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***RESEARCH ARTICLE***
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# Effect of Chemical Fertilizer NPK and Humic Acid on Growth traits of *Dedonia viscosa* L. Seedlings.

**Zana Abubakr Lak[1]** **Bnar Ali Muhammed[1]**
[1] *Department of Forestry, College of Engineering Agriculture Sciences, Salahaddin University, Erbil, Kurdistan region, IRAQ.*
*Corresponding Author: Zana.ahmed@su.edu.krd.

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## ABSTRACT

Organic fertilizers play a significant role in organic systems and sustainable soil management. In general, organic fertilizers increase soil fertilization and can reduce the negative effects of the excessive use of chemical fertilizers and synthetic man-made fertilizers. This study was designed to check the comparable effect between Organic and chemical fertiliser NPK on the growth traits of *Dedonia viscosa* L. The experiment was conducted in the Agriculture College Forestry Department in a plastic house from October to April 2024. RCBD full factorial, two fertilizers used humic acid, NPK and control .in April the seedlings harvested, the biometric traits height and diameter measured. The results show highly significancy about effect of plastic house conditions temperature and light on biometric growth of seedlings were p value ≤0.001 during the 6 months of experiment with increment 53 cm in height of seedling. And the results show significance between fertilizers effect on biometric and biomass growth traits (shoot biomass and root biomass) and seedling diameter if the p value were p value ≤0.05.so the data p value for the growth trait (Shoot biomass) for the seedlings showed significant P value ≤0.05 and ≤0.001 during the experiment duration between NPK, Humic acid and control. and the p-value of the ANOVA table was≥0.05 between NPK and Control and ≤0.001 between Control and humic acid. Cording to these results we recommend to propagate *Dedonia viscosa* L. inside the plastic house to keep him from winter low temperature and wind outside and even we recommend to use organic humic acid fertilizer 10ml/ltr conc, even the NPK chemical can be used in 800 ppm conc. It give good results but less than humic acid which is get better growth traits biometric and biomass.

***Keywords*:** Forest Seedling propagation, Humic and NPK fertilizers,Trees growth traits.



## INTRODUCTION

*Dedonea viscosa* L. (D. viscosa) The plant is originated from Australia and native to western America. The plant is widely distributed in particular regions of Australia, Africa, Mexico, New Zealand, India, Northern Mariana Islands, Virgin Islands, Florida, Arizona, South America and elsewhere. Now, it is available in most countries [1]. *Dedonea viscosa* L. is a flowering and woody plant belongs to Sapindaceae, the plant is a multi-stemmed shrub or single-stemmed small tree up to (7) m tall. The selected plant leaves are various in shapes and sizes and generally obovate, but some of them are lanceolate. The leaf size is about (4) to (7.5) cm long and (1) to (1.5) cm broad with deep green color. The leaves are arranged alternately and secrete a white gummy substance. Usually, the flowers are yellow, but sometimes yellow turns to red. The flower produced in panicles is about (2.5) cm in length. The plant flowers are a particular gender either male or female. The plant cannot bare both male and female. However, there is an exception; sometimes the plant bears both sexes. The fruit is about (1.5) cm with capsule shape. It is red, and during the ripening, it turns to brown color. The bark is pale and rough, with thin and exfoliating in long, thin strips. The plant is producing seeds, and the seeds need to pretreatment by hot water. The pretreatment method used only female plants with their winged fruits to treat aesthetic value [2]. Chemical fertilizers are applied to soils to compensate for poor nutrients. However, this could lead to several problems such as water, air and soil pollution. Organic materials are eco-friendly natural sources. The idea behind applying these products is to overcome the disadvantages of chemical fertilisers and the development of agriculture [3]. A category of organic fertilizer, vermicompost treatment increases nutrient content and the main essential oil ingredients of the medicinal plants. [4] examined the impact of different chemical and organic fertilizers on German chamomile yield and essential oil composition.

