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REVIEW ARTICLE
MORINGA OLIFERA: A REVIEW ON THE PHYTOCHEMICAL SCREENING, PROXIMATE ANALYSIS, MEDICINAL, NUTRITIONAL, AND PLANT BIOSTIMULANTS VALUES OF ITS LEAVES, PODS, SEEDS AND ROOTS

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Introduction

This review focus on the *Moringa olifera* as the multi-purpose tree and importance material. *Moringa oleifera* L. (Moringa), belongs to the Moringaceae family which included many species such as the famous ones *Moringa oleifera*, *Moringa peregrina (Forssk.)* and *Moringa stenopetala*. This tree has been grown in a tropical and subtropical region around the word. Fahey (2005) report that all parts of this tree has useful traits, having it a multi-purpose tree which used as natural medicine, food, feed, natural stimulants for fertilizers, forage and migration of bees. In addition, it is used as a good source of many vitamins such as C, B and A, riboflavin, pyridoxine, Folic Acid, beta-carotene, Ascorbic Acid, , nicotinic acid, alpha-tocopherol, with high mineral content for iron and calcium in order to a major source of essential amino acids (Kumar *et al.*, 2012). Dahot., (1988) indicate that the tree is anti-tumor, anti-inflammatory, antioxidants, antimicrobial activity. Moringa contains powerful fungus and antibiotics effectively used as a natural and inhibitory biomarker for many plant pathogens (Fahey *et al.,* 2001). The most important traits of Moringa is it has the biological and food values are high and can be used as, green fertilizers, medicine, Bio-pesticides and seeds production., human food, animals feed for with high protein, carotenoids content with many vitamins and minerals and some phytocompounds high levels (Kempifetrine, Isocercetrine, Rehamnite, Kempferol and cercetin). (Fuglie, 1999). Also, Moringa was used to improve nutrition, reproductive performance, support immune functions of poultry and animals, when responses to Moringa to decreased Escherichia coli and increased Leukocytes clustering in the intestine indicating an immune enhance response (Yang *et al.*, 2006).

There are many suggest to use Moringa leaves extract (MLE) in agricultural field, Moringa can act a major actin in accelerating the growth of tomato, Peanuts, maize and wheat in early growth stages. Also, *Moringa olifera* extract can act as bio natural pesticides are low cash inputs, and easily available, environmentally friendly and are useful in the IPM management of plant diseases. *M. Olifera* reported to have antimicrobial traits against many plant pathogens which cause a serious disease to many crops, included diseases transmitted by soil (Ali *et al.*, 2004; Adline, and Devi, 2018). Large an improvement in resistance of pests and diseases was observed with the use of MLE, with total yield Increases from 20% to 35% (Fuglie, 1999). This increasing in crops productivity can contribute to catch some food needs in some poor population countries of the world, associate to increase the world's peoples year after year, with high poverty (Sultana *et al.*, 2014).

This article review aims to know more information about the nature, botany description, nutritional, medicinal value and multiusers of *Moringa olifera* as a promising tree in food and human healthy supplements. This tree is a promising material in soil management, water uses treatments, animal feed, medicinal, nematicides, termiticide, cosmetic and dairy industry, and includes in IPM programs. It also we are encouraging to cultivate this tree in house garden for easy daily uses its dried or fresh leaves and pods in salts, sop and food supplements.

Description of *Moringa oleifera* Tree

Moringa oleifera is known commonly names such as Drumstick, Ben oil, Benzoil, Horseradish, Al-Ban or Life tree. It is a medium in size, fast-growing, a round 5-10m in height, crown is semi open with drooping pods and branches, foliage shape is feathery of trip innate leaves and thicker corky, whitish bark Abd El-Hack *et al.* (2018). The runk can reach a diameter of 45-50 cm, flowers long are around 1.0–1.5 cm and 2.0 cm in wide, with white color. Flowering will be start during first 5-6 months of tree planting. The Pods of this tree is in droopy shape Fig. 1, brown capsule with three sides, 25–50 cm in length, pod color is dark brown, semi spherical seeds of about 0.5-1.0 cm of diameter. The seed has three transparent wings, for easy moving and transmit by wind and water. (Fig 2: A: Seeds B: pods) and (Fig 3: leaves and Flowers).

Climate requirements

Moringa oleifera is growing in wild range of climates conditions, it was a fast-growing evergreen tree in moderated temperature with high humidity whether or sometimes seem as a deciduous tree under stress conditions such as low less than 5 C or high temperature more than 50 C in a drought whether. This tree also needs rainfall in the year between 200-2000 mm and to be growing in temperatures between 25- 40 C, this trait makes it suitable for semi arid tropical and semi tropical conditions. Generally, moringa grows or is cultivated in many countries in America, South America, Southeast Asia and Africa. The most commonly widespread and cultivated species is *Moringa oleifera* among the fourteen species in this genus, which is native to India, Nigeria and Egypt. (Olson *et al.*, 2002).

