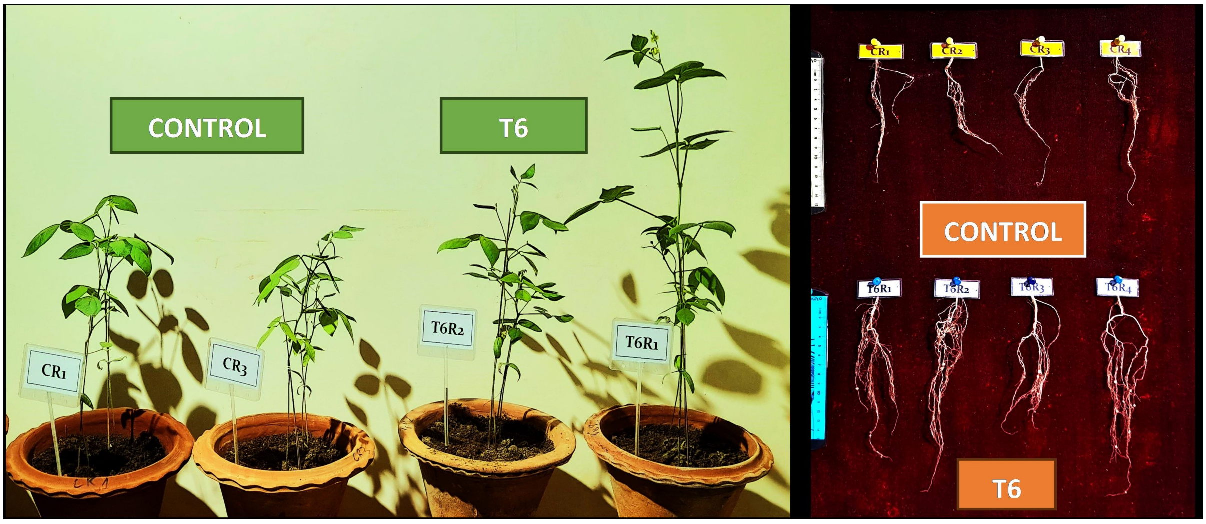

Fig. 3. Higher shoot and root length in Mung bean crops exposed to devotional music at 85±5dB for 3 hours per day (T6) compared to the control group.

experimental groups were reduced to an approximate range of 0.5 to 5 days. The impact of devotional music on the reproductive growth of Mung beans was most explicit when the yield component was measured in number and weight. Mung bean plants in all the experimental groups exposed to devotional music yielded more seeds in number and weight, showing a broad acoustic impact of devotional music on the reproductive health of Mung bean plants. The yield of the Mung bean crop in the kharif season was most significantly affected when exposed to devotional music with an intensity of 85±5 dB and for 3 hours per day (T6). The number of seeds produced and the total weight of the seeds produced in T6 improved by 131.25% and 159.46%, respectively, when compared to the control group not exposed to devotional music.

3.4. Effect of devotional music on the synthesis of plant metabolites

Plant metabolites are directly responsible for plants' growth, development, reproduction, and defence mechanisms. Synthesis of selected metabolites was studied for a substantial understanding of the physiological changes observed upon exposure to the Mung bean plants. The study was limited to the synthesis of chlorophyll, carbohydrates, and protein in the Mung bean leaf, protein and phenolics in the germinating seeds, and protein content in the harvested Mung bean seed. The findings following one-way ANOVA and Dunnett test are summarised in Table 5 and Fig. 4. Table 5 reveals that protein synthesis in the germinating seeds was enhanced with a higher sound pressure level of 80–100 dB for 1–3 hours daily. Synthesis of phenolics in the germinating seed increased with a higher sound pressure level (80–100 dB) for 2–3 hours daily. Phenolic synthesis in T9 was significantly higher in comparison to the control group. Therefore, it may be suggested that the application of devotional music at 95±5 dB for 3 hours per day could be preferred over other doses, enhancing both protein and phenolic synthesis in the germinating Mung bean seeds. This group's protein and phenolic estimations increased by 22.12% and 37.27%, respectively.

Table 4. Effect of Devotional Music on Days to Flowering (DTFL), Days to Fruiting (DTFR), Number of Seed Produced (NSP) and Total Seed Weight (TSW).

Treatment Levels	DTFL (in nos.)	DTFR (in nos.)	NSP (in nos.)	TSW (in gm)
T0 (CON)	45.75±0.75	47.5±0.87	12±0	0.37±0.09
T1 (75±5,1)	41.25±1.75	45±2.12	19.25±0	0.63±0.13
T2 (75±5,2)	45.25±1.18	46.75±0.95	17.75±0	0.64±0.15
T3 (75±5,3)	44±0	46.25±0.95	20.5±0	0.77±0.06
T4 (85±5,1)	40.75±0.75*	42.25±0.63*	23.75±0	0.81±0.09
T5 (85±5,2)	43.5±0.5	45±0	19.75±0	0.81±0.03
T6 (85±5,3)	43.5±0.29	45±0.41	27.75±2.84*	0.96±0.14*
T7 (95±5,1)	41±0.58*	42.25±1.11*	22.5±0	0.84±0.06
T8 (95±5,2)	41.5±2.53	42.75±2.29	18.25±0	0.7±0.16
T9 (95±5,3)	43.25±0.25	45.5±1.19	22±0	0.82±0.21

Table 2 shows Mean ± SE (n=4); Mean values of reproductive growth parameters in the experimental groups with an asterisk (* p < .05, ** p < .01, *** p < .001) were significantly different from the control group mean

Table 5. Effect of Devotional Music on the synthesis of plant metabolites at different growth stages of Mung bean.

