


Influence of Mineral Fertilizers on the Biometric Indicators of Chinaberry (*Melia azedarach*) in Typical and Light Gray Soils

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Abstract

The article demonstrates the positive effect of applying various rates of mineral fertilizers in the cultivation of chinaberry trees and presents data from phenological and biometric monitoring on their growth and development. The application of optimal mineral fertilizer rates (N₁₂₀P₉₀K₆₀) in light sierozem conditions and (N₉₀P₃₀K₃₀) in typical sierozem conditions resulted in an increase in the height and stem diameter of chinaberry seedlings by 1.3 - 1.5 times.

Keywords

Soil, Melia, Plant, Biometric Indicators, Mineral Fertilizers, Nitrogen, Phosphorus, Potassium, Agricultural Techniques, Growth Rate

1. Introduction

In many countries worldwide, the cultivation and reproduction of medicinal plants, the preservation and enrichment of the existing gene pool, and their natural and cultivated propagation are among the most critical issues. The development of the pharmaceutical industry and the expansion of natural medicine production based on natural plant materials are also of great importance.

An important factor in expanding the use of medicinal plants is the Decree of the President of the Republic of Uzbekistan dated April 10, 2020, No. PP-4670, "On measures for the protection, cultivation, processing and rational use of avail-

able wild medicinal plant resources” [1]. Paragraph 35.4 of Section VIII of the Decree of the President of the Republic of Uzbekistan dated May 31, 2023, No. PP-174, defines the main tasks for developing agricultural technologies for growing ornamental and medicinal seedlings of *Evodia daniellii* and *Melia* trees in the territory of the Burchmulla State Forestry in the Tashkent region [2].

Based on the above, it is relevant to include provisions for increasing the area of medicinal plants in forestry enterprises when creating beekeeping plans. When cultivating trees of the *Evodia* genus, it is important to establish plantations of these plants while reducing water deficit through the use of water-saving technologies. Their medicinal properties have been studied, and intensive cultivation technologies have been developed. Currently, no practical scientific and technical research has been conducted on this issue in the Republic. Research on developing cultivation technologies can be implemented to address this problem through the use of advanced production methods.

Otamurodov's research in the mountainous and foothill plains of Surkhandarya region, where light and typical gray soils predominate, shows that these conditions are favorable for growing medicinal plants. The area, located at an altitude of 450 - 1000 m above sea level, includes the Sariosiyo, Denau, Uzun, Shurchi, Boysun, Bandixon, Oltinsoy, and Kumkurgan districts. Otamurodov indicates that frequent loosening of the soil surface in fields and application of organic fertilizers (manure, peat, compost, etc.) improve the properties of saline soils for plant cultivation [3].

In Ruzmetov's research, the agrotechnology for intensive cultivation of medicinal plants from the Asteraceae and Lamiaceae families in various soil and climatic conditions of Uzbekistan has been developed [4]. He has determined various norms for mineral fertilizers, irrigation systems, growth and development regulators, as well as acceptable variants in combined agrotechnology.

2. Research Methodology

The *Melia* (*Melia azedarach*) tree was chosen as the object of study. Field experiments, phenological observations, biometric measurements, and soil and plant sampling were conducted according to Dospekhov's "Methodology of Field Experiment" [5]. For studying the seasonal development of plants, Beideman's "Methodology for Studying Plant Phenology" [6] was used. Variational-statistical processing of the obtained results was carried out using the "Statistics-7" program, based on Zaitsev's "Methodology of Biometric Calculations" [7].

3. Experimental Part of the Research

The study determined the influence of various mineral fertilizer application rates on the growth, development, and biometric indicators of the *Melia* tree (*Melia azedarach*) in the irrigated light sierozem soil conditions of the Surkhandarya region, focusing on plant height and stem diameter.

In 2023, experiments using various rates of mineral fertilizers for plant develop-

ment and growth demonstrated that the average plant height in the control (without fertilizers) variant was 48.6 cm, with a stem diameter of 4.8 mm. In the second variant, the height reached 55.3 cm and the diameter 5.6 mm; in the third variant, the height was 57.0 cm and the stem diameter 5.6 mm; in the fourth variant, the height was 60.2 cm and the diameter 6.0 mm; in the fifth variant, the height reached 68.7 cm and the diameter 6.7 mm. The optimal variant proved to be ($N_{120}P_{90}K_{60}$), which, when cultivated on light gray soils in the Surkhandarya region, increased the height of the *Evodia* plant by 1.4 times and the stem diameter by 1.3 times compared to the control (Figure 1).