Fig 1: A- Meringa tree, ten years old **B-Moringa tree, two years old**

Fig 2: A: Moringa seeds **B: Moringa pods (Fruits)**

Fig 3: Moringa leaves and Flowers

(Pictures collected from Agricultural engineering collage gardens – University of Baghdad-Iraq)

Nutritional values of *Moringa oleifera* tree:

All parts of this tree, including flowers, leaves, roots and immature pods of this plant (Fig. 2,3) have been consumed in high foods supplements with various medicinal and pharmacological traits (Anwar *et al.*, 2007; Chumark *et al.*, 2008; Pandey *et al.*, 2011). Peoples in many countries in Africa consume all parts of *Moringa Oleifera* in different ways. Moringa leaves used as the food source in good digestible to be eaten fresh, cooked or stored as a dried powder (Fahey, 2005). The dried leaf proximate analysis of *M. oleifera* showed that moisture 72.39%, it has highly rich energy (2625.25±79.30 Kcal/Kg) and in protein (28.0±0.33%), with appreciable levels of ash (9.89%), fats (3.89%), crude fibers (12.58%) and total carbohydrate (37.88%)%, free nitrogen extract 51.11%, cellulose 11.00%, hemicellulose 10.24% and lignin 2.41%. The leaves were found rich in vitamins and minerals. It contained high levels of Mg^{2+}, Ca^{2+}, Zn^{2+}, K^{+} and PO^{3-}, respectively, 4643.33±6.06, 82.50±6.89, 64.17±2.04,430.00±8.37 and 51.43±2.05 mg/100gm. The seeds are eaten as it is green or dry (Berger, *et al.*, 1984). The leaves and seeds of *M. Olifera* are a source of many valued compounds like protein, calcium, iron, Vitamin A, Ascorbic acid and Antioxidant compounds such as carotenoids, flavonoids, vitamin E and Phenol (Sultana and Anwar, 2008). The mineral analysis of the leaves showed that they contain the following minerals; iron (111.058 ppm), calcium (199.23 ppm), zinc (69.342 ppm), phosphorous (34.81 ppm), copper (8.733 ppm), and manganese (71.242 ppm).The presence of vitamins and minerals benefits in improving of immune system of countless diseases (Moyo,2011) and (Gopalakrishnan *et al.*, 2016). Moringa leaves contain many amino acids, such as Arg, His, Trp, Phe, Thr, Leu, Met, Ile, Lys, Val (Gopalakrishnan *et al.*, 2016). *Moringa Olifera* leaves can be used as a dietary supplement to improve the efficiency of fodder and cattle performance, or as an alternative to traditional crops for greater economic sustainability, environmentally friendly and safer and low cost production. (Aregheore, *et al.*, 2002), (Richter *et al.*, 2003). Rubanza, *et al.*, (2005) reported better nutrition digestion in animals that feed on the leaves of Moringa, probably due to their special form of food, Neutral detergent fibers, Acid detergent fibers, Crude protein, Total energy, and amino acids. Some parts of the Moringa contain anti-nutrients factors limiting their usefulness as a food source for humans or animals which contain in tree such as tannins, saponins, alkaloids and certain inhibitors (Makkar, 1996). Grubben and Denton (2004) indicated about two alkaloids kinds in Moringa roots bark, i.e. maurinine and mornin. Boss, (2004) said that the bark. The findings results by Nouman *et al.* (2013), Moringa harvested leaves at 30 cm height in the hot rainy season will gave a maximum values of biomass (472 g $plant^{-1}$) with a higher minerals content, It is concluded that the moringa tree, can be cultivated as a field crop as a good alternate for livestock fodder due to its antioxidant activities and higher minerals content. Point to note that nutrients variation by climate, location and environmental factors varies greatly effect on the food content of the tree (Gopalakrishnan, 2016). M. leaves were used to medicinal coated capsules, which is provide a human with powder, also its used as a drink, nourishing, healthy and resistant to many diseases. Also, on the leaves is the manufacture of the ziga drink, which is an important beverage that supplies energy. And the vitality of the athletes, a drink worth about 40-50 euros, which is made of leaves of the tree Mornja without any additives and also based on the papers tea industry Mornja and coffee Balmornja and others to benefit from the medical content and feed for Moringa and cook mornings in nutritious and healthful foods. We also cook green beans; leaves are also used after 90 days of planting and then cooked every 45 - 50 days. These leaves taken from plants are dried and used in manufacturing. The medicinal capsules are also used as leaves as useful and nutritious feed for cattle. Therefore, the moringa leaves can be reared in the production of cattle heads. These leaves, if added to the animals, are increased in meat production and milk yield increases by 45-65%. we suggested that more studies should be done to how this tree will use in diets.

Phytochemicals screening of the *Moringa oleifera* leaves:

The ethanolic leaf extract of *Moringa oleifera* using GC-MS proved to be a reservoir of bioactive constituents, which could be used in various diseases in future. However, isolation of each compound and their biological activities needs to be discovered further to enhance its phytochemicals importance to open new pharmacology fields for more research. It could be concluded that, *Moringa oleifera* have different bioactive compounds and may be recommended as a useful plant of phytopharmaceutical importance. Phytochemical reports of moringa leaves have indicted unique compounds (Bhattacharya *et al*., 2014). Identification of phytochemicals compounds of ethanolic extract was carried out according to standard procedures stated by WHO guidelines. Our GC-MS results indicate to 32 compounds in Moringa leaves ethanolic extract planted in Collage of agricultural engineering sciences Baghdad- IRAQ, Phytochemical examinations were carried this analysis was carried out at Feed and Food regional center – Agriculture researches center-Egypt by using a GC-MS (Agilent Technologies 7890A) according to (Santana, *et al.*, 2013). The results shows the following 14 major compounds revealed the maximum peak percentage area and 18 minor compounds reveled to minimum peak area in parenthesis shown in Fig. 3,4 : 3,4,5 -Trimethoxycinnamic acid 0.46%, Bavachinin 0.85%, 6,3,4-Trimethoxyflavanone 0.58%, Morin 0.36%, 5-Hydroxyisovanillic acid 0.26%, 5,7,3,4,5-Pentahydroxyflavone 0.59%, 5-Hydroxyisovanillicacid0. 26%,5,7,3,4,5-Pentahydroxyflavone 0.59% , 2-Hexadecanol 0.57%, Pinane 11.91%, Phytol 3.59%, Levomenthol 5.12%, 4-Hydroxy-2,3,5,5-tetramethoxychalcoe0. 39%, Hexahydrofarnesol 0.42%, 4,6-Dimethoxy-isoflavone-7-O-B-D-glucopyranoside 3.07%, 7,4-Dimethoxy-3-hydroxyflavone 3.38%, 5,7-Dimethoxyflavone 0.68%, geranylisovalerate 2.9%, 5-B-7-BH,10-Eudesm-11-en-1-o1 14.27%, Nerolidol 0.57%,Vitexin 0.59%, Quercetin 3,4,7-trimethyl ether 0.72%, Pentadecane,2,6,10-trimethyl 2.02%, 5,7,3,4-Tmethoxyflavone 0.77%, (S)-Citronellic acid 1.03%, Vitamin E 6.76%, 3-(3,4-Dimethoxyphenyl)-4-methylcoumarin 4.68%, Ascorbic acid, permethyl 7.14%, 3-Hydroxy-7,8,2,3-tetramethoxyflavone 0.8%, 7,8,3,4-Tetramethoxyflavone 1.0%,Heptacosane 2.0%, 3,2,4,5-Tetramethoxyflavone 0.67%, 3-(3,4-Dimethoxyphenyl)-4-methylcoumarin 0.34%, Gardenin 21.52%. Vinoth *et al.* (2012) reported to presence of many phytochemicals compounds supports a possible curative and preventive properties of M. oleifera leaves. The qualitative analysis for phytochemical constituents of the leaves methanolic extract of *Moringa oleifera* revealed high concentrations of Flavonoids, Alkaloids, and Saponins; 846.67, 446.67 and

