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The localization experience of *Moringa oleifera* Lam. in Saudi Arabia

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Background:

Moringa oleifera is one of the world's most useful plants. It's belonged to economically important family (Moringaceae). Two species were included *M. oleifera* and *M. peregrina* in Saudi Arabia, *M. peregrina* found abundantly in AlUla region, to achieve the economic interest and objectives on which Saudi Arabia's vision 2030 in support of the agricultural sector. So, the Royal Commission for AlUla region , has established a position to support the agricultural sector in the region (The Peregrina Center), ans consider *Moringa sp.* as a third largest production after dates and citrus.

M. oleifera tree is globally known for its economic and therapeutic roles. Its products are safe for human use and could be used without any harmful effects. The residues of the seeds are preserved in specialized way, due to their high benefits for many services and purposes, such as Medicinal, Nutritional, and plant Bio stimulants value of its leaves, pods, seeds and roots.

Aims and Objectives:

Evaluation of *M. oleifera* seeds content in Saudi Arabia to detect its productive activity thus motivate cultivation and expansion of its patch.

Methodology:

Seeds of *M. oleifera* have been collected from Jazan region (Fig.1). Seeds were cleaned to remove any impurities then; it was soaked in petroleum ether (40-60 C) for 48 to 72 h . The dried seeds were crushed into powder in a mixer and the extract was obtained using organic solvents (ratio of chloroform: methanol, 1:1) by hot extraction (Soxhlet extraction) (Fig.2).

The organic solvent was removed from the collected solution using a rotary evaporator under reduced pressure. The residual solvent was removed using a drying oven at 60°C for 1 hand flushed with nitrogen (99%) to acquire the *M. oleifera* seed oil. The extracted oil was then weighed.

M. oleifera seed oil extracted by a Soxhlet apparatus was obtained using GC-MS after the derivatization of the fatty acids into fatty acid methyl esters (FAME).

The components of *M. oleifera* oil were identified on the basis of GC retention time, their matching with the Wiley Library 2006, and comparing the fragmentation pattern of their mass spectra with those already mentioned in the literature.

M. oleifera tree is considered one of the most useful trees of the world, due to the fact that almost all parts of the tree are used.

These seeds are heavily- used because of their high oil content. Seeds are brown, rounded, covered with hard trigonal coats and have short wings. Their sizes are 0.5 to 1.0 cm long and 0.3 to 0.5 cm wide, with greyish-cream color.

The study of *M. oleifera* seeds is important because it is a vegetal specie with high oil content (30–45%). This oil has several well-known worldwide uses. Oil has a high content of monounsaturated or polyunsaturated fatty acids. *M. oleifera* oil contains an important percentage of oleic acid (around 70%). Oleic acid is a monounsaturated fatty acid that confers great stability to this oil in the face of oxidation. For such a motive, *M. oleifera's* oil has a monounsaturated fatty acid content similar to that of olive oil and is more stable than canola oil, soya bean oil, and palm tree oil.

M. oleifera's oil could be a good substitute for olive oil in the diet as well as for non-food applications, like biodiesel, cosmetics, and as a lubricant for fine machinery. Moreover, after oil extraction, the seed cake can be used in waste water treatment as a natural coagulant or as an organic fertilizer to improve agricultural productivity.

In some countries, a national program of *M. oleifera* culture has been developed as a first-rate resource to ensure human and animal feeding. So, today, *M. oleifera* cultivation has reached several countries.

The objective of this poster is to extract and analyze the content of *M. oleifera* oil, which is produced in Saudi Arabia , using a Soxhlet extractor and GC-MS to identify its components and uses in order to contribute to encouraging its cultivation and propagation.

Fig1: *M. oleifera* seeds

For more info :

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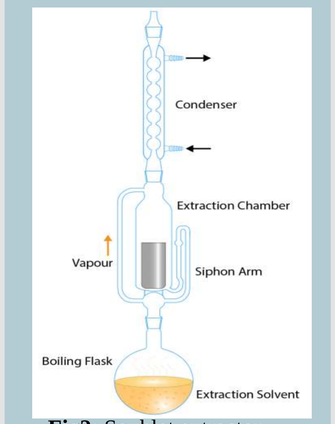

Fig2: Soxhlet extractor

Results:

M. oleifera seeds oil is brown color with acceptable odor, the oil is soluble in ether and chloroform, and insoluble in water .Gas chromatography and Gas chromatography /mass spectrometry resulted in identification of 33 compounds which representing 76 % of the total oil. The retention indices RI and area percentages (concentrations) (Fig 3) and summarized in (Table 1).

