

Boidiversity Of Asteraceae Family in Padusan Ecotourism and Natural Laboratory Area

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Abstract. Padusan is one of the villages in Mojokerto which is branded as an ecotourism and a natural laboratory area. This area has an abundant diversity of flora, one of which is *Asteraceae* family. The research was conducted in July 2023. The purpose of this study was to determine the types of plants from the *Asteraceae* family for the purpose of bioconservation. Data was collected based on exploration technique sampling on five sites. There are 17 species of *Asteraceae* plants in Padusan village, 15 genera and 9 tribe, namely: *Acmella radicans*, *Acmella uliginosa*, *Ageratina riparia*, *Ageratum conyzoides*, *Artemisia vulgaris*, *Bidens alba*, *Bidens pilosa*, *Calyptocarpus vialis*, *Crassocephalum crepidioides*, *Elephantopus mollis*, *Erigeron sp.*, *Galinsoga parviflora*, *Lactuca virosa*, *Sonchus oleraceus*, *Syndrella nodiflora*, *Tithonia diversifolia*, *Youngia japonica*.

1 Introduction

The *Asteraceae* family is the second largest family of the Angiospermae group. The *Asteraceae* family includes about 1620 to 1700 genera and 23000 to 25000 species spread throughout the world and almost inhabit all kinds of environments except Antarctica [5, 7, 12, 13]. This is supported by the unique characteristics of the *Asteraceae* family. The characteristics of the *Asteraceae* family are perennial, habitus can be herbaceous, shrubs or climbers, cup-type inflorescences surrounded by a circle of involucre bractea, has attractive flowers, the florets in the center are tubular, and the florets at the edges are ribbon-type with ligules [4].

Most members of the *Asteraceae* family have beautiful and attractive flowers that make them widely cultivated by the community as ornamental plants. The cultivation activities carried out by the community make members of this family have a relatively high economic value. In addition, the utilization of members of this family is not only as ornamental plants but also used by the community as medicinal materials, ethnobotany and biological agents [2]. The utilization of the *Asteraceae* family as medicinal materials is based on its high

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concentration of bioactive compound components, such as sesquiterpenes, lactones, pentacyclic triterpenes, alcohols, alkaloids, tannins, polyphenols, saponins, and sterols [15]. Examples of utilization of members of the *Asteraceae* family are the stems of *Helianthus* sp. used to treat skin itching, *Gynura procumbens* leaves to treat injuries or body aches and diabetes, *Ageratum conyzoides* leaves to stop bleeding in wounds [8].

Padusan is one of the villages located in Pacet District, Mojokerto Regency. Geographically, Padusan Village is at an altitude of about 190 m above sea level, located in a hilly area and surrounded by rice fields and plantations, has a tropical climate with an average temperature of about 25-30° C. This appearance makes Padusan an ecotourism area and natural laboratory [10]. In addition, it is supported by hot water tourism located on the slopes of Mount Welirang, Grejengan waterfall and Coban Cangu [9].

Today the conditions around Padusan Village have changed a lot, many green areas have been converted into supporting places for natural attractions, thus disturbing biodiversity including the *Asteraceae* family. The *Asteraceae* family is one of the many natural potentials of Padusan Village that has not been noticed. The lack of information about the *Asteraceae* family in this area causes its utilization and conservation to be not optimal. Therefore, it is necessary to conduct a study on the diversity of the *Asteraceae* family to provide information about the plant species of the *Asteraceae* family so that the potential of this plant group can be explored further.

2 Materials and methods

This research used the exploration method, which was carried out by exploring each point of the research location [11]. Sampling was carried out at 5 sampling points, namely around the Padusan Village multipurpose building, around Nabila villa, around the market, around hot spring tourism, and social forest. Sampling was accompanied by mapping of location coordinates and quantifying abiotic factors. Sampling from the *Asteraceae* family at least 1 of each species, attempted in flower. Identification is based on important characters regarding the genus and species in this case morphological characteristics using reference books namely Key to Asteraceae Genera by C.A.Backer 1934, Plant Classification by Lyman Benson, 1957, Families of Dicotyledons by Alfred Gundersen 1950, dan *Flora Pegunungan Jawa* by C.G.G.J. van Steenis 2010.

3 Results

A total of 17 species, 15 genera and 9 tribes of the *Asteraceae* family were found at the research site. Detailed observation data can be seen in Table 1 and the pictures can be seen in Fi. 1 and Fig. 2.