844.17.82mg/100g respectively, but with low oxalate content, with appearance of saponins, flavonoids, steroids and cardiac glycosides (Patel *et al.*, 2014) and (Okiki *et al.*, 2015). It is still need to carry out more pharmacological analysis to indicate and approve to use of *M. oleifera* as a medicinal plant. Further studies need for bioactive components identification of the Moringa parts extract using GS/MS and/or HPLC, as well as to identify the huge potential compounds to be developed them into an important anticancer drug, however, more research and development are required to move forward. (Khor *et al.*, 2018).

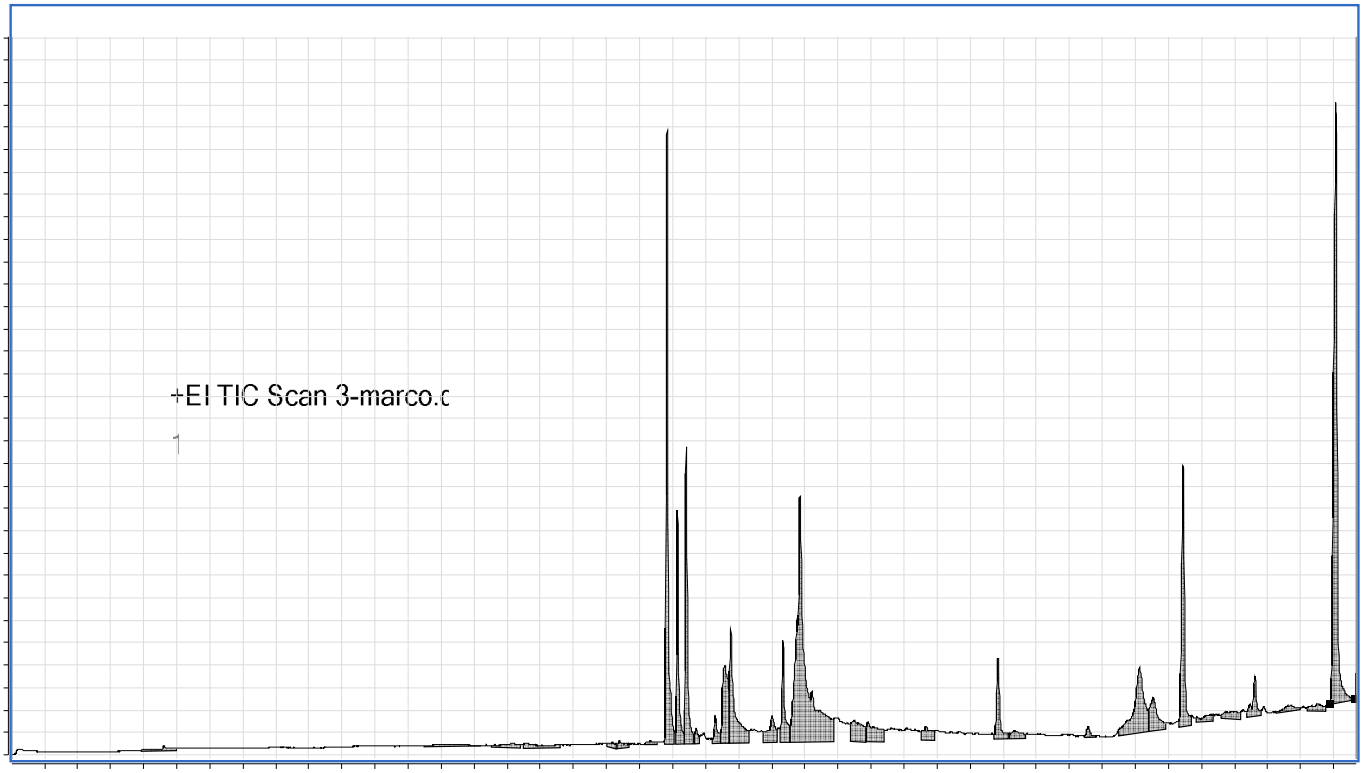

Fig. 3 : Phytochemicals chromatographs of *Moringa olifera* leaves

