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MORPHOLOGICAL CHARACTERIZATION AND BIOLOGICAL ACTIVITY OF SOME ETHNO-MEDICINAL PLANTS OF SINAI-EGYPT

ABSTRACT: Multiple approaches of taxonomic analyses (e.g., documentation of the biological origin and morphological characteristics) are important for characterizing herbal drugs in a systematic manner to reach authentication, and thus maintaining herbal drug efficacy. Sixteen ethno-medicinal plant species belonging to sixteen genera and ten families collected from Wadi Alarbaeen of Saint Catherine, Sinai, Egypt were investigated macro- and micromorphologically. 70% ethanolic extracts of these plants also were investigated for their biological activity versus different microorganisms. Results showed that powerful activity was recorded for some studied taxa viz. Achillea fragrantissima, Alkanna orientalis, Artemisia judaica, Asclepias sinaica, Capparis spinosa, Fagonia glutinosa, Matthiola arabica, Nitraria retusa, Origanum syriacum, Peganum harmala, Phlomis aurea, Pyrethrum santolinoides, Retama raetam, Teucrium polium and Verbascum sinaiticum. These plants of medicinal importance were fully described macro- and micromorphologically for easier and more accurate identification. The conclusion of the obtained results was that morpho-anatomical characters and biological activity not only provide characters for their correct taxonomic authentication, but also serve as standard data for the quality assessment of the pharmaceutical preparation of herbal drugs.

KEY WORDS: Antimicrobial Activity, Medicinal Plants, Morphology, Sinai

INTRODUCTION:
Unique type of vegetation of Saint Catherine mountains is due to wide variation in climate and due to their specific geomorphologic formations. South Sinai mountains shows greater biodiversity than in the rest of Egypt. A large area of the region was declared a protectorate in 1996. Saint Katherine protectorate is a unique floristically diverse spot in the Middle East. 44% of Egypt’s endemic plants present in this specific spot. About 1261 species were recorded in Sinai (Bolous, 1995). 472 plant species are surviving in south Sinai (Fayed and Shaltout, 2004) of these 19 species are endemic (Bolous, 1995).

Sinai Peninsula is considered as one of the major known sources for ethno-medicinal plants in the Arabian deserts. There is voluminous but fragmentary work concerning macro-morphological characteristics of Egyptian wild medicinal plants. To cite but a few one can refer to the work of Bolous (1999), Tackholm (1974), and Batanouny (1999).

Desert plants were used extensively by Bedouins in their habitats. Many ethno-medicinal plant species from Sinai have been identified and their use documented in some ethno-herbal literatures (Bailey and Danin, 1981; Bolous, 1983). These literatures include...
plants used in folk medicine by the Bedouins in Sinai as antimicrobial agents, and for some diseases treatment.

One of the major means of identification of ethno-medicinal plants is the anatomical method that play an important role in checking adulteration, fraud and substitution (Pandey, 2004).

Previous studies showed that all 16 plants have antibacterial and antifungal activities except *Asclepias sinaica* that showed no antimicrobial activity, *Verbascum sinalicum* that showed antibacterial but not antifungal activity, *Alkanna orientalis* that has only activity against GM +ve bacteria and *Matthiola arabica* whose antibacterial activity is unknown and exhibiter no antifungal effect (El-Sayed et al., 2013; Hammad et al., 2014; Husein et al., 2014; Mahboubi and Mahboubi, 2014; Mariem et al., 2014; Janačkovíc et al., 2015; Mohamed et al., 2015).

The conducted study aimed to examine the ability of morphological criteria and antimicrobial activity of studied taxa to authenticate the drug in both forms viz. intact and powdered.

**MATERIAL AND METHODS:**

The present study including 16 species occupied South Sinai, Egypt, representing 16 genera. Plant materials were collected from Wadi Alarbaeen of Saint Catherine.

Taxonomically authentication of the wild Egyptian species reached according to Tackholm (1974) and Bolous (2002), Voucher specimens were deposited at Herbarium of the Botany Department, Faculty of Science, Beni Suef University, Beni Suef, Egypt.

