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Review Article

Moringa peregrina a Natural Medicine for Increasing Immunity Defense against the COVID-19

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ABSTRACT

Moringa peregrina belongs to family *Moringa*ceae that have only one genus called *Moringa*. This genus has only thirteen species from tropical and subtropical environments. *Moringa oleifera* and M. *peregrina* are the most dominant species between them. This review aimed to conclude and investigate the chemical composition, medicinal uses in folk medicine, traditional knowledge usage and how could these ingredients raise up the human immunity for human against COVID-19. The question addressed here, if the known requirements for avoiding infection and curing from corona disease became very well as a medicinal protocols for defense and curing form such disease (e.g. group of known vitamins, analgesic and protective materials), so could we use the *Moringa peregrina* as a natural drug as a medical treatment for corona sick people and for protection from catching the infection? Based on our previous studies and collected literatures we found that *Moringa* leaves and seeds have sufficient amounts of Vitamin C, Vitamin A, Calcium and Potassium. Meantime, historically and recently M. *peregrina* has wide range of traditional, nutritional, industrial, and medicinal values. It is used in folk medicine for many human health care purposes such as fever, muscle pain, and asthma and these symptoms are mainly symptoms for sick people of COVID-19. Different recent studies proved that it can be used for other diseases such as diabetes, wound healing, disinfectant, constipation, slimness, burns, labor pain, hypertension, malaria, stomach disorder, skin problems. It has been recorded also that *Moringa peregrina* characterized by its many pharmacological activities such as anti-microbial, anti-spasmodic, anti-diabetic, anti-inflammatory, lowering lipid activity, anti-cancer, antioxidant and memory disorders. Its chemical analysis results revealed the presence of active group of compounds such as flavonoid, isothiocyanate, phytosterol, triterpenoid, glycoside and polyphenol. Based on these chemical findings and its historical review in the folk medicinal we recommend using seeds and leaves of M. *peregrina* as natural drug for COVID-19.

Keywords: Corona virus; COVID-19; Folk medicine; South Sinai; Vitamin C; Vitamin A; Medicinal plants

INTRODUCTION

Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus. Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and recover without requiring special treatment. Frequently, older people and those with chronic medical problems such as cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to get a serious infection with COVID-19. In fact, the best approach to prevent and slow down transmission is being well informed about the COVID-19 virus, the disease it causes and how it spreads. It's well-known now after more than 6 month of the outbreak of this disease, people should keep washing hands or using an alcohol based rub frequently and not touching your face (WHO) 2020 [1]. The COVID-19 virus spreads principally through droplets of saliva or discharge from the nose when an infected individual coughs or sneezes, so it's important that people practice respiratory protocol by coughing into a flexed elbow.

Based on the situation report announced by WHO (report 178 on July 2020), the number of infected cases globally is 13,378

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853, and number of death cases 580045. Even so, there are no specific vaccines or treatments for COVID-19. Since outbreak occurred in December, 2019, COVID-19 has appeared as the most dangerous pandemic threat through-out the world. It has developed a big contest for the researchers especially those virologists to find a way or another solution for this fatal disease. This is credited to the point that COVID-19 is a viral infection have the wildest frequency of recombination or replication in its positive strand resulting in the quick formation of new progeny viral cells inside the host cells. It has also been reported that has a high rate of mutagenesis and changes in structure, which has formed a fence for therapeutic protocols and investigations on this virus. In fact, nowadays the whole world is waiting for delivery of corona vaccine which expected primarily by the end of 2020 or may be by early 2021. However the treatments of this disease distributed these days owing to the increasing the number of infected people are very enormous but most protocols are sort of treating the symptoms or the implications due to the severity of cases. Therefore, the medical community is announced daily and globally for two main points first point is how to prevent the individual from catching the diseases, and the second point is how to increase the immunity system to defense against COVID-19, through certain nutritional protocols of different vitamins and minerals to increase the human power for defensing the system.

LITERATURE REVIEW

The World Health Organization (WHO) indicated that health goals can't be achieved without the incorporation of herbal medicines and that 80% of the population depends on them for their health care. In general, countryside people in developing countries are obliged to the usage of medicinal plants for their remedies due to their poverty and lack obtainability of modern medicines. Medicinal plants are vital natural supply which constitutes one of the potential sources of new products and bioactive compounds for drug development. Generally, the traditional usage of medicinal plants contributes meaningfully too many new drug developments. More than 60% of the world population and 80% of the population of developing countries depend on traditional medicine for their primary health care needs [2].