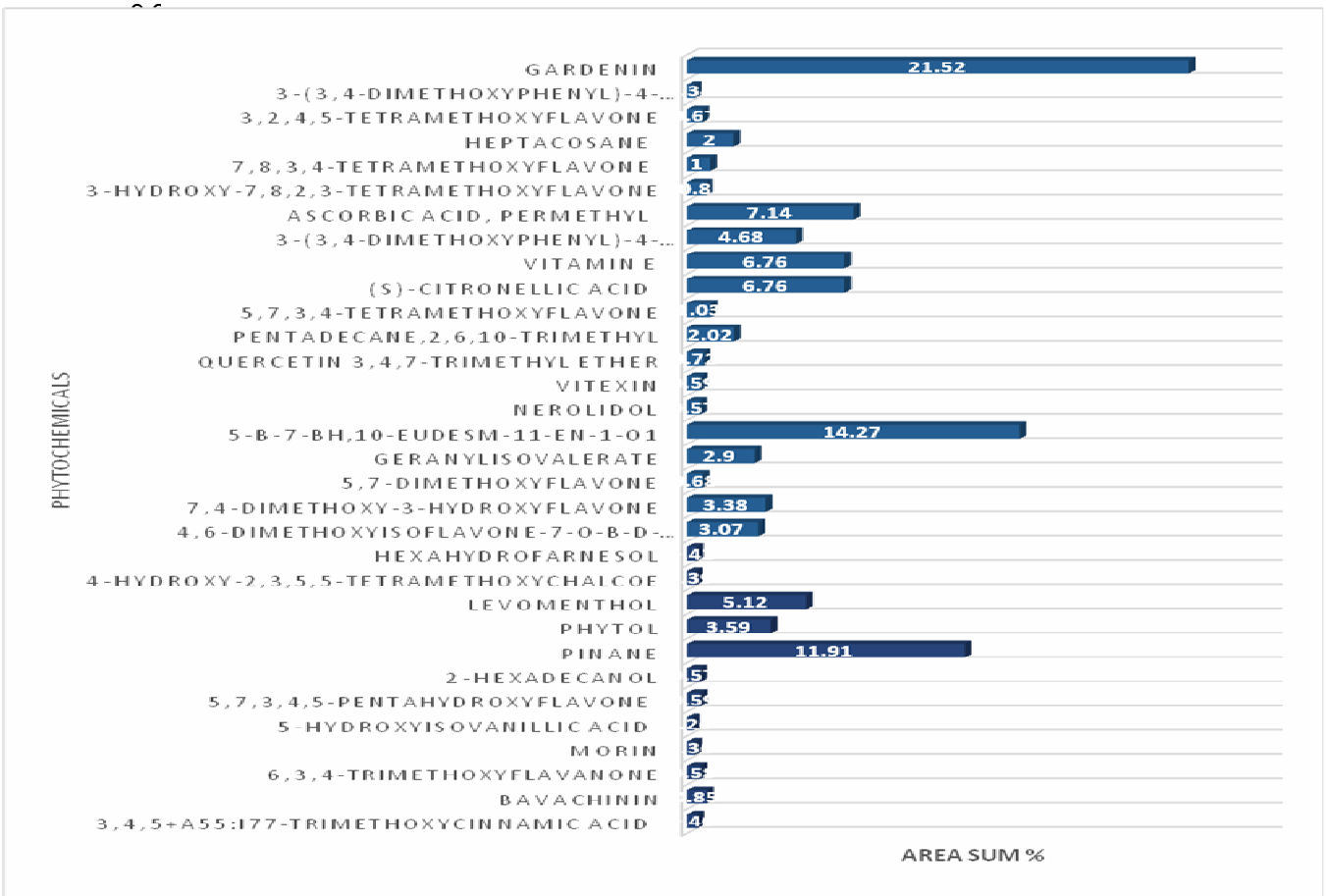

Fig. 4 : GC-MS phytochemicals screening of Moringa leaves

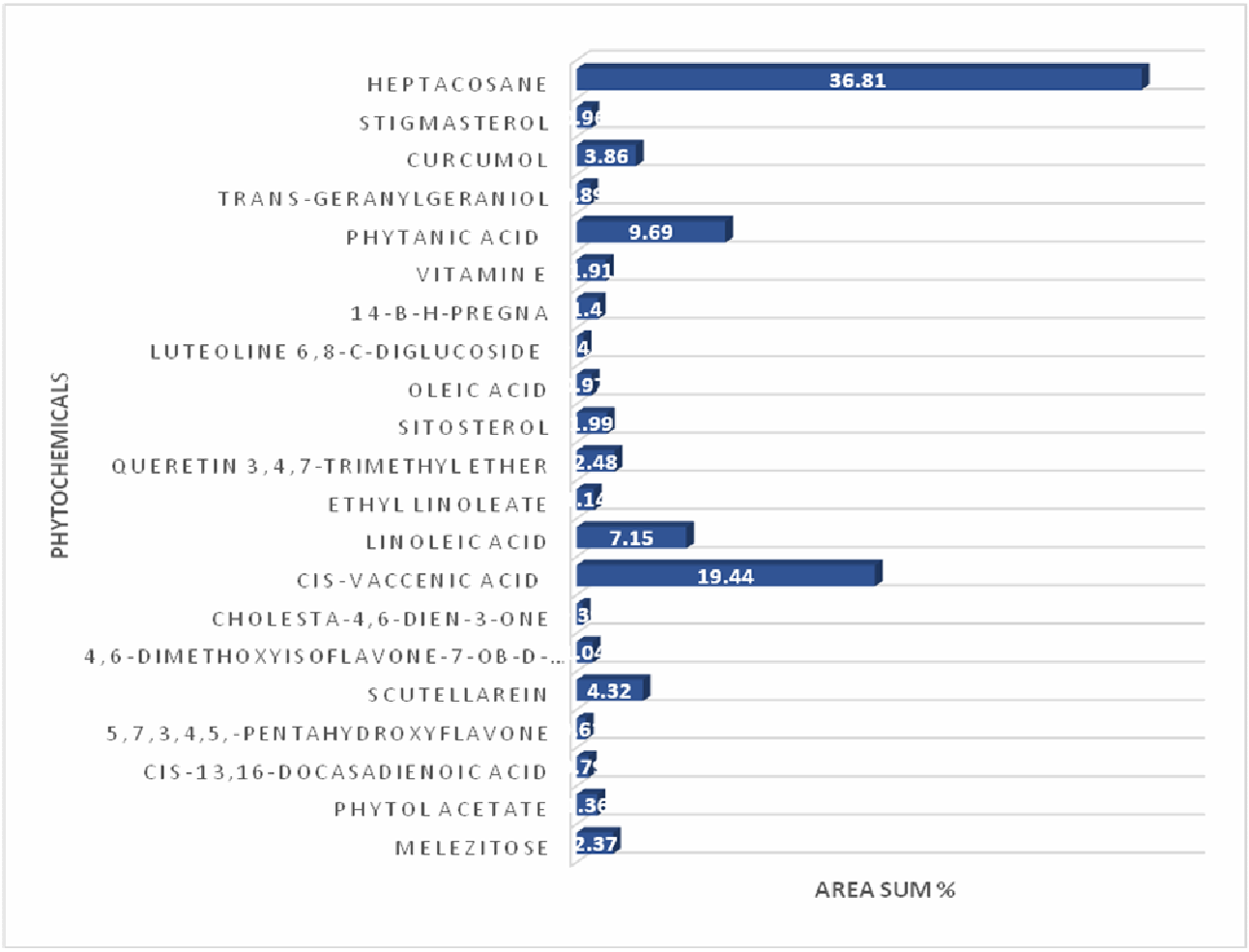

Fig. 5 : GC-MS phytochemicals screening of Moringa Pods (Fruits)

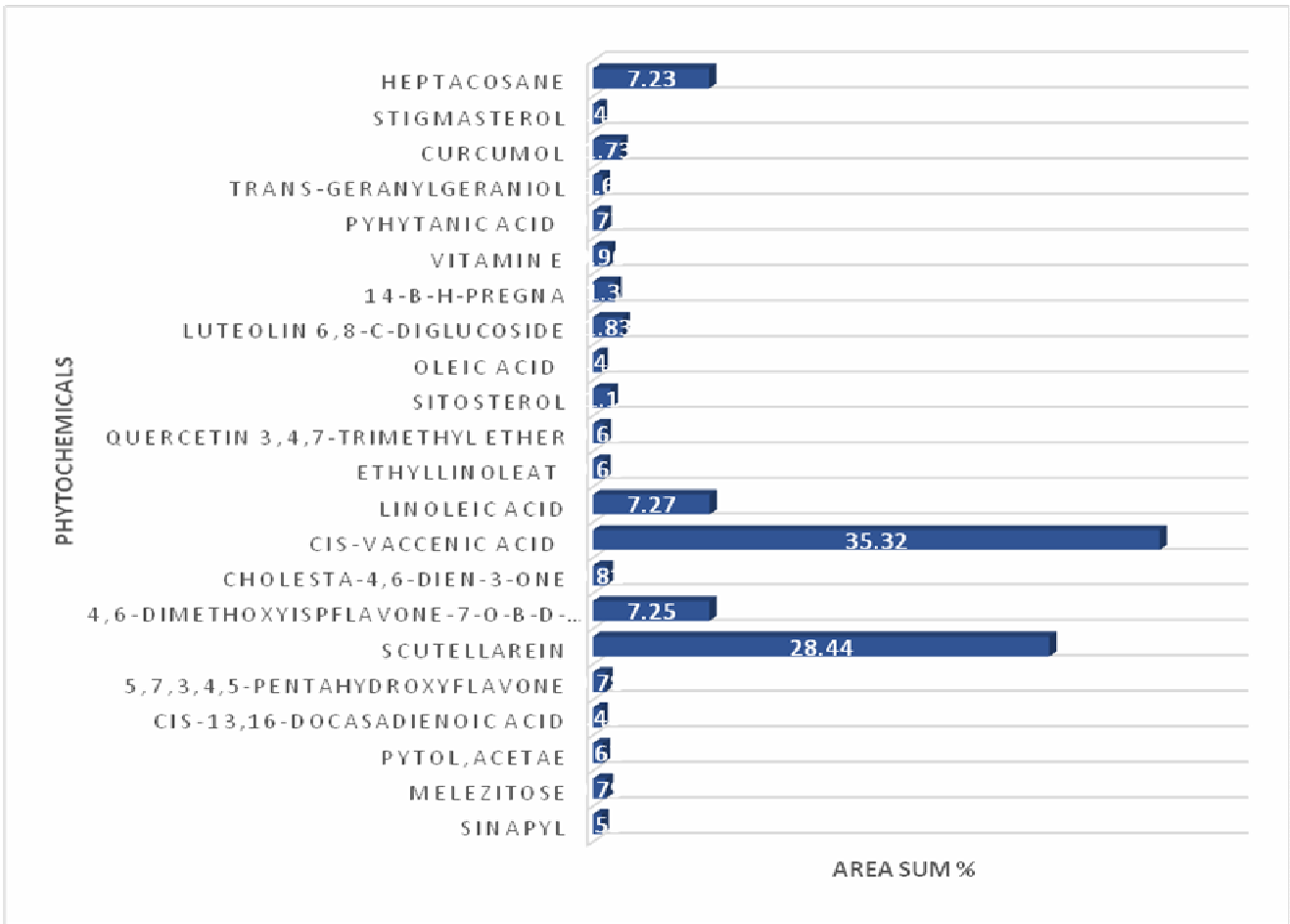

Fig. 6: GC-MS phytochemicals screening of Moringa roots

Compositional and nutritional, manufactural attributes of *Moringa oleifera* seeds:

