Effect of fertilization by biohorme and humic acid on (*Juglans regia* L.) Seedling

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Abstract

The Persian walnut (*Juglans regia* L.) is one of the important horticultural crops grown in Kurdistan region of Iraq. This research was conducted to determine the effect of humic acid and bio horme on some growth characteristics of walnut seedling. During spring season (growth stage) of 2013. The study was done on the seedlings walnut (*Juglans regia* L.). The age of treated seedlings was one year cultivated in black plastic bags filled with sandy loem soil. The treatments of experiment included concentrations of humic acid (0, 2 ,4)ml.l^{-1} and bio horm (0 , 3 , 6) ml.l^{-1}, each treatment was applied three times at 20/4, 5/5, 20/5 /2013. A complete randomized block design (R.C.B.D) with three replicates each consisted of 4 seedlings was used to carry out this research. Data collected at the end of September 2013 indicated that, foliar spray of Humic acid at 4 ml,l^{-1} resulted in a significant increase in Shoot numbers, number of leaves , shoot diameter, shoot dry weight (gm), Root numbers and Leaf area(cm^2) as compared with control treatment. Mean while spray of Bio horm at 6 ml.l^{-1}. led to the most significant increase in shoot numbers, number of leaves, shoot diameter (mm), shoot length (cm), shoot dry weights (gm), root numbers, root length, root dry weights (gm) and leaf area (cm^2). At the same time, application of Bio horm at 3 ml.l-1. gave the highest increase in percentage chlorophyll pigment as compared with control treatment.

Keywords: Seedling , *Juglans regia* , Bio horm , foliar spray , Nitrogen.

Introduction

The family Juglandaceae consists of seven genera comprising contains 60 monoecoius tree species The genus Juglans contains 20 species, all producing edible nuts in the temperate regions of the world. Among these species Persian walnut (*Juglans regia* L.) is most widely cultivated and economically important species (Arzani *et al*., 2008).

Persian walnuts are thought to have originated in present day Iran and Iraq. The Persian walnut is a medium-sized tree growing to a mature height of approximately 8 m and spread of 6 m.Walnuts are large, monoecious trees with wide, dense crowns. Older trees may have trunk diameters upwards of 1.5–2.5 m. Walnut trees have large, well-developed, deep root systems that impart significant drought and stress tolerance. At an age of 50–70 years the main roots can reach 6–7 m deep and up to 12 m laterally .Young trees have slightly furrowed, light-grey bark, while older trees have bark that is darker-grey and strongly furrowed. The leaves are alternate, 19–54 cm long and 15–40 cm wide, impair pinnate with 3–5 pairs of leaflets. The leaflets are typically dark-green, ovate, coriaceous and

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glabrous, with entire margins. The male flowers are arranged in catkins, with each flower comprising 8–40 stamens. The female flowers occur in groups of 1–3 on the ends of young branches. The fruit is drupe-like and spherical, with a green, dehiscent pericarp (husk), which releases the nut when mature. The endocarp, or "shell", is light brown and hard. The kernel is covered with a thin, yellow to brown papery layer (pellicle). In Central Asia, trees generally flower in April through May and their fruits ripen in September through mid-October. (Shalit, 1951 ; Gursky, 1932).

Exceptional examples of living walnut trees can be found in Central Asia. In the village of Khavzak in the Vakhsh mountain range in Tajikistan, there exists a tree with a crown of over 900 m2. In this region, other trees were observed with trunk diameters reaching 2.5 m. A tree with a trunk circumference of 11.5 m has been recorded as growing along the Yakhsu river, in the village of Siyafark (Kholdorov, 1990).

The Persian walnut is one of the few plants in Central Asia that is almost fully utilized, from the flowers to the roots. Walnut wood is prized for its beauty and is highly valued by woodworkers. The wood is strong, durable, and resistant to pests, rarely cracks, and does not change its volume when heated .It was often used to manufacture furniture in Europe in the 17th and 18th centuries. The demand for walnut veneer remains great and is still used for making high-quality decorative furniture, gun boxes, and various craft projects. The trees sometimes form the so-called Kapa-galls, or burls, which contain a very dense, ornamental wood with curly grain and many eyes of heartwood due to the breaking of dormant buds under the bark. (Bemmann, 1998).