Additionally, the use of herbal medications can help in the cure of one of the highest prevalence viral infections (Hepatitis C) found in Egypt, where herbs can aid in regenerating the liver tissue after the medical eradication of the virus and can help in the relief of the used drugs side effects in the treatment protocol. The aim of this paper is to focus on traditional knowledge, pharmacological activities, the importance of chemical composition of *Moringa peregrina* and its potentialities to be used as natural medicinal drug plant for increasing immunity strength of human against corona virus (COVID-19).

Background of *Moringa peregrina*

Moringa peregrina (Forssk.) Fiori. belongs to family *Moringa*ceae with the single genus *Moringa* including 13 species of dicotyledonous tropical and sub-tropical flowering trees with gummy bark and gum canals in bark and pith. There are four succulent species of bottle trees while the rest are more slender but some have tuberous roots. The alternate leaves are pinnate. They may produce an unpleasant odor when crushed. The irregular flowers are grouped in panicles and have 5 sepals and 5 petals, often reflexed. Fruits are angular dehiscent capsules containing 3-winged or wingless seeds. *Moringa*ceae are widely distributed outside their natural range. *Moringa oleifera* from India is the most widely grown, for its nutritious pods, edible leaves and flowers. The mature seeds can be roasted or used to prepare oil. The fleshy roots are grated and used as a seasoning, in spite of containing a toxic alkaloid. In general four succulent African species of Maringa are bottle trees with water-storing succulent trunks from Madagascar (*M. drouhardii*, *M. hildebrandtii*), Namibia (*M. ovalifolia*), Kenya and Ethiopia (*M. stenopetala*). In addition, three other species are characterized with tuberous root succulents native to Kenya, Somalia and Ethiopia (*M. borziana*, *M. longituba*, *M. pygmaea*).

Moringa was well known in the ancient world, but only recently has been "rediscovered" as a multipurpose tree with a wide variety of potential uses. The pleasant-tasting edible oil, which can be extracted from the seeds, was highly valued by the ancient Roman, Greek and Egyptian civilizations for use in making perfume and in protecting skin. The ben oil has been used by the Egyptians since Old and Middle Kingdoms. *Moringa peregrina* is one of the most endangered trees in world due to over-cutting for medicinal value and other different uses, however it is an important source of browse, wood fuel and timber, and over-grazing. Collecting seeds of *Moringa* for marketing due its unique chemical composition is one of the most important threats affecting the appearance of new trees as a new population in Egypt. The seeds of *M. peregrine* have different economic and medicinal importance due to its unique composition of oil, proteins fiber, carbohydrates and ash contents. The leaves are excellent source of vitamins, minerals, proteins and a very low source of fat and carbohydrates. Both leaves and pods supply several amino acids, including the sulfur-containing amino acids methionine and cystine, which are often in short supply in the Bedouin diet (Makkar and Becker, 1996).

Nomenclature and systematic position

Moringa peregrina belongs to the phenotypically varied groups of angiosperms due to its size. It is the sole genus of *Moringa*ceae with fourteen species distributed throughout the dry tropics of the World. *Moringa* spans a vast range of life forms (habit). *Moringa* has different names; in Philippines, the leaves of *Moringa* are cooked and fed to babies, it is called mother's best friend. Its vernacular name (Arabic) is Habb El-Yassar [3]. According to Boulos [4], the synonyms of *Moringa peregrina* (Forssk. Fori) are *Hyperanthera peregrina* Forssk., *Moringa aptera* Gaertn., Fruct., and *Moringa arabica* (Lam.) Pers. According to Boulos and the system by Melchior [5], adapted than system of Engler, *Moringa* is classified as follows: Division: Angiospermae Subdivision: Dicotyledoneae Class: Archiclamydeae Order: Papavarales Family: *Moringa*ceae. Floristic category: Afro-oriental, S. Arabian domains of Sudano-Zambezian region with extension to the middle and SaharoSindian sub-regions [3].