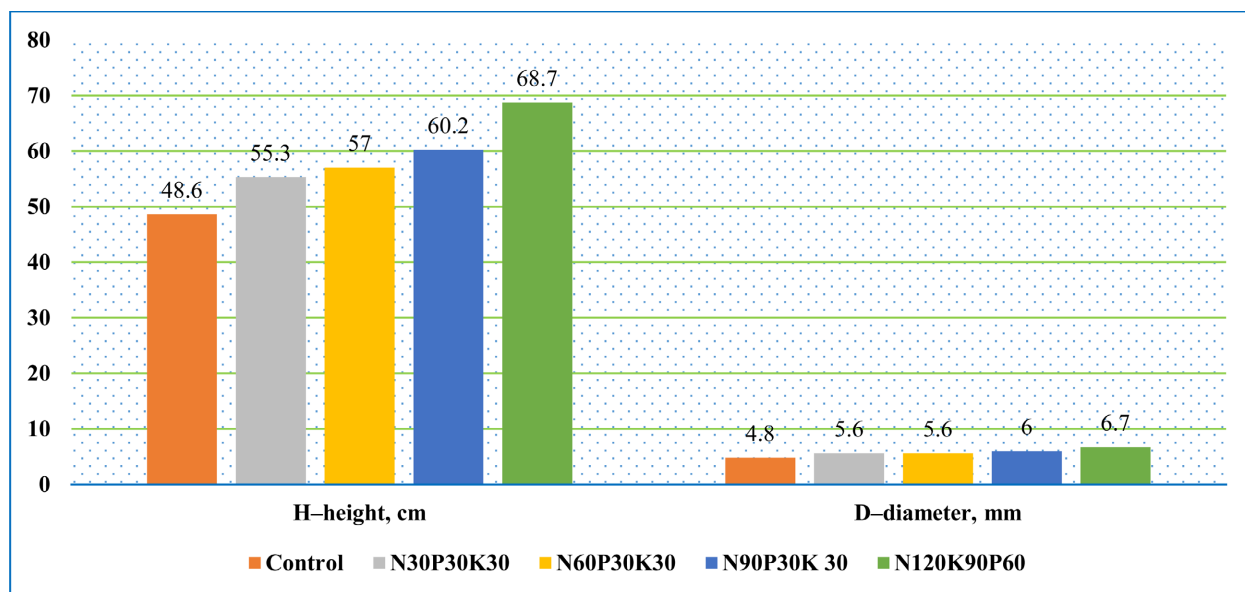


Figure 1. Biometric indicators of growth and development of *Melia* seedlings using various mineral fertilizer rates (Surkhandarya Forestry, 2023).

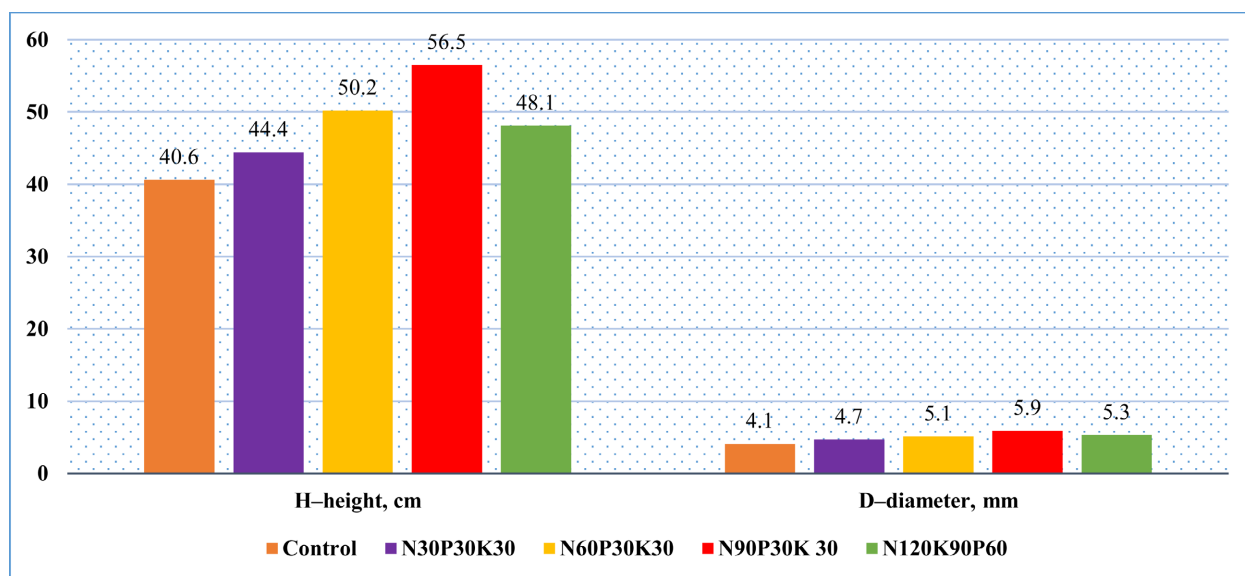


Figure 2. Biometric indicators of growth and development of *Melia* seedlings (Darkhon Research and Experimental Farm, 2023).

In the conditions of typical sierozem soils of the Tashkent region, the influence of various mineral fertilizer application rates on the growth and development of the *Melia azedarach* tree and biometric indicators of plant height and trunk diameter were also determined.

During scientific research conducted in 2023, monitoring data showed that the average plant height in the control variant (without fertilizers) was 40.6 cm, with a diameter of 4.1 mm. In the second variant (N₃₀P₃₀K₃₀), the indicators were 44.4 cm in height and 4.7 mm in diameter. In the third variant (N₆₀P₃₀K₃₀), the seedlings had a height of 50.2 cm and a trunk diameter of 5.1 mm. In the fourth variant (N₉₀P₃₀K₃₀), the seedlings had an average height of 56.5 cm and a diameter of 5.9 mm. In the fifth variant (N₁₂₀P₉₀K₆₀), these indicators were 48.1 cm in height and 5.3 mm in diameter. Compared to the control, the height increased by 1.3 times (139%), and the stem diameter by 1.4 times (143%) (Figure 2).

4. Conclusions, Proposals, and Recommendations

Based on the results of the research conducted in 2023, the following conclusions can be drawn:

- 1) When growing *Melia* seedlings in light gray soil conditions with the application of mineral fertilizers N₁₂₀P₉₀K₆₀, it is evident that the average height is 141.2% greater, and the trunk diameter is 139.9% larger compared to the control.
- 2) During the growth and development of *Melia* seedlings in typical sierozem soils, when supplemented with mineral fertilizers (N₉₀P₃₀K₃₀) at a rate of 100%, the seedling height increased by 139%, and the trunk diameter by 142% compared to the control.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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