Table 1. Plant Species of the *Asteraceae* Family Found in the Ecotourism and Natural Laboratory Area Padusan Mojokerto

No	Fern Name	Scientific Name	Tribe
1	Legetan Putih	<i>Acmella radicans</i> (Jacq.) R.K.Jansen	Heliantheae
2	Legetan Kuning	<i>Acmella uliginosa</i> (Sw.) Cass.	Heliantheae
3	Teklan, Regel	<i>Ageratina riparia</i> (Regel) King & H.Rob	Eupatorieae
4	Bandotan	<i>Ageratum conyzoides</i> L.	Eupatorieae
5	Baru Cina	<i>Artemisia vulgaris</i> L. (DC.)	Anthemideae
6	Jarum Spanyol	<i>Bidens alba</i> L.	Coreopsideae
7	Ketul	<i>Bidens pilosa</i> L.	Coreopsideae

No	Fern Name	Scientific Name	Tribe
8	-	<i>Calyptocarpus vialis</i> Less.	Heliantheae
9	Sintrong	<i>Crassocephalum crepidioides</i> (Benth.) S.Moore	Senecioneae
10	Tutup Bumi	<i>Elephantopus mollis</i> Kunth	Vernonieae
11	Jelantir	<i>Erigeron</i> sp. L.	Astereae
12	Losch, Kuniran	<i>Galinsoga parviflora</i> Cav.	Millerieae
13	Selada liar	<i>Lactuca virosa</i> Habil.	Cichorieae
14	Tempuyung	<i>Sonchus oleraceus</i> L.	Cichorieae
15	Jotang	<i>Syndrella nodiflora</i> (L.) Gaertn.	Heliantheae
16	Kipahit	<i>Tithonia diversifolia</i> (Hemsl.) A.Gray	Heliantheae
17	Kamanilan	<i>Youngia japonica</i> (L.) DC.	Cichorieae

4 Discussion

The *Asteraceae* family is the second largest family of the Asteridae subclass of the Magnoliopsida class which includes about 23000 to 25000 species, 1620 to 1700 genera and about 13 tribes that are distributed throughout the world and almost inhabit all kinds of environments except Antarctica [5, 7, 12, 13]. According to Cronquist (1981), the distribution of the *Asteraceae* family is best in open areas. This is in accordance with the environment where the *Asteraceae* family grows in the ecotourism area and Padusan Mojokerto natural laboratory. Based on the identification results, *Asteraceae* plants in ecotourism and natural laboratory Padusan Mojokerto is very diverse, namely 17 species, 15 genus and 9 tribe.

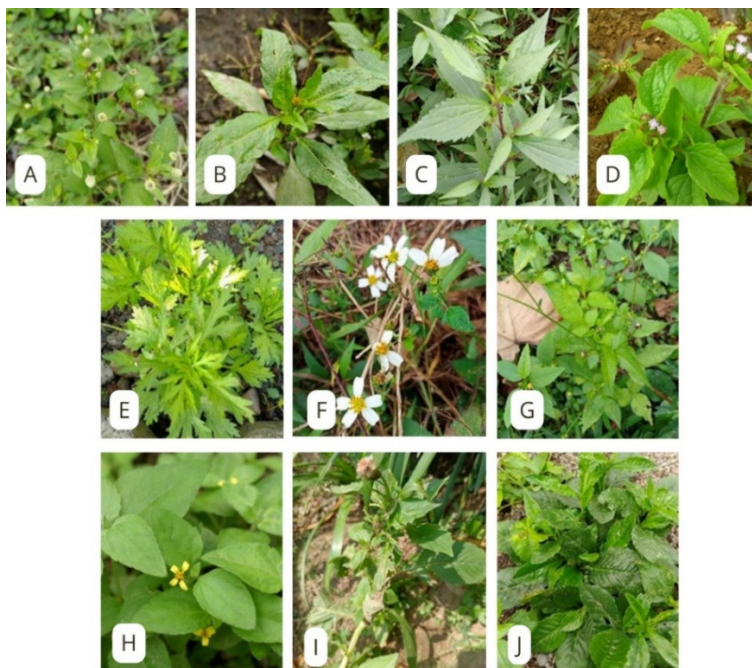


Fig. 1. Some of the Asteraceae family found in Padusan, Mojokerto: A) *Acemella radicans*, B) *Acemella uliginosa*, C) *Ageratina riparia*, D) *Ageratum conyzoides*, E) *Artemisia vulgaris*, F) *Bidens alba*, G) *Bidens pillosa*, H) *Calyptocarpus vialis*, I) *Crassocephalum crepidioides*, J) *Elephantopus mollis*. Photo credit: (A-J) M. Hisyam Baidlowi.

