



Journal of  
**Plant Sciences**

ISSN 1816-4951



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## Review Article

# Infraspecies Identity of *Verbesina encelioides* (Cav.) Benth. and Hook. (Asteraceae) from Libya

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### Abstract

**Background and Objective:** *Verbesina encelioides* (Cav.) Benth. and Hook. belongs to the family Asteraceae, growing in roadsides and waste places, it was previously recorded as a new addition to the flora of Libya at the generic and species level without determining its infraspecies status. The aim of this study was to determine infraspecies status of this species. **Materials and Methods:** The plant is reported to be widely distributed in Tripoli as roadside, waste places, garden species and in disturbed habitats. Flowering and fruiting specimens of *V. encelioides* were collected from many places in Tripoli and brought to the herbarium of the Department of Botany, Faculty of Sciences, University of Tripoli and subjected to detailed morphological examination, which confirmed that it belongs to subsp. *encelioides*. **Results:** The finding of this study adds a new taxon to the flora of Libya. Information about its morphological features, biology, ecology, distribution and invasiveness were provided. **Conclusion:** In this study, *Verbesina encelioides* subspecies *encelioides* is discovered and recorded in the flora of Libya, which is previously identified and recorded at species level without determining the infraspecies identity, therefore this finding is significant to taxonomists and readers because it adds a new taxon to the flora of Libya.

**Key words:** *Verbesina encelioides*, Asteraceae, golden crownbeard, alien species, invasive species

**Citation:** Mohammed H. Mahklouf and Mohamed N. Abuhadra, 2020. Infraspecies identity of *Verbesina encelioides* (Cav.) Benth. and Hook. (Asteraceae) from Libya. J. Plant Sci., 15: 28-32.

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**Competing Interest:** The authors have declared that no competing interest exists.

**Data Availability:** All relevant data are within the paper and its supporting information files.

## INTRODUCTION

The family Asteraceae in the Libyan flora comprises 97 genera and 237-240 species<sup>1,2</sup> However, there were no herbarium or literature data of the genus *Verbesina* in Libya. This genus is the largest one in the tribe *Heliantheae*, which contains about 300 worldwide species of herbs, shrubs and trees, ranging from Eastern Canada to central Argentina<sup>3</sup>. It is reportedly divided into 12 sections, using characters such as corolla color, inflorescence morphology, capitulum size and ray flowers presence<sup>4</sup>.

*V. encelioides* is a member of the tribe Heliantheae and section *Ximenesia*<sup>5</sup>. It was divided into 2 subspecies (*encelioides* and *exauriculata*)<sup>6</sup>. The native range of *Verbesina encelioides* is generally North and South America, specifically Mexico and the southwestern United States of Texas, Arizona<sup>7-11</sup>. However, it should be pointed out that there exist some discrepancies as to the true native range of *V. encelioides*. Researcher suggests the native range also includes Montana, while the United States Geological Survey lists and describes *V. encelioides* on its webpage for "Native Wildflowers of the North Dakota Grasslands"<sup>9</sup>. Panero and Jansen<sup>3</sup> studies support a North American origin for this genus.

It is a drought tolerant and well adapted invasive species and has successfully naturalized in many warm regions of the world. Its current world distribution includes the 5 continents of America (Argentina, Arizona, Hawaii, Mexico), Africa (Algeria, Egypt, Morocco, Tunisia), Asia (India, Saudi Arabia, Yemen), Europe (Belgium, France, Spain) and Oceania (Australia, Victoria)<sup>12</sup>.

For Europe, Hansen<sup>13</sup> reported its presence as doubtful in Germany, Sweden and Switzerland, while EPPO sources indicate it from Denmark, Spain, UK and Austria<sup>14,15</sup>.

The way and time of its introduction and arrival to Libya remain unknown. However, Sharashy<sup>16</sup> recorded *Verbesina encelioides* as a new record to the flora of Libya without determining its infraspecies status, therefore, the present paper introduces infraspecies status of our collected specimens as subsp *encelioides*.

## MATERIALS AND METHODS

The plant is widespread in Tripoli as a roadside and waste places plant, it was monitored from March-October, 2019, specimens were collected many times from many places in Tripoli within this period (Fig. 1 and 2). The collected



Fig. 1: *Verbesina encelioides*, habit



Fig. 2: *Verbesina encelioides*, heads

specimens were brought to the herbarium and subjected the ordinary herbarium techniques. Plant identification and authentication procedure were carried out at the national herbarium of botany department (ULT), Faculty of Science, University of Tripoli using the data from the following literatures<sup>7,8,15,17,18,20-24</sup>. The specimens were given a voucher number (76107981-NR) and deposited in the same herbarium.

## DESCRIPTION OF SPECIES

*Verbesina encelioides* (Cav.) Benth. and Hook. subsp. *encelioides*.

**Synonyms:** *Verbesina encelioides* (Cav.) Benth. and Hook. f. ex A. Gray subsp. *encelioides* *Ximenesia encelioides* Cav.



Fig. 3: *Verbesina encelioides*, auricles



Fig. 5: *Verbesina encelioides*, central achene



Fig. 4: *Verbesina encelioides*, marginal achene

**Common names:** Golden crownbeard, American dogweed, butter daisy, cowpen daisy, crown beard, crown-beard, crownbeard, gold weed, golden crown beard, golden crown daisy, golden crown-beard, skunk daisy, South African daisy, wild sunflower, yellow top.

