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The effect of fertilizing with Urea's Influence on Growth and Essential Oil of Mosul-Grown Medicinal Plants) plants (sweet seed, cumin, coriander, and anise) grown in Mosul city

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ABSTRACT

The Apiaceae family is among the medicinal plants with widespread use in most countries because they have anti-microbial and viral effects. The seed spices contain essential oils that have various pharmacological effects. Apiaceae family consider is wildy common crops in Iraq because of their oils and therapeutic useful The current experiment was conducted at Mosul dam place , during 2017/2018 to study the effect of fertilizer on growth, yield, essential oil of (sweet berries, cumin, coriander and anise). This experiment was carried out in the agricultural season (2017-2018) in the city of Mosul (Mosul Dam), (sweet berries, cumin, coriander and anise). were planted, and the results were analyzed statistically. A factorial experiment was carried out with three replications for each treatment within a Randomized Complete Block Design (RCBD). Regarding the effect of fertilization, there were significant effects speciely in coriander plant of nitrogen fertilizers on the cultivated plants, as shown statistically



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Introduction

The Apiaceae or Umbelliferae is a large plant family containing 434 genera and 3780 aromatic plant species [1]. Plants (Foeniculum, cumin, coriander, and anise) belonging to the Apiaceae family are among the medicinal plants with widespread use in most countries because they have anti-microbial and viral effects.[2]. Several studies have shown that Apiaceae's EOs possess a wide range of biological activities, such as antioxidant, antimicrobial, anti-inflammatory, ant carcinogenic, antidiabetic, cardioprotective, hypocholesterolemic, hepatoprotective, and neuroprotective properties [3]. Fennel (*Foeniculum vulgare* Mill.), which belongs to the Apiaceae family, is one of the most important medicinal and aromatic plants due to its estrogenic activities and uses as a carminative, diuretic, anti-inflammatory, and antimicrobial [4]. Biological fertilizers are very important in sustainable agriculture, as it has been found necessary to reduce the use of chemical fertilizers in agricultural ecosystems in order to obtain high-quality products that are free from chemical compounds harmful to humans. [5].

Plants of the Apiaceae family, such as coriander and fennel, are considered species with high nutritional value. Due to their content of numerous phenolic compounds, they are also regarded as medically important. Therefore, they have been introduced into genetic modification and various breeding programs to enhance disease resistance and increase productivity [6].

Spices are considered essential in the household kitchen, as they are also regarded as medicinal herbal remedies used both as food and as treatment at the same time. The active compounds found in their essential (volatile) oils have proven importance and therapeutic effects. According to reports from the World Health Organization (WHO), most people in developed regions prefer medicines derived from herbal sources. (3)

Seed spices are characterized by containing active compounds represented by essential oils, both fixed and volatile types, whose various medicinal benefits have been scientifically proven. These properties have attracted the attention of many scientists and plant breeders [7].

From countries of the world until they have become an important economic resource, and in this regard, medicinal plants are considered to be of great importance in the field of pharmaceutical research and development of the drug industry, not only because they contain therapeutic materials, but also interfere with nutrition. The cultivation and production of the aforementioned herbs is considered one of the important production sectors in Iraq, being a major source of medical products, support for the

local pharmaceutical industry, and a resource for the development of the cosmetics and perfume industries. Soaps and detergents with their active ingredients and aromatic compounds [8] Plants of the Apiaceae family are annual, biennial, or perennial herbs, contain oil ducts rich in volatile oils. Medicinal plants can also be grown under rainfed conditions. Rainfed plants are plants that depend on rain as a source of water, and human intervention in them is minimal. It grows and reproduces depending on the type of soil and the environment [9]. Since man began cultivating plants, it has been known that soils vary greatly in terms of their fertility, and knowing the basic factors that influence soil fertility or its ability to produce the best plant growth has been one of the desired things to research for a long time [10] Nitrogen suffers from a significant loss in the soil through the transformation of nitrogen forms from one form to another that is not usable and the occurrence of significant absorption by plants and organisms in the soil, fixation between the layers of some clay minerals so that they become in an unusable form, and adsorption to the surfaces of colloids. It evaporates at normal temperatures and is washed into the lower layers of the soil [11]. One of the best nitrogen fertilizers is urea, which is white pearly granules whose diameter ranges between 2-3 millimeters, with a low density, containing 46% nitrogen and its composition. Anise (*Pimpinella anisum* L.) is an herbaceous plant that belongs to the Apiaceae family. It has many health uses, such as acting as a carminative, thereby improving digestion, as well as a diuretic and a galactagogue. Due to its antioxidant content, it is considered a good antimicrobial agent and an inhibitor of pathogenic bacterial growth in medicine [12].