About 17 species of *Asteraceae* family in Padusan, a simple key to the as follows [1, 3, 14]:

- 1a. Heads homogamous; corolla tubular 2
- 2a. Pappus consisting of numerous hairs or bristles, often caducous 4
 - 4a. Anthers with a sagittate base; receptacle naked (without pales); leaves alternate, sometimes, moreover, resolute *Elephantopus mollis*
 - 4b. Anthers with an obtuse, entire, or slightly incised base; receptacle naked or paleaceous; leaves alternate or opposite 5
 - 5a. Leaves all alternate; corolla gradually widened into the limb; style-arms with truncate, subpenicillate apex *Crassocephalum crepidioides*
 - 5b. Leaves opposite, rarely partly alternate; other corolla; other style-arms 6
 - 6a. Receptacle columnar, with attenuate apex; pales carinate, compressed, enclosing the flowers; anthers hardly connate *Ageratia riparia*
 - 6b. Receptacle flat or convex, glabrous or hairy, naked 7
 - 7a. Phyllaries 6-9, 2-seriate, lanceolate to ovate; corolla white *Acmella radicans*
 - 7b. Phyllaries 5-6, uniseriate, narrow to ovate; corolla orange *Acmella uligiosa*
- 2b. Pappus consisting of scales, sometimes with an aciculate apex, or cup-shaped and in that case sometimes with some awn at the apex, often caducous 8
 - 8a. Receptacle naked; anther-base sagittate or entire; receptacle convex; base anther is connate *Ageratum conyzoides*
 - 8b. Receptacle paleaceous (pales sometimes caducous); base anther is sagittate 9
 - 9a. Achenes without awns at the apex; pappus numerous *Galinsoga parviflora*
 - 9b. Achenes with awns at the apex; pappus wanting 10
 - 10a. Radiate flower heads, white, with ray-florets *Bidens alba*
 - 10b. Discoid or radiate flower heads, orange, without ray florets *Bidens Pilosa*
- 1b. Heads homogamous and the corolla ligulate, or heads heterogamous (sometimes marginal flower neuter) and the corolla different as to shape 3
 - 3a. Heads homogamous; flowers ♂; corolla ligulate; receptacle naked 11
 - 11a. Achenes beaked, oval, oblong or linear compressed, with one or more prominent ribs at each side; corolla yellow or violet *Lactuca virosa*
 - 11b. Achenes with an attenuate apex, but not beaked; corolla yellow 12
 - 12a. Achenes laterally compressed; leaves alternate *Sonchus oleraceus*
 - 12b. Achenes angular or subterete; leaves partly rosulate *Youngia japonica*
 - 3b. Heads heterogamous, sometimes with euter marginal flowers; corolla of margin and disk-flowers different in shape, length, or colour; receptacle naked or paleaceous 13
 - 13a. Receptacle paleaceous or provided with 1-1,5 mm long, white hairs 14
 - 14a. Pales embracing the flowers, or at least conduplicate and carinate; receptacle conical, hollow; pappus consisting of some membranous, afterwards hardened scales and 2-3 broad awns *Tithonia diversifolia*
 - 14b. Pales otherwise, pappus consisting of awns or scales 15
 - 15a. Achenes of marginal flower oblong, dorsally flattened, winged, wing divided into segments; pappus-awns 2-4, obliquely erect *Syndrella nodiflora*
 - 15b. Achenes otherwise, pappus-awns 2-3 afterwards horizontally patent, connate by a short margin *Calyptocarpus vialis*
- 13b. Receptacle naked, glabrous, shortly hairy, or rarely with minute scales 16
 - 16a. Pappus cup-shaped, consisting of a rim *Artemisia vulgaris*
 - 16b. Pappus consisting of long hairs or fairly long, bristles, or scales *Erigeron* sp.

