ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Effect Of Green Iron Nano Particle Prepared From Ficus Carica On (Capsicum Annuum) Growth Parameter.

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ABSTRACT

Synthesis of bio-fertilizers is the main concern of the whole word due to its friendship with environment. The synthesis nanoparticles was achieved by adding 1M Ferric sulphate to Ficus carica leaves extracted from leaves in 1:1 in sterilized beaker, heating at 80°C. The nano particles were characterized using instrumental analysis such as UV- visible, XRD and FTIR. The novel bio-fertilizer was treat with plants using different concentrations by irrigation only 100ml per a week for all treatments and compare the results with control (non-treated plants), the investigated the impact of iron nanoparticles (100, 250, 500 ppm. concentrations) on physiological parameters of (Capsicum annuum) . Iron nanoparticles caused increases in plants fresh weight and dry weight, and in the number of leaves and roots and the length of shoot and root. The results clearly shows that using the synthesized bio-nanocompund enhance the quantity and quality of agricultural products.

Keywords: UV- visible, XRD, FTIR, Iron nanoparticles.

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ISSN: 0975-8585

INTRODUCTION

Nanotechnology sciences provide agriculture friendly biofertilizers instead of hazards chemical fertilizers (1). Nanoparticles supply nutrients easily to plants due to the larger surface area, easy attachment and fast mass transfer, Nano fertilizers are widely used now a day. Plants are the important organisms in the food chain and may be the path way for accumulation Nano particles(NP) in higher organisms . Most of the recent research focusing on the effects of NPs on seed germination and of plant growth (2). The effects appear at a highly concentration of NPs as well as the plant species and growth conditions used in the experiments. Recently some studies approved that NPs accumulated near the root and only a small percentage was detected in the leaves, due to the large size range. Iron oxide nano particle are used in cosmetic , medicine and in agriculture (3). Two methods of Nano-fertilizers application are foliar spraying and drenching. Foliar application of micronutrients, now a common horticultural practice, enhanced its uptake by the leaves (4,5). The mode offertilizer application influences their efficiency andenvironmental impact (6). The aim of this study was to preparing green iron nanoparticles by using Ficus carica leaves and to determine the effects of liquid nanoparticles on the Capsicum annuum. Growth parameters.

MATERIALS AND METHODS

Preparation of Ficus leaf extract

Preparing extract from Ficus carica leaves by sing 25 g of ficus leaves powder in 250 ml deionized water, heated at 80°C to get extract, filtered solution kept at 4°C(7).

Synthesis of green iron nanoparticles

Synthesis nanoparticles by adding 1M Ferric sulphate to Ficus carica leaves extract in 1:1 in sterilized beaker, heating at 80°C black color, centrifuge the extract and discard the supernatant were discarded and the pellet was washed with deionised water and was centrifuged again to remove any impurities(8).

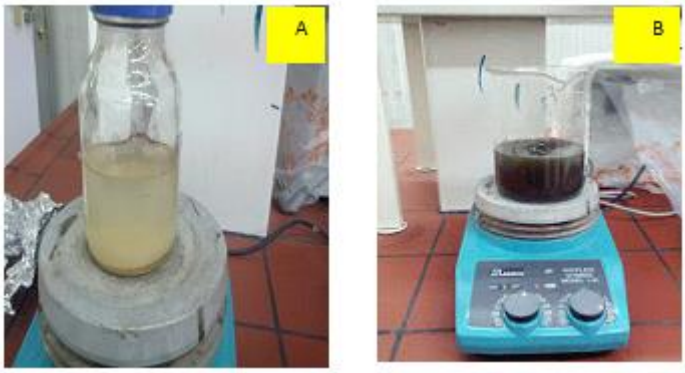


Figure 1: Preparation iron nano-particles.

Characterization Methods and Instruments

The spectra of UV-visible were recorded over the200–700 nm range with a UV 1650 PC-Shimadzu B UV-visible spectrophotometer (Osaka, Japan). The range of FT-IR spectra were from 400-4000 cm^{-1} on a model spectrum 100 series (Perkin Elmer, Walthman, MA, USA). The crystalline. Purity of iron nano particles structures and phase identified by XRD-6000; Shimadzu, Tokyo, Japan) .