, Considering the nutritional and medicinal importance of cumin (*Cuminum cyminum*), it is one of the most widely used spices in the world. It is an annual plant whose medical significance has been scientifically proven through numerous studies for various conditions, including the treatment of digestive disorders, indigestion, as a good antimicrobial agent, and for the benefit of kidney stones [13]. One of the best nitrogen fertilizers is urea, which is white pearly granules whose diameter ranges between 2-3 millimeters, with a low density, containing 46% nitrogen and its composition. [11] .One of the best nitrogen fertilizers is urea, which is white pearly granules with a diameter between 2-3 mm, with a low density, containing 46% nitrogen, and its chemical composition is $(\text{NH}_2)_2\text{CO}_2$, which is the highest concentration of nitrogen fertilizer. Its use in agriculture has been widespread for a long time due to its cheapness. Nitrogen unit price. The urea fertilizer completely dissolves in the soil and is quickly transformed in the biologically active soil into ammoniacal nitrogen and then into nitrate

nitrogen suitable for plant absorption. [14] Due to the lack of studies on the permaculture of medicinal plants using added nitrogen fertilizers and the extent of their effect on the yield and oil of plants of the Apiaceae family, this research was conducted.

Materials and methods

The local strain of Apiaceae family plants was adopted from the local market (agricultural season 2015-2016). The field experiment was carried out in the agricultural season (2017-2018) in the city of Mosul (Mosul Dam), which extends between longitudes 30-42 5 and 15-42 5 east. At latitudes 15-36 5 and 30-36 5 north and 220-300 meters above sea level, plants (sweet seed, cumin, coriander, and anise) belonging to the Apiaceae family (Table 1) were planted on 12/20/2017. Classification of plants by Dr Talal Taha .Ali,Alnoor university, Collage of health and medical Technique .

Table 1. Scientific, English and common names of cultivated plants

English name	Scientific name	Sequence species
Fennel	<i>Foeniculum vulgare</i>	- 1
Cumin	<i>Cuminum cyminum</i>	-2
Coriander	<i>Coriandrum sativum</i>	-3
Anise	<i>Pimpinella anisum</i>	4-

Soil samples representative of the field were taken from the experimental site at a depth of (0-30 cm) before the planting date. The soil samples were air-dried using the method [15] Table (2) shows the analysis results and estimation units. The land was prepared by conducting in-depth plowing, then smoothing it, leveling it, and dividing it into boards whose dimensions were (3X3 meters = 9 square meters .

The distance between one hole and another, and between one line and another, was (25 cm). (5-6 seeds) were placed in each hole at a depth of 3-5 meters. The seeds were covered with a light layer of soil, and the amount of seeds was 10 kg.ha-1, as recommended by [16] .A factorial experiment was carried out with three replications for each treatment within a randomized block design. A factorial experiment was carried out with three replications for each treatment within a Randomized Complete Block Design (RCBD) [17] . The experiment included the addition of urea (46% nitrogen) at 100 kg.ha-1, without adding fertilizer, and with three replications (4 plants x 2 fertilizer x 3 replicates = 24 experimental units. Special fertilizers were added to each experimental unit, sprinkled, a month after planting, based on what was mentioned by [16] i.e. in (The History of Fertilizer Spreading) . Plants were harvested on 6/2/2018. The productivity and volatile oil in the seeds were calculated after extraction using

the Clevenger device according to [18]and described by [19] The results were analyzed statistically according to a randomized complete block design (RCBD) and using a computer according to the SAS program [20], and the means were compared using the (LSD) test at the 5% probability level.