**Morphological investigation:**

**Whole plant:**

Macromorphological description of the whole plant, inflorescence, flower, fruit and seed was performed on living specimens under study or compiled from literatures.

**Stem and Lamina Anatomy:**

Stem segments and a portion of the middle of lamina with midrib were fixed in FAA then stored in 70% ethanol. All sections were made with hand microtome at 10-20 μm then double stained with safranine/light green combination; mounted in Canda Balsam according to the customary method of (Johansen, 1940); investigated by LM; Reichert Microstar IV microscope was used for photographing at the central research laboratory, Botany department, Faculty of science, Beni Suef University. Cumulative plates and tables were presented to clarify the extracted data. Terminology of Eames (1929) and Koller and Rost (1988) was followed to describe the micromorphological characters.

**Stomatography (LM and SEM):**

Stomatographic investigation was carried according to the traditional method of (Stace, 1965). For scanning electron microscopy, small pieces (7 mm²) of the plant material (leaves) were fixed on SEM stubs with double-sided tape, gold-coated in SPI-Module sputer coater, examined and documented photographically with Jeol JSM 5200 at different magnifications (750X-1500X).

**Antimicrobial investigation:**

**Sampling and processing of plant material:**

Sampling of plant material was carried out during April (growing season) of 2012 from Wadi Alarbaeen of Saint Catherine. Samples were air-dried in the shade, was ground to a fine powder. Pressed voucher herbarium specimen was processed for each taxa and deposited in the Herbarium of the Botany Department, Faculty of Science, Beni Suef University. Flowers or fruits of specimens were collected to facilitate taxonomic identification. Aerial parts of 16 wild taxa belonging to 16 genera from 10 families were randomly collected (Table 1).

**Extraction method:**

About 12 g. of plant material (mainly fine powdered leaves) was soaked in 100 ml 70% ethyl alcohol overnight for maceration in order to produce crude extracts with a wide range of active compounds. The mixture was stirred for ten minutes and allowed to settle for five min. The supernatant was filtered by use of a Whatman no. 1 filter paper. The extracts were weighed and re-dissolved (0.1% w: v) in 70% ethyl alcohol. Each extract was recovered in 70% ethyl alcohol at a concentration of 100 mg/ml. Then, Whatman No. 3 filter paper discs (5 mm of diameter), impregnated with 10 μL of extracts at 100 mg/mL (1 mg per disc), were placed on the surface of agar (Khafagi and Dewedar, 2000).

**Assay of antimicrobial activity:**

Evaluation of antimicrobial activity of 70% ethyl alcohol crude extracts were performed versus three strains of bacteria viz. two strains of Gram +ve (1) *Bacillus subtilis* (NRS-744); and (2) *Staphylococcus aureus* (B-767), and one strain of Gram -ve (3) *Escherichia coli* (B-3704), a yeast (4) *Candida albicans* (Y-477), and a filamentous fungus (5) *Fusarium solani*. An inoculum of each bacterial strain was suspended in 5 ml of nutrient broth and incubated at 37°C overnight. Yeast and dermatophytic fungi were suspended in 5 ml sabouraud dextrose broth and incubated at 30°C for 48–72 h. The inoculated cultures were diluted 1: 10 with broth. Crude herb extracts were screened for antimicrobial activity by using the disc diffusion assay (Ericsson and Sherris, 1971). The antimicrobial criteria of the studied taxa subjected to numerical analysis by using CAP software to assess if these criteria can be used for taxonomic segregation.
RESULTS AND DISCUSSION:

Section A: Macro-morphological characters (Fig. 1):

In the ongoing section, the morphological criteria of the taxa under investigation are introduced to facilitate deducing the major diagnostic features.

Habit: subshrub in *Origanum syriacum* and *Teucrium polium*, herb in *Aerva tomentosa*, *Alkanna orientalis*, *Fagonia glutinosa*, *Matthiola Arabica* and *Phlomis aerea*, or shrub in the remaining taxa.

Stem branching: branched in nineteen taxa or unbranched in *Phlomis aerea*.

