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EFFECT OF DIFFERENT LOCATIONS ON CHEMICAL COMPOSITION AND FATTY ACIDS IN THE SEEDS OF EIGHT FLAX CULTIVARS

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ABSTRACT **This study was conducted at the experimental station farm in Giza and Gemmiza during 1995/1996 and 1996/1997 seasons to study the effect of two different locations (Giza and Gemmiza) on chemical composition and saturated as well as unsaturated fatty acids content in the oil extracted from the seeds of eight flax cultivars, (Giza7, Giza8, Belinka, Fiking, Ariama, Bom bay, Coffwar and Gohwar), two of these cultivars were local (Giza 7 and Giza 8) and the rest were imported cultivars. The seeds from the two seasons were mixed together when making the chemical analysis used in this study. The result revealed that the oil percent differed according to cultivars and linolenic acid, (18:3) was the major unsaturated fatty acid in linseed oil. The highest content of (18:3) was found in cultivars Giza7 (55.57) regarding the Giza location and in cultivars Giza7 (55.66) regarding the Gemmiza location. Meanwhile, the lowest content was found in cultivars Belinka (51.67) and Fiking (50.83) in Giza and Gemmiza locations, respectively. The differences were due to differences in cultivars not differences in location.**

INTRODUCTION

Linseed (flax) *Linum usitatissmum. L.* is one of the oldest crops cultivated for its seeds and fibers .The two products of seed are linseed oil and linseed-meal. Linseed oil has been used in several countries as a drying oil and is often mixed with other types of oils as sunflower and soybean oils in

the manufacture of paint and varnish. Also, it is used for making linoleum printers' ink, soap, antibiotics and other products linseed is a good source of potassium, phosphorus, calcium and magnesium. Schultzry and French (1978) Found that, in some countries, the oil extracted from unheated seed is used for food purposes .The linseed–cake is a product left after extraction from its seeds which may be further ground to give linseed meal. Linseed–cake is very rich with protein which is used for the livestock and quick growing animals feed.

The linseed production is not enough to cover the local consumption, especially for seed oil, where our country imports about 85% from annual requirements.

Abd El Rahman and Youssef (1979) found that the percentage of fatty acids of two flax oil cultivars (Giza 4 and Hera) after maturity were palmitic (6.2and 7.3), stearic (3.2) and 4.0), oleic (23.4 and 23), linolenic (15.0 and 14.1) and linolenic (52.2 and 51.4). Osman and Abou-lila (1985) observed that the fatty acid compositions of Giza 5 flax cultivars were combined about (20%) saturated fatty acids (myristic acid (0.29%), palmitic acid 14.44 and stearic acid (5.13%), while the unsaturated fatty acid levels were about 80% (oleic acid 21.54%, linoleic acid 7.08 and 51.52%lenolenic acid). Patterson (1989) stated that fatty acid compositions of linseed oil contained 10.0%, 4.0%, 22.0%, 16.0% and 52.0% of palmitic acid, stearic, oleic, lenoleic and lenolenic acids, orderely. While palmitoleic, arachidic acid, and arachidonic acid were traces. On the other hand, he mentioned that there was a variation in linolenic acid (35.0-62.0%). Allan (1990) showed that the fatty acid contents in flax oil were 7% palmitic, 4% stearic, 20% oleic, 17% lenoleic and 52% lenolenic acids, respectively. Panford and De man (1990) reported that fatty acids composition of linseed oil contained: C16:0 (4.8%), C18:0(4.7%), C18:1(19.9%), C18:2(15.9%), C18:3(52.7%) saturated fatty acids 9.5% and unsaturated fatty acid (88.5%). El-Kady (1985) studied the amino acid compositions of linseed meal and found that lucien, valine and phenylalanine were the major amount of indispensable amino acids, while glutamic was the highest of dispensable amino acids

followed by aspartic and arginine. He added also that the major unsaturated fatty acid for linseed oil was linolenic, which were 55.4% and 57.41 in Giza 7 and Giza 8 linseed cultivars, respectively.

The present study was aimed to investigate the effect of two different locations, Giza and Gemmiza, on chemical and fatty acid compositions in the oil seeds of some flax cultivars.

MATERIALS AND METHODS

Two field experiments were carried out at Giza and Gemmiza Agricultural Research Station in 1995/96 and 1996/97 seasons to study the effect of location (Giza and Gemmiza) on chemical composition and fatty acid contents of eight linseed cultivars (Giza 7, Giza 8, Belinka, Fiking, Ariama, Bom bay, Coffwar, Gohwar). The seeds of the two seasons were mixed together in randomized order.

The experiment was laid out in randomized Complete block design with four replications .The plot area was $6m^2$ (2*3m). High Performance Liquid Chromatography (HPLC) with the column (250×4.5 mmi-d) and a mixture of acetonitril water 85:15, v/v at a flow rate of 20 ml/min as the mobile phase (Analysis chemistry 1979).

All agricultural practices and Chemical composition characters for flax production were as followed.

