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GROWTH OF *Tamarix aphylla* (FARASH) SEEDLINGS AS AFFECTED BY VARIOUS DOSES OF UREA FERTILIZER

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Abstract
The growth and development of Farash (Tamarix aphylla) plants at the nursery level was studied as affected by the application of urea fertilizer in 2022. Urea is a widely used nitrogenous fertilizer with a high nitrogen concentration, which is essential for plant growth and development. Tamarix aphylla is a drought-resistant, slow growing species that can be utilized to reclaim desert and saline soils. Tamarix aphylla (Farash) is a xerophytic plant found extensively in Pakistan's desert rangelands, including Thal & Cholistan. It is used for the fixation of sandy soils in the deserts. Its wood is of good quality and is resistant to insects / pests. It is assumed that the growth rate of desert plants including Tamarix aphylla can be increased by the application of urea fertilizer. However, little research has been carried out to investigate the effect/impact of urea fertilizer on the growth behavior of this important tree in Pakistan. The present study was planned to evaluate the impact of urea fertilizer on the growth behavior of the Tamarix aphylla seedlings. The experiment was conducted under completely randomized design (CRD) with three replications. There were five treatments including control. There were 5 plants in each treatment. There were 25 plants in each replication. So, the total number of plants was 75. Urea fertilizer was applied through foliar application and through roots as well to study their effects on plant height, root length, shoot length,number of leaves, number of branches, diameter at root collar, root fresh weight, root dry weight, shoot fresh weight, shoot dry weight, and root shoot ratio as well. Foliar spray of urea significantly promoted all the growth attributes of the plants more as compared to the plants with root application of fertilizer.

INTRODUCTION

Native area and natural habitats of *T. aphylla*

Tamarix aphylla is indigenous to North Africa, Southeastern Europe and Asia including Pakistan. Tamarix aphylla was introduced from regions of North africa into numerous areas in 1823 as an ornamental plant, windbreaks and to strengthen stream banks. The genus *Tamarix* has about 54 species that are widely distributed in the

world. *Tamarix aphylla* is extensively dispersed in various regions of the world. It is one of the most significant members of the *Tamarix* genus (Al-Msary, 2024).

There are more than 60 species of halophyte plants of the genus *Tamarix* of the Tamaricaceae family, which are cultivated in almost every region of the world under the popular names "Tamarisk" and "salt cedar." These plants are distinguished by their needle-like leaves which secret salt through salt glands. Although tamarisk species are best recognized for growing in hot, dry areas, they may also be found in other areas. Tamarix species are basically grown in arid areas. It is heat, salt, drought, and frost resistant. Immature trees of *Tamarix aphylla* have light grey trunks, while its mature trees have dark grey to black trunks and rough stems up to 1 m in diameter. It is not a pine or conifer. *Tamarix aphylla* biophysical ranges are 0 to 1200 m above sea level. For natural growth, it needs 100 to 500 mm of rainfall per year. It can resist temperatures from 10 to 50 °C (Khan, 2023).

Natural habitats for *Tamarix aphylla* growth include salt marshes, salty deserts, coastal plains, canals, riverbanks, and sand dunes. It may thrive in salty soil and spread more readily in locations that occasionally flood than in those that never do. It grows well in loamy soil and is very adaptable to stiff clays and sand (Zhong and Borong, 2002).

Uses of T.aphylla

The wood of Tamarixaphylla may now be utilized in a variety of ways. Soft branches and leaves are other valuable sources of fodder, particularly during the dry seasons of the year. Although its wood is combustible and has a calorific value of 4835 kcal/kg, it burns slowly due to its salt content, especially in tiny branches. Its wood has been suggested for use as fence posts and is utilized as fuel in the United States. Close-grained wood from T. aphylla is used for producing fruit boxes, carts, tool handles, decorations, furniture, and wheels. On the other hand, it may be utilized as raw material for the manufacturing of particle boards. It is regenerated from seed as well as by branch cuttings (Luna, 2006).

Medicinal uses of T. aphylla

The plant has also been used in traditional medicine for various purposes. For example, in Egypt, the bark of *Tamarix aphylla* has been used to treat malaria, while in Iraq, it has been used as a diuretic and to treat liver and digestive disorders. (Almatroodi et al., 2022).

Urea fertilizer

Urea fertilizer has high nitrogen content (46%). It is chemical fertilizer used extensively for gaining higher yields of various crops like wheat, rice, maize, sugarcane, vegetables and fruit trees etc. It promotes lush green and leafy growth in plants. Urea is also applied to farm trees for accelerating their vegetative growth. However it is less utilized for promoting the growth of seedlings of farm trees particularly in Pakistan (Rahman, 2014).