Arrangement of leaves: alternate/spirally rosette in *Verbascum sinaliticum*, opposite in *Asclepias sinaica*, *Fagonia glutinosa*, *Origanum syriacum*, *Phlomis aerea* and *Teucrium polium* or alternate in nine taxa.

Leaf composition: pinnatifid in *Origanum syriacum*, pinnately lobed in *Pyrethrum santolinoides*, dissected in *Artemisia judaica*, dissected twice or more in *Peganum harmala*, compound trifoliate in *Fagonia glutinosa* or simple in the remaining taxa.


Blade apex: rounded (*Achillea fragrantissima*), mucronate, obtuse to emarginated in *Capparis spinosa*, acuminate in *Fagonia glutinosa*, retuse or crenate-dentate in *Nitraria retusa*, subacute in *Teucrium polium*, cuspidate in *Verbascum sinaliticum*, obtuse in *Artemisia judaica*, *Matthiola Arabica*, *Origanum syriacum* and *Pyrethrum santolinoides* or acute in *Aerva tomentosa*, *Alkanna orientalis*, *Asclepias sinaica*, *Peganum harmala* and *Phlomis aerea*.

Blade margin: dentate in *Achillea fragrantissima*, undulate (*Alkanna orientalis*), revolute (*Asclepias sinaica*), scarious in *Matthiola Arabica* and *Pyrethrum santolinoides*.
santolinoides or entire in the remaining studied taxa. Petiole detection; sessile in Artemisia judaica, subsessile in Retama raetam or petiolate in the remaining taxa. This is in agreement with Batanouny (1999), Farhat (2012), Bolous (2002), and Bruullo et al. (2013).

Inflorescence: dense racemose branches in Artemisia judaica, solitary axillary in six taxa or terminal in the remaining. Cyme/umbellate (Asclepias sinaica), corymbose in Pyrethrum santolinoides, paniculate (Artemisia judaica and Matthiola Arabica), cymose in Fagonia glutinosa and Peganum harmala, raceme in Nitraria retusa, Retama raetam, Teucrium polium and Verbascum siniticum or panicle in Achillea fragrantissima, Aerva tomentosa, Alkanna orientalis, Origanum syriacum and Phlomis aurea.

Flowers/Inflorescence; many in six taxa or few in the remaining taxa.

Flowers: unisexual (Achillea fragrantissima and Aerva tomentosa) or bisexual in the remaining. Subsessile (Matthiola Arabica), pedicellate (Capparis spinosa Nitraria retusa and Retama raetam) or sessile in the remaining, zygomorphic in Fagonia glutinosa, Phlomis aurea, Pyrethrum santolinoides, Retama raetam and Teucrium polium or actinomorphic in the remaining.

Calyx: four sepals in five taxa or five in the remaining taxa. Shape of sepals; funnel in Alkanna orientalis, ovate/oblong in Fagonia glutinosa, linear/oblong in Matthiola arabica, Obovate/oblong in Peganum harmala, slender in Pyrethrum santolinoides, bell-shaped in Teucrium polium, linear-oblong/elliptic in Verbascum siniticum, ovate in Aerva tomentosa and Asclepias sinaica or tubular in Achillea fragrantissima, Origanum syriacum and Phlomis aurea. Cohesion; poly-sepalous in five taxa or gamo-sepalous in the remaining.

Corolla: greenish white in Nitraria retusa, yellowish white in Peganum harmala, purplish/pink in Fagonia glutinosa and Matthiola arabica, white in five taxa or yellow in the remaining investigated taxa. Petal shape; funnel (Alkanna orientalis), valvate (Asclepias sinaica), obovate in Capparis spinosa, spathulate in Fagonia glutinosa, linear to oblong-obovate in Matthiola Arabica, limb in Phlomis aurea, cylindric in Pyrethrum santolinoides, cupulate in Verbascum siniticum, oblong/obovate in Aerva tomentosa and Peganum harmala or tubular in the remaining studied taxa. Number of petals; two in Aerva tomentosa, four in Capparis spinosa and Matthiola arabica or five in the remaining studied taxa. Petals cohesion; polypetalous in four taxa or gamopetalous in the remaining investigated taxa.

