

Effect of length Exposure and Types of Voice on Corn Seeds (Zea Mays) Viability and Early Growth

Pengaruh Lama dan Jenis Paparan Suara Terhadap Viabilitas dan Pertumbuhan Awal Benih Jagung (Zea Mays)

Jasmi ^{1*}, Ibnu Maja ², Agustinur ¹

¹Agrotechnology Study Program, Faculty of Agriculture, Teuku Umar University

²Alumni of the Agrotechnology Study Program, Faculty of Agriculture, Teuku Umar University

*Corresponding Author: jasmi@utu.ac.id

ABSTRACT

Seed quality includes three aspects, namely genetic quality, physical quality and physiological quality. Physiological quality is an aspect of seed quality as indicated by seed viability and vigor. This study aims to analyze the effect of different types of sound exposure on viability and early growth of corn seeds, and to analyze the effect of long exposure to sound on viability and early growth of maize seeds. The research was carried out in the laboratory of the Faculty of Agriculture, Teuku Umar University on September 20 - October 19, 2019. This study used a Split Plot with the main plot type of sound exposure consisting of four levels, and the main sub-plot, namely the length of sound exposure consisting of three levels. Observed parameters; germination rate, growth speed, synchronous growth (KST), stomata openings. Based on the research results, the best germination rate, growth rate, growth impregnability, leaf width, and stomatal openings were found in the Al-Quran Murottal exposure. In the long exposure to sound treatment, it showed that the length of exposure to sound had no significant effect on germination, growth speed, growth impregnability, leaf width of maize plants, and stomata opening of maize plants.

Keywords: Seed, Sound Type, Duration of Exposure, Viability

ABSTRAK

Mutu benih mencakup tiga aspek yaitu mutu genetik, mutu fisik, dan mutu fisiologis. Mutu fisiologis adalah aspek mutu benih yang ditunjukkan oleh viabilitas dan vigor benih. Penelitian ini bertujuan untuk menganalisis pengaruh jenis paparan suara yang berbeda terhadap viabilitas dan pertumbuhan awal benih jagung, dan menganalisis pengaruh lama pemaparan suara terhadap viabilitas dan pertumbuhan awal benih jagung. Penelitian dilaksanakan di laboratorium Fakultas Pertanian Universitas Teuku Umar. pada 20 September - 19 Oktober 2019. Penelitian ini menggunakan Rancangan Petak Terpisah (Split Plot) dengan petak utamanya jenis paparan suara yang terdiri dari empat taraf, dan anak petak utama yaitu lama paparan suara terdiri dari tiga taraf. Parameter yang diamati; daya berkecambah, kecepatan tumbuh, keserempakan tumbuh (KST), bukaan stomata. Berdasarkan hasil penelitian daya berkecambah, kecepatan tumbuh, keserempakan tumbuh, lebar daun, dan bukaan stomata terbaik dijumpai pada pemaparan murottal Al-Quran. Pada perlakuan lama paparan suara menunjukkan bahwa lama paparan suara tidak berpengaruh nyata terhadap daya berkecambah, kecepatan tumbuh, keserempakan tumbuh, lebar daun tanaman jagung, dan bukaan stomata tanaman jagung.

Kata Kunci: Benih, Jenis Suara, Lama pemaparan, Viabilitas

INTRODUCTION

Seed quality includes three aspects, namely genetic, physical, and physiological quality. Physiological quality is an aspect of seed quality as indicated by seed viability and vigor. Sadjad (1993) stated that seed viability is a symptom of seed life which can be demonstrated through seed metabolism with growth symptoms. Seed vigor is the ability of seeds to grow normally in suboptimal environmental conditions or to have high growth rates and synchronization in optimum conditions. Also, the characteristics of seeds that have high vigor are that they can be stored for a long time so that it can make it easier to store large amounts of seeds. The high seed vigor also has the characteristics of the seeds germinating quickly and evenly, free from disease, and resistant to microorganisms.

The last few decades have researched the effect of sound on plant growth. Most of these studies use a single, regular voice (music) as a background of the positive influence of music on humans so that it is expected to have a similar impact on plant growth. One of the technologies to increase productivity is through the application of sonic bloom technology. Sonic bloom technology is a breakthrough technology aimed at making plants grow better. One of the technologies to increase productivity is through the application of sonic bloom technology. Sonic bloom technology is a breakthrough technology aimed at making plants grow better. Sonic bloom utilizes high frequency sound waves which function to spur the opening of the leaf mouths (stomata) combined with nutrition (Mulyadi, 2005). Sound vibrations can affect the opening of leaf stomata to be wider (Kadarisman et al 2011), so that it can absorb more water and CO₂ and optimize the photosynthesis process, so that plant growth and productivity can be optimally increased.

Mareza et al (2009) stated that exposure to sound can stimulate enzyme activity in seed cotyledons so that they germinate faster, in addition to other allegations that

there is an increase in seed vigor which can increase the germination power of a plant.