Annual herbs are growing up to 150 cm high. Stems are densely short-hairy. Petioles winged, wings dilated at the base to form a pair of stipule-like auricles. Leaf blades lanceolate to triangular-ovate, up to 10×7 cm, 3-veined, with a coarsely dentate margin, covered with appressed fine hairs especially on the lower surface, bases broadly cuneate to truncate, lower leaves are opposite and triangular, while the upper

leaves are alternate and lanceolate. Peduncle subtended by leaf-like bracts. Heads are 2.5-5 cm in diameter, solitary at ends of long peduncles or in clusters of 2-3, paleaceous and involucre bracts 1-2 series, 7-15 mm long, linear-lanceolate to linear, appressed greyish hairy. Palea is 6-8 mm, linear, abruptly acuminate. Ray flowers 10-15/head, yellow, pistillate, rays elliptic-ovate, 1-2 cm long, 3-toothed at apex, disk flowers numerous, 8 mm long, yellow-orange, tubular, 5 toothed, hermaphrodite, achenes flattened, grayish brown, pubescent, with 2 apical long fine appendages 1-2 mm long, achenes of 2 types, marginal achenes sterile, oblong, not winged, 5-6.5 mm long, central achenes obovate, broadly winged, 7-10 mm long including wings<sup>25</sup> (Fig. 1-5),  $2n = 34$ .

**Flowering time:** From April-October.

## RESULTS AND DISCUSSION

*Verbesina encelioides*(Cav.) Benth. and Hook. subspecies *encelioides* has been reported as a widespread weed in waste places and roadsides in many parts of Tripoli. It is easily recognized by its distinguishing characteristics include its opposite (below) and alternate (above) lanceolate to deltoid leaves with a grayish undersurface, winged petioles with ear shape auricles, flattened winged achenes, brightly colored yellow disk florets and large yellow ray florets (10-25 mm), which make the plant look like a small sunflower (*Helianthus* sp.)<sup>26,27</sup>. It can be differentiated from the garden sunflower (*Helianthus annuus* L.) by its opposite leaves on the lower part of the plant and the substantially smaller heads and winged achenes<sup>17,24</sup>.

Sharashy<sup>16</sup> was recorded this species for the first time in the flora Libya at the species level without determining its infraspecific status and he wasn't determined whether his specimens belonged to subsp *encelioides* or *exauriculata*, while our specimens have been determined as a type subspecies *encelioides* which distinguished from subspecies *exauriculata* by ear-shaped auricles, outgrow on each side of the petiole base, semi-ovate and borne on most leaves and achene wing apices acute and phyllaries typically over 12 mm long<sup>5,28</sup>, while in subspecies *exauriculata* auricles oblong, not ear-shaped and mainly restricted to the petioles of upper leaves, achene wing apices obtuse and phyllaries average less than 12 mm long<sup>5,24</sup>.

*V. encelioides* figures on the European Plant Protection Organization (EPPO) observation list of Invasive Alien Plants<sup>29</sup>. It is regarded as a noxious weed in several states of the United States of America<sup>23</sup>. In particular, it is problematic for peanut farmers in southern states of the United States<sup>24</sup>. In Australia, it occurs as a weed of sandy loams along roadsides, stock routes and field headlands and in some woodland communities<sup>30</sup>. In North India, it is a prominent weed infesting field crops and abundant along roadsides and railway tracts and on the wastelands, occurring mostly in sandy and sandy-loam soils<sup>22</sup>. It was recently recorded in Morocco, where it colonizes wastelands, roadside borders and field crops<sup>31</sup>.

More recently *V. encelioides* subsp. *encelioides* was detected in Tunisia in 2011 from agricultural fields and along highway (A1: Tunis-Sfax) at Hencha-Sfax<sup>8</sup>.

The way of its introduction to Libya remains unknown, while in other countries there are reports regarding the introduction of seeds with wool or as contaminants in pasture hay or cereal grain<sup>14</sup>.

It is a drought tolerant erect annual plant, germinating by seeds in early spring or autumn with a main flowering peak from July to November. The plant grows better in disturbed and ruderal zones than in agricultural fields. In fact, however, the plant is easily dispersed and it is likely to establish elsewhere in the semi-arid region. Although *Verbesina encelioides* is a beautiful plant, local people do not use it as ornamental because of its unpleasant smell, in addition, it is a poisonous plant especially for livestock<sup>14</sup>. It can be considered as naturalized but with a high invasive potential favored by the dry climate and by the high proportion of areas with disturbed habitats which requires the implementation of an appropriate management plan, including quarantine and potential eradication.

**Invasive attributes:** A number of characteristics aid in the aggressive qualities of this plant including, ability to withstand drought, ability to handle a wide range of growing conditions,

rapid growth, allelopathic effects on other plants, high seed production and dispersal ability, high periods of seed dormancy and high germination rates<sup>22,32</sup>.

## CONCLUSION

In this study, *Verbesina encelioides* subspecies *encelioides* is discovered and recorded in the flora of Libya, which is previously identified and recorded at species level without determining the infraspecific identity, therefore this finding is significant to taxonomists and readers because it adds a new taxon to the flora of Libya.

## SIGNIFICANCE STATEMENT

Our finding is very important due to its novelty and originality regarding the new record added in the flora of Libya and helps taxonomists to monitor the distribution and spread of this subspecies in Libya and its possible impact to the diversity and natural habitats in Libya.

## ACKNOWLEDGMENT

The study was fully done by the authors without any assistance.

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