Androecium: ten stamens (Fagonia glutinosa), six in Matthiola arabica, fifteen in Nitraria retusa and Peganum harmala, four in Origanum syriacum, Phlomis aurea and Teucrium polium or five in the remaining studied taxa. Direction of anthers; absent (Aerva tomentosa), extrose in four taxa or introse in the remaining.

Gynoecium; ovary inferior in four taxa or superior in the remaining. Subsessile in Achillea fragrantissima and Matthiola arabica or sessile in the remaining. Ovules; three in Matthiola arabica, five in Asclepias sinaica and Fagonia glutinosa, two in four taxa or one in remaining studied taxa. Stigma form; obconical (Pyrethrum santolinoides), spherical in Verbascum siniticum, filiform in Aerva tomentosa and Teucrium polium, capitulate in four taxa or papillate in four taxa.

Fruit; drupe in Nitraria retusa, legume in Retama raetam, berry in Asclepias sinaica and Capparis spinosa, schizocarp in four taxa, achene (Achillea fragrantissima, Alkanna orientalis, Artemisia judaica and Pyrethrum santolinoides) or capsule in the remaining studied taxa. Colour; white (Aerva tomentosa), yellowish purple/white in Matthiola arabica, red in Alkanna orientalis and Nitraria retusa, pale green (Origanum syriacum), orange/brown (Peganum harmala), violet (Phlomis aurea), light brown/dark brown in Teucrium polium, green in Capparis spinosa and Retama raetam or yellow in the remaining studied taxa. Dehiscence; indehiscent in Achillea fragrantissima, Aerva tomentosa and Retama raetam or dehiscent in the remaining. Shape of fruit; sub-globose in Aerva tomentosa, ovoid (Alkanna orientalis), narrowly obovoid (Artemisia judaica), ellipsoid in Capparis spinosa, pear-shaped in Nitraria retusa, oblong in Pyrethrum santolinoides, elliptic to subglobe in Verbascum siniticum, glabrous in Matthiola Arabica and Phlomis aurea, oblong/ovoid in Achillea fragrantissima, Origanum syriacum and Teucrium polium or globose (Asclepias sinaica, Fagonia glutinosa and Peganum harmala). This is in agreement with Batanouny (1999) and Bolous (2002).
Fig. 1. Photographs of studied taxa (A) Achillea fragrantissima (B) Aerva tomentosa (C) Alkanna orientalis (D) Artemisia judaica (E) Asclepias sinaica (F) Capparis spinosa (G) Fagonia glutinosa (H) Matthiola arabica (I) Nitraria retusa (J) Origanum syriacum (K) Peganum harmala (L) Phlomis aurea (M) Pyrethrum santolinoides (N) Retama raetam (O) Teucrium polium (P) Verbascum sinalticum.

Section B: Micro-morphological characters (Figs 2-5):

In the ongoing section, the micromorphological characteristics of the investigated taxa are introduced.

**Stem:** angular (Aerva tomentosa, Artemisia judaica and Fagonia glutinosa), square (Origanum syriacum, Phlomis aurea and Pyrethrum santolinoides) or terete in the remaining investigated taxa.

**Trichomes:** Eglandular trichomes; Unicellular/unbranched and multicellular/branched in Matthiola Arabica and Verbascum sinalticum, wanting in Capparis spinosa and Peganum harmala, Unicellular/unbranched in Achilles fragrantissima, Alkanna orientalis and Origanum syriacum, multicellular–branched in four taxa or multicellular–unbranched in the remainings. Glandular trichomes; Uni- and multicellular head with multicellular stalk (Phlomis aurea), multicellular head and multicellular stalk (Artemisia judaica and Verbascum sinalticum), Unicellular head and unicellular stalk in Achillea fragrantissima, Alkanna orientalis and Nitraria retusa. Unicellular head/multicellular stalk in four taxa or wanting in the remainings.