In traditional folk medicine, young, green fruits were used as a health supplement. A decoction of nuts was imbibed to treat high arterial pressure, cardiac diseases, and to rinse the mouth to treat gum disease. Juice from the fruit husk was applied as an ointment to treat mild skin conditions, such as eczema. A tea made from the leaves has been used to treat diabetes (Burmistrov, 1996). The leaves have also been used as a vermifuge (a medicine used to expel intestinal worms) and to treat, tuberculosis, scrofula, and rickets, and the bark from the roots has been used to make a mild laxative (Akopov, 1981). The results obtained indicate that walnut green husks may become important for the obtainment of a noticeable source of compounds with health protective potential and antimicrobial activity (Oliveira et al., 2008). The many folk medicinal uses of walnut are supported by the wide array of pharmacologically active health compounds more recently studied from the nuts, nut husks, leaves, and bark (Alasalvar and Shahidi, 2009).

Poor callus formation in walnut made it a difficult to propagate fruit species (Kuniyuki and Forde, 1985 ; Coggeshall and Beineke, 1997). Out of that reason different methods of producing grafted planting material have been looked for worldwide. (Gautam, 1990) established that walnut propagation by cuttings was difficult to be realized. According to (Rongting and Pinghai, 1993).

The presence of high concentration of phenol compounds in its tissues and their oxidation by wounding, was the major reason hampering the application of planting seeds. At present budding and grafting are the most widely used approaches in the production of grafted walnut trees (Gandev, 2007). As for budding, the most commonly used technique is patch budding (Germain and Prunet, 1999 ; Solar *et al*., 2001).

Scientific research has proved that application of fertilizers in contemporary seedling production represents not only an additional source of nutrient matter, but also a powerful means and important factor in production of high-yielding seedling material for various purposes , (Landis *et al*., 1994 ; Šijačič-Nikolić et al., 2006).

Storing of nutrients, such as nitrogen and phosphorus, in seedlings has a considerable effect on survival and development of seedlings in the course of replanting. The balance of nutrients in seedlings is important for optimum post-replanting physiological processes and performance. Fertilizers are useful for improvement of nutrient content, soil texture, plant tissue and higher yield production (Mitrović *et al*., 2011).

Humic acid

They are black or dark brown materials which are partially or fully decomposed plant or animal wastes. Main composition of soil organic materials is humus, which are the most important reasons of using humic acids in increasing soil fertility. And humic acid is one of bio-stimulants which are known as the organic materials that promote plant growth and help plants to with stand harsh environments when applied in small quantities (Chen *et al*., 1994). The most important property of humic acids is their ability to combine insoluble metal ions, oxides, and hydroxides, and afterwards to release them to crops slowly and continuously when needed. The humic acids can be grouped as physical, chemical, and biological (Singh and Amberger, 1997 ; Çelik, 2003).

It is also highly beneficial for both plant and soil; it maintains proper plant growth as well as it increases nutrient uptake, tolerance to drought and temperature extremes, activity of beneficial soil microorganisms, and availability of soil nutrients particularly in low organic matter without excessive use of agricultural chemicals which are considered a menace to the environment (Eissa *et al.*, 2007 and Ismail *et al.*, 2007).

Humic materials may increase root growth in a similar manner to auxins. (Khattab et al., 2012). In this respect, humic acid has many effects due to their increase of cation exchange capacity which affects the retention and availability of nutrients, or due to a hormonal effect, or a combination of both. Application of fertilizers has a positive impact on growth and development of seedlings, and consequently, their quality (Haase, 2008).

Increases in root length and stimulation of the development of secondary roots have been observed for humic substances in nutrient solutions. The typical response curve shows increasing growth with increasing humic substance concentration in nutrient solutions. Shoots generally show similar trends in growth response to humic substances. (Russo and Berlyn, 1990). The stimulatory effects

of humic substances have been correlated with enhanced uptake of macronutrients. Humic substances can complex transition metal cations. A small fraction of lower molecular weight components in humic substances can be taken up by plants. These components seem to increase cell membrane permeability and may have hormone-like activity (MacCarthy *et al*, 1990).

