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Bidens Pilosa, Invasive Plant of the Family Asteraceae, Morocco Description and Ecology

Hind Elaidi[a]*, Soukayna Boudik[a], Abdelilah Jbilou[a], Nadia Belahbib[a], Lahcen Zidane[a], Ouafae Benkhnigue[b], Jamila Dahmani[a]
Laboratoire de Productions Végétales, Animales et Agro-industrie, Faculté des Sciences, Université Ibn Tofail, Kénitra[a]
Département de Botanique et d'écologie végétale, Institut Scientifique, Université Mohamed V, Rabat[b]
hind.elaidi@uit.ac.ma (ESID 2869 6163 2023)*

Abstract
Invasive plant species are a potential threat to both crops and native flora. Indeed, these species can disrupt ecosystems by competing with native species and occupying their range. It is therefore very important to know these species and their functioning. Among these plants, one species that is particularly present in urban wastelands and in uncultivated areas ; Bidens pilosa. It is native to South America and belongs to the Asteraceae family, which includes nearly 23% of invasive plants. The objective of the present contribution is to provide as detailed description possible of the species, with illustrations and measurements of all parts and organs, especially since all descriptions made so far are incomplete or poorly illustrated. For that, 10 individuals of different destination of the city of Salé and Kenitra were studied and examined microscopically, emphasizing the vegetative and reproductive part of the plant, and from microscopic point of view, showing the pilosity and ackenes.

Keywords:
Biological InvasionAsteraceae, Bidens Pilosa, Botanic description, Morocco

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Introduction

Alien species (ES) are defined as species that are not native to an ecosystem, i.e., introduced. They sometimes become invasive (IAS) and are likely to have environmental, economic and agronomic impacts (IUCN/PACO, 2013). The concept of biological invasion is revealed the first time by Elton (1958) in his book "the Ecology of invasions by animals and plants", since we find more and more works devoted to the problems related to biological invasion (Richardson and Pysek. 2007, Hoffman .2016

This phenomenon is favored by the strong globalization especially with the numerous commercial exchanges with distant countries. Thus, several species have invaded and continue to invade new ecosystems. The study of the impact of IS on ecosystems is the subject of much ecological and biological research (Reichard and Hamilton 1997; Pysek and Richardson 2007; Bucharova and Keulmen 2009; D. Pimentel et al 2001). Knowing the origin of the plant, the history of its introduction, and its invasive potential is the first step towards controlling and limiting invasion by exotic plants (Bucharova and Keulmen,2009; Ben Ghabrit et al 2018)

In Morocco, Tanji and Taleb (1997) listed 12 invasive alien species, a list that was confirmed by Bouhache and Taleb (2012); the latter added more species: 7 as introduced and 10 invasive. Similarly, they cited that 31.1% of invasive alien species originate from the USA, 38% from the Mediterranean basin, 31% from Eurasia and Australia. These proportions testify to the diversity of the origin of products imported by Morocco.

Many contributions have focused on invasive species in Morocco. Recently, Phyllanthus tenellus Roxb, a new species in the flora of Morocco and North Africa, was identified by Khamar et al. (2022); it is a species originating from tropical regions and is becoming naturalized in Morocco.

Result

Bidens pilosus belongs to the genus Bidens, family Asteraceae. Like all composites, the Systematic study of the genus Bidens has really started since the 19th century. And not surprising to find contributions even before; specimens of genus Bidens took a place in botanical systematics thanks to the botanical philosopher Charles Linnaeus (1788). (Sherff .1936,) In Morocco, the genus Bidens is represented by only 3 species (Fennane et al. 2014); B. aureus, a naturalized species that is confined to the western Rif, B. pilosus also naturalized and whose range is expanding and finally B. frondosus considered as a weed (Fennane et al. 2014). It is important to note that this last species has only been reported in the Rif precisely at Bab Taza towards Jbel Lakraa, at 1700 m altitude and at coordinates 35.11899 - 5.20151 (EPPO, 2014; Fennane, 2014; CABI, 2022).

Botanical description:

Bidens pilosus is an annual plant in the family Asteraceae. The average height of the plant is 30-70 cm, sometimes 150 cm (Figure 1 A). The stem is erect, branched, and solid, reddish-green, quadriform, with simple hairs; hispid (Figure 1 D). The leaves are opposite, and composed of 3 sometimes 5 leaflets (Figure 1 C), indented, with the lateral leaves sessile or subsessile and toothed. The flowers are grouped in a compact inflorescence which is the capitulum (figure 1 A), of average size 7 mm. The bracts are in two rows, the external green ones having the same length as the internal black ones, sometimes slightly long. The flowers are radiate, with white ligules, (Figure 1 A). As for the androecium, it is formed of 5 stamens welded at the level of the anthers; it is said to be synanthereous. While the gynoecium is formed by an ovary with a single compartment, a style and 2 stigmas (Figure 1 B), the gynoecium is bicarpellate. The ovary contains a single ovule with parietal placentation. The level of insertion of the ovary is lower than the level of insertion of the

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perianth, so it is an inferior ovary gynoecium as in all Asteraceae.

