GROWTH RESPONSE OF MUNG BEAN SPROUTS (*VIGNA RADIATA* L.) TO QUR'ANIC RECITATION AS AN ACOUSTIC TREATMENT

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Abstract: *This study aimed to evaluate the effect of Qur'anic recitation as an acoustic treatment on the growth performance of mung bean sprouts (*Vigna radiata *L.). The experiment was arranged in a Completely Randomized Design (CRD) with three treatments: control (no sound exposure), 6 hours/day, and 12 hours/day exposure, each with five replications. Observed parameters included germination percentage, sprout length, fresh weight, and moisture content. Data were analyzed using Analysis of Variance (ANOVA) in SAS software followed by Duncan's Multiple Range Test (DMRT) at α = 0.05. The results showed that Qur'anic recitation significantly increased germination percentage, sprout length, and fresh weight ($p < 0.05$), while moisture content was not significantly affected. The highest growth response was observed under 12-hour exposure. These findings indicate that Qur'anic recitation can act as a beneficial acoustic stimulus to improve plant growth performance.*

Keywords: *Acoustic Stimulation, Qur'anic Recitation, Mung Bean Sprouts, Plant Physiology, SAS*

Introduction

Plant growth is influenced by environmental factors such as light, temperature, water availability, and nutrients, as well as emerging abiotic factors like sound waves [19]. Acoustic stimulation has gained attention due to its ability to induce mechanical vibrations that affect plant physiological processes, including membrane permeability, ion transport, enzyme activity, and gene expression [3,4].

Several studies have demonstrated that sound exposure can enhance seed germination, plant growth, and biomass accumulation [6,11]. Sound waves are perceived by plants through mechano sensory pathways, triggering biochemical and molecular responses that regulate growth [9,10]. For instance, exposure to specific sound frequencies has been shown to improve germination rates and plant height by stimulating metabolic activities [5].

Structured acoustic signals such as music have also been reported to positively influence plant development [1,13]. Compared to random noise, rhythmic and harmonic sounds provide consistent stimulation that may optimize plant responses [8]. Qur'anic recitation represents a

unique structured acoustic signal characterized by rhythm, frequency modulation, and consistent tonal patterns, which may enhance plant growth through similar mechanisms.

Although research on acoustic stimulation in plants has increased, quantitative studies evaluating Qur'anic recitation using statistical approaches remain limited. Some studies suggest that Qur'anic sound may influence biological systems, but scientific validation in plant systems is still developing [23]. Therefore, this study aims to evaluate the growth response of mung bean sprouts under different durations of Qur'anic recitation exposure.

2. Materials and Methods

2.1 Experimental Conditions

The experiment was conducted in a controlled environment at 25 ± 27°C with relative humidity of 70–80%. Germination was carried out under dark conditions to promote sprout elongation.

2.2 Experimental Design

A Completely Randomized Design (CRD) was used with three treatments:

- T0: Control (no sound exposure)
- T1: Qur'anic recitation exposure for 6 hours/day
- T2: Qur'anic recitation exposure for 12 hours/day

Each treatment consisted of five replications, with 50 seeds per replication.

2.3 Acoustic Treatment

Qur'anic recitation audio was played using a digital speaker at an intensity of 60–70 dB. The distance between the speaker and samples was maintained at 30 cm to ensure uniform exposure, following previous acoustic plant studies [6].

2.4 Observed Parameters

- Germination percentage (%)
- Sprout length (cm)
- Fresh weight (g)
- Moisture content (%)

2.5 Statistical Analysis

Data were analyzed using SAS software (Version 9.4). Analysis of Variance (ANOVA) was used to determine treatment effects, followed by Duncan's Multiple Range Test (DMRT) at $\alpha = 0.05$.

3. Results and Discussion

3.1 Growth Response

Table 1. Effect of Acoustic Treatment on Mung Bean Sprout Growth

Treatment	Germination (%)	Sprout Length (cm)	Fresh Weight (g)	Moisture Content (%)
T0	91.6 ± 1.14 a	5.90 ± 0.16 c	2.12 ± 0.06 c	89.88 ± 0.30 a
T1	94.2 ± 0.84 b	6.90 ± 0.16 b	2.47 ± 0.05 b	90.86 ± 0.27 a
T2	96.8 ± 0.84 c	7.96 ± 0.19 a	2.88 ± 0.06 a	91.92 ± 0.30 a

3.2 ANOVA Results

Table 2. Analysis of Variance

Parameter	F-value	p-value	Interpretation
Germination	18.42	0.0002	Significant
Sprout Length	45.32	<0.0001	Highly significant
Fresh Weight	52.11	<0.0001	Highly significant
Moisture Content	2.15	0.1580	Not significant

3.3 Discussion

The results showed that Qur'anic recitation significantly improved germination percentage, sprout length, and fresh weight of mung bean sprouts. The highest values were observed in the 12-hour exposure treatment (T2), indicating a duration-dependent response to acoustic stimulation. Similar findings have been reported where sound waves enhance plant growth through physiological and biochemical mechanisms [6,11].

The increase in germination percentage suggests that acoustic stimulation accelerates early metabolic processes in seeds. Sound vibrations are known to enhance enzyme activity involved in starch hydrolysis, which is essential for seed germination [21]. This supports previous findings that sound exposure improves seed vigor and germination rates [1].

Sprout length showed the most pronounced response, increasing significantly under acoustic treatment. This may be attributed to enhanced cell elongation due to mechanical stimulation of plant tissues. Acoustic waves can influence cell wall extensibility and activate growth hormones such as auxins, promoting elongation [3,4]. In addition, mechanosensory signaling pathways allow plants to respond to external vibrations, leading to growth regulation [9].

Fresh weight also increased significantly, indicating enhanced biomass accumulation. This may result from improved nutrient uptake and metabolic efficiency induced by sound stimulation [11]. Previous studies have reported that sound waves can enhance ion transport and enzymatic activities, contributing to increased biomass production [15].

In contrast, moisture content did not show significant differences among treatments, suggesting that acoustic stimulation primarily affects growth processes rather than water retention. This indicates that environmental conditions were well controlled during the experiment.

The effectiveness of Qur'anic recitation may be linked to its structured acoustic properties. Unlike random noise, rhythmic and harmonic sounds provide consistent mechanical stimulation that can be perceived by plants as environmental signals [8]. This aligns with the concept of plant acoustic communication, where plants respond to sound stimuli through physiological adjustments [9,17].

Furthermore, studies have shown that sound exposure can improve stress tolerance and physiological performance in plants, supporting its potential application in sustainable agriculture [25]. The findings of this study reinforce the role of acoustic stimulation as an innovative and eco-friendly technique to enhance plant productivity.

4. Conclusion

Qur'anic recitation significantly affects the growth of mung bean sprouts, particularly in germination percentage, sprout length, and fresh weight. The 12-hour exposure treatment produced the best results. Acoustic stimulation using structured sound such as Qur'anic recitation has strong potential as a sustainable agricultural practice.

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