Application different concentrations of humic acid in tomato and cucumber which obtain increased the growth of tomato and cucumber plants significantly, in terms of plant heights, leaf areas, shoot and root dry weights. Plant growth increased with increasing concentrations of humic acids incorporated into the medium up to a certain proportion, Plant growth tended to be increased by treatments of the plants with 50–500 mg/kg humic acids, but often decreased significantly when the concentrations of humic acids derived in the container medium exceeded 500–1000 mg/kg. These growth responses were most probably due to hormone-like activity of humic acids or could have been due to plant growth hormones adsorbed onto the humates (Atiyeh *et al*, 2002).

Bostan and Islam, (2003) They noted the highest values obtained of the effects K-Humate treatments increased both of the length and diameter walnut seedling growth, and the lowest values were in control, humic acid caused significant differences in all shoot characteristics as compared to the control. The increases in fresh, dry weight, shoots characteristics Chlorophyll content might be due to the influence of humic acid which provides nutrient minerals that involve in plants bio activities and finally leads to growth induction. Furthermore, humic acid increases the porosity of soil and improve growth of root system which leads to increase the shoot system (Garcia *et al.*, 2012).

Humic acid treatments effect on leaf content of total chlorophyll of Florida Prince peach trees. Treatments increased significantly in leaf content of total chlorophyll than the control. (Abd El-Razek *et al*., 2012).

Khattab *et al.*, (2012) Recorded that the shoot length, average number of leaves and Leaf area increased significantly by increasing the raising amount of humic acid,in the experiment was designed to study the effect of adding humic acid on growth pomegranate trees (*Punica granatum* L.). obtained by Shaddad *et al.*, (2005). on apricot, Omar and Abdelall, (2005), and Abbas *et.al*, (2006) on grape, Eissa *et. al* on Anna apple, Ismailet al. on pear they clearly showed a gradual increase in shoot diameter, average shoot length, number of leaves/shoot and leaf area parallel to increasing humic acid application.

Foliar Humisol spraying gave a significant increase of 5.5% in plant height, and a non-significant increase of 2.9% in plant diameter compared to control groups of walnut (*Juglans regia* L.) seedling rootstock (Paunović *et al*., 2013).

An investigation was conducted to determine the effects of humic acid on the plant growth Hass avocado on Mexican seedling rootstocks. The study indicated that the growth of avocado seedling was significantly increased with the additions of humic acid over the untreated trees. Shoot dry weight and dry root weight significantly increased with humic acid over the control. The increase of plant growth, plant biomass, and relative growth rate were likely an influence of humic

acid since it was able to improve nutrient uptake, especially of nitrogen that leads to better growth in avocados seedling. (Rengrudkij and Partida, 2003).

Increases in leaf chlorophyll content, as a consequence of humic acid application, were detected in two grapevine rootstocks, 41B and 110 Richter (Zachariakis *et al*., 2001).

The grapevines treated with two different concentrations, 5 and 20mg/L.of the humic acids exhibited increase in shoot growth, length of shoots, nitrogen and total chlorophyll contents (Ferrara *et al*., 2005).

Bio horm

The Bio horm (the bio regulator) is construction of regular growth from natural content, which content of: (Ascorbic acid, Citric acid, Fulvic acid, free ammonium acid 20%, molybdenum 4% and cytokinins).

cytokinins as well in which induce the physiological Activities (for instance activating some enzymes that involved in Photosynthesis) and increase the total chlorophyll in the plant, this will Positively reflect on the activity of photosynthesis and the synthesized materials which will positively reflect on shoots characteristics, increase in plant growth and enhance new shoots growth (Omer, 2010).

Mazher *et al.*, (2011). They noticed that Plants were sprayed with concentration of cytokinin (20, 40 ppm) , (20 and 40 ppm), ascorbic acid in addition to the untreated plants (control). the application of kinetin had a significant stimulatory effect on growth parameters of plants. However, the most effective treatment which had the tallest plants,the highest number of leaves, branches, stem diameter and root length when application of kinetin compared with in control plants. These increments may be due to accumulation of greater photosynthesis leading to better growth parameters. application of 100 or 200 ppm ascorbic acid as a foliar in application had a favourable effect on all growth parameters of *Codiaeum variegatum* L. The highest plant heights, number of leaves, stem diameter, number of branches, root length as well as fresh and dry weight of all plant organs were recorded with plants treated with 200 ppm ascorbic acid compared with control favourable (Balbaa, 2002).

Jensen ,(2004) found that seaweed extract which include cytokinin, this which applied as a foliar spray, cause the treated plant to undergo changes of various kinds .including root stimulation, thicker and stronger steams, an increase in vegetative growth, and increase in photosynthesis process.

