

Responses of Alzheimer's disease to some Egyptian medicinal plants

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Abstract

Alzheimer's disease is a progressive disorder that causes brain cells to waste away and degenerate. Alzheimer's disease caused by dementia and a continuous decrease in thinking, behavioral, and social skills that take out a person's ability to function clearly. The early signs of the disease due to forgetting later events or conversations. According the disease progresses, a person with Alzheimer's disease will develop strong memory distorting and lose the ability to carry out everyday officials.

Alzheimer's disease medications improve symptoms or slow the rate of decrease. These treatments could help people with Alzheimer's to maximize function and maintain independence. There no treatment that cures Alzheimer's disease or changes the disease process in the brain. With advanced stages of the disease, complications from strong loss of brain function, such as dehydration, malnutrition and infection drive to death. It found that numerous medicinal plants, which described in old literature of Arabic traditional medicine, help to cure Alzheimer's disease (AD) and to strengthen memory.

Traditional medicinal plants played a principal role in the making of mother interest treatment of cancer and infectious diseases for the last four decades. Many natural products noted as important tools for drug development, despite advances in combinatorial chemistry. Egyptian flora is the most diverse in the world, becoming an interesting spot to prospect for new chemical leads or hits due to its species diversity. There are many programs established in Egypt as a strategy to identify potentially active substances. High methods of techniques used for the analysis of large extracts in a relatively short period and considered one of the most efficient ways to find new drives for natural products. Some of the Egyptian medicinal plants, such as *Capsicum annuum*, *Citrus limon* (L.) Burm, *Daucus carota*, *Ficus carica*, *Psidium guajav* and *Solanum lycopersicum*. will clarificate in the present review article.

Keywords: Egyptian, Medicinal plants, Alzheimer's, Disease.

1. Introduction

Alzheimer's disease (AD) is a disorder generative disease affecting older adults, about 24 million World population suffer from dementia, in which majority of patients have AD. AD described by memory loss, behavior deterioration, weakness impairment, and thought slowness. Mental and neural dysfunction occurs due to the accumulation of oxidative damage to nucleic acid, protein, and mitochondria in the brain. In Egypt, a survey conducted on 1,993 people above 64 years of age regarding subjective memory complaints. Cognitive performance, mood, sex, education and age are associated with the prevalence. Reports on 24% of people between 65 and 69 years of age cleared increase of 59% in people up to 90 years or above group. EMC are 52.8% in people with anxiety and depression. Severe psychological stress or drug use can cause amnesia. Various allopathic medicines prescribed in AD, but they exert side effects. Therefore, herbal medicine could be a good source of drugs for the treatment of

AD and memory deficit with fewer or no side effects. Medicinal plants represent an important part of disease remedies in economically weak regions of the world, such as Africa. The South Mediterranean region, including Egypt, is a rich source of medicinal plants that have several uses as alternative medicine across history.

Forever recent scientific advancements and the world, the system of traditional medicine and complementary alternative medicine considered a primary healthcare modality in resource-constrained healthcare settings. Herbal medicinal systems purposed and established through empirical observation and trial and error experiments since time immemorial to maintain good health and alleviate ailments and diseases. Earlier, the importance of traditional medicinal plants and phototherapy often disregarded and undervalued. Presently revitalization and renewed interest in traditional medicinal plants noticed among the public and scientific community. The cooperative efforts of ethnobot-

anists, anthropologists, pharmacists, and physicians could be a workable strategy to evaluate and validate the usage of traditional medicinal plants with modern scientific methods and innovative techniques. Furthermore, conducting clinical trials to assess their efficacy and human safety is imperative and must done.

The use of medicinal plants as a fundamental component of the African traditional healthcare system is perhaps the oldest and the most assorted of all therapeutic systems. In many parts of rural Africa, traditional healers prescribing medicinal plants are the most easily accessible and affordable health resource available to the local community and at times the only therapy that subsists. Nonetheless, there is still a rare of updated comprehensive compilation of promising medicinal plants from the African continent.

1.1. Egyptian medicinal plants and Alzheimer's disease.

Capsicum annum: Sweet pepper is a non-pungent chili of the *Capsicum annum* species and is an important ingredient in daily diets due to its characteristics such as pungency, aromas, and flavors. Sweet pepper is a rich source of bioactive compounds such as phenols, carotenoids, and flavonoids, which can promote potential health benefits against various non-communicable diseases, sweet peppers or bell peppers (*Capsicum annum*) belong to the Solanaceae Juss family, they have been reported to contain many significant bioactive compounds, such as phenolic compounds, carotenoids, ascorbic acid, tocopherols, and capsaicin [1]. Types and quantities of bioactive compounds differ among different colored sweet peppers. For example, chlorophyll is higher in unripe green peppers than in ripe orange, yellow, and red peppers [2]. This chlorophyll structurally modified into new pigments, such as red or yellow carotenoids (xanthophyll- and anthocyanin-related pigments) [3]. These phytochemicals provide many potential health benefits, especially phenolic (phenolic acids and flavonoids).

