



A Comparative Study on the Effect of Foliar Application of NPK and Different Mediums on *Melia azedarach* L. Growth

Hardy Kakakhan Awla Shekhany^{1*}

¹Department of Forestry, College of Agriculture, Salahaddin University-Erbil, Iraq.

Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

An experiment was conducted to study the effects of NPK foliar application and three different Mediums including (Sand, Compost and Peat moss) on the growth of pre-sowing *Melia azedarach* L. seeds. NPK application (20-20-20) at 500 ppm concentration significantly increased of shoot length 202.58 mm, shoot dry weight 1.93 g, root fresh weight 0.68 g and root dry weight 0.37 g. Seeds sowed in three different mediums; Sand, Compost and Peat moss the results showed that Peat moss had best performance in almost all the parameters shoot diameter 2.52 mm, shoot length 248.92 mm, shoot dry weight 2.23 g and root fresh weight 0.83 g. Interaction of medium Peat moss with NPK 500 ppm significantly increased all the studied parameters.

Keywords: NPK foliar spray; *Melia azedarach* L. seed; compost and peat moss.

1. INTRODUCTION

The tree *Melia azedarach* (Family: Meliaceae) is known locally as bakain or drek (Hindi), Persian lilac or China tree (English), and Fleurs lilas

(French). In South America is commonly known as "paraiso" or paradise, and in the US as Indian lilac or white cedar (Sharma and Paul, 2013). The whole plant or its specific parts (leaves, stem, and roots) are known to have medicinal

*Corresponding author: E-mail: hardy.awla@su.edu.krd;

properties and have a long history of use by indigenous and tribal people in India. *Melia azedarach* is a deciduous tree up to 45 m tall; bole fluted below when old, up to 30-60 (max. 120) cm in diameter, with a spreading crown and sparsely branched limbs. Bark smooth, greenish-brown when young, turning grey and fissured with age [1,2]. *Melia azedarach* is used as an ayurvedic medicine in India and Unani medicine in Arab countries as an antioxidative, analgesic, anti-inflammatory, insecticidal, rodenticidal, antidiarrhoeal, deobstruent, diuretic, antidiabetic, cathartic, emetic, antirheumatic and antihypertensive. It is highly nutritious having a calorific value at 5100 kcal/kg. Also, it is used to manufacture agricultural implements, furniture, plywood, boxes, poles, tool handles and fuel wood. It is widely planted as a shade tree in coffee and abaca plantations. It is a well-known ornamental tree [3]. *M. azedarach* is distinguished from other members of the Meliaceae in the southeastern U.S. A by the nature of its compound leaves, and by its drooping, persistent clusters of yellowish fruits. *M. azedarach* is not easily confused with any other plants in its introduced North American range [4].

Healthy seedlings production is essential for raising hearty plants. Different growth media plays a vital role in effective production of horticultural seedlings in nurseries [5]. Peat moss, due to its appropriate physical properties, such as, low bulk density and high total porosity and its high nutrient exchange capacity constitute one of the main substrate components for seedling production in containers [6,7].

Plant nutrition one of the most important factors that increase plant production. NPK foliar nutrition had a significant effect on plant growth characters [8,9]. Aerial spray of nutrients is preferred and gives quicker and better results than the soil application [10].

The aim of the study was to evaluate the influence of different soils media (Sand, Compost and Peat moss) and foliar spray of NPK on the growth of *Melia azedarach* seedlings.

2. MATERIALS AND METHODS

2.1 Study Area

The study was carried out in Grdarasha research field-Erbil city, College of Agriculture, Salahaddin University-Erbil-Iraq (Latitude North 36.16°,

Longitude East 44.03° and the Altitude 436 meters above sea level).

2.2 Growing Media and Growth Performance of Seedlings

The black polyethylene bags with (30×30×45) cm were used. Each bag was filled with three medium (sand, compost and peat moss). Ten seeds was planted in each bag and irrigated with water; the amount of irrigation water was 500 ml/bag every three days till the end of the experiment. Selected chemical and physical properties of studied water, which is analyzed in directory of environmental - Erbil, are shown in Table 1.