Figure 1: Bidens pilosa whole plant in a pot with an ornamental plant (a) ; Tubular flower (e) ; leaf with toothed margin; (c) ; hispid stem; (d) capitula; (a) ; achaines : central (large and tapered) and peripheral (small and stocky) (b and f)

The fruits are endowed with polymorphism The most dominant are the central achenes of 1 cm long, while the peripheral achenes, less numerous, are smaller not exceeding 4 mm in length. Both types of achenes have two to four stops, with the presence of nipples at the edge (Figure 1: E,F)

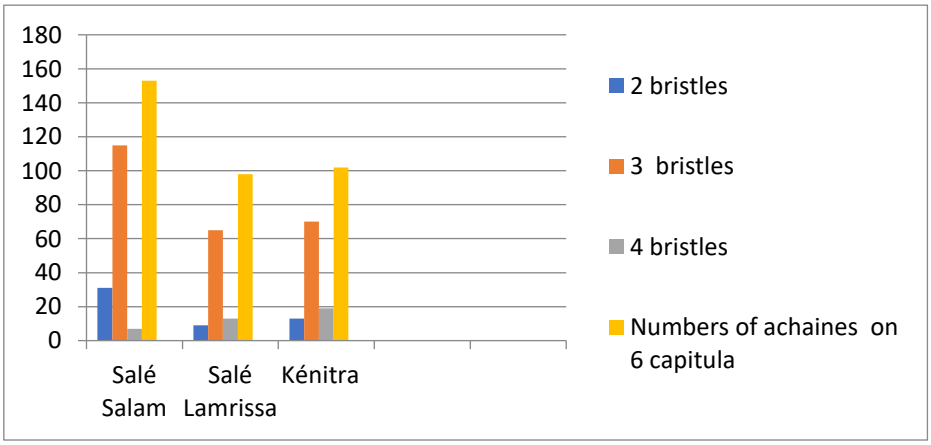

Figure 2: Total different achaines content corresponding on 6 capitula in 3 destinations

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Methods

During recent botanical surveys that we conducted in different parts of the Morocco-Middle Atlantic plant region (Rabat - Sale) (Figure 1), which took place from January to April 2022, we observed an unusual species that we collected for identification. The samples were collected at three sites in the town of **Sale**: neighbored lakwas, in the garden of a college, Coordinate 34°03'03.0"N and 6°48'57.8"W; Said Hajji Ward, in a pot with an ornamental species, 34°04'34.0"N and 6°47'18.7"W and in a public garden 34°04'34.6"N and 6°47'24.9"W. These samples were examined and photographed in the field and in the laboratory. The identification was made through specialized documents (Fennane et al 2014.Muller 2004.Van Damme C 1980) with a binocular magnifying glass. The specimens were deposited in the Laboratory of Crop, Animal and Agro-Industrial Production.

Discussion

The genus Bidens is a large genus, included in the subtribe Coreopsidinea, of Tribe Helianthea; it includes about 235 species, distributed in five geographical areas: Central Pacific Island, North and Central America, West Indies, South America, Africa. (Sherff. 1932), Bidens pilosus is an annual herbaceous plant native to South America and found in all tropical and subtropical regions of the world. The species has been introduced throughout the world, eventually becoming naturalized. (Fennane. 2014; Wittenberg et al. 2006, EPPO. 2014, CABI.2022.). Like all exotic plants, Bidens pilosa exhibits strong allelopathy; a concept originally introduced by Austrian scientist Molisch in 1937. It is a mechanism by which plants release active substances into the environment, acting on their growth and development as well as that of other plants (Yu et al.1991, Arthur et al.2016); allowing it to thrive in almost any environment.

In addition, Khan et al (2009) showed that the species found has an effect on the growth of Echinochloa crus-galli and Raphanus sativus; this effect is due to ethyl acetate acid fraction. Moreover, in the same study, they showed the effect of Polyacetylenes of Bidens pilosa on insect pests.

Due to its chemical composition; rich in flavonoids, polysaccharides, essential oils; the effects of Bidens pilosa; antioxidant, antimicrobial, antiallergic; hypoglycemic, antidiabetic, anti inflammatory have been proved in several contributions (Arthur et al .2012, Horiuchi M et al.2006)

In Africa, Bidens pilosa is used in human food, as a vegetable in several African countries; Sierra Leone, Liberia, Ivory Coast, Benin, Nigeria, Cameroon, South Africa. (Arthur et al.2012).Same author reported that the population

Morphological characters to better characterize each taxon of Bidens, are found in the anatomy of the fruits and microflowers, as well as in the electron microscopy of the achains so chromosomes.

Conclusion

Biological invasion is now a matter of paramount precaution for ecologists around the world, despite the barriers some countries have put in place to protect their ecosystems, the impact of invasive plants on agriculture and the ecosystem is considerable. In Africa, for example, weeds cause reduced agricultural yields (Holou et al). Nevertheless, biological invasion is favored by ecological disturbances

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So, all publications encouraged to call for the management of biological invasion and developing interdisciplinary collaborations.

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