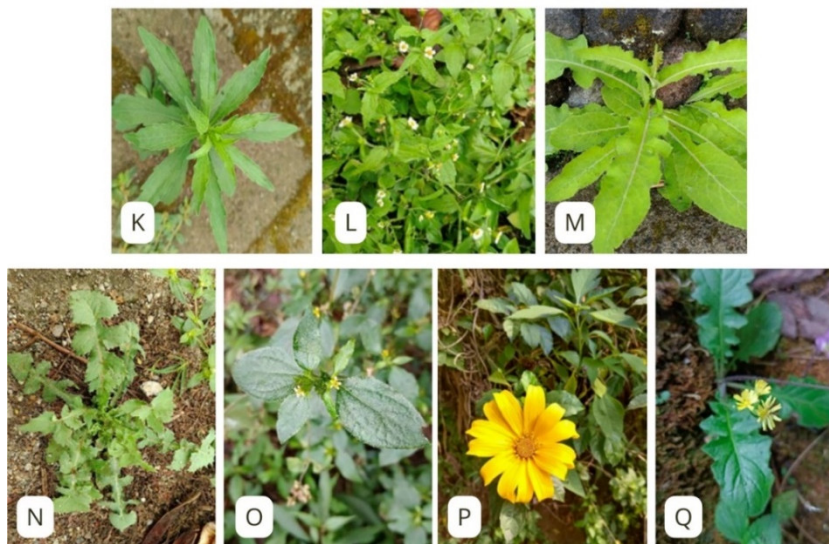


Fig. 2. Some of the Asteraceae family found in Padusan, Mojokerto: K) *Erigeron* sp., L) *Galinsoga parviflora*, M) *Lactuca virosa*, N) *Sonchus oleraceus*, O) *Syndrella nodiflora*, P) *Tithonia diversifolia*, Q) *Youngia japonica*. Photo credit: (K-Q) M. Hisyam Baidlowi.

4.1 *Acmella radicans* (Jacq.) R.K Jansen

Annual, herb, erect to ascending to 50 cm tall. Stem green or purple, many-branched, sparsely hairy. Leaves opposite; petioles 2–20 mm long, green or purple, glabrous or sparsely hairy; lamina narrowly ovate to ovate- rhomboid, 1–12 × 0.5–7 cm, base attenuate, margin denticulate, apex acute to acuminate, triplinerved, adaxial surface green, abaxial surface pale green or purplish. Capitula discoid, axillary or terminal, cone-like, 4–5 mm diam; peduncles 1.5–4 cm long, slender, green, pilose to strigose; receptacles narrowly conical, apex acuminate; phyllaries 2-seriate, lanceolate to ovate. Disc flowers 4-merous, white. Corolla tubular, c. 2 mm long, 4–5 lobed, base bulbous, white; cypsela dimorphic; marginal trigonous, obcordate, margin corky, densely ciliate, surface with few tubercles; others laterally compressed, margin corky, densely ciliate, surface with few tubercles; pappus of 2 subequal bristles. Stamens 4, ca. 1 mm long; filaments free, filiform, white; anthers linear, connate, black-brown; styles ca. 1.5 mm long, papillose, yellowish brown; achenes cylindric, ca. 2–3 mm long, blackish brown, margin ciliate.

4.2 *Acmella uliginosa* (Sw.) Cass.

Annual, herb, erect to ascending or occasionally decumbent, green to red, glabrous to moderately pilose. Leaves opposite; petioles 6–10 mm long, sparsely to moderately pilose, narrowly winged; lamina usually lanceolate to narrowly ovate or sometimes ovate, base attenuate, apex acute to acuminate, glabrous to sparsely pilose above and below, margin sinuate to dentate, sparsely ciliate. Peduncles 2.3–5 cm x 0.5–1 mm in diameter, sparsely pilose. Heads usually radiate, apex receptacle acuminate. Phyllaries 5–6, uniseriate, narrowly to broadly ovate, apex rounded to acute, margin entire to irregularly dentate, sparsely to moderately ciliate. Ray florets 4–7, inconspicuous and only slightly exceeding the phyllaries; corollas yellow to orange-yellow; achenes moderately to densely ciliate with straight-tipped hairs; pappus of 2–4 short subequal bristles. Disc floret corollas is yellow, 4-numerous;

stamens 0.6-0.9 mm long, anthers brown-black; style 0.9-1.1 mm long; achenes moderately to densely ciliate with straight-tipped hairs, lacking an evident cork-like margin and shoulders; pappus of 2 unequal bristles.