## MATERIAL AND METHODS

### 1- Experiment set up

This study conducted in Agricultural college during October to April 2024 inside the Polyethylene House Figure(1a,1b), the seedlings beringed from central forestry nursery which belong to the ministry of Agriculture. One species used *Dedonea viscosa, the* experiment designed as RCBD one factor to check the effect of different fertilizer types organic and chemical in comparable with control on growth traits.

## 2- Seedling planting

The seedling planted in polyethylene bags in dimension (30*15) cm, the bags filled up with silt media, ten pots used per treatment, the total number of seedlings were 30 Figure (2 ,3). the seedlings irrigated and rested for one week withought treatment to acclimate with the polyethylene situation,the climate inside polyethylene house are near the outside in winter near (5) °C degree plus and warmer in months of (February, march, April), the seedlings stayed inside the polyethylene house six months treated with silvicultural treat watering till the harvest in April.

## 3- Fertilizer treatment

Two types of fertilizers used to fertilize the seedlings in comparable with control treatment, NPK 800 ppm and humic acid (10) ml per liter used, the NPK preapared by dilution 0.8 gm of NPK in 1 liter diluted water, the humic acid prepared by diluted 10 ml humic acid in 1 liter of diluted water figure (4) the seedling fertilized with (50) ml of fertilizers /week/seedling for six months, each seedling irrigated with diluted water zero ions (500) ml/ week.

## 4- seedling harvest treatments

In first week of April the seedling harvest started, the seedlings isolated from the bags and washed with nozzle spray water to remove the silt from the roots and putted inside cartoon bags and transported to the labs to measure the biometric and biomass traits (fig. 5a, b,c).

## 5- Biometric measuring

The height of seedling measured with tape measure in dimension (0- 200) cm, the diameter measured with caliper (0- 150) mm, the height measured from the base of seedling to the highest tip and the diameter measured in the middle of seedling to get the real value.

## 6- Biomass measuring

The biomass measured in the lab, the seedlings cutted in the root and stem connecting area and each part putted in cartoon bags and labeled, the samples putted in oven in 60 °C for 48 hours to drying the samples, the biomass measured as dry matter in (gm ±0.1). the samples weighted and the data recorded.

## 7- Data management and statistical analysis

The data transported to excel file Microsoft program and SPSS program used for statistical analysis. The data analysed with GLM linear model (Anova one two way) full factorial multi variable. first the data checked with Shapiro to check the normality of data, then descriptive statistic calculsted to get the means of variable with standard error value. Anova two way used to measure the p value. Even the graphs made with SPSS.

## RESULTS AND DISCUSSIONS.

### 1- Biometric data according to time (six months) experiment duration

According to statistical analysis results, the data p value for the growth traits (Height and Diameter) for the seedlings showed significant P value $\leq 0.001$ during the experiment duration between D1 which is the date of starting the experiment and D2 the day of harvesting for the growth traits height and Diameter of seedlings (graph 1,2), so the means of height of seedlings in D1 were (42) cm were the mean of D2 were( 95) cm with increment yield (53) cm during six months and the p value of anova table were $\leq 0.001$. and for the diameter traits the D1 mean were (2.2) mm and for D2 were (4.5) mm and the p value were $\leq 0.001$ which means high significantly of growth traits per time duration first to end of experiment.

### 2- Biometric data according to fertilizers type (Organic and chemical)

According to statistical analysis results, the data value for the growth trait (Height) for the seedlings showed non-significant P value $\geq 0.05$ during the experiment duration between NPK and Humic acid and control. so the means of height of seedlings in NPK were (68) cm were the mean of humic acid were (68) and (61) cm in control. and the p value of anova table were $\geq 0.05$ and for the diameter traits significant p value found between control and humic acid mean$\leq 0.05$ if the mean diameter for humic acid were (4) mm and (2.2) mm for control. No significanty difference was found between control and NPK and NPK with humic acid if P value were were $\geq 0.05$ fig (3,4) .

