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Effect of Bio-Fertilization and Foliar Spraying in the Mustard Seed Content Brassica Alba L. from Some Fatty Acids

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Abstract

The field experiment was carried out in the fields of one of the agricultural in the district of Mahaweel in the province of Babylon during the agricultural season 2016-2017 to study the effect of bio-fertilization and foliar spraying in the content of mustard seeds from some fatty acids. The factorial experiment was applied in accordance with the randomized complete blocls design (RCBD) with three replicates. The experiment included two factors: the first factor is the bio-fertilization of the mycorraiza fungi (without addition, addition of the mycorraiza) and the second factor is the foliar spray with PRO.SOL solution in three concentrations (0, 5, 10) Ml/l.Fatty acids were estimated (Eruic acid,Oleic acid, Linoleic acid, Palmitic acid, Stearic acid α-Linolenic (Using HPLC, the results showed that bio-fertilization and foliar spraying increased the seed content of fatty acids by the superiority of treatment T 5 on all other treatments and gave the highest rates of Palmitic (179.21) µg/ml, Stearic (132.01) ug/ml and Eruic (225.19) ug/ml and Oleic (140.03) ug/ml and linoleic (77.20) ug/ml and α-linolenic (178.95) ug/ml.

Keywords: *Mustard, Bio fertilization, foliar spraying, fatty acids HPLC.*

Introduction

Brassica alba L. is one of the most important medicinal and oil crops in the world. It belongs to the Brassicaceae family, which contains about 350 genus and 3500 species and is one of ten important economic families.[1] Ranks fifth among the world's most important oil crops after soybeans, sunflowers, and field pistachios and cotton[2]. Mustard has great medicinal importance as there are many chemical studies on the seeds of white mustard seed, which included clinical studies to support the medical application of mustard oil, and formed derivatives (allylisothiocyanate)Which amounts to 60-92%, which is an important component in stopping cancer and is considered an antioxidant compounds (Antioxidant),White mustard is used medicinally in the pharmaceutical industry and for treatment of many diseases such as rheumatism treatment and tranquility, as well as its use as a laxative, analgesic for angina, cough, abdominal and chest pain, prevents atherosclerosis and hypertension, treats gout, It has been proven to treat cerebral palsy, headache, dizziness, tonsillitis, narrowing of the respiratory tract, used as a neurosurgery, treatment of stomach pain, lung congestion, cracking of hands, fear and enlargement of lymph nodes. As well as to improve appetite and digestion, softens the intestines, expels the gases, and the saliva of the saliva and the skin and numb the nerves of the skin to remove the feeling of pain in its place [3,4]. The importance of bio-fertilizers has been increased as a supplement to agricultural operations, the widespread use of which has reduced the collateral damage resulting from the use of fertilizers and chemical pesticides. Bio-fertilizers have received widespread attention in recent years due to cheap prices and environmentally friendly fertilizers,It works to improve plant growth by releasing growth-promoting substances and increasing the readiness of some major elements such as phosphorus and micronutrients, thereby

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increasing plant growth rather than maintaining soil fertility. The protection of certain pathogens as well as their role in improving water relations and increasing the tolerance of the host to drought. It also works to improve the soil building through the release of chlorine, which works to maintain soil and increase the soil's ability to retain water [5,6]. The importance of foliar spraying is that it provides the plant with its various nutrient requirements during the various stages of growth[7] and from the common foliar fertilizers, which contains the major nutrients (N, P, K), as well as containing many elements The addition of these elements to the soil lead to sedimentation and lack of use, especially in the soils of our country Iraq[8].

The objective to study the effect of bio-fertilization and foliar spraying in the content of mustard seeds from some fatty acids and their estimation using HPLC.

Materials and Method

The field experiment was carried out in the fields of one of the agricultural in the district of Mahaweel in the province of Babylon during the agricultural season 2016-2017 to study the effect of bio-fertilization and foliar spraying in the content of mustard seeds from some fatty acids and their estimation using HPLC. The factorial experiment was applied in accordance with the randomized complete block design (RCBD) with three replicates. The experiment included two factors: the first factor is the bio-fertilization of the mycorraiza fungi (without addition, the addition of the mycorrhiza) and the second factor is the foliar spray with PRO.SOL solution in three concentrations (0, 5, 10) Ml/l.Random samples were taken from the soil before planting in depth (0-30 cm) for the purpose of knowing the physical and chemical soil properties (Table 1), which shows the soil characteristics. The soil was prepared and its plowing was orthogonal plowing and was cleaned and settled and then divided into three replicates each of 6 experimental units with an area of(2 x 3) m^2. The seeds were planted on 5/11/2018 by placing three seeds in each seedbed, 10 cm between seeds bed and 2 cm deep For small size seeds,After that, all the soil and crop service operations were carried out, such as spawning, weeding, irrigation, fighting, and others. The mycorrhiza *Glucusmosseae*, which is produced in the laboratories of the Agricultural Research Department of the Ministry of Science and Technology, was added to a mushroom vaccine of 35 g per jour in the treatment along the lines of cultivation foliarspraying ProSol is produced by ProSol International and is a fully soluble fertilizer containing a balanced ratio of major nutrients and an important group of micronutrients such as zinc, manganese, boron, and others. Spray paper fertilizer on vegetative parts in the early morning and in three installments after the first month Of agriculture and repeated spraying every month. The mixture of fatty acid were separated on m FLC(Fast Liquid Chromatographic) on reversed phase 3 µm particle size, (50 x 2.0 mm I.D) C-18DB column, separation occurred on liquid chromatography Shimadzu 10AV-LC equipped with binary delivery pump model LC-10A Shimadzu, the eluted peaks were monitored by Shimadzu SPD 10A vp Detector at 215 nm,the data were recorded on shimpack C-R8A integrator (Shimadzu,koyota, Japan). The optimum separation condition as follow

Column: FLC (Fast Liquid Chromatographic) column, 3 µm particle size, (50 x 2.0 mm I.D) C-8DB column

The mobile phase was: acetonitrile: tetrahydrofuran (THF):,0.1 % phosphoric acid in THF (50.4:11.6: 38, V/V) detection: UV set at 215 nm the flowrate of 1.5 ml/ min. temp: 40 C.