4.3 *Ageratina riparia* (Regel) King & H. Rob

Perennial, herb or shrubs, erect, stems pubescent, villous. Leaves opposite; petiole 7-15 mm long; lamina elliptic, 0.4 - 1.3 cm wide, apex acuminate, base attenuate, margin serrate or jagged. Receptacle columnar, attenuate apex. Capitulum turbinate, 5-7 mm in diameter, homogamous, comprising solely of disc florets, arranged as cymose panicles, involucre bracts linear to lanceolate, apex acute, ciliate, ca. 2.5-4 mm long, pappus scabrous, 2.5-3 mm long, attached on a hyaline ring; corolla 5-lobed at apex, abruptly narrowed into a tube in the lower half, whitish, the lobes ciliate adaxially, anthers ca. 0.75 mm long, hardly connate; style bifid, exerted; achenes 5-ribbed, ribs hispidulous.

4.4 *Ageratum conyzoides* L.

Annual, herb, with inconspicuous main root. Stems robust, erect, ca. 4 cm in diam. at base, simple or branched from middle, stems and branches reddish, or green toward apex, white powdery puberulent or densely spreading long tomentose, 50-100 cm tall, sometimes less than 10 cm. Leaves often with axillary abortive buds; petiole 1-3 cm, densely white spreading villous; median leaves ovate, elliptic, or oblong, 3-8 × 2-5 cm; upper leaves gradually smaller, oblong, sometimes all leaves small, ca. 1 × 0.6 cm, both surfaces sparsely white puberulent and yellow gland-dotted, basally 3-veined or obscurely 5-veined, base obtuse or broadly cuneate, margin crenate-serrate, apex acute. Capitula small, 4-14, in dense terminal corymbs; peduncle 0.5-1.5 cm, powdery puberulent; involucre campanulate or hemispheric, ca. 5 mm in diam.; phyllaries 2-seriate, oblong or lanceolate-oblong, 3-4 mm, glabrous, margin lacerate; corollas 1.5-2.5 mm, glabrous or apically powdery puberulent; limb purplish, 5-lobed. Achenes black, 5-angled, 1.2-1.7 mm, sparsely white setuliferous; pappus scales 5 or awned, 1.5-3 mm, sometimes with tapering setae.

4.5 *Artemisia vulgaris* L. (DC.)

Aromatic perennial, herb; stems erect, 0.4 - 1.5 m, branched, ribbed reddish, sulcate, pilose. Leaves alternate, 2.5 - 10 × 4 - 5 cm. The cauline 1- pinnatisect; lobes entire, densely white-felted beneath, green above, entire, the lowermost pair amplexicaul; uppermost leaves smaller than the cauline, near-lanceolate, acute, with 2 small basal clasping lobes. Inflorescence a lax panicle; peduncle 0 - 8 mm, ebracteate; capitula 3 - 4 mm diam.; phyllaries 2 - seriate, narrowly ovate, obtuse, scarious-margined, the inner about 4×1 mm, oblong-lanceolate, obtuse, tomentose; marginal florets female, filiform; the inner florets bisexual, fertile; corolla reddish; achenes not seen.

4.6 *Bidens alba* L.

Annual, herb; stem erect, to 1 meter. Leaves opposite, range from 3-lobed to odd pinnately compound with 3-5 leaflets. Lamina of leaflet is ovate to lanceolate, with an acuminate leaf apex and serrated leaf margin, glabrous or pubescence. Flower arranged in panicles of heads subtended an involucre made of 2 series of phyllaries: the outer series longer than the inner series. There are 5 or 6 six zygomorphic white flowers with the corolla up to 1 cm in length that occur to the edge of the head. The actinomorphic flowers occur in the center of the head,

have a pappus of 2-4 hairs and a yellow corolla with 5 fused petals forming a tube. There are 5 anthers fused to the corolla tube. The ovary is inferior and is an achene at maturity. The achenes have tubercles that assist in dispersal by attaching to passing animals.

4.7 *Bidens pilosa* L.

Herb, stem glabrous or subglabrous. Leaf 1-pinnately divided; segments 3–5, ovate, lanceolate; upper surface of lamina subglabrous, beneath tomentose, adpressed pilosulose, cuneate at base, apices mostly acute, sometimes acuminate, margins serrate; terminal leaflets 3–10 × 0.7–3.5 cm; lateral leaflets 1.5–6 × 0.3–2 cm; petioles 1–7 cm. Capitula solitary to corymbose; capitula radiate or discoid; peduncles 3–5 cm pilose, hispidulous, elongate in fruiting time; calycular bracts mostly 8, spatulate to linear, 4–6 mm pilosus to pilosulose, hispidulous; involucre turbinate to campanulate, 4–8 × 6–10 mm; phyllaries mostly 8, lanceolate, 4–6 mm, margins scarious winged, ciliate. Ray florets mostly 5, lamina whitish, 10–12 mm. Disc florets 25–50, yellowish 3–5 mm, tubulate. Palea similar to phyllaries, slightly shorter or equal to disc flowers. Achenes dark brown to blackish, light brown to yellowish at apex, 6–10 mm, hispid to anthrosely hispidulous or strigose at apex; pappus (2–)3–4 barbed, 1–2.5 mm; outer achenes ± flat linear to narrowly cuneate, each surface obscurely 2-grooved, subglabrous at basal; inner achenes ± equally 4-angled, linear, surface of all sides 2-grooved, truncate at apex.