No work has been carried out to check the effect of urea fertilizer on the growth and development of T. aphylla seedlings in Pakistan. So, present study was designed to evaluate the possible role of urea in increasing the growth of T. aphylla plants at nursery level.

Effect of urea fertilizer on the growth of trees

Urea fertilizer works as a powerful source of nitrogen. It promotes vegetative development of the trees. It increases leaf area of the trees and stimulates the production of healthy and green foliage. It also significantly increases initial development and promotes overall canopy volume. However, excessive use of urea may lead to root damage of the trees and also increases soil and tap water pollution. (Bhatti, 2023).

Urea fertilizer boosts Photosynthetic activity in trees because nitrogen is a fundamental element of chlorophyll. Urea quickly promotes photosynthetic capacity of plants / trees, enabling them to change sunlight into usable energy more proficiently (Huang, 2016).

Urea accelerates vegetative growth of trees. It stimulates quick root development, promotes the production of more number of leaves and builds

a powerful canopy in trees (Karole and Tiwari, 2016).

Urea improves root and shoot mass allocation. It promotes chlorophyll synthesis which in turn promotes photosynthesis. Thus more food is produced by the plant which enhances growth of the plants / trees. (Anonymous, 2026).

The impact of urea fertilizer on the growth and development of Platanus occidentalis trees was threshed out. The dry weight of shoot and root increased by the application of urea. Similarly photosynthetic activity increased which enhanced the growth and biomass production of trees (Robert, 2024).

Urea application to Tamarix can have different effects on the plant depending on the timing, rate, and frequency of application. One study that investigated the effects of urea on Tamarix plants revealed that urea had a significant effect on the growth and development of the plant. Different growth parameters viz. water-use efficiency, leaf nitrogen and carbon contents were analyzed. The study found that urea application significantly increased the growth and water-use efficiency of Tamarix and the effect was more significant when urea was applied in the early and middle growing season at rates. (Tarxyn, 2026).

A study was conducted to thresh out the effects of urea on the growth / development of Terminalia arjuna seedlings. Five treatments were applied to the seedlings including control.

The treatments included control, one gram and two gram urea as root application and one gram and two gram urea as foliar spray. The study showed that maximum growth incurred in the seedlings that were treated with 2 gram urea as foliar spray. All growth parameters including shoot and root length, collar diameter and plant height, fresh and dry weight of root and shoot and root / shoot ration were improved by this treatment (Aslam et. al., 2025).

An experiment was conducted to evaluate the effect of urea fertilizer on the growth of fig (Ficus carica) seedlings at three years age. The results indicated that application of urea fertilizer at the rate of 500 g per seedling significantly increased the leaf area and number of branches. The chlorophyll content, fruit weight and overall yield of the fig trees were also significantly improved as compared to control (Al-Shareefi et. al., 2020).

The foliar application of urea on the pear (Pyrus communis) trees was carried out. The plant height, number of leaves, number of branches, number of fruits per tree and biomass yield of trees were significantly enhanced as compared to control (Curetti, 2023).

Five percent urea solution was applied to apple trees by foliar spray. The tree volume was increased significantly as compared to control (no fertilization) (Zubair, 2017).

Urea was applied to olive trees by foliar application at two concentrations (0.5% and 1%). The overall biomass of the trees, number of fruits and fruit weight all were increased as compared to control (Migeed, 2017).

Materials and Methods

The present study was performed at Postgraduate Research area of Department of Forestry and Range Management, UAF in 2022.

2.1. Tree Saplings

The two month old saplings *ofTamarix aphylla* were collected from postgraduate research area of Department of Forestry and Range Management, UAF. The healthy saplings were separated from weaker ones. Only vigorous and healthy saplings were selected for final experiment. All the selected saplings were homogeneous in health and stature. All Experiment units were arranged under completely randomized design (CRD). The tree saplings were uniform in age and height.

Soil media

Silt soil samples were obtained from the Forestry Nursery and Experimental Area Department of Forestry and Range Management at UAF. Prior to being placed into pots, the soil was dried and then sieved to ensure uniform particle size. Each pot was filled with 5 kg of prepared soil media.

2.3. Earthen pots

The soil media was poured into the 75 earthen pots. The height and diameter of the vertical column was approximately 18 inches and 12 inches respectively.

Shifting

Two months old seedlings were shifted in the pots from polythene tubes.

Fertilizer application

The plants were protected and irrigated for two weeks until they adjusted in the new environment. After two weeks, the treatments were applied.

Treatments

5 treatments were applied with three replications.