Morphological description

Moringa peregrina is a slender, deciduous shrub or tree with an ovoid crown; it can grow up to 10 meters tall. The leaves of *M. peregrina* are feathery, pale green, compound tri-pinnate, 30-60 cm long with many small leaflets, 1.3- 2.5 cm and 0.3-0.6 cm wide [4]. The leaflets are early deciduous, simple, petiolate, glabrous on both surfaces; the blade is ovate- oblanceolate, margin entire, and apex obtuse, sometimes mucronate [3,6]. Flowers of *M. peregrina* are fragrant, with white, creamy, pinkish to pale, 2.5 cm in diameter, born in sprays, with five at the top of the flower and stamens are yellow. The fruits or pods of *M. peregrina* are pendulous ridged, brown, triangular. The pod splitting lengthwise into 3 parts containing about 20-25 trigonous seeds embedded in the pith. Pods are tapering at both ends, 9-ribbed. The seeds of *M. peregrina* are dark brown with 3 papery wings [6]. Zahran and Willis [7] stated that the pendulous pods ripen in October. The angled nut-like white seed (Behen-nut) are bitter-sweet taste and rich in oil (ben-oil) [8].

Ecology

Moringa peregrina grows in the Southern part of Sinai and the Red Sea Zone on steep rocky slopes and cliffs of the mountains. The trees are confined to the base of mountains that are higher than 1300-1500 m above sea level. *Moringa* is a fast growing, perennial tree which can reach a maximum height of 7-12 m and a diameter of 20-40 cm at chest height. Although, it is a rare species, *M. peregrina* has a wide geographic range, growing from the Dead Sea area sporadically along the Red Sea to northern Somalia and around the Arabian Peninsula to the mouth of the Arabian (Persian) Gulf, Red sea coast and Sinai Mountains [4,8] (Figure 1).

Figure 1: Flowers of *Moringa peregrina* growing in South Sinai Mountains.

Previous studies

In general, the previous old and recent studies on the *Moringa* genus were mainly focused on *M. oleifera* [9-11]. In fact, this plant species is very resistant to harsh conditions and has a cosmopolitan distribution therefore; people used it regularly in arid land and have been studied in different aspects of scientific research and developmental projects (cultivation and conservation). On the other hand, our target species did not take strong attention for studying its potentialities till the last two decades. Recently, *M. peregrina* is having more scientific considerations due to its nutritional importance, medicinal values, traditional knowledge's of usage, and industrial values. Therefore, the present paper is focusing on the most value studies which have been done on *Moringa peregrina*.

In 1979 Kjaer et al. [12] investigated the isothiocyanates in myrosinase treated seed extracts of *Moringa peregrina*, they revealed that seeds treated with myrosinase produce 2-propyl, 2-butyl and 2-methylpropyl isothiocyanate, in addition to 5,5-dimethyloxazolidine-2-thione. All of these compounds are new to the family, but known as natural derivatives from other sources. Alternatively, 4-(4'-O-Acetyl-alpha-L-rhamnosyloxy) benzyl isothiocyanate together with substantial quantities of its non-acetylated counterpart, earlier recognized as a component in hydrolyzed seeds of *M. oleifera*, constituted the additional mustard oils observed in *M. peregrina* seeds [12].

In 1984, Somali et al. [13] studied the chemical composition and characteristics of *M. peregrina* seeds and seeds oil. They revealed that *M. peregrina* kernel contains 1.8% moisture, 54.3% oil, 22.1% protein, 3.6% fibers, 15.3% carbohydrate and 2.5% ash. Composition and characteristics of the extracted oil were determined. GLC of methyl esters of the fatty acids shows the presence of 14.7% saturated fatty acids and 84.7% unsaturated fatty acids. Fatty acid composition is as follows (%): palmitic 9.3, palmitoleic 2.4, stearic 3.5, oleic 78.0, linoleic 0.6, linolenic 1.6, arachidic 1.8 and behenic 2.6, therefore, one can say that *M. peregrina* certainly has a potential as a new source of fat and protein (Figure 2).

Figure 2: Shows the Pods of *Moringa peregrina* growing in gardens in Suez canal university at Ismailia, Egypt.