This study examines the use of sound waves with various types of sound, in which three sounds are used, namely classical music (violin sound), rock music and murotal Al-Quran. The use of classical music refers to research conducted by Prasetyo Joko (2014) that the exposure to sound can increase germination, where classical music produces the largest percentage of germination, namely 98% when compared to the types of noise and mix sounds of 93% and control of 90%. , while the use of murotal Al-Quran refers to research conducted by (Dahlia Yati, 2018) which shows that the sound of reciting the verses of the Koran increases germination by 10%, plant height by 23.34%, number of leaves by 14, 81%, leaf width was 27.29%, leaf length was 39.33%, and wet weight was 35.71%. Therefore, this research will study the effect of the type and duration of sound exposure on the viability and initial growth of corn seeds.

Sound-based on the frequency is divided into three types, namely infrasonic audio sonic, and ultrasonic. Sound waves that can be heard by humans are of the audio sonic type. The energy or vibration generated by the sound source affects a plant, which can open leaf stomata. The vibrations from the sound will transfer the energy to the leaf surface and will stimulate the leaf stomata to open wider (Kadarisman et al 2011). The purpose of this study was to determine the effect of different types of sound exposure and duration of sound exposure on viability and early growth of corn seeds.

METHODS

This research was conducted in the laboratory of the Faculty of Agriculture, Teuku Umari University starting from September 2019 - October 2019. The materials used in this study were bonanza, cotton, and water varieties. While the tools used in this study are active MP3 speakers, mobile phones, digital calipers, rulers, hand

sprayers, acrylic boxes, Petrides, microscopes, and writing instruments.

In this study, using a split-plot design with the main plot type of sound exposure consisting of four levels, namely: V0: No sound exposure (Control), V1: Classical Music, V2: Rock Music, V3: Murotal Al-Quran. The sub-main plot, namely the length of exposure to sound consists of three levels, namely: P1: 2 hours, P2: 3 hours, P3: 4 hours. Sound exposure time is given in the morning (at 08.00 WIB).

Research Implementation

a. Preparation

In the preparation stage, an acrylic box was made as a soundproof room, which aims to prevent plants from being exposed to other sounds outside the sound they want to test. Then prepare the seed planting medium in the form of cotton seedlings in Petrides.

b. Planting the seeds

The corn seeds used in this research were bonanza varieties. Corn seeds are planted on Petrides that have been given humus soil as a growing medium and put in an acrylic box where there is an MP3 active speaker. The number of corn seeds used was 5 seeds in each Petrides.

c. Sound Exposure

The types of voices given are Classical music of the maid with the flaxen hair instrument from Ricard Stoltzam, Rock Music of the Afterlife instrument from Avenged Sevenfold, and Murotal Al-Quran 30 juz from Sheikh Misyari Rasyid and as a comparison of control plants (sound exposure sign) The sound level used ranges from 70-75 dB. According to Resti et al., (2018) Classical music is known to have a frequency range of 143-383 Hz, rock music has a frequency range of 120-192 Hz and *murotal* Al-Quran have a frequency range of 165-423 Hz.

d. Maintenance

The seeds will be watered every day with a hand sprayer to keep the seed's environment moist.

Experimental Observation

Observations were made on five sample plants in each experimental unit.

Observations were made on all sample plots from the beginning of germinating seeds to one month. The parameters observed are as follows:

a. Germination (DB)

Observations of the successful seeds germinated were observed on day 7 by direct observation. Germination is calculated based on the number of seeds that germinate.

$$DB = \frac{\Sigma \text{ Number of seeds germinating}}{\text{number of seeds planted}} \times 100\%$$

b. Growth speed (KcT).

Observations of normal sprouts were carried out every day from day 3 to day 5, using the following formula;

$$= \frac{G_1}{D_1} + \frac{G_2}{D_2} + \frac{G_3}{D_3} + \dots + \frac{G_n}{D_n}$$

c. Simultaneous growth (KsT)

Simultaneous growth (KsT) is calculated based on the number of strong normal sprouts carried out on the 4th day after planting expressed as a percent of normal strong sprouts.

$$KsT = \frac{\Sigma \text{ Strong normal sprouts}}{\text{number of seeds planted}} \times 100\%$$

d. Stomata

Stomata was observed using a microscope with a magnification of 100 times. Observations were made of maize plants aged 8 DAS

e. Leaf Width

Leaf width was measured at the age of 7 days after planting using millimeter paper.

All existing data were analyzed using the BNT test (Least Significant Difference) at a significance level of 5%.

RESULTS AND DISCUSSION

Effect of Sound Type

The best germination power was found in treatment V3 (*murotal* frequency of Al-Quran) and V1 (frequency of classical music) which were significantly different from V0 (control) but not significantly different from V2 (frequency of rock music) can be seen in Table 1.