- T_0 (No fertilizer) Control
- T_1(foliar spray) 1 gram urea solution
- T_2(foliar spray) 2 gram urea solution
- T_3 (root application) 1 gram urea
- T_4 (root application) 2 gram urea

2 .7. Weighing Balance

A weighing balance was used to determine the weight or mass of plant samples. It was available in research lab.

Oven

A sample drying oven (DHG-9202 Electro thermal Thermostatic Drying Oven) was used to dry samples (Leaves, Stem and Roots). The box body, both internal and external, was constructed using high-quality steel sheets that are welded together. The surface undergoes electrostatic spraying treatment. The internal workroom was made of either finished stainless steel or coated with high temperature resistant silver paint. The door was equipped with an observation window or features a double-door structure. Its appearance was stylish and modern, while offering energy-saving benefits. The temperature control system is based on a microcomputer and features an intelligent digital display. It ensures accurate and reliable temperature control, displaying both the preset temperature and the actual temperature inside the box simultaneously. Additionally, it includes alarm functions for over temperature, heat, electronic leakage, and sensor failure, as well as a timing function. An intelligent LCD temperature controller is also available as an optional feature.

Growth Parameters

The recorded data includes the following parameters.

i. Shoot length (cm)
ii. Root length (cm)
iii. Stem diameter (mm)
iv. Number of leaves
v. Number of branches
vi. Shoot fresh weight (g)
vii. Shoot dry weight (g)
viii. Root fresh weight (g)
ix. Root dry weight (g)
x. Root shoot ratio (%)

2.10. Statistical Analysis

The collected data was analyzed using two-way analysis of variance for species treatment. The means differences were tested by using Tukey HSD test. All the means are presented and all tests were taken significant at $P< 0.005$.

Results

3.1. Shoot length

The maximum shoot length (42.00 cm) was gained by the plants under treatment T_2 followed by T_4 (37.33 cm) and T_3 (27.66 cm).

Table: 3.1.. Effect of urea fertilizer on shoot length of *Tamarix aphylla* after application of different treatments

Treatment	Shoot length (cm)
T_0	19.00 c
T_1	26.33 b
T_2	42.00 a
T_3	27.66 b

T_4	37.33 a

T_0 = Control (no fertilizer), T_1= 1g urea (foliar spray), T_2 = 2 g urea (foliar spray)
, T_3 = 1 g urea (root application), T_4 = 2 g urea (root application).
LSD = 5.0154

3.2. Root length

Maximum Root length (5.60 cm) was gained by the plats under T_2 followed by T_4 (5.01 cm) and T_1 (4.00 cm).

Table: 3.2. Effect of urea fertilizer on the root length of *Tamarix aphylla* after application of different treatments

Treatment	Root length (cm)
T_0	3.66 b
T_1	4.00 b
T_2	5.60 ab
T_3	3.66 b
T_4	5.01 a

T_0 = Control (no fertilizer), T_1= 1g urea (foliar spray), T_2 = 2 g urea (foliar spray)
, T_3 = 1 g urea (root application), T_4 = 2 g urea (root application).
LSD = 5.0154

3.3. Number of branches

Maximum number of branches (4.66) were produced by the plants under T_2 followed by T_4 (4.33) and T_3 (3.34).

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Table: 3.3. Effect of urea fertilizer on the number of branches of *Tamarix aphylla* after application of different treatments

Treatment	Number of branches
T_0	2.66 c
T_1	3.33 bc
T_2	4.66 ab
T_3	3.34 bc
T_4	4.33 c

T_0 = Control (no fertilizer), T_1= 1g urea (foliar spray), T_2 = 2 g urea (foliar spray)
, T_3 = 1 g urea (root application), T_4 = 2 g urea (root application).

3.4. Collar diameter

The maximum collar diameter (3.12 mm) was attained by the plants under T2 followed by T4 (3.02 mm) and T3 (2.66 mm)

Table: 3.4. Effect of urea fertilizer on the collar diameter of *Tamarix aphylla* after application of different treatments

Treatment	Collar diameter (mm)
T_0	2.42 b
T_1	2.61 b
T_2	3.12 a
T_3	2.66 b
T_4	3.02 a

T_0 = Control (no fertilizer), T_1= 1g urea (foliar spray), T_2 = 2 g urea (foliar spray) , T_3 = 1 g urea (root application), T_4 = 2 g urea (root application).

3.5. Shoot fresh weight

The maximum shoot fresh weight (2.60 g) was attained by the plants under T2 followed by T4 (2.59 g) and T3 (2.27 g).