Hanshal, (2011) study the effect of spraying Biohorm on three potato cultivars, Spraying of Biohorm was superior Significantly in plant length, leaf area , chlorophyll SPAD unit, dry matter compared with untreated treatment. Bio horm had a significant effect on plant height, number of productive tillers as well as fresh and dry weight of rice plant. In this connection, bio horm increased significantly the previous haracters as compared to without bio horm treatment (Tagour, 2010). Olive trees that treated with Bio horm lead significantly increasing in length of vegetative growth, number of new vegetative growth, length

of new vegetative growth, leaf area, vegetative dry weight, total chlorophyll in olive trees (Omer, 2010).

Materials and methods

The study was carried out at agriculture college field – Salahaddin university-Erbil, Kurdistan region of Iraq, during spring season (growth stage) of 2013 and the source of seedlings the same field of collage. The study was done on the seedlings walnut (*Juglans regia* L.). The age of treated seedlings was one year cultivated in black plastic bags (45cm length) filled with sandy loem soil. The treatments of experiment included concentrations of humic acid (0, 2 ,4)ml/L and Biohorm (0 , 3 , 6)ml/L .The experiment was arranged in factorial experiment based on randomized complete design with three replications.

At the end of experimental periods the field measurements were recorded: plant height (cm), number of branches per plant, number of leaves per plant, seedling diameter (mm), wet and dry weights of vegetative part (gm), root length (cm) and wet and dry weights of roots (gm). Chlorophyll content in the leaves determined by chlorophyll meter SPAD 502 (Hardim et al., 2012).

Statistical analysis of results based on factorial complete randomized design with three replications. The data were submitted to analysis of variance, and means were compared using Duncan's test at $p< 0.05$ to determine the significance of differences between the conducted treatments (Duncan, 1955 ; SAS institute, 2005).

Rustles and Discussions

Humic acid effect

(Table1) shows the significant effects of in different levels of Humic acid on Shoot numbers, number of leaves, shoot diameter (mm), shoot length (cm), shoot dry weights (gm), Root numbers, Root length, Root dry weights (gm, Leaf area (cm), and the highest value (3.74 , 8.70 . 0.65, 52.28, 10.09, 10.84, 32.79, 11.61, 142.59) were measured in the level of (4.00) ml. The highest value of totale chlorophyll content (41.07) was obtained in the level of (2.00)ml/L. Main composition of soil organic materials is humus, which are the most important reasons of using humic acids in increasing soil fertility, humic acid is one of bio-stimulants which are known as the organic materials that promote plant growth to with stand harsh environments when applied in small quantities.The most important property of humic acids is their ability to combine insoluble metal ions, oxides, and hydroxides, and afterwards to release them to crops slowly and continuously when needed. The humic acids can be grouped as physical, chemical, and biological. The increase of plant growth, plant biomass, and relative growth rate were likely an influence of humic acid since it was able to improve nutrient uptake, especially of nitrogen that leads to better growth in seedling.

Similar effects were obtained by (Chen et al., 1994. Singh and Amberger, 1997; Çelik, 2003, Russo and Berlyn, 1990, Eissa et al., 2007 and Ismail et al., 2007. Abd El-Razek et al., 2012).. The increases in fresh, dry weight, shoots Chlorophyll content, fresh, dry weight roots Chlorophyll content and total chlorophyll content might be due to the influence of humic acid which provides

nutrient minerals that involve in plants bio activities and finally leads to growth induction and increases in leaf chlorophyll content, as a consequence of humic acid application . Furthermore, humic acid increases the porosity of soil and improve growth of root system which leads to increase the shoot system (Garcia et al, 2012).

Increases in root length and stimulation of the development of secondary roots have been observed for humic substances in nutrient solutions. The typical response curve shows increasing growth with increasing humic substance concentration in nutrient solutions. Shoots generally show similar trends in growth response to humic substances. The stimulatory effects of humic subs- tances have been correlated with enhanced uptake of macronutrients. Humic substances can complex transition metal cations. A small fraction of lower molecular weight components in humic substances can be taken up by plants. These growth responses were most probably due to hormone-like activity of humic acids or could have been due to plant growth hormones adsorbed onto the humates. These components seem to increase cell membrane permeability and may have hormone-like activity, these results agree with MacCarthy et al, (1990) and Atiyeh et al, (2002) who respondent that application different concentrations of humic acid which obtain increased the growth of plants significantly.