The study to find out *M. peregrina* seeds in a seed bank was studied by Prendergast during four expeditions to Oman (two for the southern province of Dhofar and two for the mountain

ranges of Jebel Akhdar and Eastern Hajar) [14,15]. Moreover, seed germination was studied by Moustafa et al. [16], whereas they stated that seeds of *M. peregrina* showed rapid and high germination after ten days at 25°C.

The role of seed as water purifier had been investigated by Jahn [17-19] and Jahn et al. proved that *Moringa* seeds can used as a natural purifier for water and cultivating *Moringa*ceae species for multipurpose and activities in the Sudan [20]. This article presents the uses and locations for the most important six *Moringa* species (*M. peregrina*, *M. oleifera*, *M. stenopetala*, *M. longituba*, *M. drouhardi and M. ovalifolia*). Madsen et al. [21] studied an effect of water coagulation by seeds of *Moringa* on bacterial concentrations. Morover, Kalogo et al. studied the effect of a water extract of *Moringa* seeds on the hydrolytic microbial species diversity.

Anatomical studies are very few, it needs further investigations. Al-Gohary and Hajar [22] studied the stems and leaves of *M. peregrina* at different levels of soil moisture content within the range between permanent wilting percentage and moisture equivalent. The diameter of stem gradually increased with increase of water supply which generally led to progressive formation of vascular elements as well as cortical and pith tissues. In arid region, *M. peregrina* showed tendencies towards xerophytes adaptation. The leaves are covered with remarkably dense trichomes, relatively increased in the values of stomata frequency and index, and a reduction in the proportion of the air spaces in Mesophyll tissue. Such decrease in coefficients of mesophytic characteristic of the species gradually disappeared with the increase of the soil moisture content. The variation in water supply led only to quantitative changes of the micro-morphological attributes of the species but no qualitative modifications took place [23]. Moreover, the epidermal cells of *M. peregrina* are tangentially and radially elongated. Trichomes are glandular and unicellular. Mesophyll is a dorsoventral type. Palisade tissue of 1-2 layers which are discontinuous adaxially at the midrib region. Medvein is crescent-shape and surrounded by parechymatous sheath. Mechanical tissue of collenchyma was recorded abaxial and adaxial at the midrib region. It is obvious that various anatomical changes were obtained in stems and leaves of *M. peregrina* in response to variation of available soil moisture content. The diameter of stem increased gradually as water supply increased. Such factor is usually a feature associated to increase of soil moisture [22]. During the course of their study, the number of parechymatous layers of cortex progressively increased with increase in available moisture from the lowest level (0-5%) to the highest (95-100%) also gradually increased of scelerentymatous mass of pericycle, phloem, xylem elements, as well as the diameter of pith was observed to accompany the elevation in the soil moisture content. Furthermore, xylem and phylum were in the form dictyostele with much reduced medullary rays in the stem of plants growing under low moisture level (0-5%) [22] (Figure 3).

Figure 3: The whole tree of *Moringa peregrina* growing in wadi bed habitats in Saint Catherine protectorate, south Sinai, Egypt.

Olson and Carlquist [23] studied stem and root anatomical correlations with life form diversity, ecology, and systematics in *Moringa*. A study was conducted to observe the variation in stem and root anatomy associated with habit in thirteen species of *Moringa* to test the assumption that habitat differences are associated with anatomical differences. *Moringa* species are classified into four types according to the gross appearance; bottle trees, sarcorhizal, slender trees, and tuberous shrubs [23] They revealed that the slender trees (such as *M. peregrina*) have slender trunks at maturity and tough, fibrous roots with smoother, spongier and more fragile bark than the stem. Jahn [18] studied the germination, cultivation techniques of *Moringa* tree and propagation of *M. peregrina* and another four wild species (*M. oleifera*, *M. stenopetala*, *M. drouhardii* and *M. longituba*). In addition to an account was given of insect pests of *Moringa* in relation to defoliation, damage to buds and fruit, damage to the trunk and to cuttings.

The seeds of *M. peregrina* need little or no pretreatment prior to germination with viability rates for fresh seeds having been reported to be up to 80% reducing to approximately 50% after 12 months storage. Seeds may be sown directly or in seed beds with transplanting after two to three months. The best time of year for sowing is reported to be at the beginning of the wet season. If planted out during the dry season half-shade should be provided and watering should be carried out regularly until the tree is established. Watering every other day has been reported to increase the drought tolerance of the tree, [20].