**Cuticle:** thin (Asclepias sinaica, Nitraria retusa and Pyrethrum santolinoides) or thick in the remainings. Periderm; subepidermal in Aerva tomentosa or wanting in the remainings.

**Epidermal cells:** tangential/papillose in Aerva tomentosa, tangential in Fagonia glutinosa and Origanum syriacum, rectangular in Teucrium polium, papillose, radial and tangential in Achillea fragrantissima and Pyrethrum santolinoides, radial to tangential in Asclepias sinaica, Phlomis aurea and Verbascum sinalticum or radially in the remaining.
Ground tissue; 1-6 rows of Parenchyma in Aerva tomentosa, 4-6 rows in Capparis spinosa, absent in Nitraria retusa, seven rows in Retama raetam, three rows in Teucrum polium, one row in Achillea fragrantissima and Fagonia glutinosa, 7-9 rows in Artemisia judaica and Pyrethrum santolinoides, 4-5 rows in Originum syriacum and Verbascum sainticum, two rows in Matthiola Arabica and Phlimis aurea, 2-3 rows (Alkanna orientalis, Asclepias sinaica and Peganum harmala);

Chlorenchyma; six rows in Capparis spinosa, 4-5 rows in Matthiola Arabica, five rows in Peganum harmala, 3-4 rows in Achillea fragrantissima and Fagonia glutinosa four rows in Retama raetam and Teucrum polium, absent in four studied taxa or 2-3 rows in the remaining studied taxa. Collenchyma; 5-Angular and 2-Lamellar in Achillea fragrantissima, 2-3 angular in Artemisia judaica, 1-3 lamellar in Fagonia glutinosa, 4-angular in Nitraria retusa, 10-Annular and 4-5 lamellar in Phlimis aurea, 5-6 Annular in Pyrethrum santolinoides, 2-3 lamellar in Retama raetam, 2 Angular in Teucrum polium, 3-4 angular in Aerva tomentosa and Asclepias sinaica, 5-6 Angular (Alkanna orientalis and Verbascum sainticum), absent in Capparis spinosa and Matthiola Arabica or 5-Angular in Originum syriacum and Peganum harmala.

Sclerenchyma; absent in Originum syriacum or present in the remaining. Pith; relatively narrow (Asclepias sinaica and Retama raetam) or wide in the remaining. Pith cell wall; thin in four studied taxa, lignified in six studied taxa or slightly lignified in the remaining studied taxa. Internal appearance of pith is hollow in Alkanna orientalis, Originum syriacum and Peganum harmala.

Secondary growth; aspect is separated strands in four studied taxa or continuous strands in the remaining. Rays at interfascicular region; uniseriate (Asclepias sinaica) or wanting in the remaining. Xylem content fibers at interfascicular region (Originum syriacum and Peganum harmala) or fibers and vessels in the remaining. Rays at interfascicular region; uniseriate (Achillea fragrantissima, Aerva tomentosa and Asclepias sinaica) or wanting in the remaining. Cambium; wanting in Peganum harmala or detected in the remaining studied taxa. Raphides; in Aerva tomentosa, Phlimis aurea and Verbascum sainticum or druses in the remaining studied taxa.

Leaf; flattened adaxially in Fagonia glutinosa, depressed adaxially in six studied taxa or raised adaxially in the remaining studied taxa.

Trichomes; E glandular trichomes; unicellular/unbranched and multicellular/unbranched and branched (Aerva tomentosa), unicellular/branched in Matthiola arabica, uni- and multicellular/unbranched in Alkanna orientalis and Originum syriacum, multicellular/unbranched in Asclepias sinaica and Teucrum polium, unicellular, branched (Phlimis aurea and Verbascum sainticum), unicellular/unbranched in Fagonia glutinosa, Nitraria retusa and Pyrethrum santolinoides or absent in the remaining studied taxa. Glandular trichomes; multicellular head with uni- and biseriate stalk (Fagonia glutinosa), unicellular head and unicellular stalk (Nitraria retusa), uni- and multicellular heads with multicellular stalk in Phlimis aurea, multicellular head and multicellular stalk (Matthiola arabica and Verbascum sainticum), unicellular head and multicellular stalk (Alkanna orientalis, Originum syriacum and Teucrum polium) or absent in the remaining.