Cleared that the phytochemicals in sweet peppers mainly act as antioxidants, which can prevent the occurrence of some oxidative stress-related diseases, such as cancer, cardiovascular disease, and neurodegenerative diseases [4].

Capsaicin is the major pungent ingredient in hot chili peppers and is a highly selective agonist for the transient receptor potential. Physiologically, capsaicin known for its ability to cause pain and the sensitization of both peripheral and central nerves (leading to symptoms mimicking neuropathic pain, such as allodynia, secondary hyperalgesia, referred pain area, and visceral hyperalgesia). It less well known that capsaicin can induce desensitization and the withdrawal of epidermal nerve fibers. The effects of capsaicin are dependent on the dose and route of administration [5]. Chilli peppers have used for a broad range of therapeutic applications in Indian, Native American, African, and Chinese medicinal traditions for the treatment of rheumatism, and arthritis, [6]. For many years, investigators have known that free radicals could cause cell degeneration, especially in the brain. The brain and nervous system particularly showed oxidative stress due to limited antioxidant capacity they added that the

brain makes up about 2% of a person's mass but consumes 20% of their metabolic oxygen [7]. The wide majority of this energy used by the neurons. Some brain cells, like neurons, cannot make glutathione, but instead rely on surrounding astrocyte cells to provide useable glutathione precursors, because the brain has limited access to the bulk of antioxidants produced by the body, neurons are the first cells to be affected by a shortage of antioxidants, that most susceptible to oxidative stress [8]. High levels of both Cu and Fe, with relatively low levels of Zn and Mn, do an important role in brain cancer and in degenerative diseases of the brain (Parkinson and Alzheimer's diseases, multiple sclerosis, etc.) [9].

Citrus limon (L.) Burm: Lemon is the common name and belongs to the family Rutaceae. It is rich in vitamin C, bioflavonoids, acids and volatile oils; it also contains coumarins such as bergapten, which sensitizes the skin to sunlight. Bergapten is sometimes added to tanning preparations since it promotes pigmentation in the skin, though it can cause dermatitis or allergic responses in some people he added that Some of the plants more recent applications are as sources of anti-oxidants and chemical exfoliants in specialized cosmetics [10]. Cited that the bioflavonoids in the fruit help to strengthen the inner lining of blood vessels, especially veins and capillaries, and help counter varicose veins and easy bruising [11]. Arranged that Citrus fruits used as fresh, also to produce jams, juices, beverage, and canned products, whereas their essential oils (EOs) used in perfumes and cosmetics as well as in several pharmaceutical formulations as antimicrobial and antifungal [12]. Cleared that Citrus fruits are rich sources of nutrients and no nutrient molecules. Among the first group, macronutrients, such as sugars and dietary fiber, and micronutrients, such as potassium, folate, calcium, thiamin, niacin, vitamin B6, vitamin C, phosphorus, magnesium, copper, riboflavin, and pantothenic acid, are the most abundant ones [13].

However, added that secondary metabolites such as flavonoids, alkaloids, coumarins, limonoids, carotenoids, phenol acids, and volatile compounds such as terpenes and alcohols are the principal bioactive compounds and the most active for their health benefits, such as antioxidant, radical scavenging, anti-inflammatory, and cardioprotective effects [14].

Indicated that Acetylcholinesterase (AChE) regulates the concentration of the transmitter at the synapse by hydrolyzing and inactivating Acetylcholinesterase [15]. Inhibitors of this enzyme have therapeutic applications in diseases linked to a deficiency in ACh (Alzheimer's disease, senile dementia, ataxia, myasthenia gravis, and Parkinson's disease). Due to its structural similarity to ACh, sinapine (sinapoyl choline) considered and active as a potential AChE inhibitor. They added that sinapine could significantly inhibit AChE activity in vitro, being more effective in a cerebral homogenate of rats. Because of the high content of sinapine in Citrus limon. Tested aqueous extracts and found that both extracts exhibited a concentration-dependent AChE inhibitory activity [16]. For (Citrus limon (L.) Burm.f.) extract containing 72.8 µg/mL sinapine. They added that sinapine significantly inhibited AChE in rat cerebral homogenate and rat blood se-

rum. Perry et al, 2000, illustrated that Citrus has neurodegenerative disorders [17].