Moringa seed oil (33-40% yield by weight), also known ben oil, it is a sweet, non sticking, nondrying, light brown to semitransparent oil that resists rancidity. Moringa refined oil is a, odorless oil that is resistant to ablution. It can also be used as a natural source of phyhenic acid, which has been used as a stabilizer in the manufacture of margarine, parsley, and foods containing semi-solid fats and solid fats, eliminating the need for hydrogenation, as well as it has been used as eaten green, roasted, powdered in salads and tea or used in curries for fine lubrication of machine, and in the manufacture of perfume and hair care products and in food processing (Tsaknis, *et al.*, 1999). The mature seeds of Moringa contained 332.4g crude protein, 414.0g crude fat, 212.2g carbohydrate and 44.4g ash per kg dry matter. The seeds content cysteine + methionine of ($43.6g.kg^{-1}$ /protein), then exceptionally higher and close to milk, egg, chicken, and cow's milk. (Oliveira *et al.*, 1999). The seed oil has been founded a high contain of unsaturated fatty acids, especially oleic (71.60%), in addition to dominant saturated acids in Moringa seeds Palmitic and behenic (6.4%) in total. The seeds oil found a high contain levels of β -sitosterol (45.58%), stigmasterol (23.10%) and campesterol (15.81%). α-, γ- and δ-tocopherols were detected levels up to of (15.38), (25.40) and (15.51) mg/kg of oil, respectively (Lalas and Tsaknis,2002). Singh et all., (2013) was identified ten phenolic compounds (*p*-coumaric acid, gallic acid, ferulic acid, protocatechuic acid, caffeic acid, epicatechin, catechin, cinnamic acid, quercetin and vanillin) in Moringa seed defatted (DMF). These phenolics compounds from Moringa seeds can consider a good source of antioxidants and antibacterial for pharmaceutical and food industries uses. Abd El-Rahim, (2017) indicate to use Moringa seeds oil to improve the stability of soybean and sunflower oils and using seeds powder in purification of olives and commercial fried oils.

Moringa seeds powder have many manufactured used, one of its best uses is the use for drinking water a purification and flocculate contaminants (Berger *et al.*, 1984) and to reduce the effect of Cd in the soil when adding 3g/kg soil followed with increasing of physiological traits in wheat crop. (Faramawy, 2016). Aqueous extract of Moringa seeds reduced the numbers of fecal Staphylococcus aureus, coliforms in rivers and wells water, in addition to the reduction of heavy metals such as iron, manganese, copper, chromium and zinc in wastewater and borehole water (Nkurunziza *et al.*, 2009). Bhatia *et al.*, (2007) reported that the pretreatment of palm oil mill effluent (POME) by using Moringa oleifera seeds as natural coagulant., these results were agreed with (Egbuikwem and Sangodoyin., 2013) and (Maina *et al.*, (2016) to use the Moringa seeds extract for removal of turbidity and E. coli in three different water sources. Moringa seed powder had 99.5% bacterial removal efficiency (James and Zikankuba 2017). Moringa seed powder can be used for water purification, replacing dangerous, antibacterial, expensive chemicals such as aluminum sulfate, arsenic from aqueous system for canal and industrial waste water treatments as an alternative sustainable friendly matter in the third words countries (Jahn *et al.*, 1986), (Lea, 2010), (Ferreira *et al*., 2011),(Deeba *et al*., 2014); (Kansal, and Kumari *et al.*, 2006), (Kumari and Sharma, 2006), (Kumar *et al*., 2012), (Idris, *et al.*, 2016). These results were agreed with Sharma et all., (2008) and Shan et all., (2017, they use of Moringa oleifera seeds as a natural, coagulant and ecofriendly way for water simple purification.

***Moringa oleifera* Pods (Fruit) and Root**

Moringa green pods used as a fresh healthy vegetable. Pods extracts act as biofunctional inducers along with displaying antioxidant traits and inhibiting of skin papilloma genesis in mice (Promkum, *et al.*, 2010). Fig. (5) shows the GC-MS phytochemical analysis of moringa fruits (pods). The major compounds following heptacosane 36.81%, vaccenic acid 19.44%, scutellarein 4.32%, curcumal 3.86%, Vitamin E 1.91% in addition to many antioxidant compounds. The GC-MS results also found the same major compounds in the root such as heptacosane 7.23%, vaccenic acid 35.32%, scutellarein 28.44 % Fig. 6. Table no. 1 shows the nutritional value of Moringa leaves, root and Pods. A many study reported to use moringa root powder for Nematoda and fusarium biocide control. (Najar *et al*., 2011).

Table 1: Nutritional values of Moringa leaves, pods and seeds

Nutrients	Fresh leaves	Dry leaves	Leaf powder	Seed	Pods
Calories Cal	92	329	205	-	25
Protein gm	6.7	29.4	27.1	35.97	2.5
Fats gm	1.7	5.2	2.3	38.67	0.1
Carbohydrates gm	12.5	41.2	38.2	8.67	3.7
Fiber gm	0.9	12.5	19.2	2.87	4.8
Vit. B_1 mg	0.06	2.02	2.64	0.05	0.05
Vit. B_2 mg	0.05	21.3	20.5	0.06	0.07
Vit. B_3 mg	0.8	7.6	8.2	0.2	0.2
Vit. C mg	220	15.8	17.3	4.5	120
Vit. E mg	448	10.8	113	751.67	-
Ca mg	440	2185	2003	45	30
Mg mg	42	448	368	635	24
P mg	70	252	204	75	110
K mg	259	1236	1324	-	259
Cu mg	0.07	0.49	0.57	5.20	3.1
Iron mg	0.85	25.6	28.2	-	5.3

values are in 100 g per plant, (Uphadek *et al.*, 2018)