Olson pooled the data of DNA sequences and morphology for a phylogeny of *Moringa*ceae [24]. He presented that with thirteen species, *Moringa* is for its size one of the most phenotypically varied groups of angiosperms. It ranged from huge "bottle trees" to tiny tuberous shrubs, and spanning the range from radial to bilateral floral symmetry. *Moringa* is currently divided into three sections, but because of the basal grade, it cannot be divided into useful monophyletic infra-generic taxa. The phylogeny-based informal terms "bottle tree grade", "slender tree clade", and "tuberous clade" are suggested as alternatives. Relationships within *Moringa* species were found to be largely congruent with a previous study of wood anatomy.

According to Duke [6] the *Moringa* leaves contains 7.5 H2O, 6.7gm protein, 1.7 gm fat, 1.3 gm total carbohydrates, 0.9 gm fiber, 2.3 gm ash, 440 mg Ca, 70 mg P, 7 mg Fe, 110 µg Cu, 5.1 µg I, 11.300 IU vitamin A, 120 µg vitamin B. Alternatively, Das showed that M. *peregrina* leaves on ethanol extraction yielded a number of amino acids (aspartic acid, glutamic acid, serine, glycine, threonine, alnnine, valine, lucine, isoleoucine, histadine, lysine arginine, phenyl-alanine, tryptophan, cysteine and metheonine) [25]. The later nine amino acids present in the flowers and fruits. The flowers contained both sucrose and D-glucose, whereas the fruits showed the presence of sucrose only. The leaves contain 0.8 mg nicotinc acid, 220 mg ascorbic acid, and 7.4 mg tocopherol per 100 gm [6]. Estroginc substances, including the anti-tumor compound, β-sitosterol, and a pectinesterase are also reported.

The predominant unsaturated fatty acid was oleic acid (70.52%) followed by gadoleic acid (1.5%). The predominant saturated fatty acid was palmitic acid (8.90%) followed by stearic acid (3.82%). The main sterols were beta-sitosterol (27.28%), stigmasterol (26.79%), campesterol (25.47%) and Delta-5avenasterol (10.18%). Other sterols present included 24-methylene cholesterol, brassicasterol, campestanol, Delta-7-campestanol, clerosterol, Delta-5-, -2-4-stigmastadienol, Delta-7-stigmastanol & Delta-7-avenasterol. The oil contained 145 mg alpha-tocopherol/kg, 58 mg gamma-tocopherol/kg and 66 mg delta-tocopherol/kg. Induction period (at 120°C) of the oil was 10.2 h; this was reduced to 8.1 h after degumming [26].

Specific studies related to conservation are carried out since 1995, starting with a reproductive ecology, studying of wild endangered trees and shrubs in South Sinai [27]. He aimed to help in regeneration and rehabilitation of the destructive vegetation, soil protection, and reduction of dangerous effects of floods throughout the area. M. *peregrina* is one of seven species studied by Moustafa et al. [16]. Their study aimed to investigate the relationships between the distribution of the species and physical environmental factors. They indicated that altitude, nature of soil surface and soil texture, which all act on the amount of available moisture, and salinity, were the main physical factors controlling the distribution of woody plant communities.

Chemistry of *Moringa* and its characteristic as anti-corona (COVID-19)

In this section we are going to explain the main uses for *Moringa* in treating different diseases or symptoms of diseases, and the chemical components that allow *Moringa peregrina* to be good and promising candidate for curing suspected COVID-19 sick people. We found that most important characteristic of *Moringa peregrina* can be used for increasing the immunity level and cure sick and suspected people.

The leaves of M. *peregrina* are applied as poultice to sores, for headaches, and it has its purgative properties and stop bleeding. *Moringa peregrina* has an anti-bacterial and anti-inflammatory effect and its leaf tea treats gastric ulcers and diarrhea. Bark, leaves and roots are acrid, pungent, and are taken to promote digestion [28,29].