Daucus carota: Carrots are a multi-nutritional food source; they are an important root vegetable, rich in natural bioactive compounds recognized for their nutraceutical effects and health benefits. The four types of phytochemicals found in carrots, namely phenolics, carotenoids, polyacetylenes, and ascorbic acid. These chemicals help in the risk reduction of cancer and cardiovascular diseases due to their antioxidant, anti-inflammatory, plasma lipid modification, and anti-tumor properties. Numerous factors influence the amount and type of phytochemicals present in carrots. Genotype and color differences play an important role; high contents of α and β -carotene are present in orange carrots, lutein in yellow carrots, lycopene in red carrots, anthocyanin in the root of purple carrots, and phenolic compounds abound in black carrots. Found that oxidative stress plays an important role in both the initiation and progression of neurodegenerative diseases, such as Alzheimer's [18]. Therefore, much attention to antioxidants to develop therapeutic strategies against neurodegenerative diseases. Published that fruits and vegetables are rich sources of nutrients that contain phytochemicals, also known as bioactive ingredients, and have nutrition effects and health benefits [18].

Discovered that natural substrates for biotransformation could be pure compounds isolated from plant extracts or major components of essential oils representing the major constituent of the essential oil of carrot fruit (*Daucus carota* L.) (67 percent) [19]. Added that extract of carrot fruit due to enhancement in memory and cognitive functions in aged and young mice [20]. Consequently, it could consider a useful anti-Alzheimer agent. Moreover, showed an in-vitro anti-inflammatory effect through the inhibition of cyclooxygenases [21]. Cited that Carrot fruit essential oil of both *D. carota* L. var. *sativus* and var. *boissieri* growing in Egypt showed in-vitro anti-inflammatory activities via inhibiting both prostaglandin E2 and 5-LOX [22]. Vasudevan and Parle, published that *Daucus carota* extract (carrot) runback the amnesia induced by scopolamine and diazepam besides significantly reducing the brain acetylcholinesterase activity [23].

Ficus carica: The common name is Fig; it belongs to the family Moraceae, cultivated in the Mediterranean region. The fruit eaten fresh or dried; fruits considered a source of calcium, sugar, iron, copper, carbohydrates, potassium, and vitamin A. In addition, Buenrostr et al, arranged that its fruit contains vitamins, minerals, carbohydrates, and phenolic compounds such as phenolic acids, flavonols, and flavones, which play an important role in its therapeutic efficiency [24]. reported that the Ficus bark enhanced memory in rats and added that Ficus (250 and 500 mg/kg) significantly increased acetylcholine levels in the hippocampus of rats. They illustrated that it has the potential to treat memory deficits in patients with AD. Its fruits (figs) and leaves present important nutritional components (vitamins, minerals, sugars, amino acids, etc.) and health-related effects due to their phytochemical composition. They added that numerous bioactive ingredi-

ents, such as phenolic compounds (phenolic acids), flavonoids (flavonols, flavones, and anthocyanins), coumarins, sterols, and volatiles (monoterpenes, sesquiterpenes, nor isoprenoids, ketones, alcohols, esters, etc.), *Ficus carica* is a species of great antioxidant nutritional value comprising a protective mechanism against innumerable health disorders related to oxidative stress as well as Alzheimer's disease.

Used normal and modern isolation and characterization techniques to identify of about 126 chemical constituents, based on the nature of the fruit, the chemical constituents are divided into eight categories: hydroxybenzoic acids, hydroxycinnamic acids, flavonoids, coumarins, furanocoumarins, volatile constituents, triterpenoids, and miscellaneous [25]. Lee et al, added that the aroma and quality of the FC leaves are dependent on volatile constituents the plant phenolic are known to exhibit a wide spectrum of activities in the pharmaceutical science [26]. Selvaraju et al., (2014) found that figs could improve memory related behavioral deficits, reducing the A β and oxidative damage and enhancing the antioxidant system in AD transgenic mice [27]. Protection from A β mediated oxidative damage in the brain potentially considered as a promising strategy for therapeutic intervention in AD; they added that the figs diet seems to be an effective modifying therapeutic strategy for AD.

Psidium guajava: *Psidium guajava* is an important leaves and the bark food crop and medicinal plant in tropical and subtropical countries is widely used as food and in folk medicine around the world and returns to a comprehensive of the chemical constituents, pharmacological, and clinical uses. Different pharmacological experiments in a number of in vitro and in vivo models carried out. Also identified the medicinally important phyto-constituents, a number of metabolites in good yield and some shown to possess useful biological activities belonging mainly to phenolic, flavonoid, carotenoid, terpenoid and triterpene. Extracts and metabolites of this plant, particularly those from leaves and fruits possess useful pharmacological activities. *P. guajava* mainly known for its antispasmodic and antimicrobial properties in the treatment of diarrhoea and dysentery and has been used extensively as a hypoglycemic agent. Many pharmacological studies have demonstrated the ability of this plant to exhibit antioxidant, hepatoprotection, anti-allergy, antimicrobial, antigenotoxic, antiparasitic, cytotoxic, antispasmodic, cardioactive, anticough, antidiabetic, anti-inflammatory and anti-noiceptive activities, supporting its traditional uses.