Plant material and treatments

Seeding the seed of pepper on cork spot after germination, we were waiting for about one month then we collect the same length of pepper plant then transferred in to planter with five replicates' per each treatment . Prepared two controls : water and Iron, while the treatment of iron green nano particles done by using three concentrations (A1: 0.01, A2: 0.001, mg/l). Spraying method were used in our study for plant

irrigation only 100ml per a week for all treatments. Calculate the plant parameters such as fresh weight, length of shoots and roots, number of roots.

Figure 2: Showed plant growth after sixth weeks.

RESULT AND DISCUSSION

Fig (3) Showed Ultraviolet-visible spectroscopy (UV-Vis) result, the spectrum of iron nano-particle in the 415 nm indicate the iro nanoparticles formation , in this region the electromagnetic spectrum was found. Fig (4) showed the results of XRD spectrum, we found a strong diffraction peaks at 2θ values of 30.4°, 35.8°, 43.5°, 54.1° and 57.4°, corresponding to the crystal planes of (200), (311), (511) , respectively. The result agree with (9) showed the spinal phase refereed as standard magnetite.

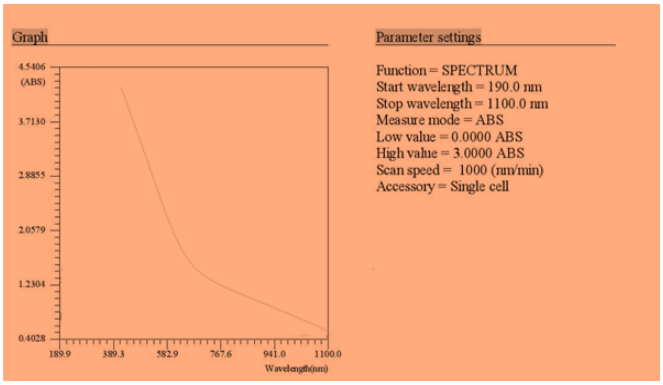


Figure 3: UV-visible absorption spectra of Fe3O4/Ficus extract.

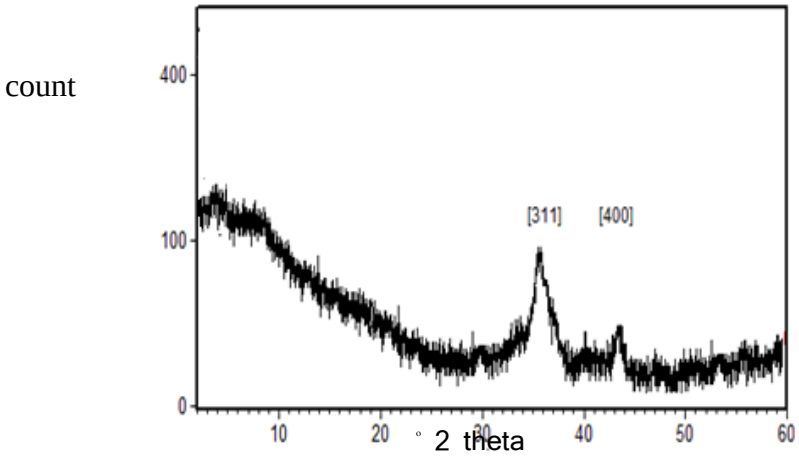


Figure 4: XRD pattern of Iron-NPs synthesized using Ficus extract.

ISSN: 0975-8585

Figure (5) Showed Infrared Spectroscopy, Functional groups of the active components based on the peak value in the region of infrared radiation. Spectral features at 2975 cm^{-1} The band relateted to the stretching vibration of C–H in the methyl groups, [10]. In addition, signals at 3,387 cm^{-1} (OH stretching) . The peak at 1415.75 cm^{-1} indicates the C-C, 1,604 cm−1 was attributed to the binding of a C=O group with the nanoparticles [11]. The formation of Fe3O4 is characterized by two absorption bands at 530 and 384 cm^{-1} which correspond to the Fe–O bond in magnetite [12]. From the FTIR result, the active group present in Ficus extract may be worked as capping agents preventing the nanoparticles aggregation in solution[13].