Table 1. Chemical and physical properties of the studied water

| Water properties | Tap water |
|------------------------------------|-----------|
| pH | 7.8 |
| E.C ms.cm-2 | 360 |
| T.D.S (ppm) | 180 |
| Hardness (ppm) | 240 |
| Alkalinity (ppm) | 162 |
| K ⁺ (ppm) | 0.9 |
| Na ⁺ (ppm) | 9.4 |
| NO ₃ ⁻ (ppm) | 38 |
| Cl ⁻ (ppm) | 55.2 |
| Ca ⁺⁺ (ppm) | 40 |

2.3 NPK Solution Preparation and Applying

NPK (20:20:20) solution at concentration of (0 and 500 ppm) modified from Demirkiran and Cengiz [11]. They were prepared by dissolving 1.250 gm in 500 ml of Distilled water according to the treatment. NPK nutrition was added as foliar spray during 2 times, the first one after 20 days from germination while the second one after 20 days from the first one [12].

Treated seeds were covered with white polyethylene at 2.5 m height. Monthly averages temperature and humidity were recorded throughout the experiments period and shown in Table 2.

2.4 Data Collection

Shoot diameter was measured by (digital vernier caliper) from the stem near the contact point with the root of the seedling.

Table 2. Average air temperature and relative humidity during the study period

| Year | Month | Average air temperature °C | Average air humidity % |
|------|----------|----------------------------|------------------------|
| 2015 | November | 12.40 | 42.50 |
| | December | 10.00 | 43.20 |
| 2016 | January | 11.20 | 45.10 |
| | February | 12.20 | 44.01 |
| | March | 15.45 | 44.40 |
| | April | 19.50 | 43.00 |
| | May | 25.00 | 36.20 |

Shoot length was measured from the contact point between the stem and the soil surface to the growing tip of the main stem.

The shoot fresh weight was measured by sensitive balance just after harvesting.

Shoot system was oven dried to constant weight at 70°C according to Baninasab and Mobli [13] methods.

Root length was measured from the contact point between the soil surfaces to the growing tip of the main root.

The root fresh weight was measured by sensitive balance immediately after harvesting.

Root system was oven dried to constant weight at 70°C [13].

2.5 Statistical Analysis

The results analyzed based on factorial complete randomized design (F-CRD) the application treatments for the seedling growth experiment contain three medium (Sand, Compost and Peat moss), two NPK foliar application (20:20:20) (0 and 500ppm) with three replications, each replicate was contained ten seeds. The data were submitted to analysis of variance, the means were compared by least significant differences (LSD) at probability level of 5% for field [14].

3. RESULTS AND DISCUSSION

3.1 Media Effects on *Melia azedarach* L. Growth

Table 3 shows the effects of mediums on shoot diameter, shoot length, shoot dry weight and root fresh weight. The highest value of shoot diameter, shoot length, shoot dry weight and root fresh weight (2.52 mm, 248.42 mm, 2.23 g and 0.83 g) were recorded from Peat moss medium. Lowest results of shoot diameter and shoot

length (1.66 mm and 122.36 mm) were obtained from Sand and the lowest value of shoot dry weight and root dry weight (0.53 g and 0.23 g) were recorded from Compost. These results were indicated to medium deciduous tree attaining a height up to 45 m tall; bole fluted below when old, up to 30-60 (max. 120) cm in diameter, with a spreading crown and sparsely branched limbs [15].

3.2 Effect of NPK on *Melia azedarach* L. Growth

Table 4 shows the effects of NPK concentrations on growth parameters. The results show no significant differences between the treatments except shoot length, shoot dry weight, root fresh weight and root dry weight, the highest levels (202.58 mm, 1.93 g, 0.63 g and 0.37 g) were observed in 500 ppm NPK. Plant nutrition one of the most important factors that increase plant production. Nitrogen (N) is the most recognized in plant for its presence in the structure of the protein molecule. Accordingly, N plays an important role in synthesis of the plant constituents through the action of different enzymes [16].

