

Therapeutic Potentials of Bioactive Compounds in Some Species (Amberboa Tubiflore, Anacyclus Clavatus and Anvillea Garcinii) in the Family Asteraceae

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Abstract

Original Research Article

The plants worldwide used as a traditional medicine for treating of several disorders. Many biological activities have been achieved by a large number of secondary metabolites which extracted from these medicinal plants. The bioactive compounds presented in a different concentration in this plant family according to the reagent used for extraction. In this study we concentrate on three species from the family Asteracea which collected from a specific area in Libya. The active compounds have been isolated by using different types of reagent. Also in this research, we have summarized the pharmaceutical prospecting of natural compounds such flavonoids, sesquiterpenes, fatty acids, lignans, sterols and other metabolites isolated from the genus Amberboa, Anacyclus and Anvillea and their progresses in biotechnological applications as pharmaceuticals for the three species.

Keywords: Therapeutic, Potentials.

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INTRODUCTION

The family Asteraceae one of the largest plant families contain about one thousands genera and twenty thousand species [1]. Symptoms of several neuropsychiatric diseases are relieved by plants from the Asteraceae family [2]. Naturally occurring secondary metabolites are widely distributed in nature and have diverse significant biological activities [3, 4]. The pharmacological activity of many members Asteraceae due to presence of important phytochemical compounds such as polyphenols, flavonoids, and diterpenoids [5, 6]. Several studies revealed the antibacterial, antifungal, anti-inflammatory, insecticide, and antitumor capacities of Asteraceae species. More over many types used for skin diseases such as *Artemisia afra* Jacq used for wound healing [7], *Artemisia dubia* L. used to cure scabies and other skin infection [8], *Centaurea nigra* L. used also for wound healing [9] and *Agreratum conyzoides* Linn, Leaf juice is used on skins scars and Leprosy [10]. The genus *Amberboa* also belongs this family and contain six species, *Amberboa ramosa* Jafri, which is an annual herbaceous plant found in India and Pakistan. The plant has cytotoxic and antibacterial activity [11]. Many

bioactive compounds reported from the *Amberboa* ramose such as, flavonoids, steroids, and triterpenoids [12]. Butyrylcholinesterase inhibition may be an effective tool for the treatment of Alzheimer's disease (AD) and related dementias [13]. These inhibitors may act as drug potentials in the discovery and reducing memory deficiency in Alzheimer's disease patients by potentiating and affecting the cholinergic transmission process [14].

Amberboa tubiflore

This one of five species found in Libya in Zawia region, the plant is annual herbaceous this type contain flavonoids, alkaloids, tannins, coumarins and terpenes. In this study many reagents used to extract these bioactive compounds. In India grows *Amberboa* ramose where the previous study reveals presence of long chains ester 1 and 2 [15]. Tyrosinase is a copper containing enzyme which presented in animal and plants, which is a key enzyme in a melanin biosynthesis process in animals and plants. There for inhibitors of tyrosinase used in the treatment of dermatological diseases associated with hyperpigmentation, also in cosmetics for whitening and depigmentation after