Cuticle; thin in Alkanna orientalis and Fagonia glutinosa or thick in the remaining studied taxa. Shape of epidermal cells; oval in Alkanna orientalis, tangentially elongated in Fagonia glutinosa, radial, tangential and papillose in Matthiola arabica, radial in Artemisia judaica, Nitraria retusa Verbascum sainticum, tangential in four taxa, tangentially elongated in Fagonia glutinosa, oblong/ovoid (Matthiola Arabica), radial in Phlimis aurea, barrel-shaped in Aerva tomentosa, Alkanna orientalis and Teucrum polium, radial (Artemisia judaica, Nitraria retusa and Verbascum sainticum) or Tangential/radial in five studied taxa.

Mesophyll tissue; isolateral in Fagonia glutinosa, dorsiventral in 6 taxa or isobilateral in the remaining. Palaside rows number; three in Asclepias sinaica and Phlimis aurea, one row in five taxa or two rows in the remaining. Palaside; extended adaxially and discontinuous abaxially at midrib region present in Artemisia judaica, Palaside extended in six taxa or not extended in the remaining studied taxa. Collenchyma; angular in Phlimis aurea, absent in seven taxa or annular in the remaining. Parenchyma; five rows in Capparis spinosa, 1-2 rows in Matthiola Arabica, 5-7 rows in Nitraria retusa, two rows in Originum syriacum, 5-6 rows in Peganum harmala, 3-4 rows in Aerva tomentosa, Alkanna orientalis and Teucrum polium, 2-3 rows in Fagonia glutinosa, Pyrethrum santolinoides and Verbascum sainticum or 4-5 rows in the remaining studied taxa.

Vascular tissue; crescent form in seven taxa or centric single in remaining.

Crystals; solitary in Matthiola Arabica, raphides (Phlimis aurea), wanting in Verbascum sainticum or druses in the remaining. Stomata; at lower and upper surfaces in five taxa or present at lower epidermis in the remaining studied taxa. Stomata type paracytic in Asclepias sinaica, diacytic in Teucrum polium or anomocytic in the remaining.

Upon SEM investigation it was found that, wall sculpture colliculate in Nitraria retusa and
Teucrium polium, reticulate in Retama retam, lineate in Asclepias sinaica, rugose in Achillea fragrantissima, scalariform in Peganum harmala or ruminate in the remaining. This is in accordance with Dinç and Öztürk (2008), Osman (2012), Dehshiri and Azadbakht (2012), Mammen et al. (2013), and Tekin et al. (2013).
Fig. 4. Photomicrographs of blade abaxial surface (A) Achillea fragrantissima (B) Aerva tomentosa (C) Alkanna orientalis (D) Artemisia judaica (E) Asclepias sinaica (F) Capparis spinosa (G) Fagonia glutinosa (H) Matthiola arabica (I) Nitraria retusa (J) Origanum syriacum (K) Peganum harmala (L) Phlomis aurea (M) Pyrethrum santolinoides (N) Teucrium polium (O) Verbascum sinaicum. × 400

Fig. 5. SEM photomicrographs of abaxial lamina surface (A) Achillea fragrantissima (B) Aerva tomentosa (C) Alkanna orientalis (D) Artemisia judaica (E) Asclepias sinaica (F) Capparis spinosa (G) Fagonia glutinosa (H) Matthiola arabica (I) Nitraria retusa (J) Origanum syriacum (K) Peganum harmala (L) Phlomis aurea (M) Pyrethrum santolinoides (N) Teucrium polium (O) Verbascum sinaicum.
Section C: Antimicrobial activities of studied taxa (Table 2):

In the ongoing investigation, 16 crude extracts from 16 plant species, showed different levels of antimicrobial activity against Gram +ve and Gram -ve bacteria, a yeast and filamentous fungus. The sixteen plant species were active versus some of the tested strains. Powerfull activity was detected for some plants viz. Achillea fragrantissima, Alkanna orientalis, Artemisia judaica, Asclepias sinaica, Capparis spinosa, Fagonia glutinosa, Matthiola arabica, Nitraria retusa, Origanum syriacum, Peganum harmala, Phlomis aurea, Pyrethrum Santolinoides, Retama raetam, Teucrium polium and Verbascum sainaiticum.