Results and discussion

Productivity

Table (4) indicates the effect of nitrogen fertilization on the productivity of (sweet seed, cumin, coriander, and anise) seeds (kg/dunum) compared to unfertilized productivity. We find in it that the productivity of the coriander plant per plant was significantly superior to the rest of the other cultivated plants, then cumin and cumin. Sweet and anise respectively.

Regarding the effect of fertilization, there were significant effects of nitrogen fertilizers on the cultivated plants, and they were as a percentage reaching 175 for sweet bean, 109 for cumin, 54 for coriander, and 180 for star anise, and this is shown in Table (6). The benefits of nitrogen for plants are that it is involved in the synthesis of amino acids, proteins, nucleic acids (RNA and DNA), amino acids and lecithins, and participates in the synthesis of groups of Porphyrins are involved in the synthesis of chlorophylls and cytochromes, which are important in the processes of photosynthesis and respiration. They increase the greenness of the plant, encourage vegetative growth significantly, and form the basic part of the protoplasm. Enzymes and hormones do not work in the absence of nitrogen [11] , so it led to an increase in productivity for the four species studied.

Table 2. Monthly averages of maximum and minimum temperatures (°C), relative humidity (%), and rainfall amounts (mm) during the study period for the Mosul Dam area

The amount of rain falling in mm	Relative humidity rate%	Average minimum temperature	Average maximum temperature	Month	Year
0	58	20	32	jan	2017
13	78	12	20	veb	
9	77	9	14	Mar	
24	81	5	15	jan	2018
90	86	6	17	veb	
18	76	12	24	Mar	
82	75	14	27	Apr	
75	74	18	32	May	
0	40	25	39	Jon	2017
0	58	20	32	jan	
13	78	12	20	veb	
9	77	9	14	Mar	
24	81	5	15	jan	
90	86	6	17	veb	
18	76	12	24	Mar	
82	75	14	27	Apr	
75	74	18	32	May	
0	40	25	39	Jon	

As for the productivity of the four species, the decrease in rain rates during the research period had a clear impact on

the decrease in productivity, especially in the star anise plant, which appeared to be intolerant to drought and due to its dependence on rain, it was the least productive, while the coriander plant gave high productivity .

Table (3): Some chemical and physical characteristics of the study soil

The value	The attribute
34.6%	Calcium carbonate gm.kg-1
1.93	Organic matter gm.kg-
22.7%	
23.6 %	Alluvial gm.kg-1
23.6 %	Clay gm.kg-1
7.65	pH (1:1)
0.66	Electrical conductivity (1:1) dsi Siemens.-1
14	Ready nitrogen mg.kg-1 ppm nitrate
36	Ready phosphorus milligram.kg-1 ppm
0.54%	Ready potassium mg.kg-1

Table 4. Explain the Effect of nitrogen fertilization on the productivity of (sweet seed, cumin, coriander, and anise) seeds (kg/donum) compared to unfertilized productivity.

5% LSD	Nitrogen fertilization	Without fertilization	Plant name
11	97.22	55.55	<i>Foeniculum vulgare</i>
35	127.77	61.12	<i>Cuminum cyminum</i>
78	888.88	578.70	<i>Coriandrum sativum</i>
14	64.81	23.14	<i>Pimpinella anisum</i>
	35	22	LSD 5%

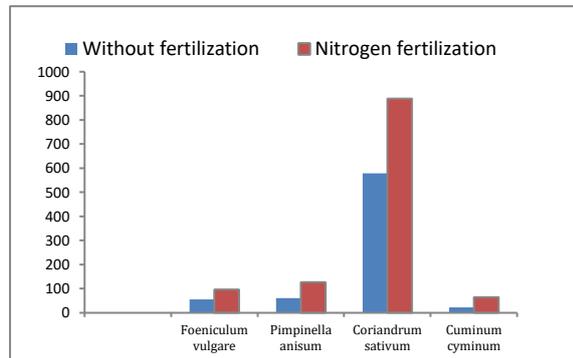


Figure 1. Explain the effect of nitrogen fertilization on the productivity of (sweet seed, cumin, coriander, and anise) seeds (kg/donum) compared to unfertilized productivity. The percentage of volatile oils