Treatment Levels	at 72 hours of Seed Germination		In leaf sample at 40 days after seed sowing		
	Protein (mg/ml)	Phenolics (mg/ml)	Chlorophyll (mg/gm)	Protein (mg/ml)	Carbohydrate (mg/ml)
T0 (CONTROL)	1.13±0.13	1.61±0.12	1.2±0.09	0.28±0.02	0.43±0.04
T1 (75±5,1)	1.09±0.03	1.57±0.08	1.42±0.13	0.37±0.02*	0.45±0.02
T2 (75±5,2)	0.91±0.11	1.38±0.1	1.47±0.06	0.34±0.01	0.43±0.04
T3 (75±5,3)	1.09±0.11	1.46±0.1	1.48±0.1	0.33±0.0085	0.64±0.1*
T4 (85±5,1)	1.37±0.29	1.55±0.14	1.61±0.12	0.37±0.01*	0.65±0.04**
T5 (85±5,2)	1.18±0.15	1.87±0.06	1.73±0.18*	0.37±0.02*	0.49±0.01
T6 (85±5,3)	1.46±0.28	1.81±0.19	1.64±0.08	0.43±0.03***	0.41±0.05
T7 (95±5,1)	1.25±0.19	1.59±0.04	1.75±0.04*	0.46±0.04***	0.4±0.02
T8 (95±5,2)	1.4±0.21	1.75±0.1	1.71±0.11*	0.41±0.02***	0.36±0.05
T9 (95±5,3)	1.38±0.17	2.21±0.17**	1.93±0.14***	0.37±0.02*	0.36±0.02

Table 5 shows Mean ± SE (n=4); Mean values in the experimental groups with an asterisk (* p < .05, ** p < .01, *** p < .001) were significantly different from the control group mean

Synthesis of plant metabolites in the vegetative growth phase was measured 40 days after seed sowing. An apparent enhancement of chlorophyll and protein synthesis was recorded in all the groups exposed to devotional Music and significantly higher in most groups treated with a higher sound pressure level from 80–100 dB and for 1–3 hours per day. However, the synthesis of carbohydrates was increased only in limited groups. Data revealed that chlorophyll and protein synthesis in the Mung bean plants could be upregulated to a range of 34.17 - 60.83% and 32.14 - 64.28%, respectively, when exposed to devotional music 80–100 dB for 1–3 hours per day. The highest and the most significant improvement in carbohydrate synthesis was observed in the T4 group, that is when the plants were exposed to devotional music at 85±5 dB and for 1 hour per day; the carbohydrate synthesis in this group escalated by 51.16% in comparison to the control group.

The concentration of protein content in the Mung bean seeds was also recorded after harvesting the Mung bean crop. The result of the data analysis is presented in Fig. 4, revealing that the protein concentration in the control group was the lowest. The protein concentration in all the experimental groups was significantly higher except for T2 and T3. Thus, it was found that devotional music can activate a qualitative improvement in the seeds with an enhanced protein concentration. It was observed that the protein concentration in seeds could increase to a range of 34- 60.82% when exposed to devotional music at 80–100 dB for 1–3 hours per day for the entire length of plant growth.

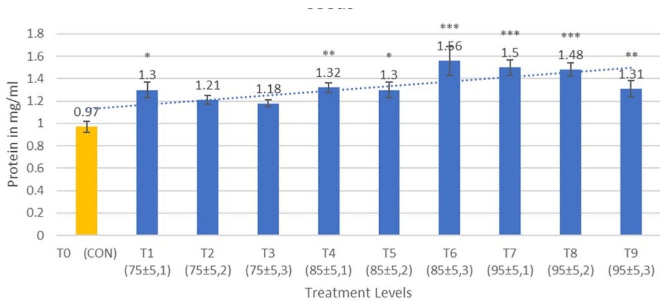

Fig. 4. Concentration of Protein in the Harvested Mung bean seeds.

