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Brassicaceae Planted On Various Soil types: Impact Of Rain Harvesting Irrigation On Growth Performance

Fauzi Said

Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA Cawangan Melaka Kampus Jasin, Melaka, Malaysia.

Author's Information:
Fauzi Said
Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA Cawangan Melaka Kampus Jasin, Melaka, Malaysia.

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Abstract:

Water scarcity is a significant issue that typically affects regions that did not receive enough rain. This problem is addressed by a technology called rainwater harvesting irrigation, which involves collecting rainwater and storing it for later use. This irrigation system can be used for both indoor farming and field irrigation. The major goal of this study is to construct and assess the efficacy of rain collecting irrigation for home farming on Brassica junceagrown on various soil types. In this study, there are three treatments with three replications each: T1 Mineral Soil (MS), T2 Organic Soil (OS), and T3 Mixture of Mineral and Organic Soil (MS + OS).

Keywords:
Brassica juncea, Irrigation, Rainwater, Growth Performance

Introduction:

Al-Quran, the righteous book, stated that the diversity of flora demonstrated Allah Subhanahuwataala's majesty (Hudzari et al., 2013 and 2016). Some plants have roots that extend deep into the ground, whereas others, like vegetables, only extend to the surface. The annual plant Brassica juncea, sometimes known as Chinese mustard, is a member of the Brassicaceae family and is indigenous to southern and eastern Asia. For hundreds of years, Brassica juncea has been grown as food in Europe and Asia. This plant includes numerous minerals that have been shown to be beneficial for human health, including iron, calcium, pantothenic acid, vitamins (A, B, C, E, and K), and many others (Jahan et al., 2014 and Faiz et al., 2013).Additionally, it is a plant with significant economic value that is frequently used as a source of oil and medication in addition to being consumed as a vegetable (Sharma et al., 2017). Because it has a higher tolerance for these compounds and stores the heavy metals inside its cells, the mustard plant is also employed in phytoremediation to remove heavy metals like lead from the soil in hazardous waste sites, according to Rathore et al. (2019). Additionally, it has been said that Brassica juncea can withstand yearly precipitation of 500 mm, 4200 mm, annual temperatures of 6°C–27°C, and a pH range of 4.3–8.3.

One irrigation method that collects water from surfaces where it rains and stores it so that it can be used for home or agricultural purposes is known as rainwater collecting (Nashriyah et al., 2014 and Syazili et al., 2013a). In places with insufficient rainfall for agricultural growth, this method is employed as an option to address the water scarcity problem (Velasco-Muoz et al., 2019). By providing water during dry spells, it also helps to increase agricultural production. Ex-situ (capturing rainwater from outside the farmland) and in-situ (catching rainwater on the farming itself) are the two methods that rainwater can be captured (Hartog, 2013).

The use of rainwater harvesting irrigation has several benefits, including ensuring that crops have access to water, reducing flooding in urban catchments, reducing nutrient loads to rivers, using a low-cost technology, requiring little training, and many more (Wan et al., 2013). This irrigation method can be used in backyard farming in addition to being appropriate for use in the field. This study's primary goal is to develop and assess the impact of rain harvesting irrigation for small-scale home farming on the growth performance of Brassica juncea cultivated on various soil types.

Methods and Materials:

Brassica juncea seeds were purchased from Aeonbig, Ampang, a reputable seller. The seeds were immersed in water for 24 hours to begin the imbibition process, which was then followed by the germination phase. This technique may aid in hastening the germination of Brassica juncea seeds. After that, all floating seeds were strained to remove any poor-filled or dead seeds. In each of the paper cups that had been filled with the various types of soil (T1 Mineral Soil (MS), T2 Organic Soil (OS), and T3 Mixture of Mineral and Organic Soil (MS + OS), the seeds that had already germinated were then immediately planted. Finally, two weeks after planting the seeds, NPK (15:15:15) fertiliser was sprayed.

A recycled bottle (9.5L) that serves as a rainwater collector, a wood enstick to support the host, 1 metre of a medium-size host (16 mm), and 1 metre of a small-size host (4.5 mm) were used to build this irrigation system. This irrigation system's construction only cost RM 3.00, which is reasonable and inexpensive.