Biohorm effect

The applications of bio horm concentrations increased significantly the Shoot numbers, number of leaves, shoot diameter (mm), shoot length (cm), shoot dry weights (gm), root numbers, Root length, Root length, Root dry weights (gm), Total chlorophyll content, Leaf area (cm^2) (Table 2) and the highest effect was assessed when the treatment with (6.00)ml/L, (3.89) ,(9.31) , (0.66)mm , (51.67) cm, (9.69)gm, (9.65) , (32.13) , (10.50)gm, (41.77) , (Leaf area)cm^2, respectively, Compared with the control. Bio horm had a significant effect on plant height, number of productive tillers as well as fresh and dry weight of plant. In this connection, bio horm increased significantly the previous characters as compared to without bio horm treatment ,growth characters by bio horm treatment could be due to stimulating dry mass production through enhancement of cell division and chlorophyll accumulation which leads to higher photosynthetic activity, accumulation of dry matter, turn reflected on the increasing in translocation accumulation of certain microelements in plant organs, this in turn on their growth characters (Salama and Awadalla, 1987 and Smirnoff, 1996) reported that the increase in the growth and development of plants in response to antioxidant treatment might be due to the enlargement of cell division and/or the influence on DNA replication.

The interpretation of the positive effect biohorm concentrations, that the Biohorm (the bio regulator) is construction of regular growth from natural content, which content of: (Ascorbic acid, Citric acid, Fulvic acid, free ammonium acid 20%, molybdenum 4% and cytokinins).

Table (1). Effect of Humic acid on growth characteristics of walnut (*Juglans regia* L.)

B	Shoot numbers	number of leaves	shoot diameter(mm)	shoot length(cm)	shoot dry weights(gm)	Root numbers	Root length (cm)	Root dry weights(gm)	Total chlorophyll	Leaf area(cm^2)
0.00	2.18 b	6.18 c	0.55 c	44.64 c	8.19 b	6.25 b	23.84 b	6.99 c	36.99 b	95.81 b
3.00	2.76 b	7.10 b	0.61 b	49.27 b	9.18 a	7.47 b	29.76 a	8.61 b	38.37 b	128.03 b
6.00	3.89 a	8.45 a	0.66 a	51.67 a	9.69 a	9.65 a	32.13 a	10.50 a	41.77 a	143.20 a

Values followed with the same letters are not significantly different from each other according to Duncan's Multiple Range test at (5%) level.

Table (2). Effect of Biohorm on growth characteristics of walnut (*Juglans regia* L.)

H	Shoot numbers	number of leaves	shoot diameter (mm)	shoot length(cm)	shoot dry weights(gm)	Root numbers	Root length (cm)	Root dry weight (gm)	Total chlorophyll	Leaf area(cm2)
0.00	2.06 c	5.34 c	0.58 c	42.56 b	7.92 c	4.49 c	23.34 c	6.67 c	36.14 b	111.55 b
2.00	3.04 b	7.58 b	0.59 b	50.74 a	9.05 b	8.05 b	29.59 b	7.82 b	41.07 a	112.92 b
4.00	3.74 a	8.70 a	0.65 a	52.28 a	10.09 a	10.84 a	32.79 a	11.61 a	39.93 a	142.59 a

Values followed with the same letters are not significantly different from each other according to Duncan's Multiple Range test at (5%) level.

cytokinins as well in which induce the physiological Activities (for instance activating some enzymes that involved in Photosynthesis) and increase the total chlorophyll in the plant, this will Positively reflect on the activity of photo-synthesis and the synthesized materials which will positively reflect on shoots and roots characteristics, increase in plant growth and enhance new shoots and roots growth.

These results are consistent with obtained by the Balbaa, (2002) ; Jensen, (2004) ; Tagour, (2010) ; Hanshal, (2011) ; Omer, (2010).