### 3- Biomass data according to fertilizers type (Organic and chemical)

According to statistical analysis results, the data p value for the growth trait (Shoot biomass) for the seedlings showed significant P value $\leq 0.05$ and $\leq 0.001$ during the experiment duration between NPK and Humic acid and control. So the mean of shoot biomass of seedlings in NPK was 29.5 g, the mean of humic acid was 36.5g, and the mean of the control was 17.9 g. The p-value of the ANOVA table was$\geq 0.05$ between NPK and Control and $\leq 0.001$ between Control and humic acid. for the root biomass trait significant p value found between humic acid with NPK and control mean$\leq 0.05$ if the mean root biomass (6.1) g for humic acid were (4.6) g for NPK and (4.1) g for control. No significant difference was found between control and NPK if P value was$\geq 0.05$ (5,6).

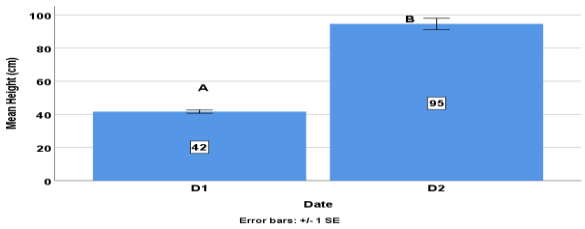


Fig. 1 : means oh height of seedlings in day of starting .

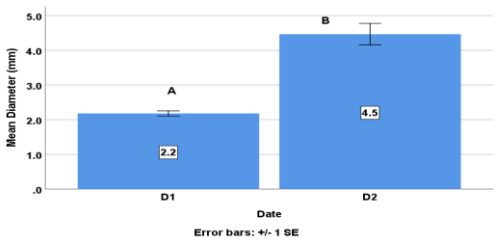


Fig. 2 : means oh Diameter of seedlings in day of starting the experiment The experiment and day of harvest.

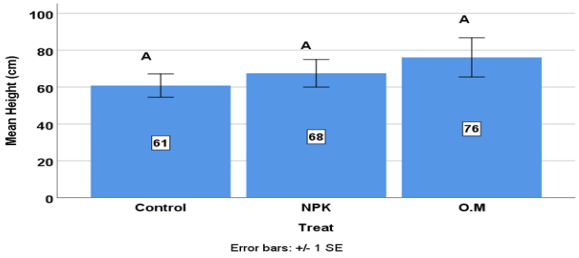


Fig. 3 : means oh height of seedlings in treatments

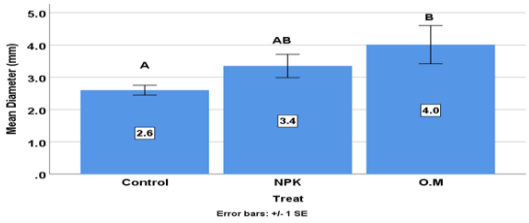


Fig. 4 : means oh height of seedlings in treatments Control, NPK and Humic acid Control, NPK and Humic acid.

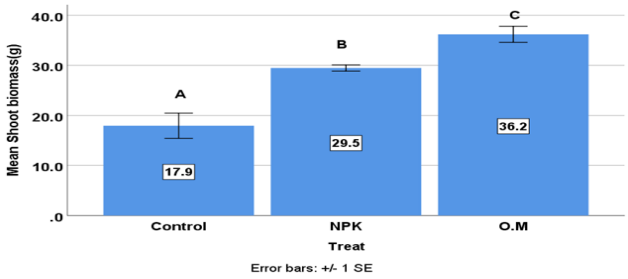


Fig. 5: means oh shoot biomass of seedlings in

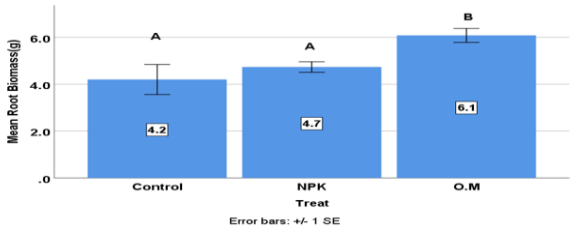


Fig. 6 : means oh Root t biomass of seedlings in treatme treatments Control, NPK and Humic acid. Control, NPK and Humic acid.