The sequences of the eluted fatty acids standard were as follow, each standard was 25ug/ml

The HPLC separation profile revealed the presence of various chromatographic peaks in the studied mustard seeds sample extract. The assayed of the separated compounds representing the major detected peaks and summarizing the obtained data for each of the detected chromatographic peak are discussed below. Quantitative determination of fatty acids was done by comparison the peak area of authentic standard with that of sample peaks under the same optimum separation condition, by using the following equation:

Concentration of sample µg/ml = [(Area of sample / Area of standard) × conc. of standard x dilution Factor]

Results and Discusion

The results of Table (4) show that bio-fertilization and foliar spraying resulted in an increase in the content of mustard seeds of fatty acids. The bio-fertilization of the Mycorraizafungi led to increased fatty acids in mustard seeds. The treatment of T1 gave the highest rates of all measured fatty acids is Palmitic acid (*(166.93* µg/ ml, Stearic (121.14) ug/ml,Eruic (219.63) ug/ml, Oleic

(128.21) ug/ml and Linoleic (68.94).While the control treatment was given to the lowest of all measured fatty acids. This may be due to the fact that bio-fertilization increases the efficiency of nutrient absorption due to the infection of Mycorrhizaby means of fungus that extends far deeper into the soil than the root hairs, and its absorption efficiency is better than root hairs, The fungal infection leads to increased chlorophyll, plastids, activity and mitochondria, improving the nutritional status of the plant and thus increasing the active substance. These results were consistent with the results(10) and what he found (11).As for the effect of foliar spraying it has led spraying a concentration of T3 10 ml/letter higher rates of acid oils measured compared not spray To treatment T1, as given treatment T3 higher rates which Palmitic reached (169.25) µg/ml and Stearic (119.86) ug/ml and Eruic (217.93) ug/ml and Oleic (123.52) ug/ml and Linoleic (63.10) ug/ml and α - linolenic (161.67), ug/ml and may be attributed largely to foliar spraying content of major nutrients and micro led to increased vegetative growth and reflected this positively increase metabolic outcomes and outputs of the secondary active compounds including fatty acids, these results agreed with his findings (12)(13)(14)interaction between bio-fertilization and foliar spraying increased the content of mustard seeds from fatty acids, if treatment T 5 was highest compared to all other treatments, Palmitic was 179.21 µg/ml, Stearic (132.01) ug/ml, Eruic (225.19) ug/ml and Oleic (140.03) ug/ml and linoleic (77.20) ug/ml and α-linolenic (178.95) ug/ml.

Table (1) Physical and chemical properties of soil

Character	pH	Ec	N Mg.kg-1	P Mg.kg-1	K Mg.kg-1	Organic Matter (%)	Soil separators			Texture
							Sand gm.kg-1 soil	Loamy gm.kg-1 soil	Clay gm.kg-1 soil	
Value	7.6	2.5	35	14.28	16.2	0.75	446	403	151	Sand loamy

Table(2): The Retention Time and the area of fatty acids

Seq	Subjects	Retention time minute	Area	Concentration
1	Palmetic C16:1	2.67	148513	25ug/ml
2	Stearic acid C18:0	3.48	215419	25ug/ml
3	Erucic acid	4.83	182735	25ug/ml
4	Oleic C18:1 omega 9	5.74	190503	25ug/ml
5	Linolenic C18:2 omega 6	6.04	166361	25ug/ml
6	α -Linolenic C18:2 omega 3	8.0	165643	25ug/ml

Table(3): Treatments used through the study

Treatments	Type of Treatments
Control To	Without Treatments
T1	addition of the mycorrhiza
T2	foliar PRO.SOL 5 ml/letter
T3	foliar PRO.SOL 10 ml/letter
T4	Mycorraiza + foliar PRO.SOL 5 ml/letter
T5	Mycorraiza + foliar PRO.SOL 10 ml/letter

Table (4): Concentration of fatty acid extracted from mustard seeds oils in µg/ml in different samples

Treatments	Palmitic acid	Stearic acid	Erucic acid	Oleic acid	Linolic acid	α -linolenic acid
Control To	161.30	110.30	213.59	115.90	55.03	152.45
T1	171.51	121.14	219.63	128.21	68.94	165.23
T 2	166.93	114.60	215.07	119.12	59.12	157.44
T3	169.25	119.86	217.93	123.52	63.10	161.67
T 4	176.18.	128.15	222.84	135.98	72.91	172.13
T 5	179.21	132.01	225.19	140.03	77.20	178.95

Conclusion

In light of the results of the study obtained, we can conclude that the bio-fertilization of the Mycorrhiza and foliar spraying by PRO.SOL has had an effect in increasing the content of mustard seeds of fatty acids.

Financial Disclosure: There is no financial disclosure.

Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under the Department of Pharmacy, Medical Institute Tech. Mansour/Middle Tech. University, Iraq and all experiments were carried out in accordance with approved guidelines.

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