

**EFFECT OF DIFFERENT MINERAL FERTILIZERS ON THE GROWTH OF
Abelmoschus manihot (L.) MEDIK**

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In modern pharmacology and plant science, increasing attention is being paid to the introduction and cultivation of non-traditional medicinal and food plants that contain a wide range of biologically active compounds (BACs). One such promising species is *Abelmoschus manihot* (L.) Medik., a herbaceous plant belonging to the family Malvaceae and native to the tropical and subtropical regions of East and Southeast Asia.

The flowers and leaves of this species are rich in flavonoids (particularly rutin, hyperoside, and myricetin), polysaccharides, and steroids, which account for its pronounced anti-inflammatory, antioxidant, cardioprotective, and immunomodulatory properties. Despite its high therapeutic and agronomic potential, the successful cultivation of *A. manihot* outside its natural distribution range is associated with several ecological constraints. As a typical representative of subtropical flora, this species is highly sensitive to temperature, solar radiation, and soil moisture conditions.

The introduction of *A. manihot* into other climatic zones, such as regions with sharply continental arid climates or temperate latitudes, inevitably induces adaptive physiological and morphological changes. These changes are reflected in altered growth rates, modifications of plant architecture, and significant shifts in the timing of key phenological stages. Without a thorough understanding of phenological development and the dynamics of vegetative biomass accumulation under specific environmental conditions, it is impossible to optimize cultivation practices or determine the optimal harvesting period for medicinal raw materials with the highest content of biologically active compounds.

The objective of this study —was to investigate the growth and developmental characteristics, as well as the reproductive phenology, of *Abelmoschus manihot* (L.) Medik. under different mineral fertilizer treatments.

Phenological observations and biometric measurements were conducted during the 2026 growing season following the methodology described by Beydeman (1974).

To determine seed germination under field conditions, seeds were sown in the experimental field during spring at a depth of 1–2 cm. Seeds collected in 2024 were sown on 7 April, while seeds collected in 2025 were sown on 27 April 2026. Field germination ranged from 23.5% to 46.5%.

Fertilizer Treatments

The experiment consisted of six treatments. The first treatment served as the control, while the remaining five treatments received different mineral fertilizer formulations. Fertilizers were applied at a rate of **25 g m⁻²**, dissolved in 10 L of water, and applied at different stages of plant development.

Treatment 1: Control (no fertilizer)

Treatment 2: N₃₂:P₁₀:K₁₂

Treatment 3: N₁₃:P₄₀:K₁₃

Treatment 4: N₁₀:P₁₀:K₃₈

Treatment 5: N₂₀:P₂₀:K₂₀

Treatment 6: Sequential fertilization:

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Juvenile stage – N₃₂:P₁₀:K₁₂

Immature stage – N₁₃:P₄₀:K₁₃

Virginal stage – N₁₀:P₁₀:K₃₈

Field experiments evaluating the effects of different mineral fertilizers on the growth and development of *Abelmoschus manihot* led to the following findings.

Seed Germination. Under field conditions, seed germination ranged from 23.5% to 46.5%, indicating moderate germination capacity under the experimental conditions.

Growth Rate and Phenological Development.

Mineral fertilizer application significantly accelerated plant development. Plants in Treatment 2 (N₃₂:P₁₀:K₁₂), Treatment 3 (N₁₃:P₄₀:K₁₃), and Treatment 4 (N₁₀:P₁₀:K₃₈) reached the flower bud initiation stage between 8 and 12 June. In contrast, plants in the control treatment and Treatments 5 and 6 remained in the virginal stage during the same period.

Morphometric Characteristics. The highest effectiveness in vegetative growth and organ development was observed in Treatment 4 (N₁₀:P₁₀:K₃₈). As of 12 June, plants in this treatment attained the greatest height (16–17 cm) and produced the highest number of metamers on the main shoot (8–9).

Plants in Treatments 2 and 3 also demonstrated vigorous growth, reaching heights of 10–13 cm and developing larger leaf blades compared with the control. Effect of Sequential Fertilizer Application. The sequential application of different fertilizer formulations in Treatment 6 (N₃₂:P₁₀:K₁₂ → N₁₃:P₄₀:K₁₃ → N₁₀:P₁₀:K₃₈) did not produce the anticipated stimulatory effect. According to biometric measurements taken on 12 June, plants in this treatment reached only 9–10 cm in height, performed less favorably than plants receiving a single fertilizer formulation, and showed growth characteristics similar to those of the control.

The results indicate that the application of the mineral fertilizer N₁₀:P₁₀:K₃₈ (Treatment 4) is the most effective strategy for optimizing the cultivation of *Abelmoschus manihot*. This fertilizer promoted the highest field germination, accelerated the transition to the generative stage, and significantly enhanced the linear growth of plants.