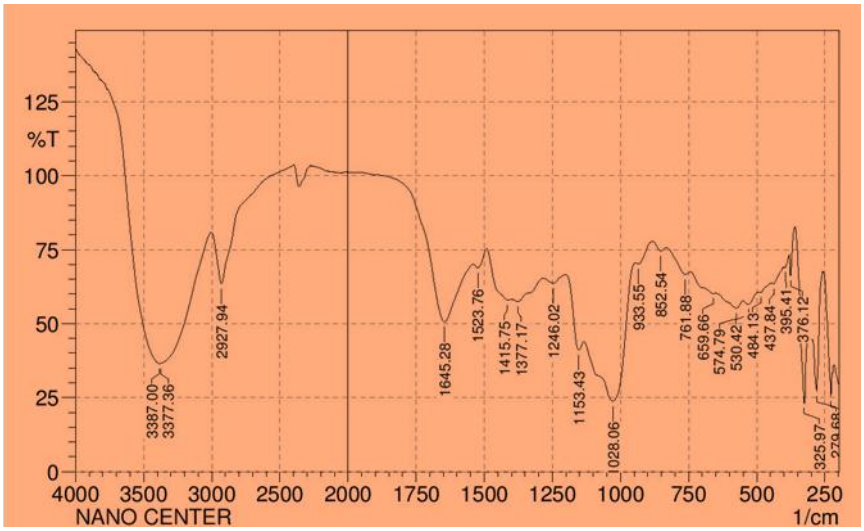
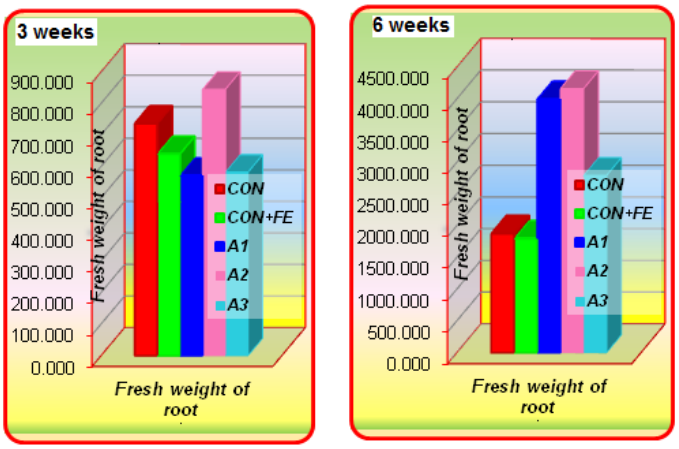


Figure 6: FT-IR spectrum for the iron -NPs.

Our experimental plants after three weeks and sixth week of treatment with green iron nano particles in three diluents such as: 1:10, 1:100, 1:1000. While we used two controls for compares first 0.05M ferric sulfate and water . The parameters detected were fresh and dry weight of shoot and root, length of shoot and root, number of shoot and leaves the results exhibit as shown : After three weeks(w^3) we found fresh weight of shoot for all treatments , water and iron controlles , at the green nanoparticles diluents : CON, CON +FE, A1, A2, A3 , as shown : 781.667, 1132.667, 1028.667, 1592.333 , While after sixth weeks(w^6)the fresh weight of plants were, 2373.333, 2163.333, 5310.333, 5313.333, 4093.333, significantly shoot A2 gave the highest value While the dry weight of shoot (w^3)226.667 , 183.333, 272.333, 396.333, 342.333, (w^6) 430, 223.3, 736.667, 726.667, 596.667. The result showed that A1 and A2 were significantly gave the best results in compare with the other treatments after sixth weeks in fresh and dry weight of shoots , Fig 7