sunburn [16]. Ester 1 and 2 derived from *Amberboa* *ramosa* showed strong to moderate inhibitory activity against tyrosinase [17]. Many pharmaceutical natural compounds such as flavonoids, sesquiterpenes, fatty acids, lignans, and sterols were isolated from the genus *Amberboa* and they prove the progress in biotechnological applications as pharmaceuticals [15]. Khafagy *et al.* isolated sesquiterpenes lactose with exo-methylene and primary hydroxyl groups from the ether extract of *Amberboa tubuliflora* [18]. It revealed antibacterial activity against *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Bacillus subtilis*. As well as many other compound were isolated from *A. ramosa* such as flavonol glycoside, 7,4 dihydroxy-3,8-dimethoxyflavone 5-O-D-glucoside along with eight known flavonoids such as 6,4 dihydroxy-3,5,7-trimethoxyflavone, 5,7-dihydroxy-4-methoxyflavone, 6,3-dihydroxy-3,5,7,4-tetramethoxyflavone where elucidated by spectroscopic analysis [18]. 6, 4 dihydroxy-3,5,7-trimethoxyflavone, 5,7-dihydroxy-4-methoxyflavone [19, 14, 20]. These compounds displayed weak to moderate inhibition against xanthine oxidase enzyme. Where the hydroxylation of purines particularly conversion of xanthine to uric acid catalyzed by xanthine oxidase. The compounds 5,7-dihydroxy-4-methoxyflavone, 7,4-dihydroxy-3,8-dimethoxyflavone 5-O-D-glucoside were tested for inhibition against xanthine oxidase and found the IC₅₀ values as 408.559, 139.2 and 177.857 M, respectively. It was evident from the results that, glucosidation of phenolic group at C-5 had a marked decreasing effect on the enzyme inhibitory action [20]. Flavonoids occupy an important position among the natural phenols and they widely spread group of natural products. Many diseases investigated to be treated by various classes of flavonoids like, capillary bleeding, increased capillary fragility, diabetes, allergic manifestation, hypertension and cold [21]. Stated that a number of flavonoids have anti-protozoal, anti-inflammatory and an anti HIV-I activities [22].

Anacyclus clavatus

From family Asteracea widely distributed in Libya (Zawia). It contains many bioactive compounds such as flavonoids, terpenes and essential oils. Natural plants essential oils, many research revealed detailed studies on it is antimicrobial potentials. Important antimicrobial effects of various plant extracts against some pathogenic micro-organisms were reported [23, 24]. The essential oils belong to the aromatic plants in the family Asteracea have been cited to have antifungal activity [25]. *Anacyclus clavatus*, one member of this family, widely distributed in Tunisia [26]. Furthermore, *A. clavatus* in traditional folk medicine used for treatment of gastric ulcer (TheFloc'h E). *A. pyrethrum* specie from the same genus has been reported to have medicinal use. The roots of its have been introduced in many pharmaceutical preparations, according to Indian medicine for treatment of sciatica, paralysis, hemiplegia, and amenorrhea [27]. As well as many

previous biological studies revealed an antibacterial, anti-inflammatory, antioxidant and immune stimulating activities for the roots [28]. A methanol extract from *A. pyrethrum* has showed little antibacterial effects against *Staphylococcus aureus* and *Staphylococcus sanguis* [29]. Anacycline is a natural insecticide extracted from *A. pyrethrum* [30]. Significant antibacterial effects showed with a volatile oil determined by terpenoids of *A. clavatus* [31]. In North Africa about 1700 endemic subspecies many of them are specific to Morocco [32]. In North -West Africa and other Mediterranean countries 13 annual and perennial species of *Anacyclus* genus mostly encountered [33]. In traditional medicine many *Anacyclus* species such as *A. pyrethrum*, *A. radiatus*, *A. valentinus*, *A. cyrtolopodioides* and *A. Clavatus* are used. Their pharmaceutical potentials due to the presence of flavonoids, and terpenoids [33, 4, 34]. The roots of *A. pyrethrum* can be used for the treatment of various disorders in human being such as antidiabetic, immunostimulating effect, inhibitory effects, antidepressant activity and anticonvulsant activity memory-enhancing activity, aphrodisiacs, antimicrobial activity, antioxidant, local anesthetic effect, insecticidal effect, interactions with testosterone, interaction with libido, and its interaction with testicles [35].