Interaction effects of Humic acid and Bio horm

Table (3) shows that the interaction of humic acid and Bio horm significantly affected the growth (*Juglans regia* L.) seedlings. The highest Shoot numbers, number of leaves, shoot diameter (mm) , shoot length (cm) , shoot dry weights (gm) , Root numbers , Root length , root dry weight were (4.41) (10.81) , (0.69 mm) , (55.74 cm) , (10.95 gm) , (12.36) , (35.66cm) , (12.58 gm) , respectively, were observed in seedlings treated with 4ml/L humic acid and 6ml/L Bio horm. The best results of total chlorophyll content (45.72) measured in treated with 2ml/L Humic acid and 6ml/L Bio horm. The highest total chlorophyll content (44.72) measured in treated with ($2ml.1^{-1}$) humic acid and ($6ml.1^{-1}$) Bio horm, but there was no significant difference with treatment ($4ml.1^{-1}$) humic acid and ($6ml.1^{-1}$) Bio horm.But the highest value of leaf area was observed in treatment of ($4ml.1^{-1}$) humic acid and ($3ml.1^{-1}$) Bio horm.

These increase Characteristics of growth due to using of humic acids increasing in soil fertility, humic acid are known as the organic materials that promote plant growth to with stand harsh environments when applied in small quantities. The most important property of humic acids is their ability to combine insoluble metal ions, oxides, and hydroxides, and afterwards to release them to crops slowly and continuously when needed. The increase of plant growth, plant biomass, and relative growth rate were likely an influence of humic acid since it was able to improve nutrient uptake, especially of nitrogen that leads to better growth in seedling. (Russo and Berlyn, 1990 ; Eissa et al., 2007 and Ismail et al., 2007 ; Abd El-Razek et al., 2012 ; MacCarthy et al, 1990 ; Atiyeh et al, 2002).

The Bio horm (the bio regulator) is construction of regular growth from natural content, which content of: (Ascorbic acid, Citric acid, Fulvic acid, free ammonium acid 20%, molybdenum 4% and cytokinins).

Cytokinins as well in which induce the physiological Activities (for instance activating some enzymes that involved in Photosynthesis) and increase the total chlorophyll in the plant, this will Positively reflect on the activity of photos-ynthesis and the synthesized materials which will positively reflect on shoots characteristics, increase in plant growth and enhance new shoots growth (Omer, 2010).

The application of kinetin had a significant stimulatory effect on growth parameters of plants. However, the most effective treatment which had the tallest plants,the highest number of leaves, branches, stem diameter and root length as well as fresh and dry weight of all plant when application of kinetin compared with

in control plants. These increments may be due to accumulation of greater photosynthesis leading to better growth parameters. application of ascorbic acid as a foliar in application had a favourable effect on all growth parameters. The highest plant heights, number of leaves, stem diameter, number of branches, root length as well as fresh and dry weight of all plant organs were recorded with plants treated with 200 ppm ascorbic acid compared with control favourable (Balbaa, 2002).

Jensen, (2004) found that seaweed extract which include cytokinin, this which applied as a foliar spray, cause the treated plant to undergo changes of various kinds .including root stimulation, thicker and stronger steams, an increase in vegetative growth, and increase in photosynthesis process.

The plants response to the treatments with Humic acid and Bio horm due to the interaction between of both (Omer, 2010 and Tagour, 2010).

Final conclusions

Based on the research and analysis of morphometric characteristics of walnut seedlings from seeds from three different locations in Serbia, it can be concluded that there is no statistically significant difference in the root collar diameter, height of shoots (above-ground parts of seedlings) and root length (underground part of seedlings) of all seedlings, no matter which seed they orginate from.

Plant growth varies depending on the treatment. Control seedlings and seedlings treated with controlled release mineral fertilizer *Osmocote* show better results concerning radial growth and height increment than those treated with microbiological preparation *BactoFil* and complex NPK fertilizer *Florin*. The seedlings treated with *Bactofil* have on average the shortest height, but the longest roots, as opposed to seedlings treated with *Osmocote*, which produces a stimulating effect on plant height growth. The seedlings treated with *Florin* show the poorest results with respect to all monitored morphometric markers, even when compared to control seedlings.

Justification for using fertilizers is reflected primarily in the production of high-quality seedlings. Fertilizing with *Osmocote* and *BactoFil* gives satisfactory results in the seedling production, because these seedlings have well developed roots and close height to root-collar diameter ratio (slenderness ratio). This is of particular importance when seedlings are used for a forestation of poor-quality stands, which are most common, and therefore imposing the need for use of seedlings with better developed root system as compared to the above-ground part. When seedlings are used as rootstock, a large root collar diameter is desirable, as it facilitates application of different grafting methods.