ISSN: 0975-8585

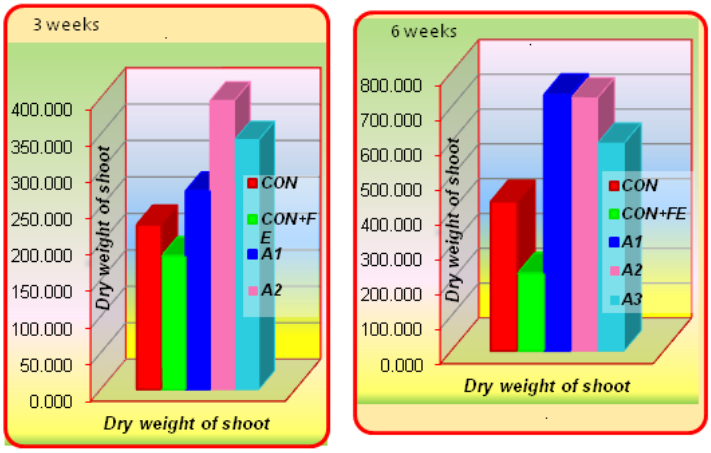


Figure 7: Shows the differences between the fresh weight and dry weight of treated plants.

It s greed with (14) found that the increasing in fresh and dry Wight gave highest weight in compare with controls may be its due to many factors such as reduction of water available to plants, degradation of cell membranes, reduction of photosynthesis Fig (8) Showed the differences between the fresh weight and dry weight of treated samples.

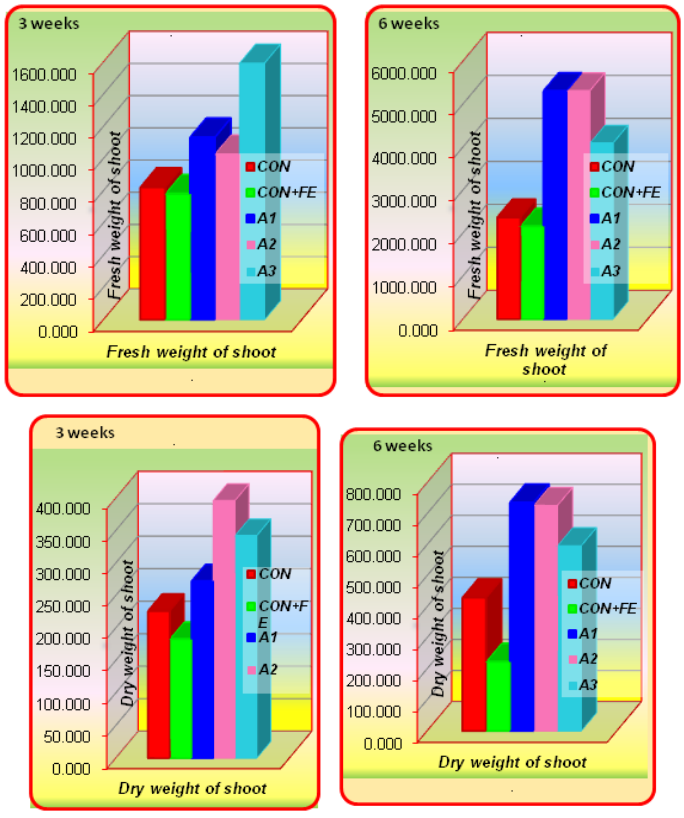


Figure 8: Shows the differences between the fresh weight and dry weight of root of treated plants.

After three weeks(w^3) we found fresh weight of root for all treatments, water and iron controllers , at the green nanoparticles diluents: CON, CON +FE, A1, A2, A3 , as shown : 737.000, 640.333, 571.333, 844.667, 581.667 While after sixth weeks(w^6)the fresh weight of root were, 1876.667, 1800.000, 3993.333 , 4160.000, 2790.000, significantly A1 A2 gave the highest value While the dry weight of root (w^3) 110.667, 111.000, 117.333, 164.667, 178.667, (w^6) 183.333, 176.667, 243.333, 210.000, 220.000. The result showed that A1 and A2 and A3 were significantly gave the best results in compare with the controls after sixth weeks

ISSN: 0975-8585

in fresh and dry weight of root , Fig n(9) Showed number of leaves after 3 and 6 weeks. Number of leaves (w^3) 7, 6, 10, 8. (w^6), 5, 5, 12, 12, 12.