Anvillea garcinii

From family Asteraceae is small woody shrub, densely branched, 20-50 cm. The leaves triangular, small roughly green-grey in color. Their flowers yellow orange. It usually flowers in spring, but could flower in the year. Used traditionally for symptomatic relief of many illnesses such as cold, digestive problems, indigestion, pulmonary affections. Natural habitat is North Africa and Endemic of Sahara. The plant is dried and crushed then mixed with honey or olive oil or crushed date (to overcome bitterness) is good for colds [36]. *AG* possesses many biological properties there for the plant used as traditional medicine such as anti-HIV, antitumor, hypoglycemic and anti-inflammatory activities [37, 9, 38]. Found as well in desert of Iran and many Middle Eastern countries including Palestine, Egypt and Saudi Arabia [39]. The ethanolic extract of the *Anvillea garcinii* has been showed a hypoglycemic and lipid lowering activity [40]. Previous study on Saudi *AG* has been proved it's a reliable source for flavonoids and sesquiterpenes [41, 36, 42]. Perveen S. *et al.* [43], isolate two new compounds, 9 α -hydroxyparthenolide-9-O- β -D-glucopyranoside, spinacetin 3-O- $[\alpha$ -L-rhamnopyranosyl (1 \rightarrow 6)- β -D-glucopyranoside]-7-O- $[\alpha$ -L-rhamnopyranoside] and three known flavonoids, namely kaempferol 3-Orutinoside, kaempferol 7-O- β -D-glucopyranoside and quercetin 7-O- β -D-glucopyranoside from the leaves of *AG*. The total ethanolic extract of *AG* have been demonstrated a high protection for the gastrointestinal mucosa from lesion induced by ulcerating agents. The protection effect could be due to the cytoprotective effects and an anti-secretory mechanism, which

enhances the mucosal blood flow. These effects could be attributed due to the anti-inflammatory and antioxidant potential of bioactive constituents present in the extract [43]. At inflammatory sites, activated phagocyte NADPH oxidase (NOX2) produced in excess can accentuate inflammatory responses; AG extract was very efficient at limiting NADPH oxidase activation. Therefore AG has strong anti-inflammatory properties which make it a promising candidate for further medicinal application [44]. On the other hand, the important mechanism of action which is responsible for the strong anti-ulcer activity of the ethanol extract of AG is the antioxidant properties of its compounds [45].

MATERIAL AND METHODS

Detection of flavonoids

10 ml of methanol added to 1 mg plant powder then heated in water bath for 5 mints then filtered in test tube, then 5 ml of the extract taken and add to it drops of (ALCL3) where the color is changed to yellow indicating the presence of flavonoids. To make sure 5 ml of the extract taken and add to it drops of KOH and drops of HCL and 0.5 mg of magnesium also added then a red color well appear.

Detection of alkaloids

2.5 mg of the plant powder added to 25 ml methanol then kept in water bath for 5 mints, then the extract filtered then evaporated for a while, then the remnant of extract added to 5 ml of Hcl then heated for 5 mints then kept to cold, then divided to two parts, add the Mayer's reagent to the first part, the second part treated by Wagner's reagent. By the two ways the presence of alkaloids assured by the appearance of the residual, the results assured by using Dragendorff reagent.

Detection of saponins

For saponins detection, 2.5 mg of the plant powder to the boiled water then kept to cold then mixed strongly the positive result indicated by the appearance of the foam depth, if 1cm depth mean (+), if the foam depth 1.5 cm (++) , if the depth is 2 cm indicate the presence of saponins (+++).

Detection of tannins

Add 1 mg of the plant powder to 10 ml of ethanol then put the solution in the evaporated machine then the remnant treated with 10 ml solution of (NaCl 0.9 %), then the solution divided in to two parts:

- Add to the first part 1% gelatin
- Add to the second part FeCL3

With the first part a gelatinous residual will be formed. While with the second part a blue residual were formed in the test tube.

