JUATIKA
JURNAL AGRONOMI TANAMAN TROPIKA
VOL. 7 NO. 1 January 2025

DOI :https://doi.org/10.36378/juatika.v7i1.3988
eissn 2656-1727
pissn 2684-785X
pages : 67 – 70

RESEARCH ARTICLE Open Access

Morphological Characteristics of Leaf Color and Leaf Shape of Soybean Variety Anjasmoro (*Glycine max* (L.) Merril) under Water Stress

Lufita Nur Alfiah[1,*], Khusnu Abdillah[1], Zaimah[1]

Abstract

Anjasmoro soybean variety exhibits intolerance to water stress, which can significantly impact the growth of soybean plants, particularly concerning leaf morphological characteristics. This study aims to assess the effects of water stress on the leaf color and leaf shape of the Anjasmoro soybean variety. The research was conducted from June to July 2024 at the Gauze House of Food Crop Agribusiness at SMKN 1 Tambusai, Rokan Hulu, and the Integrated Laboratory of the Agrotechnology Study Program at the Faculty of Agriculture, Pasir Pengaraian University. The materials utilized in this study included Anjasmoro soybean seeds, soil, 35 x 40 cm polybags, and 15 kg of goat manure. This investigation employed a Non-Factorial, Completely Randomized Design (CRD), focusing on the variable of water stress (P) with three replications. The water stress treatments consisted of four levels: P0: 25% field capacity (KL) water stress applied twice daily, P1: 25% KL water stress applied twice daily, P2: 25% KL water stress applied once every three days, and P3: 25% KL water stress applied once every six days. The results indicated that water stress did not significantly affect the leaf color and leaf shape of the Anjasmoro soybean variety in the P0, P1, and P2 treatments. However, the P3 treatment resulted in observable leaf color and shape changes. These findings suggest that the Anjasmoro soybean variety has a low drought tolerance.

Keywords: Anjasmoro, Leaf Morphology, Plant Adaptations,Plant Tolerance, Water Stress

1. Introduction

Plant morphology is a specialized field within botany that examines plant bodies' composition, shape, and structure (Gembong, 2022). Environmental factors, including water stress, significantly influence this discipline. Water stress refers to a condition in which plants experience inadequate water intake, leading to leaf morphology and pigmentation alterations. Specifically, changes in leaf color are affected by chlorophyll concentrations, physiological characteristics, and variations among different soybean cultivars (Rahmawati et al., 2022).

Rosmaina et al. (2019) noted observable changes in agronomic traits under both normal and drought conditions, indicating that these characteristics are susceptible to water deficits. The extent to which water scarcity impacts the growth and yield of soybean plants is contingent upon several factors, including the water deficit's duration and severity, the plant varieties' genetic traits, and the specific growth phases (Rusmana et al., 2020). Soybean plants are susceptible to drought and excessive moisture throughout their life cycle, with drought stress posing a significant challenge to soybean cultivation (Anindya, 2024). The Anjasmoro soybean variety exhibits intolerance to drought, necessitating optimal water supply for its growth (Septiaswin, 2021). Mahardika (2022) further emphasized that reduced field capacity adversely affects soybean growth. Gea (2024) reported that water stress influences leaf width and count. However, current research on the morphological adaptations of the Anjasmoro soybean variety to water stress has primarily focused on leaf width and count, neglecting the effects on leaf shape and color. Given these considerations, the researcher is motivated to conduct a study titled "The Effect of Water Stress on the Morphological Characteristics of Leaf Shape and Leaf Color of the Anjasmoro Soybean Variety (*Glycine max* (L.) Merril)."

2. Material and Methods

This research began in June-July 2024 in the Gauze

*Correspondence: zaimahagt@gmail.com
1) Universitas Pasir Pengaraian - Jl. Tuanku Tambusai Kumu, Rambah, Rambah Hilir Distric, Rokab Hulu Regency, Riau 28558, Indonesia

House of Food Crop Agribusiness of SMKN 1 Tambusai, Rokan Hulu N.1.05696, E.100.26209 and Integrated Laboratory of Agrotechnology Study Program, Faculty of Agriculture, Pasir Pengaraian University.

2.1. Tools and Materials

The materials used in this study include soybean seeds of the Anjasmoro variety, soil, and polybags measuring 35 x 40 and 15 kg of goat manure. The tools used in this study include hoes, meters, rollers, measuring cups, wood/poles, stakes, bench scales, raffia rope, sieves, measuring cups, scissors, label boards, label paper, cameras, thermometers, digital soil pH meters, Munsell color charts, leaf color charts, black duct tape, and stationery.

2.2. Research Design

The design used in this study was a Non-Factorial, Completely Randomized Design (CRD), with the studied factor being water stress (P), which was repeated 3 times. Water stress consists of 4 levels, namely: P0: Water stress 25% KL 2 times a day, P1: Water stress 25% KL 2 times a day, P2: Water stress 25% KL once every 3 days, P3: Water stress 25% KL once every 6 days.