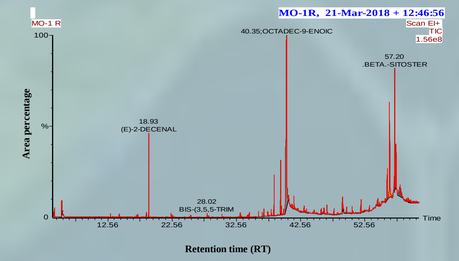

Fig3: Gas chromatography /mass spectrometry chromatogram of the *M. oleifera* seeds oil.

#	Name	RT	RI	Area %
1	2-OCTENAL	12.97	1082	0.490
2	NONANAL	16.97	1132	0.220
3	3-METHYLENE-UNDECENE	18.53	1279	0.500
4	(E)-2-DECENAL	18.93	1293	6.480
5	6-METHYL-1-OCTENE	22.42	1426	0.330
6	9-METHYL-1-UNDECENE	30.32	1713	0.340
7	9-OCTADECENE	33.16	1832	0.430
8	TETRADECANOIC ACID	34.38	1886	0.310
9	1,2-BENZENEDICARBOXYLIC ACID	34.56	1895	1.630
10	METHYL ESTER OF DECANOIC ACID	36.02	1965	0.780
11	N-HEXADECANOIC ACID	36.83	2004	0.910
12	1-DOCOSENE	37.45	2036	0.390
13	PALMITOLEIC ACID	37.99	2064	0.460
14	TRIMETHYL SILYL ESTER OF HEXADECANOIC ACID	38.42	2086	3.970
15	METHYL ESTER OF 9-OCTADECANOIC ACID	39.53	2141	0.650
16	2-METHYL-UNDECANOIC ACID	39.94	2169	0.660
17	OLEIC ACID	40.35	2191	41.440
18	2-NONADECANONE	43.12	2353	0.740
19	2-METHYL DODECANOIC ACID	43.44	2373	0.370
20	2-HEXYL-1-OCTANOL	44.66	2443	0.670
21	1-HEXADECANOL	46.09	2539	0.650
22	DIISOCTYL ESTER OF PHTHALIC ACID	46.64	2565	0.720
23	EICOSANE	47.73	2630	1.380
24	HEXADECANE	49.19	2717	1.360
25	OCTYL ESTER OF CAPRONIC ACID	49.73	2750	0.800
26	17-PENTATRIACONTENE	53.25	2960	1.100
27	CYCLOTRIDECANE	54.54	3040	1.400
28	VITAMIN E	54.82	3052	1.800
29	CAMPESTROL	56.03	3128	0.650
30	STIGMASTA-5,22-DIEN-3-OL	56.36	3149	11.480
31	DI-(9-OCTADECENOYL)-GLYCEROL	56.72	3198	0.900
32	BETA. -SITOSTEROL	57.20	3199	7.690
33	(3. BETA.)-GORGOST-5-EN-3-OL	57.40	3210	4.820

Table1: Chemical composition of *M. oleifera* seed oil.

Discussions:

Unsaturated and saturated fatty acids are the major constituents present in GC/MS analysis. The percentage of unsaturated fatty acid components present in *M. oleifera* seeds oil was 51.4%, whereas saturated fatty acids were 48.6% (Abdulkarim *et al.*, 2005). The high degree of unsaturation of the oil is due to high percentage of oleic acid (41.4%). Apart from oleic acid, other prominent fatty acids present were sterols, tocopherols, alkanes, and alcohol compounds. Our results agreed with that report by Aja *et al.*, (2014) and Efeovbokhan *et al.*, (2015). Meanwhile the major chemical constituents of the oil was like that published by Anwar and Rashid, (2007) on *M. oleifera* seeds growing wildly in Pakistan, and Leone *et al.*, (2016) on *M. oleifera* seeds growing cultivated in Milan. However, the percentage of seed chemical constituents vary due to environmental conditions such as season of collect, area of collect.

As a recommendation, we advise multiplying and exploiting this plant because it is multi-important and guarantees economic returns.

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