**Effect of climatic factors on the growth of seedlings.**

The results in graphs (1,2) show that all plant characteristics (height) and (diameter)of seedlings for plants *Dedonia viscosa* L. for growing conditions inside the plastic house conditions are better than outside and has a significant p value and the Duncan test was ≤ 0.001 during the experiment duration between D1 which is the date of starting the experiment and D2 the day of harvesting for the growth traits height and Diameter of seedlings, So the means of height of seedlings in D1 were (42) cm were the mean of D2 were (95) cm with increment yield (53) cm during six months and the p value of anova table were ≤ 0.001. and for the diameter traits the D1 mean were (2.2) mm and for D2 were (4.5) mm and the p value were ≤0.001 which means high significantly of growth traits per time duration first to end of experiment and this is due to its suitability climatic conditions in terms of average temperatures and humidity for growing *Dedonia viscoa* L. seedlings and this is consistent with the results of [5] and [6]. It was stated that the appropriate temperature range is between (15–28) °C inside the plastic house so the optimum temperature inside the plastic house enhancement the growth of seedlings because it has a role in increasing photosynthesis which the optimum temp degree are between (20-25) °C [7] and the suitable temperature increased the activity of root and stomatal conductivity to increase the uptake of water and nutrient from the soil [8] and increase the gas exchange $CO_2$ and $O_2$ assimilation to produce glucose sugar which then convert to biomass and these compatible with [9] for growth of plant in optimum environment in correlations with cell physiology and biology.

**1- Effect of Fertilizers nutrients on biometric and biomass growth traits of seedlings**

The results in graphs (3,4) for biometric traits characteristics (height) and (diameter)of seedlings for plants *Dedonia viscosa* L. under fertilizing with NPK and Humic acid in comparable with control According to statistical analysis results shows that, the data p value for the growth trait (Height) for the seedlings showed non-significant P value ≥0.05 during the experiment duration between NPK and Humic acid and control. So the mean height of seedlings in NPK was (68) cm, the mean height of humic acid was (76) cm, and the mean height of the control was (61) cm. and the p value of anova table were ≥0.05 and

for the diameter traits significant p value found between control and humic acid mean≤0.05 if the mean diameter for humic acid were (4) mm and (2.2) mm for control. No significant found between control and NPK and NPK with humic acid if P value were were ≥0.05 figure (3,4) and for Biomass traits the results were shows According to statistical analysis results, the data p value for the growth trait (Shoot biomass) for the seedlings showed significant P value ≤0.05 and ≤0.001 during the experiment duration between NPK and Humic acid and this results is compatible with [10]when they fertilized *pawlownia tomentosa* seedlings with humic acid and NPK, and control. so the means of shott biomass of seedlings in NPK were (29.5) g were the mean of humic acid were (36.5) g and (17.9) g in control. and the p value of anova table were ≥0.05 between NPK and Control and ≤0.001 between Control and humic acid This is due to increased growth shoot biomass of *Dedonia viscosa* Seedlings depend on the availability of elements Nutrients necessary for seedling growth in the silt medium with Adding N.P.K. fertilizer compared to control media, as... Nitrogen plays an important role in seedling growth It also regulates the plant's absorption of potassium In addition, phosphorus is included in the composition of many... Proteins that act as enzymes for many activities. It is vital to the plant and is also involved in synthesising acids, Amino, nuclear, and chlorophyll molecules, in addition to Nitrogen, phosphorus and potassium, which improve seedling growth, as proven by [11]. for the root biomass trait significant p value found between humic acid with NPK and control mean≤0.05 if the mean root biomass (6.1) g for humic acid were (4.6) g for NPK and (4.1) g for control. No significant found between control and NPK if P value were were ≥0.05 fig. the results certificate that Humic acid will increase of growth traits of seedlings because the role of Humic acid improving the soil fertility nutrients and increasing the availability of nutrient elements and continuously availability in soil and result increased the growth of seedlings [12]. The presence and nature of organic matter in a mineral soil adds unique physical and chemical properties, making such soils more fertile, Organic matter associated with the cells of living microorganisms, Organic matter associated with living soil fauna, Organic fragments with recognizable cellular structure derived particulate organic matter from any source but usually dominated by plant-derived materials, Organic materials with chemical structures that do not allow them to be placed into the category of non-humic biomolecules, Organic materials that are soluble in alkaline solution but precipitate on acidification of the alkaline extract [8]