3.3 Interaction Effects of Mediums and NPK on Growth Characteristics

Table 5 shows significant differences among the treatments. The greatest shoot diameter, shoot length, shoot fresh weight, shoot dry weight, root length, root fresh weight and root dry weight (2.95 mm, 308.07 mm, 10.14 g, 4.32 g, 137.09 mm, 1.33 g and 0.59 g) was measured from the interaction of Peat moss medium and the level of 500 ppm NPK. However, the minimum values of shoot diameter, shoot length, shoot fresh weight, shoot dry weight, root fresh weight (1.51 mm, 97.25 mm, 0.53 g, 0.17 g and 0.15 g) were obtained from the Sand medium control. The application of organic waste or compost on soils used for crop production is of great importance due to the nutritional input and low cost [17].

Table 3. Effect of selected medium on the growth characteristics of *Melia azedarach* L.

| Medium | Shoot diameter (mm) | Shoot length (mm) | Shoot fresh weight (g) | Shoot dry weight (g) | Root length (mm) | Root fresh weight (g) | Root dry weight (g) |
|--------------|---------------------|-------------------|------------------------|----------------------|------------------|-----------------------|---------------------|
| Sand | 1.66 | 122.36 | 1.42 | 0.62 | 105.32 | 0.28 | 0.26 |
| Compost | 1.71 | 149.89 | 1.47 | 0.53 | 65.72 | 0.23 | 0.06 |
| Peat moss | 2.52 | 248.42 | 6.53 | 2.23 | 103.52 | 0.83 | 0.36 |
| L.S.D < 0.05 | 0.58 | 62.52 | N.S. | 1.38 | N.S. | 0.53 | N.S. |

Table 4. Effect of NPK on growth characteristics of *Melia azedarach* seedlings

| NPK (ppm) | Shoot diameter (mm) | Shoot length (mm) | Shoot fresh weight (g) | Shoot dry weight (g) | Root length (mm) | Root fresh weight (g) | Root dry weight (g) |
|--------------|---------------------|-------------------|------------------------|----------------------|------------------|-----------------------|---------------------|
| 0 | 1.76 | 144.53 | 1.49 | 0.32 | 82.42 | 0.22 | 0.09 |
| 500 | 2.17 | 202.58 | 4.80 | 1.93 | 100.62 | 0.68 | 0.37 |
| L.S.D < 0.05 | N.S. | 50.95 | N.S. | 1.12 | N.S. | 0.43 | 0.25 |

Table 5. Interaction effects of mediums and NPK on growth characteristics

| Medium | NPK (ppm) | Shoot diameter (mm) | Shoot length (mm) | Shoot fresh weight (g) | Shoot dry weight (g) | Root length (mm) | Root fresh weight (g) | Root dry weight (g) |
|--------------|-----------|---------------------|-------------------|------------------------|----------------------|------------------|-----------------------|---------------------|
| Sand | 0 | 1.51 | 97.25 | 0.53 | 0.17 | 98.53 | 0.15 | 0.09 |
| | 500 | 1.82 | 147.47 | 2.31 | 1.07 | 112.11 | 0.42 | 0.44 |
| Compost | 0 | 1.68 | 147.58 | 1.00 | 0.63 | 78.78 | 0.19 | 0.05 |
| | 500 | 1.73 | 152.20 | 1.94 | 0.42 | 52.67 | 0.27 | 0.08 |
| Peat moss | 0 | 2.08 | 188.78 | 2.92 | 0.15 | 69.94 | 0.33 | 0.14 |
| | 500 | 2.95 | 308.07 | 10.14 | 4.32 | 137.09 | 1.33 | 0.59 |
| L.S.D < 0.05 | | 0.83 | 89.10 | 8.17 | 1.96 | 61.97 | 0.75 | 0.44 |

4. CONCLUSION

Generally the seedlings of *Melia azedarach* gave the best results in the field parameters. NPK foliar application and Peat moss medium increased in vegetative growth and were the best for root parameters.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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