The water was delivered by gravity in this irrigation system, which ran without the aid of a pump or power source. This irrigation system's

construction involves a number of processes. First, a hole was drilled at the bottle's base, and a medium-sized (16 mm) hose was inserted inside. To stop water from flowing, the hose's end was sealed. The hose was then supported by a wooden stick that was taped in place at the bottom. The main pipe was then punctured with 3 tiny holes. The tiny size hose (4.5 mm) has been cut into three sections, with the ends taped shut. Every hose was fastened to the holes that had been drilled in the hose. Last but not least, tiny slits were created along the small size hose to let water escape. Measurement of a parameter The study's characteristics included plant height and leaf count, which are the fundamental indicators of plant growth (Syazili et al., 2013b). The height of the plant was measured using a ruler, and the number of leaves was manually counted. From 7 Days After Sowing (DAS) through 19 Days After Sowing, all data were collected at 3-day intervals (DAS).

Conclusion :

As a result, the irrigation system's adoption was effective since it had no negative effects on the ability of plants cultivated in various types of soil to thrive. To make the process of watering plants easier, it is advised to design and utilise this irrigation system at home or on small farms. Because this technique uses rainwater to irrigate plants and rainwater may be retained for use in irrigation in the future, it can help conserve water (Mohd et al., 2010). Additionally, it uses gravity to provide water to the plants rather than a pump or power source, so it is completely energy-free. Additionally, this irrigation system's construction components are less expensive and it is simple to purchase from a hardware store.

References:

1. Faiz ZM, Zulkifly A, Hafizah MHM et al. Monopole antenna technique for determining Moisture Content in the Dioscoreahispida tubers. Australian Journal of Crop Science 2013; 7(1): 6.

2. Hartog M.Rain water harvesting for small-scale irrigation of maize in the Central Rift Valley, Ethiopia. Wageningen University. https://www.researchgate.net/publication/258773852_Rainwater_harvesting_for_small-scale_irrigation_of_maize_in_the_Central_Rift_Valley_Ethiopia
3. Hudzari RM, Noorman MM, MNN et al. Engineering Technological in Agriculture Research and Education. Advanced Materials Research 2013; 705: 493-498.
4. Hudzari RM, Syazili R, Hayan B et al. Design and Development of Mechatronic Application in Agricultural Irrigation Device. World Journal of Engineering and Technology 2016; 4(3).

5. Jahan, Md. Sarwar, Khandaker et al. Application of Copper Increased Corn Yield through Enhancing Physiological Functions. Australian Journal of Basic and Applied Sciences 2014; 8(16): 282-286.

6. Md. Razali H, Ishak W, Ismail W et al. Parameter acceptance for software development of oil palm fruit ripeness prediction. Journal of Software Engineering 2010; 4(3): 244-256.

7. Mat N, Md. Razali H, Khandaker et al. Effects of Irrigation Frequencies on Aerial Agro-Morphological Parameters of Dioscoreahispida Dennst. Journal of Applied Sciences Research 2014; 8(9): 27-37.

8. Rathore SS, Shekhawat K, Dass A et al. Phytoremediation Mechanism in Indian Mustard (Brassica juncea) and Its Enhancement Through Agronomic Interventions. B Biol Sci 2019; 89: 419-427.

9. Sharma A, Kumar V, Kanwar MK et al.Phytochemical profiling of the leaves of Brassica juncea L, using GC-MS. International Food Research Journal 2017; 24(2): 547-551. Retrieved from http://www.ifrj.upm.edu.my/24 (02) 2017/(11).pdf

10. Roslan S, Md. Razali HH, Abbas Z et al. Rapid Detection Techniques for Mechanical Properties Determination on Surface of Dioscoreahispida rhizome. Engineering2013a; 68: 446-452.

11. Syazili R, Hudzari RM, Kamarul et al. Development of Rapid Detection Device for Determination of Alkaloid Level in Dioscoreahispida, Advance Research Material 2013b; 626: 464-469.

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