The roots, leaves, flowers and seeds of M. *peregrina* are mostly used in folk remedies for tumors [30-33]. Pods doing as a de-wormer and treat liver and spleen problems and pains of the joints. Due to the high protein and fiber content of pods, they can cure malnutrition and diarrhea. The root of M. *peregrina* is used for dropsy, and its juice is applied externally as rubefacient or counter-irritant. Moreover, roots are bitter as a tonic to the body and lungs, and are emmenagogue, expectorant, mild diuretic and stimulant in paralytic afflictions, epilepsy and hysteria [6].

In general, the flower juice of M. *peregrina* is useful for urinary problems. Moreover, it improves the quality and flow of mothers' milk. The seed oil is used for diarrhea and conversely it has a laxative effect.

Nutritional analysis to M. *peregrina* indicates that the leaves and pods contain wealth of essential and disease preventing nutrients, vitamins and as well as group of all essential amino acids [29,34] (Table 1).

Table 1: Nutritional analysis of *Moringa peregrina* pods, fresh raw leaves, and dried leaf powder per 100 g of edible portion [29].

Nutritional Analysis		**Fresh**	**Dried**
Vitamins	**Pods**	**Leaves**	**Leaves**
Vitamin A - B carotene (mg)	0.100	6.800	16.3
Vitamin B – Choline (mg)	423.0	423.0	-
Vitamin B1 – Thiamine (mg)	0.100	0.200	2.60
Vitamin B2– Riboflavin (mg)	0.100	0.100	20.5
Vitamin B3 – Nicotinic Acid (mg)	0.200	0.800	8.20
Vitamin C – Ascorbic Acid (mg)	120.0	220.0	17.3
Amino acids contents	**Pods**	**Leaves**	**Leaves**

Arginine (mg)	360.0	406.6	1325
Histidine (mg)	110.0	149.8	613
Lysine (mg)	150.0	342.4	1325
Tryptophan (mg)	80.00	107.0	425
Phenylalanine (mg)	430.0	310.3	1388
Methionine (mg)	140.0	117.7	350
Threonine (mg)	390.0	117.7	1188
Leucine (mg)	650.0	492.2	1950
Isoleucine (mg)	440.0	299.6	825
Valine (mg)	540.0	374.5	1063
Moisture (%)	86.90%	75%	7.50%
Calories	26.00	92.00	205.0
Protein (g)	2.500	6.700	27.10
Fat (g)	0.100	1.700	2.300
Carbohydrate (g)	3.700	13.40	38.20
Fiber (g)	4.800	0.900	19.20
Minerals (g)	2.000	2.300	-
Calcium (mg)	30.00	440.0	2003
Magnesium (mg)	24.00	24.00	368.0
Phosphorous (mg)	110.0	70.00	204.0
Potassium (mg)	259.0	259.0	1324
Copper (mg)	3.100	1.100	0.600
Iron (mg)	5.30000	0.7	28.20
Oxalic acid (mg)	10.00	101.0	0.00
Sulphur	137.0	137.0	870.0

RESULTS AND DISCUSSION

The results of the chemical composition and characteristics of M. *peregrina* seeds and seeds oil revealed that seeds contain 1.8% moisture, 54.3% oil, 22.1% protein, 3.6% fibers, 15.3% carbohydrate and 2.5% ash, while as composition and characteristics of the extracted oil were determined by GLC of methyl esters of the fatty acids shows the presence of 14.7% saturated fatty acids and 84.7% unsaturated fatty acids. The fatty acid composition is as follows (%): palmitic 9.3, palmitoleic 2.4, stearic 3.5, oleic 78.0, linoleic 0.6, linolenic 1.6, arachidic 1.8 and behenic 2.6. Therefore, certainly M. *peregrina* has potential power as a new source of fat and protein [13].

The phytochemical analysis done by Asghari et al. [35] revealed that the leaves and seeds of M. *peregrine* contain appropriate quantities of vitamin C (83 and 14 mg/100 g/DW; and Vitamin A: 6.8 ± 0.7 and 24.8 ± 0.7 mg/100 g/DW, respectively and also calcium content where 764.8 and 1164.8 mg/100 g/DW and potassium content was 900.2 and 572 mg/100 g/DW, respectively. This led us to suggest that Maringa leaves and seeds for sure is very good sources for vitamin C, A and calcium plus

potassium and that is for sure will support strongly the human immunity against COVID-19 infection.