Medicinal Uses

Moringa trees has many medical uses as well as its high value food (sultana *et al.*, 2008). All parts of *Moringa oleifera* have been used as natural medicines in many countries such as, Pakistan, India, Philippines, Thailand and Niger. Moringa has many pharmaceutical effects intervention in the treatment of many diseases in the traditional medicinal system (Abalaka *et al.*, 2012). Moreover, moringa have long been recognized in the Unani and Ayurvedic systems of medicine for prevention and treatment of several diseases, e.g., gastric ulcer, hay fever, fatigue, skin diseases and bronchitis, psychosis, eye diseases, fever and as an aphrodisiac (Anwar *et al.*, 2007). The aqueous extracts of barks and roots were found to be effective in preventing of implantation, fruits aqueous extracts have shown significant anti-inflammatory activity, methanolic and ethanolic extracts of leaves and seeds have shown anti-ulcer anthelmintic and anti-tumour activity. *Moringa oleifera* is used as drug in many ayurvedic practitioners for the treatment of asthma. *Moringa* leaves contains various phytochemical compounds which having potent anticancer and hypotensive activity and are considered full of medicinal properties and used in siddha medicine (premi *et al.*, 2010). Various parts of this tree such as the leaves, roots, seed, bark, fruit, flowers and immature pods act as cardiac and circulatory stimulants, antipyretic, antiepileptic, possess antitumor, anti- inflammatory, antiulcer. Moringa has anti-properties for microbes and this explains why it is used extensively in prevent of respiratory diseases in humans (Anwar *et al.*, 2007). Doughari *et al.* (2007) has been clarified anti - bacterial for Aquatic and ethanolic extracts for moringa leaves. Renitta *et al.*, (2009) indicate that the concentration of 100 mg L^{-1} for ethanol extract of leaves, flowers and seeds were very active against Escherichia coli, Pseudomonas and Staphylococcus aureus. (Okiki *et al.*, 2015). The methanolic extract of dried leaf of *Moringa oleifera* was found to possess potent phytochemicals with high inhibitory activities on UTIs origin bacteria. Bharali *et al.*, (2003) have used Moringa seed pods extracts in examined skin tumor prevention following ingestion. *Moringa oleifera* is one of the most common vegetables used by tropical and subtropical populations. Liver tissue damage has been significantly improved by using the Moringa leaf extract. Histochemical tests have confirmed these results in addition to that the DNA in liver cells, the results showed that the extract of Moringa leaves had returned the amount of DNA in these cells to levels much better than those detected in animals treated with carbon tetrachloride alone. The plant extracts of Moringa can improve glucose metabolism and the general condition of individuals suffering from diabetes, not only by changing blood sugar levels but also by improving the metabolism of fat, the content of antioxidants.

Scientists have found that the Moringa leaves extract stimulates the death of programmed cancer cells and arrests the cancer cell cycle of the colon and rectum. In addition, analysis of plant extracts found to contain compounds Important anti-cancer. *Moringa olifera* leaves extract was assessed on the liver cancer cell line. It was found that the leaf extract has a significant anticancer effect on liver cancer cells compared to that of the plant bark extract. Thiocarbamate from the leaves was found to be a potent chemical preventive agent in chemo carcinogenesis, so the seed extracts have also been found to be effective on antioxidant parameters, hepatic carcinogen metabolizing enzymes, and skin papilloma genesis in mice (Uphadek *et al.*, 2018). Khor *et al.* (2018) were findings identify a plant extract with anticancerous effect on the lung cancer cell line A549, as well as an anti-cancer agent against breast and colorectal cancer cell lines (Al-Asmari *et al.*, 2015) Faisi *et al.* (1994) indicated to the use of niacimycin and niacinin A, which resulted from the extraction from Moringa leaves produced significant negative effects on muscle contraction and contraction of the elements in the atria isolated in guinea pig, In addition, changes in coagulation factor, changes in serum composition, coupled with inhibition of the enzyme, Induction, or change in blood or tissue levels of other transversions has been observed after the mice treatment by root cortex extract *Moringa oleifera* L. 500 mg / kg and 184 mg / kg, but Mazumder *et al.* (1999) found that the methanol extract of Moringa root contain a high concentration (> 46 mg / kg / bw) of raw extract and 0.2% of alkaloids affecting the liver Kidney functions and bloody parameters. Phytate level in *M. olifera* leaves is around 3.1% Which may reduce the minerals availability in monogastric (Makkar and Becker, 1996). The study of Lin, *et al*. (2018) provides evidence that *M. oleifera* leaves possess antioxidant activity with contains numerous dietary phytochemicals, including flavonoids, with healthy promoting effects, such as prevention the damage of normal DNA cells and promotion of cancer cell apoptosis. (Reddy *et al.,* 2011), (Reddy *et al.,* 2012) were used modified leaves bark powder of *Moringa oleifera* for Optimization of Cu (II), Cd (II), and Ni (II) biosorption from aqueous phase. The roots of the Moringa contain some important alkaloids such as Morgenine, which raises the tension of the heart and blood vessels. More studies were required in order to achieve a level of proof required for full biomedical endorsement of Moringa, in this case, a cancer preventative, as well as further studies were needed to check and advise the suitable human daily uptake of different parts of moringa.