1. Oil percentage: it determined according to A.O.A.C. (1990).
2. Fatty acids: it determined by high performance studied
3. Crude protein: determined by the method of A.O.A.C. (1990) using Microkjeldahl.
4. Ash content: was determined according to the method described by A.O.A.C. (1990).
5. Total carbohydrates: were calculated as deference percentage as mentioned by (Fraser and Holmes, 1959).

RESULTS AND DISCUSSION

Chemical Composition of Linseed: -Chemical compositions of eight cultivars (Giza7, Giza8, Belinka, Fiking, Ariama, Bom bay, Coffwar,

and Gohwar) in two locations (Giza and Gemmiza) are shown in Table (1). It could be observed that there is no real difference on oil percentages between the two levels locations but there is a remarkable difference between cultivars in the same location. Ariama cultivar gave the highest oil percentage in Giza and Gemmiza (42.86% and 42.93%) but Fiking cultivar gave the lowest oil percentage (29.94% and 30.20%) respectively. As compared with all other cultivars. These results are in harmony with those found by El-Sweify (1993) and Mostafa (1994).

The results in Table (1) show also that Gohwar cultivar in Giza location contained a relatively higher crude protein (23.30%) on dry weight basis as compared with the other cultivars. The ash content of Giza7 cultivar in Giza location was the highest percentage (6.29%). The carbohydrate content was (25.96) regarding Giza 7 cultivar in Gemmiza location. which is considered the highest percentage. The result from ash, carbohydrate and protein are in harmony with those of El-Sweify (1993) and Mostafa (1994).

Fatty Acids Composition of Linseed: -

Fatty acids are the integral constituents of every fat and oil. The relative percentages of fatty acids of eight cultivars (Giza7, Giza 8, Belinka, Fiking, Ariama, Bom bay, Coffwar and Gohwar) in two locations (Giza and Gemmiza are presented in Tables (2) and (3)

From the results recorded in Table (2), it is clear that saturated fatty acids showed no real differences in different locations, but it was varied in the different cultivars. Gohwar cultivar gave the lowest value of total saturated fatty acids (8.36%) in Giza location. But Giza 7 gave the lowest value (9.01) in Gemmiza location. The results revealed that the linseed oil contains low amount of saturated fatty acids.Palmetic acid represents the major saturated fatty acid. Bom bay cultivar gave the highest value of Palmatic and Arachidic fatty acids 7.37%and 0.91% respectively and Giza7 gave the lowest value of Palmatic and Arachidic fatty acids 5.30%and 0.68% respectively at Giza and Gemmiza location.Stearic fatty acids were 3.93 %and4.48% in Fiking cultivar but in Ariama were 2.10%and 2.06% at Giza and Gemmiza location respectively. The results are in agreement with

Table (1): Effect of locations on chemicals composition of flax seed cultivars.

Locations	Cultivars	Oil %	%Protein	Ash	Carbohydrate
Giza	Giza 7	37.60	22.18	6.29	25.26
	Giza 8	39.60	22.26	5.89	23.82
	Belinka	33.60	19.28	5.99	22.18
	Fiking	29.94	22.38	5.36	21.28
	Ariama	42.80	19.26	5.86	22.68
	Bom bay	31.00	23.18	5.22	23.07
	Coffwar	36.40	22.56	5.18	22.78
	Gohwar	30.80	23.32	5.31	24.16
Mean		35.22	20.8	5.64	23.15
Gemmiza	Giza 7	37.72	21.16	6.19	25.96
	Giza 8	39.68	20.12	5.96	24.01
	Belinka	33.72	20.06	5.00	23.06
	Fiking	30.20	21.86	5.16	22.01
	Ariama	42.93	19.56	4.96	22.76
	Bom bay	31.23	22.90	5.32	23.27
	Coffwar	36.45	22.76	5.81	22.97
	Gohwar	30.28	22.49	5.76	24.62
Mean		35.28	21.36	5.52	23.58

Table (2): Effect of location on saturated fatty acids (S.F.A) found in the seeds of flax cultivars.

Location	Cultivars	Saturated Fatty acids			Total S.F.A
		Palmatic	Stearic	Arachidic	
Giza	Giza 7	5.49	3.04	0.69	9.22
	Giza 8	6.40	2.12	0.89	9.41
	Belinka	6.54	3.59	0.90	11.03
	Fiking	5.97	3.93	0.82	10.72
	Ariama	6.47	2.10	0.81	9.38
	Bom bay	7.26	3.05	0.91	11.22
	Coffwar	5.64	3.72	0.81	10.17
	Gohwar	5.93	1.69	0.74	8.36
Mean		6.21	2.91	.82	9.94
Gemmiza	Giza 7	5.30	3.03	0.68	9.01
	Giza 8	6.47	3.08	0.90	10.45
	Belinka	6.40	3.62	0.89	10.91
	Fiking	6.13	4.48	0.85	11.46
	Ariama	6.42	2.06	0.82	9.30
	Bom bay	7.37	3.03	0.89	11.29
	Coffwar	5.95	4.20	0.85	11.00
	Gohwar	5.90	3.39	0.74	10.03
Mean		6.24	3.36	0.83	10.43

Table (3): Effect of location on unsaturated fatty acids (P.U.S.F.A) of some oil seeds flax cultivars.