Table: 3.5. Effect of urea fertilizer on the shoot fresh weight of *Tamarix aphylla* after application of different treatments

Treatment	Shoot fresh weight (g)
T_0	2.10 b
T_1	2.21 b
T_2	2.60 a
T_3	2.27 b
T_4	2.59 a

T_0 = Control (no fertilizer), T_1= 1g urea (foliar spray), T_2 = 2 g urea (foliar spray) , T_3 = 1 g urea (root application), T_4 = 2 g urea (root application).

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3.6. Shoot dry weight

The maximum shoot dry weight (0.77 g) was attained by the plants under T_2 followed by T_4 (0.75 g) and T_3 (0.59 g)

Table: 3.6. Effect of urea fertilizer on the shoot dry weight of Tamarix aphylla after application of different treatments

Treatment	Shoot dry weight (g)
T_0	0.47 c
T_1	0.56 b
T_2	0.77 a
T_3	0.59 b
T_4	0.75 a

T_0 = Control (no fertilizer), T_1= 1g urea (foliar spray), T_2 = 2 g urea (foliar spray) , T_3 = 1 g urea (root application), T_4 = 2 g urea (root application).

3.7. Root fresh weight

The maximum root fresh weight (1.28 g) was attained by the plants under T2 followed by T4 (1.27 g) and T1 (1.13 g).

Table: 3.7. Effect of urea fertilizer on the root fresh weight of *Tamarix aphylla* after application of different treatments

Treatment	Root fresh weight (g)
T_0	0.96 c
T_1	1.13 b
T_2	1.28 a
T_3	1.12 b
T_4	1.27 a

T_0 = Control (no fertilizer), T_1= 1g urea (foliar spray), T_2 = 2 g urea (foliar spray)
, T_3 = 1 g urea (root application), T_4 = 2 g urea (root application).

3.8. Root dry weight

The maximum root dry weight (0.39 g) was attained by the plants under T2 followed by T4 (0.30 g) and T1 (0.23 g).

Table: 3.8. Effect of urea fertilizer on the root dry weight of *Tamarix aphylla* after application of different treatments

Treatment	Root dry weight (g)
T_0	0.20 c
T_1	0.23 b
T_2	0.39 a
T_3	0.22 b
T_4	0.30 a

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T_0 = Control (no fertilizer), T_1= 1g urea (foliar spray), T_2 = 2 g urea (foliar spray)
, T_3 = 1 g urea (root application), T_4 = 2 g urea (root application).

3.9. Root / shoot ratio

The maximum root / shoot ratio was attained by the plants under T_2 (0.41) followed by T_4 (0.40) and T_3 (0.30).

Table: 3.9. Effect of urea fertilizer on the root / shoot ratio of *Tamarix aphylla* after application of different treatments

Treatment	Mean
T_0	0.28 b
T_1	0.27 b
T_2	0.41 a
T_3	0.30 b
T_4	0.40 a

T_0 = Control (no fertilizer), T_1= 1g urea (foliar spray), T_2 = 2 g urea (foliar spray)
, T_3 = 1 g urea (root application), T_4 = 2 g urea (root application).

Discussion:

The present study was carried out to thresh out the effect of urea fertilizer on the growth behavior of Tamarixaphylla seedlings. All the growth parameters including shoot and root length, collar diameter, number of branches, shoot and root fresh and dry weights and root / shoot ratio were significantly improved by the application of urea fertilizer. The highest increase in all the parameters was noted under T_2 (2g urea, foliar spray) followed by T_4 (2g urea, root application).

In fact, the effect of urea fertilizer on the growth of T. aphylla seedlings has not been studied in the ecological conditions of Pakistan. So, literature on this specific topic is not available. However previous studies on the other trees show the significant effect of urea on the growth behavior of other trees. The results of present study are in line with the findings of (Robert, 2024) who reported significant improvement in fresh and dry weights of shoot and root of Platanus occidentalis trees under the application of urea fertilizer. He further reported that photosynthetic activity of trees was enhanced by the application of urea which added to growth and biomass yield of the trees. Although the study of (Robert, 2024) was on different tree species, however the results of both studies confirm the positive impact of urea fertilizer on the growth and development parameters of trees, in general.

Similarly (Aslam et. al., 2025) reported the enhanced growth of Terminalia arjuna tree seedlings under the foliar and root application of urea fertilizer. He noted a significant increase in shoot and root length, shoot and root fresh ad dry weights and root / shoot ratio of Terminalia seedlings with the application of urea. The study showed that maximum growth was made by the plants under the application of 2g urea, foliar spray. The results of this study are in accordance with our findings. Although the tree species in both studies are different but it is confirmed that almost all growth parameters were improved by the application of urea fertilizer in both studies.