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# تأثير السماد الكيميائي والعضوي على صفات النمو لنبات ديدونيا.

**زانا ابوبكر لك[1]** **بنار علي محمد[1]**

*قسم الغابات، كلية علوم الهندسة الزراعية، جامعة صلاح الدين، أربيل،، أقليم كوردستان، العراق.*

الخلاصة

تلعب الأسمدة العضوية دورًا مهمًا في النظم العضوية والإدارة المستدامة للتربة. بشكل عام، تعمل الأسمدة العضوية على زيادة تخصيب التربة ويمكن أن تقلل من الآثار السلبية الناجمة عن الاستخدام المفرط للأسمدة الكيماوية والأسمدة الاصطناعية. تهدف هذه الدراسة إلى التحقق من التأثير المقارن بين السماد العضوي والكيميائي ***NPK*** في صفات نمو ***Dedonia viscosa.L.***. أجريت التجربة في كلية الزراعة قسم الغابات في البيت البلاستيكي خلال الفترة من أكتوبر إلى أبريل 2024. تم استخدام المعامل الكامل ***RCBD*** لإجراء المعاملة 10 مكررات لكل معاملة.استخدم أسمدة حمض الهيوميك العضوي والمركب الكيميائي ***NPK*** والمقارنة. تم دراسة سمات الارتفاع والقطر المقاسة في الشتلات وسمة الكتلة الحيوية. أظهرت النتائج تأثيركبير لظروف البيت البلاستيكي ، درجة الحرارة والضوء على نمو البادرات البيومترية حيث كانت قيمة ***p ≥0.001*** بين ***D1*** و***D2*** خلال 6 أشهر من التجربة مع زيادة 53 سم في ارتفاع الشتلة. وأظهرت النتائج أهمية بين تأثير الأسمدة على صفات نمو الكتلة الحيوية والكتلة الحيوية (الكتلة الحيوية الخضرية والكتلة الحيوية الجذرية) وقطر البادرات إذا كانت القيمة ***p ≥0.05***.لذلك فإن قيمة البيانات ***p*** لصفة النمو (الكتلة الحيوية الخضرية) للشتلات أظهرت قيمة ***P*** معنوية .***0.05***و 0010. خلال مدة التجربة بين ***NPK*** وحمض الهيوميك والمقارنة وكانت قيمة ***p*** لجدول التباين 0.05 ≤ بين ***NPK*** و***Control*** و 0.001 ≤ بين ***Control*** وحمض الهيوميك. وبناء على هذه النتائج نوصي بأكثار نبات ***Dedonia viscosa.L.*** داخل البيت البلاستيكي لحمايته من درجات الحرارة المنخفضة في فصل الشتاء والرياح الخارجية، كما نوصي باستخدام سماد حمض الهيوميك العضوي 10مل/لتر ، وحتى سماد ***NPK*** الكيميائية يمكن استخدامها بتركيز 800 جزء في المليون. ويعطي نتائج جيدة ولكن أقل من حمض الهيوميك الذي يحصل على صفات نمو أفضل بيومترية وكتلة حيوية.

الكلمات المفتاحية : أكثار شتلات الغابات ، الاسمدة العضوية والكيميائية ، صفات نمو الاشجار.