Locations	Cultivars	Unsaturated Fatty acids			Total P.U.S.F.A	P.U.S.F.A /S.F.A
		Oleic	Linoleic	Linolenic		
Giza	Giza 7	17.64	17.57	55.57	90.78	9.85
	Giza 8	16.84	18.61	55.14	90.59	9.63
	Belinka	17.9	19.40	51.67	88.97	8.07
	Fiking	18.56	18.43	52.29	89.28	8.33
	Ariama	18.29	20.17	52.16	90.62	9.66
	Bom bay	17.71	16.21	54.86	88.78	7.91
	Coffwar	17.08	17.02	54.73	89.83	8.83
	Gohwar	19.09	19.75	52.80	91.64	10.96
Mean		17.89	18.40	53.78	90.06	9.15
Gemmiza	Giza 7	17.73	17.60	55.66	90.99	10.10
	Giza 8	16.79	18.61	54.15	89.55	8.57
	Belinka	18.20	19.73	51.16	89.09	8.17
	Fiking	18.79	18.92	50.83	88.54	7.73
	Ariama	18.49	20.46	51.75	90.70	9.75
	Bom bay	17.69	16.28	54.74	88.71	7.86
	Coffwar	17.45	16.85	54.70	89.00	8.09
	Gohwar	18.77	19.97	51.23	89.97	8.97
Mean		17.99	18.55	53.03	89.57	8.65

those of Allam (1990) and El-Kady (1985).

Unsaturated fatty acids composition in flax seed oil are shown in table (3). The result revealed that linolenic acid was the major component in linseed oil cultivars. It ranged from (51.67) to (55.57) in Giza location Meanwhile, it ranged from 51.16% to 55.66% in Gemmiza location. Linoleic fatty acid was (20.17%) and (20.46%) in Ariama cultivar but in Bom bay cultivar was 16.21%and 16.28% at Giza and Gemmiza locations, respectively. At both locations Gohwar cultivar gave the highest value of Oleic acid 19.09% and 18.77%the differences in unsaturated fatty acid compositions were due to the cultivars not for the two locations. These results are in harmony with these of El-Kady (1985).

Generally, it could be concluded from the results that the differences occurs as result of different cultivars not from location.

Result also indicated that cultivar fiking had less oil quality than other cultivars because it give the lowest value of P.U. S.F.A/S.F.A ratio (7.73) but Gohwar cultivar gave the highest value of P.U.S.F.A /S.F.A (10.96) as compared with all other cultivars. Cultivar Gohwar give the highest value of total unsaturated fatty acid (91.64) while cultivar fiking gave the lowest value in unsaturated fatty acid (88.54%) as compared with all other studied cultivars .The results are in agreement with those of Sebedio et al (1987), Panford and DeMan (1990).

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تأثير منطقة الزراعة على التركيب الكيماوي ومحتوى الزيت من الأحماض الدهنية في بذور ثمانية أصناف من الكتان

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أجريت هذه التجربة في المزرعة التجريبية بمحطة البحوث الزراعية بالجيزة والجميزة خلال الموسم الزراعي ١٩٩٥ / ١٩٩٦ و ١٩٩٦ / ١٩٩٧ وذلك لبحث تأثير منطقة الزراعة (الجيزة والجميزة) علي التركيب الكيماوي ومحتوي الأحماض الدهنية المشبعة والغير مشبعة من الزيت الناتج من بذور ثمانية أصناف من الكتان: صنفين محليين (جيزة ٧ – جيزة ٨) وستة أصناف مستوردة (Belinka– Fiking– Ariama – Bombay– Coffwar – Gohwar). وقد تم خلط البذور الناتجة من الموسمين الزراعيين خلطا عشوائيا. أوضحت النتائج أن النسبة المئوية للزيت اختلفت تبعا لاختلاف الأصناف وسجل الصنف Ariamaأعلى نسبه(٤٢,٩٣%)في منطقة الجميزه بينما سجل الصنف Fikingاقل قيمة(٢٩,٧٤%) في منطقة الجيزة.

أشارت النتائج أن نسبة حامض اللينولينك المكون الأكبر للأحماض الدهنية الغير مشبعة في زيت بذور الكتان كانت أعلى قيمة له في الصنف جيزة ٧(٥٥,٦٦%) بينما الصنف Gohwar (٥١,٢٣%) اقل قيمة في منطقة الجميزة بينما في منطقة الجيزة سجل الصنف جيزة ٧(٥٥,٥٧%)أعلى قيمة أيضا بينما الصنف Belinkaسجل(٥١,٦٧%) اقل قيمة.
كما أدت الزراعة في منطقتين مختلفتين إلى اختلاف الأصناف داخل المنطقة من حيث محتواها من الأحماض الدهنية المشبعة والغير مشبعة وكذلك نسبة كلا منهما للأخر.