Improves Seeds Germination, Vegetative Growth, Defense System and Crops Yield

Moringa oleifera leaf extract (MLE) is considered one of the plants biostimulants, when applied as foliar spray and/or in seeds treatment for enhance production positively with alterations in metabolic processes under normal or stress conditions (Rady *et al.*, 2013), (Rady *et al.*, 2015). Nwangburuka *et al.* (2012) reported that soaking of okra seeds before storage with Moringa leaves extract reduces the of fungal infection and also maintains the seeds vigor and viability for a longer time period. *Moringa oleifera* leaf extract that could protect the plants against injuries by salt stress, the increased concentrations of K^+ and Ca^{2+} ions coupled with the increased concentrations of carotenoids, free proline and AsA as antioxidants and soluble sugars with free proline as osmoprotectants under salt stress supported the growth common bean plants. In addition, Moringa leaves extract treatment improved the activity of antioxidant enzymes (Zaki and Rady, 2015). Leaf extracts of *M. oleifera* have been reported to accelerate growth of young plants (Azra, 2011), strengthen plants, improve resistance to pests and diseases, increase number of roots, increase leaf area, produce more and larger fruits and generally increase yield by 20 to 35% (Fuglie, 2009). *M. oleifera* leaf extracts enhanced germination of cereals and sorghum seeds, length of maize radicals and hypocotyls of wheat. Results showed that spinach plants sprayed with four concentrations of

aqueous and ethanolic *Moringa* extracts (1, 2, 3 and 4%) showed significant increase in leaf area, plant height, fresh and dry weight, chlorophyll a, chlorophyll b, carotenoids, ascorbic acid, phenols and (N, P, K, Ca, Mg and Fe) nutrients uptake compared to those untreated plants. Phiri, (2010) and Iqbal, (2014) found a significantly higher in leaf area, net assimilation rate and crop growth rates were also recorded by three sprays of 2% moringa + 2% brassica at 15, 30 and 45 DAS. The increase in pods yield was probably due to the presence of high endogenous levels of cytokinin-like substances (zeatin, kinetin, etc.) resulting in the increase in number of fruits per plant, size of fruit then in pea crop yield. (Singh *et al.*, 2013). Bashir *et al.* (2014) indicates that, the Moringa leaf extract used significantly increased the growth and yield of tomato plants in all trials with erect stemming, fresh leaves, regular branching and healthy fruits and regular flowering. Dunsin and Odeghe, (2015) showed that plant height, number of leaves, fruit weight and yield of sweet bell pepper were significantly ($P \leq 0.05$) influenced by the application of Moringa leaf extract at ratio 1:32 (v/v) directly at the plant at 1 and 2 weeks after transplanting. These results were agreed with Muhammed *et al*., 2013), Rehman *et al*. (2017) and (Amirigbal, 2014), they indicated to the high content of natural growth stimulants in moringa leaf extract such as zeatin , cytokinin maintained the green photosynthetic area to enhanced grain filling rate and improve grain yield, and another three cereal forages under stress environment of soil and water salinity in an arid environment which leading to greater seed and biological yields in wheat. (Basra *et al.*, 2011), also the plum fruits quality was improved by spraying moringa levels extract by affecting on senescence and source-sink relationship (Yasmeen *et al.*, 2012), (Thana *et al*. 2017), and (Abusuwar and Abohassan, 2017). Howladar, (2014) report that Moringa oleifera leaf extract can mitigate the salinity stress and cadmium effects in bean crop. Application of MLE could alleviate the salinity adverse effect in sweet basil plant with increase in proline levels in leaves and root, in addition to increase the growth and certain physiological parameters (Faramawy, 20169), these results were agreed with Hanafy, (2017) to use *Moringa oleifera* leaf extract as a bio-fertilizer for drought stress mitigation of Glycine max.

Antioxidant Potential of Moringa Leaves

The analyzed of total flavonoids content by following a spectrophotometric method of Dewanto *et al.* (2002). The antioxidant capacities were evaluated by using scavenging assays of 1,1-diphenyl-2-picrylhydrazyl radical (DPPH), ferric reducing antioxidant power. Total phenolic content of M. oleifera leaf extract was determined in terms of gallic acid by following the method of Anwar *et al.* (2007), in the Table (2), also this table shows the antioxidant potential of Moringa leaves methanolic extract. Total Antioxidant activity 1701.8/100gm Ascorbic acid equivalent, this higher value was agreed with the results reported that the antioxidant activity in oil from the dried seeds is higher than BHT and alpha-tocopherol Table (2) results shows that the total flavonoids and phenols capacity in moringa leaves extract is 257mg/100gm quercetin and 785.5/100g gallic acid equivalent respectively.

Table 2: Antioxidant potential in *Moringa olifera* leaves extract.

Total Flavonoids	Total antioxidant capacity	Total Phenols
257mg/100g Quercetin equivalent	1701.8 mg/100g Ascorbic acid equivalent	785.5 mg/100g Gallic acid equivalent

The antioxidant potential activity of *Moringa olifera* in our study may be due to its phenolic compounds contain such as Gardenin, which identified in this work in higher percent 21.52% (Fig. 4). The *M. oleifera* leaf extracts have been reported to exhibit an antioxidant activity both in vivo and in vitro and due to phenolic and flavonoids content (Chumark *et al.*, 2008); (Verma *et al.*, 2009), (Sreelatha, and Padma,2009), (Khor *et al*., 2018). Thus, the free radical scavenging ability of *M. peregrina* could provide health benefits to humans by protection against oxidative (Wink *et al.*, 2012). Some researchers claimed that moringa leaves were rich in chlorogenic acid, gallic acid, kaempferol and quercetin glycosides (Bennett *et al.*, 2003; Brahma *et al.*, 2009), (Siddhuraju and Becker,2003). (Uphadek *et al.*, 2018) was founded that ethanolic (70%) and aqueous methanolic (80%) extracts of freeze-dried leaves showed radical scavenging and antioxidant activities.

Recommendation

We invited all researchers, investors, business men and peoples to take care of this tree at the all levels of agricultural, industrial, commercial, medical, Food supplements, preventive production and spread it everywhere and encourage to plant and distribute this tree. Moringa will be supportive of the Iraqi and other countries economy around the word. we hope and push the farmers to cultivate and spread *Moringa olifera* the life tree.

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