The percentage of volatile oils:

The oil content in the seeds of the Apiaceae family is one of the characteristics of economic and industrial importance, so most studies and research have been directed at trying to improve its production. The oil content is affected by genetic factors and environmental factors, and the most important environmental factors are fertilizers. The results of Table (5) show the effect of nitrogen fertilization on the productivity of (Sweet seed, cumin, coriander, and star anise) in the percentage of volatile oil (w/(r%) compared to the non-fertilized treatments.

We find that the productivity of the sweet bean plant was significantly higher than that of other cultivated plants, then cumin, anise, and coriander, respectively.

Regarding the effect of fertilization, there were significant effects of nitrogen fertilizers on the cultivated plants, and the percentage reached 45 for sweet bean, 37 for cumin, 63 for coriander, and 12 for star anise, and this is shown in Table (6).

The reason for the increase in the percentage of oil in fertilized plants may be attributed to the role of nitrogen in increasing the synthesis and accumulation of carbohydrates, which increased the production of secondary compounds, including oils, and to the effect of nitrogen in increasing the productivity of seeds, which leads to an increase in the efficiency of the photosynthesis process, which is reflected in the amount of volatile oil produced in a unit. Space These results are consistent with researchers [21], [22] , [23] .

Table 5. Effect of nitrogen fertilization on the productivity of (sweet seed, cumin, coriander, and star anise) in percentage of volatile oil (w/(r%) compared to non-fertilized treatments

LSD 5%	Nitrogen fertilization	Without fertilization	Species
1.5	4.86	3.33	<i>Foeniculum vulgare</i>
1.6	4.41	3.23	<i>Cuminum cyminum</i>
0.05	1.03	0.063	<i>Coriandrum sativum</i>
0.03	2.80	2.50	<i>Pimpinella anisum</i>
	2.2	1.1	LSD 5%

Seed productivity (kg/dunum)

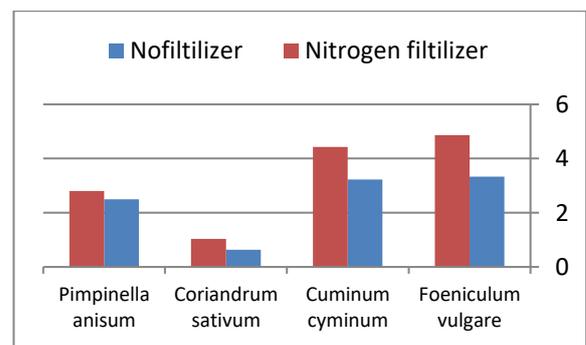


Figure 2. Explain some effect of nitrogen fertilization on the productivity of (sweet seed, cumin, coriander, and star anise) in the percentage of volatile oil (w/(r%) compared to the non-fertilized treatments.

Table (6) Explain the Percentage increase in productivity and volatile oil of cultivated plants due to fertilization

Percentage increase in oil content	Percentage increase in productivity	species
45	175	<i>Foeniculum vulgare</i>
37	109	<i>Cuminum cyminum</i>
63	54	<i>Coriandrum sativum</i>
12	180	<i>Pimpinella anisum</i>

Conclusion

The present study concluded that the four medicinal plant species used in the research differed in their response to urea fertilizer in terms of yield quantity and the percentage of medically important essential oils. *Corianderum satrivum* is an important plant belonging to Apiaceae family surpassed the others in productivity, whereas the sweet basil plant (belonging to the Lamiaceae family) was the most affected by fertilization in terms of increasing the proportion of essential oils, which possess high medical benefits, giving the product distinctiveness. On the other hand, coriander was the least productive species. This may be attributed to physiological factors and active compounds that reflect the level of essential oils present in the species.

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