4. DISCUSSION

The present study ascertains that devotional music can significantly impact seed germination and plants' vegetative and reproductive growth. Devotional music imparted substantial improvement in the metabolic activities of the plants. In the present study, the prominent reflection of the effect of devotional music in the germination phase was observed in enhanced growth of radicle; such beneficial reports in seed germination and especially the growth of hypocotyl with musical treatment in alfalfa and lettuce crops were also reported by You-Ning and How-Chiun (2020), the beneficial impact of musical sound and healing energy on seed germination was also reported by Creath and Schwartz (2004). Protein and phenolics estimation revealed an enhanced metabolic activity in the germinating seeds exposed to devotional music. Chandrakala and Trivedi (2019) stated that musical vibration frequencies facilitate physiological activities like nutrient uptake, photosynthesis, and protein synthesis, resulting in healthier plants with better yield prospects. The Green music, Classical music, Gayatri mantra, Pirith, and Nature sounds positively impacted wheat, spinach, horse gram, soya, and paddy. Music helped break seed dormancy and enhance crop yield.

Application of devotional music on Mung beans led to higher vegetative and reproductive growth. Plant shoot height, root length, and overall vegetative growth measured in plant green and dry weight were higher with selected strength of devotional music. Root growth was the most prolific among the vegetative growth parameters in the present situation. Reproductive growth of Mung bean pants was marked by early flowering and fruiting and an increase in seed production in number and weight. A higher metabolic activity triggered by the musical stimuli was found to be the underlying cause of such improvements in the vegetative and reproductive growth of the plants. Such findings conformed to many other observations reported in the earlier studies; it had been stated that mild music helped a plant in better gaseous exchange, i.e., it gives off more oxygen and receives more carbon dioxide, resulting in better plant growth, flowering, and fruiting (Massoumi et al., 2018), Roy Chowdhury and Gupta (2015) reported that exposure of Chickpea (Cicer arietinum) crop to soft rhythmic audible frequencies (music) expedited the germination of seeds, growth, and development of plants, possibly due to faster absorption of nutrients from the soil and better production of metabolites, which in due course summed up to growth at a better rate. Exposure of plants to the musical frequencies resulted in higher plant height, higher number of leaves, and overall, more developed and healthier plants. Hou et al. (2009) reported that the yield of sweet pepper, cucumber, and tomato was higher by 63.05%, 67.1%, and 13.2%, respectively, with the application of acoustic frequency technology. Incidents of disease pests in treated tomato plants, viz. red spider, aphids, grey mould, late blight, and virus disease, lowered by 6, 8, 9, 11, and 8 percent, respectively, in comparison to the control group. Hassanien et al. (2014) reported an increase in the yield of sweet pepper, cucumber and tomato by 30.05, 37.1 and 13.2%, and the yield of lettuce, spinach, cotton, rice, and wheat by 19.6, 22.7, 11.4, 5.7, and 17.0%, respectively when exposed to plant acoustic frequency technology (PAFT) at 0.1–1 kHz and SPL of (70±5) dB for 3 hours on every other day. The present study found that the yield of Mung bean in the kharif season was significantly higher when exposed to devotional music with an intensity of 85±5 dB and 3 hours per day for the entire growth period. The number of seeds produced and the total weight of the seeds produced increased by 131.25% ($p < 0.05$) and 159.46% ($p < 0.05$), respectively, when compared to the control group. The favourable impact of classical music on the synthesis of leaf pigments was reported in Salvia officinalis L by Abd El-Rahman (2017), the positive impact of string instruments on the synthesis of pigments, carbohydrates, and protein has been reported in Trigonella foenum-graecum (Fenugreek) plants by Laad and Viswanathan (2010).

5. CONCLUSIONS

The exposure of Mung plants to devotional music was highly beneficial to crop husbandry. The germination of Mung bean seeds was significantly boosted with exposure to devotional music; it was found that radical development and seed vigour index could be upregulated to the extent of 37.5% and 42.56%, respectively, when exposed to devotional music in a range of 70–100 dB for 1–3 hours per day. During the kharif season, the Mung bean plant's vegetative and reproductive growth was most augmented when plants were exposed to devotional music at 85±5 dB for 3 hours per day. Plant shoot length, root length, leaf count, green weight, and dry weight increased by 19.11%, 36.37%, 32.43 %, 52.19%, and 33.91%, respectively, and the yield of the crop in the number of seeds and the total weight of the seeds is increased by 131.25% and 159.46% respectively when treated with devotional music at 85±5 dB for 3 hours per day. Devotional music could enhance the plants' metabolic activities, resulting in higher growth and yield, and can impart qualitative improvement in the seeds produced. Devotional music could be a preferred musical stimulus for the plants for definite reasons yet to be confirmed. The effect of devotional music may be further studied compared to the other musical sounds to gain further understanding. Nonetheless, devotional music could find an easy application in the protected cultivation of crops in polyhouses and greenhouses to supplement plant growth and find the best use of the resources necessary for plant growth. Application of devotional music may enable us to reduce the use of synthetic and chemical inputs and thus contribute towards sustainable and environmentally safe agricultural practices.

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CONFLICT OF INTEREST

The data that support the findings of this study are available from the corresponding author (SG) and third author (PKG) upon reasonable request.

SUPPORTING INFORMATION

Supporting information may be found in the online version of this article.

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