Detection of Anthraquinones

1 gm of the plant powder was taken in the test tube then add 10 ml of (KOH) (concentration 0.5 N), and add to it 1ml of (H2O2) by 0.5 concentration, then put the solution in a boiled water bath for 5 mints then

keep the solution to cold, then the solution was filtered and add to it the citric acid then put the test tube to the isolation then add 5 ml toluene and mix it strongly until two isolated layers were formed then take of the above layer and put it in test tube and add to it 4 ml (KOH) by a concentration 0.5 N when the red color is appeared indicating the presence of Anthraquinones

Detection of coumarins

For coumarin detection, put 1 mg of the plant powder then add drops of distilled water, put a circle by a pencil on (KOH 2N) wet filter paper then keep the paper until dry, then put a filter paper on the Jaffna which then boiled on a bath water for 30 mints then remove the filter paper then will detect a yellow florescent by UV light.

Detection of terpenes

Add 1mg of the plant powder to 10 ml of methanol then, heated on a water bath for 5 mints then filtrate the extract then boiled until dried, then add 10 ml of chloroform then filtered and treated by Libermann-Burchard Reagent carefully on the wall of the test tube if a green circle is formed on the upper part and other one purple in color on the lower part indicate the presence of terpenes.

RESULT AND DISCUSSION

From the chemical analysis of the species under study, the bioactive compounds for each specie where determined. Amberboa tubiflore characterized by presence of flavonoids, alkaloids, tannins, coumarins and terpenes. The anacyclus clavatus, contain flavonoids, alkaloids, saponens, tannins, coumarins and terpenes. As well as the Anvillea garcinii has the same bioactive compounds in a different concentration. The family Asteraceae is the largest one among the other plant families, and more distributed worldwide, where used as food, and medical use. This study concentrates on the detection of the bioactive compounds in some species, Amberboa tubiflore, Anacyclus clavatus and Anvillea garcinii. The results reveal a difference in chemical compound content in these species; Amberboa tubiflore contains fewer amounts of flavonoids by using (AlCl3) as a reagent. Anacyclus clavatus by using (AlCl3) as a reagent containing no flavonoids on the other hand by using (KOH) as reagent, the Anacyclus clavatus contain a larg amount of flavonoids (+++). Anvillea garcinii contain also large amount of flavonoids (+++).

The detection of alkaloids reveals the specie Amberboa tubiflore contain very large amount of alkaloids (++++) by using (DR) reagent but the Anacyclus clavatus contain less amount of alkaloids (+++). As for Anvillea garcinii contain less alkaloid (++) .

The detection of saponens, the results reveal presence of saponens in the plant type Anacyclus clavatus in a weak amount (+). On other hand,

Amberboa tubiflore, Anacyclus clavatus contain no saponens.

The detection of tannins by using the gelatinous reagent, the results reveal Anvillea garcinii appearance of gelatinous residue by a large amount (++++), but Anacyclus clavatus contains less amount (+++), Amberboa tubiflore contains less amount (++) , while by using (FeCl₃) reagent Amberboa tubiflore and Anvillea garcinii contain (+++) of tannins while Anacyclus clavatus contain less amount (+).

The detection of Anthraquinones Anvillea garcinii contain good amount of it (++++), while Anacyclus clavatus contains less amount (++) , but the Amberboa tubiflore containing no Anthraquinones.

The detection of coumarins by the UV light it is clear that, Anacyclus clavatus and Anvillea garcinii contain large amount of coumarins (++++), while Amberboa tubiflore contain less amount (+++).

Detection of terpenes by Libermann-Burchord Reagent reveal Anvillea garcinii contain a large amount (++++), while Amberboa tubiflore contains less amount (++) , also Anacyclus clavatus contains more less amount (+). From the results it is clear that, the three species contain a different concentration of bioactive compounds according to the reagent used.

CONCLUSION

Asteraceae is an important plant family for being a valuable and potential source for the natural products. The species Amberboa tubiflore, Anacyclus clavatus and Anvillea garcinii this research, revealed their content of the bioactive compounds, it's clear that the higher concentration for each constituent depends on the reagent which used. As well as, the literature reviews showed an extraction of an important pharmaceutical compounds and proving their medical use. For next study, these extracted bioactive compounds from Libyan environment need to be test its pharmacological effect.

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