Table 1. Germination, Growth Speed, Immature Growth and Leaf Area of Corn at Various Types of Sounds

Parameter	Kind of Sound				BNT
	V0	V1	V2	V3	
DB % Arcsin	64 54.28 a	71 62.19 b	68 58.2 ab	74 66.17 b	7.7
KCT % Arcsin	0.4 3.17 a	0.5 3.36 b	0.4 3.29 a	0.5 3.55 b	0.29
KST % Arcsin	38 34.1 a	49 40.72 b	41 35.88 ab	53 43.84 b	7.23
LD % Arcsin	9 15.31 a	13 18.40 b	10 16.25 ab	14 18.85 b	1.52

Exposure to the murotal frequency of the Al-Quran and the frequency of classical music gave the best effect on the germination parameter, presumably because the murotal frequency sound waves of Al-Quran and classical music frequencies have a longer sound wave range compared to rock music frequencies, thus the murotal frequency of the Quran and the frequency of classical music produces more stable sound waves so that it can stimulate the activity of enzymes in the seeds. This is with the statement Mareza *et al* (2009) that exposure to music can stimulate the activity of enzymes present in the seed cotyledons so that they germinate more quickly, in addition to other allegations, exposure to music indicates an increase in seed vigor which can increase the germination power of a seed.

In observing the growth rate, giving exposure to Murotal Al-Quan frequency and classical music frequency is the best treatment for growth speed, it is thought that the murotal Al-Quran frequency and classical music frequency can cause the apical meristem in the active plumule part to split so that the seeds will germinate quickly. According to Creath *et al* (2004) who conducted research with the object of okra and zucchini seeds exposed to music, it can significantly accelerate the germination process when compared to without exposure to sound.

Giving exposure to the frequency of Murotal Al-Quran and the frequency of classical music affects the uniformity of growth of corn seeds, according to Sumardi *et al* (2005) that the application of sound wave technology in rice plants can accelerate seed growth, multiply and lengthen rice roots. With these results, the germination process can occur well. In the observation of leaf width, giving exposure to murotal Al-Quran frequencies and classical music frequencies is the best treatment, it is suspected that vibrations or waves caused by Murottal and classical music can change the metabolic activity of cells so that it allows cells to transfer compounds such as amino acids and ATP.

Effects of Duration of Sound Exposure

The results of the F test indicated that sound exposure had no significant effect on germination, growth speed, growth impregnability, and leaf width of maize. The average germination rate, growth rate, growth rate, and leaf width of maize during sound exposure can be seen in Table 2 below. This is thought to be because sound exposure can only stimulate enzyme activity in the seeds without affecting how long the exposure is received by plants. Sutan (2018) also said that giving long treatment of exposure to sound wave frequencies had no significant effect on the growth of kale plants.

Table 2. Germination rate, growth rate, growth impulsiveness, and leaf width of corn plants during the sound exposure time

Parameter		Length Time Exposure to Sound		
		P1	P2	P3
DB	%	93.00	90.00	94.00
	Arcsin	81.40	77.41	82.03
KCT	%	0.60	0.60	0.62
	Arcsin	4.44	4.44	4.49
KST	%	56.00	61.00	64.00
	Arcsin	48.63	51.69	54.22
LD	%	15.00	15.00	16.00
	Arcsin	22.80	22.72	23.30

Stomata openings

The sound exposure treatment showed a difference in the shape of the stomata opening compared to those without sound exposure (control). Plants that were given sound exposure treatment, plant stomata were more open than those that were not given treatment (control). This is by the research conducted by Kadarisman et al. (2011), the sounds of insects such as

garengpung, grasshoppers, crickets, and orong-orong can smooth stomata to open wider in three types of pea plants. Another research conducted by Carlson (2013), explained that the sound produced from sonic bloom for 3 hours can increase the opening of the stomata, so that more CO₂ can enter through the stomata and increase the rate of photosynthesis.

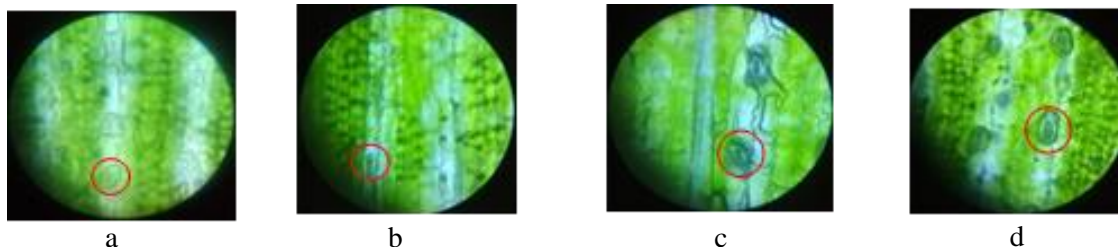


Figure 1. (a) V0 (Control), (b) V1 (Classic music), (c) V2 (Rock music), (d) V3 (Al-Qur'an Murottal)

CONCLUSION

Effect of Sound Type on Viability and early growth of corn seeds, germination capacity, growth rate, growth impregnability, leaf width, and stomatal openings were best found in the exposure to the murrotal frequency of the Koran and the frequency of classical music. However, the duration of exposure to sound showed no significant effect on germination, growth speed, and leaf width of maize plants.

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