The antimicrobial activity of *Moringa* seeds oil extracted with n-hexane was tested by Lalas et al. [36] against *Staphylococcus aureus*, *S. epidermidis*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Enterobacter cloacae*, *Klebsiella pneumoniae*, *Candida albicans*, *C. tropicalis* and *C. glabrata*. The oil showed a very good effect against all of the tested microorganisms. Results of this study by Lalas et al. emphasized that oil of *Moringa peregrina* has a biological effect as antibiotic drugs therefore we suggest it to be used as a neutral drugs.

Volatile constituents of *Moringa peregrina* seed and leaf were analyzed by Afsharypuora et al. [37] using GC and GC/MS and results showed that five glucosinolate degradation products which constituted almost the whole isolated oil of the seed kernel were identified to be: isobutyl isothiocyanate (94.0%), isopropyl isothiocyanate (4.9%), Sec-butyl isothiocyanate (0.5%), n-butylisothiocyanate (0.5%) and benzyl isothiocyanate (<0.1%); whereas the volatile isoth-iocyanates which constituted also almost the whole isolated oil of the leaf were found to be: isobutyl isothiocyanate (88.5%), isopropyl isothiocyanate (10.2%), n-butylisothiocyanate (0.4%) and sec-butyl isothiocyanate (<0.1%) Afsharypuora et al. [37].

The Investigations which have been done by Elbatran et al. [38] on *M. peregrina* aerial parts showed isolation and identification of 4-flavonoidal compounds, quercetin, quercetin-3-0-rutinoside (rutin), chrysoeriol-7-0-rhamnoside 6,8,3 ' ,5 ' -tetramethoxy apigenin. The defatted alcoholic of *M. peregrina* for 30 days induced significant decrease in serum glucose, liver enzymes, and lipid components. It also exhibited marked analgesic properties.

Eventually, the traditional uses, pharmacological efficacy, and Phytochemistry of *Moringa peregrina* have been reviewed by Senthilkumar et al. [11]. Their comprehensive and updated review reported that *Moringa peregrina* used in folk medicine for many human health care purposes including diabetes, wound healing, disinfectant, fever, constipation, muscle pains, slimness, burns, labor pain, hypertension, malaria, stomach disorder, asthma, skin problems, and to expel a retained placenta. In addition to medicinal value as antioxidant, anti-microbial, anti-diabetic, anti-spasmodic, hypertension, hepatotoxicity, lipid lowering activity, anti-inflammatory, anti-cancer, and memory disorders. Also, Senthilkumar et al. concluded the effect of *Moringa* can be seen as anti-microbial, anti-oxidant, anthelmintic, anti-mutagenic, neuroprotective, anti-cancer, anti-hypertensive, anti-diabetic, anti-infective, anti-allergic, anti-inflammatory, herbicidal, lipid lowering potential, anti-trypanosomal, and cytotoxic activities. Therefore, we suggest that plant species can be used as natural drug for protecting human and increased immunity for people against corona virus COVID-19 [39].

CONCLUSION

Now-a-days, there is a very important race for producing a vaccine for corona virus (COVID) and the entire world waiting that vaccine. In fact, no good treatment or vaccine produced yet to overcome the problem and stop infection and death cases. Therefore, we suggest this plant species for supporting people lives against this deadly virus. *M. peregrina* has a very amusing cultural heritage of traditional medicinal practices between the Bedouin and rural people of North Africa and Arabian Peninsula to treat numerous illnesses. The previous studies which have been done in the last forty years on *Moringa* generally and specifically on *M. peregrina* proved many pharmacological activities which are interrelated to traditional uses and the main classes of active compounds. In this paper, full information about the traditional uses, pharmacological value and isolated bioactive molecules from *M. peregrina* are acknowledged in order to provide combined information for using this information in folk medicine and more research future research. In conclusion, we recommend using the seeds of *Moringa peregrina* for treating the people who ate isolated in home and suspected that they are infected to take this seeds in their natural meals; this will increase the immunity in their body and protect them from getting worse. In the mean time we should have more studies in details about using these seeds for treating the already infected cases with corona virus (COVID-19).

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