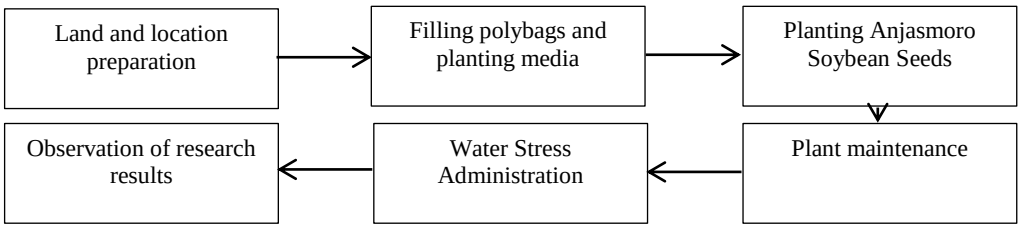

Figure 1. Research flow diagram

2.3. Data Analysis

The observation parameters that were the focus of this study included leaf color and shape. The soybean plant observation data were analyzed using Anova Software 9.0 following the Completely Randomized Design (CRD) Factorial. In the event that the RAL analysis of variance indicated a significant difference, the DMRT (Duncan Multiple Range Test) at the 5% level was employed to analyze the data further.

3. Results and Discussion

3.1. Leaf Color

The results of the analysis of variance showed that water stress significantly affected the color of soybean leaves of the Anjasmoro variety at 3 and 4 MST. The average color of soybean leaves at various levels of water stress can be seen in Table 1.

Table 1. Mean Leaf Color Scale of Soybean Variety Anjasmoro under Water Stress Condition

Water stress treatment (P)	3 MST	4 MST
P_0 (Water stress 25% KL 2 times a day)	3,22±0,26 a	3,83±0,25 ab
P_1 (Water stress 25% KL 1 time a daya)	2,94±0,30 abc	3,32±0,36 bc
P_2 (Water stress 25% KL 3 days once)	2,67±0,35 abc	2,72±0,26 bc
P_3 (Water stress 25% KL 6 days once)	2,56±0,30 bc	2,50±0,25 c
DMRT 5%	3,01	3,01
KK%	10.95%	9.40%

Description: Numbers followed by the same letter in the same column are not significantly different in the 5% DMRT test; MST = days after planting.

The findings presented in Table 1 indicate that the leaf color scale significantly impacts water stress. At the age of 3 months after sowing (MST), there is a significant difference between treatment P0, which involves subjecting plants to water stress at 25% field capacity twice daily, and treatment P3, which involves subjecting plants to water stress at 25% field capacity once every 6 days. At the age of 4 months after planting (MST), there were notable variations between the outcomes of treatment P0 (imposed with water stress at 25% field capacity twice daily) and treatment P3 (imposed with water stress at 25% field capacity once every 6 days). This demonstrates that as water stress levels increase, there is a greater impact on the coloration of leaves.

According to Gembong (2022), the leaf pigmentation of a particular plant species is subject to modification based on its environmental conditions, particularly concerning water and nutrient availability as well as light exposure. Song Ai and colleagues According to a study conducted in 2011, the absence of water reduces the chlorophyll concentration in leaves. This reduction can be attributed to inhibited chlorophyll formation, decreased rubisco enzymes, and inhibited absorption of nutrients, particularly Nitrogen and Magnesium, which are essential for protein synthesis. According to Harianja et al. (2021), alterations in the color of plantlet leaves serve as a marker for the chlorophyll levels present in the leaves. According to Permadi's (2022) findings, the greater intensity of green in

the color of a leaf is directly proportional to the increased concentration of chlorophyll within the leaves.

Figure 1. Leaf Color Scale Measurement Using Leaf Color Chart

3.2. Leaf Shape

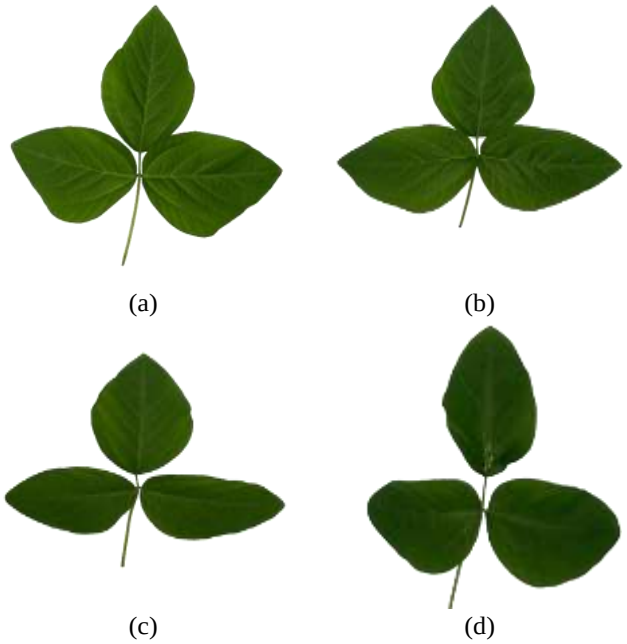

Figure 2. Effect of Soybean Leaf Shape of Anjasmoro Variety on Water Stress. (a) P0 (25% KL water stress twice a day); (b). P1 (25% KL water stress once a day); (c). P2 (25% KL water stress once every 3 days); (d). P3 (25% KL water stress once every 6 days).

