

ABSTRACT

Fitri Sholikah. 24020124410002. **Physiological, Anatomical, and Growth Responses of *Centella asiatica* L. under Drought Stress and Recovery Phases.** Supervised by Endang Saptiningsih and Erma Prihastanti.

Centella asiatica L. is an important medicinal plant widely utilized as a source of bioactive compounds. Water availability is a major environmental factor affecting the physiological, anatomical, and growth characteristics of plants. This study aimed to investigate the physiological, anatomical, and growth responses, as well as the recovery capacity of *Centella asiatica* under different levels of drought stress. The experiment was arranged in a Completely Randomized Design with four levels of water availability: 100%, 70%, 50%, and 30% of field capacity (FC). Following a 21-day acclimatization period, plants were subjected to drought stress from 1 to 42 days after treatment (DAT), followed by rewatering at 100% FC. Recovery was evaluated during the early recovery phase (43–49 DAT) and the late recovery phase (50–70 DAT). Parameters measured included relative water content (RWC), proline content, photosynthetic pigments, stomatal aperture and density, vegetative and clonal growth, and dry biomass. Data were analyzed using ANOVA followed by the LSD test at the 5% significance level. Increasing drought intensity reduced vegetative and clonal growth. Under 30% FC, leaf area, stolon length, and total biomass were reduced to 34.13%, 41.12%, and 60.41% of the control, respectively. Severe drought decreased total chlorophyll by 57.24%, increased proline accumulation by 201.18% and stomatal density by 134.89%, whereas RWC remained stable across all treatments. Following rewatering, RWC recovered most rapidly and reached values comparable to the control, followed by a decline in proline content and gradual recovery of stomatal aperture and photosynthetic pigments. Total chlorophyll increased to 116.20% of the control under the 30% FC treatment at the end of the recovery phase. However, clonal growth, root system development, and dry biomass did not fully recover. *Centella asiatica* maintained its water status and restored physiological functions following drought stress; however, growth recovery was slower, resulting in residual effects, particularly under the 50% and 30% FC treatments.

Keywords: *Centella asiatica*, drought stress, recovery, proline, stomata, relative water content.