That leaves, and the bark of guava plants have widely used in the treatment of various ailments [28]. Meanwhile cleared that phytochemicals and natural antioxidants have shown to counter chronic diseases, as they possess anticancer and antidiabetic properties and therefore reduce risks of contacting and developing Alzheimer's disease, age-linked diseases, prevent liver injuries and cataracts due to their antioxidative and anti-inflammatory properties [29]. Moreover, the fruit has hepatoprotective effects according to they added that the leaf extracts have been used for years to treat various diseases in ethno medical practices due to their high levels of flavonoids mainly quercetin [30]. found that the treatment

of Alzheimer's disease (AD), using natural products, and increase acetylcholine levels which necessary for memory function [31]. concluded that acetylcholine is a neurotransmitter that is important for healthy memory and mental health problems that compresses memory loss directly or indirectly with relation to acetylcholine, they added that low levels of this neurotransmitter have shown to have a principal role in the pathogenesis of AD [32].

Solanum lycopersicum L: Tomato (*Solanum lycopersicum* L.) is one of the most important worldwide agricultural crops. Tomato fruits are rich in a plethora of natural antioxidant compounds including vitamins, phenolics, mainly flavonoids, and carotenoids, particularly lycopene. The demand for natural carotenoids is increasing because of the broad commercial opportunities offered by such bioactive pigments due to their dyeing and functional properties; the increasing consumer awareness of the direct relationship between natural antioxidant intake and health and the widespread industrial use as ingredients in dietary supplements, pharmaceuticals, fortified foods and animal feeds.

Tomato (*Solanum lycopersicum* L.) is an important crop cultivated and consumed worldwide. The fruit can either be eaten raw or as an ingredient in many dishes and drinks. Tomatoes and tomato-based foods provide a wide variety of nutrients and other health-related benefits to the human body. Tomato compared to other fruits contains higher amounts of lycopene, a type of carotenoid with anti-oxidant properties, which is beneficial in reducing the incidence of some chronic diseases such as cancer, osteoporosis, dementia, Parkinson's disease, Alzheimer's disease and all kinds of cardiovascular disorders.

Cited that tomato leaves are valuable sources of bioactive compounds for the management of Alzheimer's disease and diabetes mellitus [33]. Found that tomato carotenoids showed more efficient superoxide anion scavengers than phenolic compounds, which had a superior ferric reducing ability; they added that ACE inhibitory activity of pomace hydrophilic extract was significantly higher at a concentration of 10 mg/mL. Referred to the dietary recommendations in recent years that proposed an increase in the consumption of foods containing phytochemicals, provide benefits for human health and play a principal role in the prevention of chronic diseases [34, 35]. cleared that one of the world's greatest plants is *Solanum lycopersicum* L. (tomato), which considered nutraceutical repack to its antioxidant activity because it considered an important source for chemical compounds, specifically secondary metabolites with antioxidant action, such as polyphenols, hydroxycinnamic acids, carotenoids and vitamins, besides others [36]. In addition, illustrated that these compounds modulate metabolic processes in the human body and show gave benefits on human health, and they could prevent the generation of reactive species that affect, besides other causes on the onset of cardiovascular diseases and neurodegenerative diseases [37].

2. Conclusion

Medicinal plants contain various phytochemical compounds, which are extractable and used as raw materials for different scientific surveys. Various secondary metabolites from plants are commercially principal and used in pharmaceutical industries. Recently, medicinal plants had wide acceptance because of their rare side effects compared to synthetic medicines and the necessity to meet the requirements of medicine for the increasing human population. However, steady supply of source materials often becomes difficult due to various factors like diverse geographical distribution, environmental changes, cultural practices, labor cost, and selection of superior plant stock when exposed by pharmaceutical industries, many discoveries reported that medicinal plants benefit in Alzheimer's disease treatment [38-42].

It hoped that the strong knowledge base of Ayurveda coupled with combinatorial sciences, high-throughput screening techniques will improve the usability with which Ayurvedic products, and formulations used in drug discovery campaigns and development processes, thereby providing new functional leads for AD and other age-associated neurodegenerative diseases. The lack of effective therapies in connection with the predicted dramatic increase in AD cases in the coming decades evokes the demand for new drug candidates. Numerous direct and indirect activities of traditionally used plants and their constituents that help features of AD reported recently. The use of herbal medicines in the treatment of AD compared with the pharmacological treatment currently in use. Such studies must include the identification of the active principle in order to improve the validation of the clinical trial. Further large-scale, multicenter studies are necessary to determine the effectiveness of these substances in the cognitive deterioration of AD. Moreover, the use of medicinal plants or their ingredients is rare in the side effects in comparison with the chemicals. Medicinal plants are also very cheap.

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