Figure 2 in this study demonstrates that the leaf morphology of the soybean variety Anjasmoro is not significantly impacted by water stress. Figure A illustrates the leaf shape under treatment P0, involving 25% KL water stress twice daily. This shape is not significantly distinct from the leaf shape depicted in Figure B under treatment P1 (25% KL water stress once a day) and Figure C under treatment P2 (25% KL water stress once every 3 days). However, it significantly differs from the leaf shape shown in Figure D under treatment P3 (25% KL water stress once every 6 days). Figure d demonstrates that applying the treatment (25% KL water stress administered once every 6 days) leads to alterations in leaf morphology, including changes in shape, rolling, thickening, and enlargement of veins. According to Opalofia et al. (2018), the first reaction of plants to drought stress is leaf rolling, which is subsequently followed by leaf shedding. Leaf rolling is a phenomenon that results from the contraction of bulliform cells, also known as fan cells. Fan cells are a group of larger epidermal cells with thin walls, substantial vacuoles, and high-water content (Mudhor et al.). 2022). The first reaction of rice plants to drought stress is leaf rolling, which is subsequently succeeded by the shedding of leaves (Opalofia et al.). 2018).

4. Conclusion

Water scarcity substantially impacts the structural attributes such as the color and shape of the leaves of Anjasmoro soybean plants. I. IntroductionThe This study investigated the impact of watering at 25% of field capacity every 6 days on the color and shape of soybean leaves of the Anjasmoro variety. II. MethodologyThe experiment involved subjecting soybean plants of the Anjasmoro variety to a watering regime of 25% of field capacity once every 6 days. III. ResultsThe findings revealed a significant influence of the watering treatment on the color and shape of the soybean leaves. These results suggest that the watering schedule of 25% of field capacity every 6 days substantially affects the appearance of soybean leaves, particularly those of the Anjasmoro variety. The Anjasmoro variety of soybeans exhibits morphological adaptations, such as changes in leaf color and shape, in response to water stress.

References

Anindya, W., Palupi, D., & Budisantoso, I. (2024). Efektivitas pertumbuhan dan hasil tanam beberapa kultivar kedelai (*Glycine max* (L.) Merril) dengan pemberian polietilena glikol (PEG) untuk simulasi cekaman kekeringan. *Jurnal Biologi*, *17*(1), 133–143.

Gea, R. O. H. (2024). Pengaruh cekaman air dan pemberian pupuk daun terhadap pertumbuhan dan hasil tanaman sawi hijau (*Brassica juncea* L.). *Agrotekda*, *8*(1), 46–57.

Gembong, T. (2022). *Morfologi tumbuhan*. Gadjah Mada University Press. ISBN 947–420–241.

Harianja, D. N., Karti, P. D. M. H., & Prihantoro, I. (2021). Morfologi mutan alfalfa (*Medicago sativa* L.) hasil iradiasi sinar gamma pada cekaman kering. *Jurnal Ilmu Nutrisi dan Teknologi Pakan*, *19*(2), 59–65.

Mahardika, Y. H., & Simanjuntak, B. H. (2022). Pemberian berbagai level air dan pengaruhnya pada pertumbuhan dan hasil tanaman kedelai (*Glycine max* (L.) Merr) varietas Grobogan. *Vegetalika*, *11*(4), 266–279.

Mudhor, M. A., Dewanti, P., Handoyo, T., & Ratnasari, T. (2022). Pengaruh cekaman kekeringan terhadap pertumbuhan dan produksi tanaman padi hitam varietas Jeliteng. *Agrikultura*, *33*(3), 247–256.

Opalofia, L. Y., Yusniwati, & Swasti, E. (2018). Drought tolerance in some of red rice line based on morphology at vegetative stage. *International Journal of Environment Agriculture and Biotechnology*, *3*, 1995–2000.

Permadi, D. N., Karti, P. D. M. H., & Prihantoro, I. (2021). Morfologi mutan alfalfa (*Medicago sativa* L.) hasil iradiasi sinar gamma pada cekaman kering. *Jurnal Ilmu Nutrisi dan Teknologi Pakan*,

19(2), 59–65.

Rusmana, N. E. P., & Justika, A. (2020). Growth and yield of various soy varieties (*Glycine max* (L.) Merr.) on drought stress. *Jurnal Keteknikan Pertanian Tropis dan Biosistem*, *8*(3), 228–235.

Septiatin, A. (2012). *Meningkatkan produksi kedelai di lahan kering, sawah, dan pasang surut*. Yrama Widya.

Song Ai, N., & Banyo, N. (2011). Konsentrasi klorofil daun sebagai indikator kekurangan air pada tanaman. *Jurnal Ilmiah Sains*, *11*(2), 166–173.