Effect of Sowing date, plant spacing and treatment with Bio health and their interactions on Growth, fruits and volatile Oil yield and its biochemical activities

A Thesis

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Summary

The present study was conducted during the growing season of 2013/ 2014 in Medicinal and Aromatic Plants Field of the College of Agriculture / Basrah University, to study the effect of sowing date, plant spacing and plant treatment with Bio Health WSG and their interactions on growth and yield of *Carum carvi* L. plant and its biochemical activities.

The study included 12 factorial treatments, which were the combinations of two sowing dates, i.e. 20/9, 10/10 ; three plant spacing , i.e. 20, 30 or 40 cm between plants and other and plant treatment with Bio Health WSG and without treatment. A Complete Randomized Block Design in a factorial experiment was used with three replicates. Treatment means were compared according to the Least Significant Difference (LSD) at probability level of 0.05%.

The most important results may be summarized as follows :-

1 –Effect of sowing dates:

Cultivated plants on 20/9 had a significant effect in plant height, number of main branches. plant^{-1}, number of fruiting branches. plant $^{-1}$, fresh and dry weights of shoot system. plant $^{-1}$, date to the appearance of the first inflorescence, the total number of inflorescences. plant^{-1}, total number of mini inflorescences. plant $^{-1}$, mean of the total number of florets. plant $^{-1}$ total sum of fruits. plant^{-1} (25.83g), weight of 1000 fruits, the productivity of fruits hectare^{-1} (2.695 tons), percentage of volatile oil (3.2%), oil yield .plant^{-1} (0.82g), productivity of oil hectare^{-1} (84.4g), refractive index of volatile oil, leaves content of total chlorophyll, fruits content of total soluble

carbohydrates. Plant cultivated on 10 /10 had a significant effect in volatile oil density and its specific gravity, while there were no significant effects for cultivated date in total number of leaves. plant $^{-1}$, total number of mini inflorescences. inflorescence^{-1}, leaves content of total soluble carbohydrate and total protein percentage in fruits.

2 –Effect of plant spacing:

Cultivated plants at 40 cm had a significant effects in fresh and dry weights of shoot system. plant^{-1}, total of mini inflorescences. inflorescence^{-1}, total number of inflorescences.plant^{-1}, sum total of fruits .plant^{-1} (21.10g). Cultivated plants distance at 30 cm had a significant effects in number of fruiting branches. plant $^{-1}$, percentage of volatile oil (3.1%), oil yield per plant (0.60g), productivity of oil per hectare (58.9kg), content of total soluble carbohydrate. Cultivated plants at distance of 20 cm had a significant effects in productivity fruits of per hectare (2.252 tons). On the other hand, there were no significant effects for cultivation distance in plant height, number of main branches. plant^{-1}, the date of the first appearance of inflorescence, mean of total number of florets . plant $^{-1}$, weight of 1000 fruits, volatile oil density, and its specific gravity, leaves content of total soluble carbohydrate and total protein percentage in fruits.

3 – Effect of treatment with Bio Health WSG

Treated plants with Bio Health WSG gave significant increases in the number of number of fruiting branches. plant $^{-1}$, percentage of volatile oil (2.7%), oil yield per plant (0.55g), productivity of oil per hectare (56.0kg), leaves content of total chlorophyll .While, treated plants with

Bio Health WSG had no significant effect on the other studied characteristics.

4- Effect of the interactions :

There were a significant effect on all the double and triple interactions in plant height , number of fruiting branches. plant $^{-1}$, dry weight of shoot system. plant $^{-1}$, total number of inflorescences. plant^{-1}, total of mini inflorescences. inflorescence^{-1}, total sum of fruits. plant^{-1}, productivity of fruits per hectare, percentage of volatile oil, oil yield per plant, productivity of oil per hectare, volatile oil refractive index and its density, leaves content of total chlorophyll, leaves and fruits contents of total soluble carbohydrate. All double and triple interactions except for the interaction of the date of agriculture cultivation and bio Health WSG treatment significant effect in total number of leaves. plant^{-1}.Double and triple interactions except for the interaction between cultivation distance and bio Health WSG treatment had a significant effect in number of main branches. plant^{-1}, fresh weight of shoot system, date of the first appearance of inflorescence, rate of the total number of florets. plant $^{-1}$, weight of 1000 fruits, specific gravity of oil, leaves content of total soluble carbohydrate. The interference between the distance, cultivation date and bio Health WSG treatment only had significant effect in the total of number of mini inflorescences. inflorescence^{-1}, and the triple interaction had only significant effect in protein percentage in fruits.

5. Chemical components of the volatile oil :

A test done by Gas chromatography-mass spectrometry Shimadzu GC MS QP2010 Ultra has showed that the most important chemical volatile oil components were carvone and limonene, whose means were ranged 32.73 – 51-55% and 33.34 -57.05%, respectively. They were differed in their content of these two components, cultivated plants on first date at a distance of 20 cm which treated with bio Health WSG produced the

content of carvone (51.55%), and plants cultivated in the second date at a distance of 40 cm not treated with bio Health WSG produced limonene at a percentage (57.05%).

5. Effectiveness of aqueous and alcoholic extracts and oil of the plant against the two types of pathogenic bacteria to human:

Test was bone to the effectiveness of four concentrations which were 50, 100, 200, 400 mg.ml^{-1} of the aqueous extracts besides, methyl and ethyl alcoholic extracts for fruits and roots of the plant at three concentrations which were 25, 50 and 100% of volatile oil of its fruit *in vitro* on the two types of bacteria tested, i.e. bacteria *Escherichia coli* and *Staphylococcus aureus* by using filter paper disc diffusion method . Each of the ethanolic extract of roots of concentration at 200 mg /ml^{-1} and concentration 100% oil were effective of the growth of bacteria *E. coli* .They reached the diameter of inhibition 20 mm. Methanolic extract of the roots at concentration of 200 mg.ml^{-1}gater gave the highest inhibition of the growth of bacteria *staph. aureus* amount 25mm.