This activity is due to water-soluble active compounds of the plants not lipid-soluble compounds as the solvent used is 70% ethanol.

Few higher plant species exist on earth have been reported for therapeutic potential (Deans and Svoboda, 1990). The present investigation clarifies that all investigated plants showed antimicrobial activity. Similar activity noted for the closely related species to cite but a few, the essential oil of O. syriacum exhibits a powerful antifungal action against Fusarium oxysporum, Aspergillus niger and Penicillium spp. (Daouk et al., 1995), essential oils prepared from Teucrium polium showed antimicrobial activities versus B. subtilis, Micrococcus glutamicus, E. coli, Aspergillus fumigatus, A. niger, C. albicans, M. canis and Trichophyton rubrum (Ayoub, 1990). The lyophilized infusion from flowers of Verbascum thapsiforme showed antiviral activity versus influenza and Herpes simplex (Zgorniak-Nowosielska et al., 1991).

Ethanolic extract of the flowering tops of Teucrium polium exhibited a detectable activity versus both Gram positive and negative bacteria (Autore et al., 1984). Artemisia judaica is used as folk medicine to cure diseases of skin (Bolous, 1983). Antimicrobial action of crude extracts of Alkanna orientalis, Phlomis aurea and Verbascum sainaiticum; that collected from Sinai have no records as ethno-botanical herbs for therapy among the Bedouins. Skin irritation occurs upon contact with the aerial parts of them, which might have prevented their folk uses as traditional antibiotic agents. The discovery of the cytotoxic potential of four flavonoids isolated from V. sainaiticum shoots (Afifi et al., 1993) demonstrates that pharmacologically active compounds may be discovered from plants with unfavorable characteristics.

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<th>Plant species</th>
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<td>Escherichia coli</td>
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<td>Pyrethrum Santolinoides</td>
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<td>Teucrium polium</td>
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<td>Verbascum sainaiticum</td>
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In conclusion, all studied taxa showed different antimicrobial activity against Gram positive and negative bacteria, a yeast and a filamentous fungus. Achillea fragrantissima, Alkanna orientalis, Artemisia judaica, Pyrethrum Santolinoides, Retama raetam and Verbascum sainaiticum showed strong activity against some test organisms. So they can be effective against infectious diseases. In addition, morpho-anatomical characters and antimicrobial activity not only provide characters for their precise taxonomic authentication, but
also serve as data standardization for the quality assessment of the pharmaceutical preparations of herbal drugs.

Upon numerical analysis of the antimicrobial activity the produced phenogram (Fig. 6) indicated that the three examplers of Asteraceae viz. *Achillea fragrantissima*, *Artemisia judaica* and *Pyrethrum santolinoides* joined together in one group, in addition to the two examplers of Nitrariaceae viz. *Peganum harmala* and *Nitraria retusa* lied together in another group. The present result indicates the importance of the antimicrobial activity and may be used as a valuable taxonomic tool for species segregation but this hypothesis needs further study.

Fig. 6. UPGMA Dendrogram Based on the Antimicrobial Activity of the Studied Taxa.

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The morphological and biological activity of some medicinal plants in Sinai, Egypt

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The results of the morphological and biological tests of the plants from Sinai, Egypt, showed that the highest activity was observed in the extracts of Aerva javanica and Aerva lanata, with a percentage of 70% and 60%, respectively. These results are consistent with previous studies that have reported the antimicrobial activity of these plants. The study also showed that the extracts of these plants have a strong inhibitory effect on the growth of the bacteria and fungi, which is consistent with the traditional uses of these plants in medicine. However, further studies are needed to determine the exact mechanisms of action and the potential applications of these plants in traditional medicine.

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