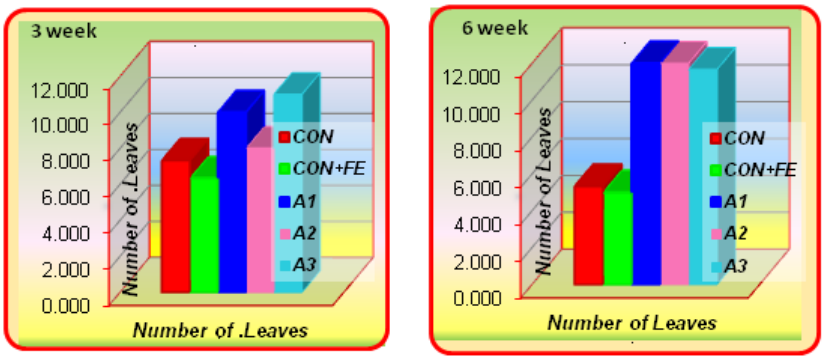


Figure 9: Showed the differences between the numbers of leaves for treated plants.

Number of root(w^3) 46, 28, 29, 50,51 . (w^6) 48, 47, 53, 53, 54, respectively, we found after 6 weeks all the treatments with green iron nano particle gave the highest number of leaves in compare with controls.

Fig (10) showed the length of shoot after three and 6 weeks**. The length of shoot (** w^3)15.8, 16.36, 17.43, 14.93, 18.43, (w^6): 16.86, 18.86, 18.400, 18.4, 20. Fig (3)showed the length of root after three and **6** weeks .

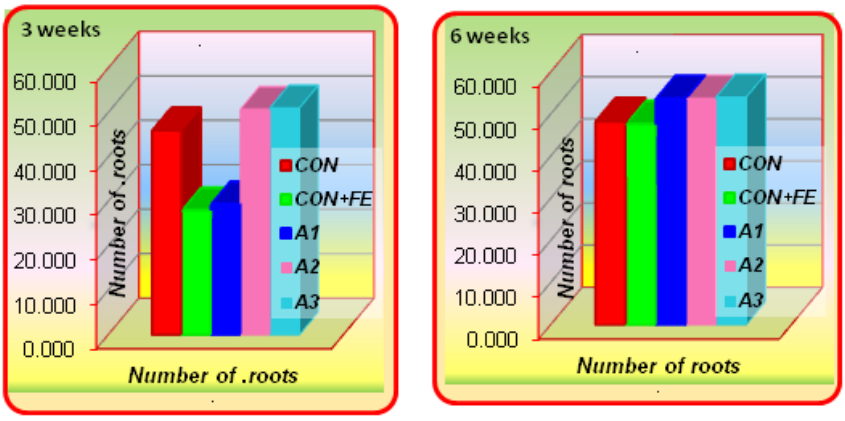


Figure 10: Shows the differences between the number of root for treated plants

Fig (10) also showed the length of root after three and 6 weeks. Length of root (w^3): 6.3, 6.83, 4.5, 6.07, 5.4. (w^6): 8.73, 7.967, 8.7, 6.36, results showed that the treatment A3 and A2 gave significant differences in the length and number of leaves root in compare with A1 and controls.

Growth rate of plants and changing in their morphology may be depending on stress such as from hormone, auxine, also (15). The initiating plant growth in increasing green nano particle concentrations may be due to decreasing reactive oxygen species (ROS) and enhance plant growth, so for these parameter, green nano-particle can used instead of chemical and hazard fertilizers for agriculture(16).

CONCLUSIONS

- The Ficus extract acting as bio reduction and stabilizing agent of iron nano particles. The hydroxyl group which present in the Ficus extract may be responsible for reduction activity.
- The characterization iron nano particles were studied using XRD, FTIR, UV-visible.

- Using green iron nano particles increasing fresh and dry weight of plants and increasing the number of leaves and roots at concentrations 500 and 250 ppm. This technology were enhanced and easily utilization of nutrients.
- Application of nanotechnology in agriculture can increasing the quantity and quality of agricultural products.

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