(Huang, 2016) reported that urea fertilizer boosts up photosynthetic capacity of plants because nitrogen is an essential element of chlorophyll. Urea quickly promotes photosynthetic capacity of plants / trees, enabling them to change sunlight into usable energy more proficiently. This explains the mechanism of urea fertilizer by which it improves the growth parameters of the plants / seedlings. This study too confirms our findings.

Urea speeds up vegetative growth of plants. It encourages quick root expansion and production of more leaves. It also builds up strong canopy in trees (Karole and Tiwari, 2016). This study also explains the mechanism by which urea promotes growth and developments of plants.

The results / findings of all above researchers confirm that urea has the ability to produce more number of leaves, faster the development of plant root and short and increase the fresh and dry weights of plats shoots and roots. It also promotes better root / shoot ratio.

Conclusion:

The results of present study show that urea fertilizer @ 2g per plant should be applied to the T. aphylla seedlings for promoting all growth parameters of the plants. Thus healthy and vigorous seedlings will be available in shorter period of time with more chances of success in the afforestation and regeneration projects.

Conflict of Interest:

There is no conflict of interest among the authors.

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REFERENCE

Almatroodi, S. A. 2022. Therapeutic Potential of *Tamarix aphylla in the* Prevention of Lung injury Through The Regulation Of Inflammation, Oxidative Stress And Cell-Signaling Molecules. App. Sci. 12(19):9925.

Al-Msary, A. N. 2024. A Morphological And Anatomical Study Of *Tamarix aphylla* (Tamaricaceae) In Iraq Central Region. J. Pur. App. Sci. 37(1):19-26.

Al-Shareefi, A. H. H. 2020. Effect Of Adding Urea Fertilizer And Spraying With Nutrient Solution (Folia Ratal) On Some Vegetable And Chemical Traits And Fruit Weight For Fig Seedlings (*Ficus carica* L.). Int. J. Agricult. Stat. Sci. 16(1): 1243-1247.

Anonymous. 2026. Importance Of Urea In Agriculture. (Https://Atdmco.Com/Wp-Content/Uploads/2025/02/Importance-Of-Urea-In-Agriculture.Pdf).

Aslam, F.2025. Impact Of Different Urea Fertilizer Dosages OnThe Growth Performance, Biomass Yield, And Physiological Traits Of *Terminalia arjuna*. Glob. For. 2(4): 123-25.

Bhatti, D. 2023. Effect Of Different Doses Of Urea And Nano-Urea On Growth And Yield Of Guava (*Psidium guajava* L.) Cv. Lucknow-49. Junagadh Agric. Univ. India.

Curetti, M. 2023. Foliar-Applied Urea At Bloom Improves Early Fruit Growth And Nitrogen Status Of Spur Leaves In Pear Trees, Cv. Williams Bon Chretien. Sci. Hort. 150(4):16-21.

Huang, W.2016. Effects Of Urea On Growth And Photosynthetic Metabolism Of Two Aquatic Plants (Cabomba Caroliniana And Elodea Nuttallii). Aquc. Bot. 1040 (2017): 69-77.

Karole, B And R. Tiwari. 2016. Effect Of Pre-Harvest Spray Of Growth Regulators And Urea On Growth, Yield And Quality Of Ber Under Malwa Plateau Conditions. Ann. Of Plan. Soil Res. 18(1): 18-22.

Khan, R. 2023. Growth Response Of *Tamarix aphylla In* Relation To Water Use Efficiency. J. Xi'an. Shiy. Univ. (Nat. Sci. Ed.). 66(4): 206-222.

Luna, R. K. 2006. Plantation Trees. International Book Distributors, Dehra Dun, India.

Migeed, A. 2017. Response Of Picual Olive Trees To Urea Winter Sprays. Midd. Eas. J. Agric. 6(4): 1431-1437.

Rahman, M. Z. 2014. Response Of Wheat To Foliar Application Of Urea Fertilizer. J. Sylhet Agril. Univ. 1(1):39-43.

Robert, J. 2024. Urea Fertilization Effects On Nutrient Uptake And Growth Of Platanus Occidentalis During Plantation Establishment. Trees. 7(1): 250–257.

Tarxyn, L. 2026. Agroforestry Database (Https://Apps.Worldagroforestry.Org/).

Zhang, D And B. Pan. 2002. Biological And Ecological Characteristics OfTamarix L. And Its Effect OnThe Ecological Environment. Science In China Series. Chinese Academy Of Science.

Zubair, M. 2017. Impact Of Foliar Application Of Urea On, Fruit Set, Return Bloom And Growth Of Apple Cv. Red Delicious. Int. J. Cur. Mic. App. Sci. 6(7):2123-2130.

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