Being a slowly decomposing fertilizer, *Osmocote* exerts a positive impact on seedling development, as the effect it produces coincides with the duration of the growing period. On the other hand, *Bactofil* is a biological preparation with a long-term effect, which significantly reduces costs of regular fertilization and, even more importantly, in seedling production time is not wasted on repeated appli-cation of agro technical measures.

Table (3): Interaction Effects of Humic acid and Biohorm on growth characteristics of walnut (*Juglans regia* L.)

	Shoot numbers	number of leaves	Shoot diameter (mm)	shoot length (cm)	shoot dry weights(gm)	Root numbers	Root length (cm)	Root dry weights(gm)	Total chlorophyll	Leaf area(cm2)
H0B0	1.23 e	5.09 d	0.53 cd	37.64 f	6.86 d	2.88 f	14.52 e	4.65 f	35.15 e	71.47 g
HoB3	1.50 de	6.62 c	0.57 bc	44.66 e	8.22 cd	4.30 ef	25.52 d	6.68 de	35.92 de	127.15 d
H0B6	3.45 abc	6.62 c	0.57 bc	44.66 e	8.22 cd	4.30 ef	25.52 d	6.68 de	35.92 de	127.15 d
H2B0	2.50 cd	7.30bc	0.50 d	47.80 cde	8.48 bc	6.33 de	28.07 cd	6.00 e	38.18 cde	88.43 f
H2B3	2.79 bc	7.27 bc	0.62 ab	50.52 bc	9.24 bc	7.52 cd	29.99 bcd	7.21 d	39.29 bcd	106.71 e
H2B6	3.82 ab	7.54 bc	0.65 a	53.89 a	9.44 abc	10.30 ab	30.72 ab	10.24 b	44.72 a	143.62 b
H4B0	2.81 bc	8.27 b	0.63 ab	48.47 cd	9.23 bc	9.55 bc	28.94 bcd	10.30 b	37.65 cde	127.53 d
H4B3	4.00 a	8.68 b	0.63 ab	52.63 ab	10.08 ab	10.59 ab	33.76 ab	11.95 a	39.91 bc	146.25 a
H4B6	4.41 a	10.81 a	0.69 a	55.74 a	10.95 a	12.36 a	35.66 a	12.58 a	42.24 ab	149.98 a

Values followed with the same letters are not significantly different from each other according to Duncan's Multiple Range test at (5%) level.

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تأثير التسميد بواسطة البايوهورم وحامض الهيوميك على شتلات الجوز (*Juglans regia* L.)

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الخلاصة

يعتبر الجوز من اهم اشجار البستنية المزروعة في اقليم كوردستان العراق، لذا اجريت هذه الدراسة لمعرفة تأثير حامض الهيوميك والبايوهورم في بعض صفات شتلات الجوز خلال الموسم الربيعي 2013، عوملت الشتلات وهي بعمر سنة واحدة ومزروعة داخل في اكياس بولي اثيلين داخل تربة مزيجية رملية وبثلاثة تراكيز لكل من الحامض (0 و 2 و 4) مل لتر$^{-1}$ وبايوهورم (0 و 3 و 6) مل لتر$^{-1}$ ونفذت كل معاملة في ثلاثة تواريخ مختلفة وهي 4/20 و 5/5 و و 5/20 حيث استخدمت في تصميم المربع اللاتيني (CRD) وبثلاثة مكررات، يتكون المعاملة الواحدة منها من اربعة شتلات، ثم اخذت البيانات في اواخر ايلول 2013 وظهر خلال تحليل البيانات زيادة معنوية في كل من عدد التفرعات الخضرية ووزنها الجاف والمساحة الورقة بسبب معاملتها بحامض الهيوميك نسبة الى معاملة المقارنة (كونترول) في حين ادت معاملة الرش بالبايوهورم وبمعدل 6 مل لتر$^{-1}$ الى اكبر زيادة معنوية في عدد الافرع الخضرية وعدد الاوراق وكل من قطر وطول والوزن الجاف لكل من الافرع الخضري والجذور ومساحة الاوراق، ادت اضافة البايوهورم بمعدل 3 مل لتر$^{-1}$ الى اعلى زيادة معنوية في النسبة المئوية للكلوروفيل.