4.8 *Calyptocarpus vialis* Less.

Perennial decumbent, herb; stems prostrate, branched from the base, rooting at nodes, spreading, strigillose. Leaves opposite, ovate to 3 × 2 cm, basally 3-nerved, cuneate at the base, margins crenate-serrate, acute at apex, scabrid on both surfaces; petiole to 5mm. Heads axillary, solitary, sessile, heterogamous; involucre bracts four, in 2-rows, lanceolate, green, shortly hairy, ciliate along margins, outer one oblong-lanceolate, inner one linear. Ray florets 5-8, yellow, ligulate, unisexual-female, petal apex 2-3 lobed; disc florets 8-10, tubular, bisexual. Achenes dorsally compressed, oblanceolate, to 5 × 1.5 mm; achenes of disc florets narrower and covered with short spines; pappus usually of 2 divergent awns, shortly hairy.

4.9 *Crassocephalum crepidioides* (Benth.) S. Moore

Annuals, rarely short-lived perennials, with fibrous roots; stems usually erect, fleshy, sparsely pubescent to glabrescent. Leaves alternate, petiolate, sparsely pubescent; lamina lanceolate to ovate, margin serrate, variously incised or lobed to pinnatifid, apex acute, base mostly attenuate. Capitula pedunculate, one to numerous in terminal or axillary panicles, erect or horizontal to nodding, homogamous, discoid. Involucre narrowly campanulate, calyculate, calycular bracts linear-subulate, pubescent to almost glabrous; phyllaries sparsely pubescent, uniseriate, c. 18–23, herbaceous with narrow scarious margin, almost glabrous to pubescent; receptacle flat. Florets orange-yellow to brick red; peduncle 1–5 cm long with numerous, usually nodding capitula; cypselas brown. Anthers 1–1.5 mm long, linear, minutely sagittate at the base; anther collar balusterform. Style 2-branched, 2–3 mm long, with apical appendages of fused papillae. Cypselas 2–2.5 mm, terete to apically and basally shortly attenuate, ribbed with spirally thickened duplex hairs on the ribs, dark brown to black; carpodium yellowish to whitish, slightly larger in diameter than the cypselas base; pappus bristles numerous, 8–12 mm long, capillary, uniform, white, persistent.

4.10 *Elephantopus mollis* Kunth

Perennial herbs, 0.5-2.0 m tall. Stems caulescent, erect or procumbent, terete, inconspicuously ribbed, pilose. Leaves alternate, 10–20 by 3–5 cm, elliptic or oblong, margin crenate, apex acute, base attenuate, subcoriaceous; both surfaces sparsely pilose with filiform hairs, cylindrical hairs and capitate glands; lateral veins 10–16-paired; petioles up to 10 mm long. Capitulescences terminal and axillary, paniculate. Foliose bracts 3, deltoid. Capitula tubular, 7–8 mm long. Receptacle glabrous. Involucres tubular, 6.5–8 mm long, 3–4 mm in diam. Phyllaries 8, in 2 series, decussate, light green, margin entire, outer surface puberulous, without glands; the outer ovate, apex acute; the inner ones lanceolate, apex acuminate. Florets 4; corollas white, zygomorphic, glabrous; corolla tubes slender, 3–5 mm long; corolla lobes bilabiate, 1.5–2 mm long. Anthers ca. 1 mm long, apical appendage acute, base rounded. Styles white, 4–5 mm long, branches ca. 1 mm long. Achenes clavate, 2.5–3 mm long, pubescent, densely covered with twin hairs but lacking glands, inconspicuously ribbed. Pappus of 5 bristles in one series, dilated at base, 2.5–4.5 mm long.

4.11 *Erigeron* sp.

Herb, shortly rhizomatous; stem short, erect, green. Leaves rosetted; petiolus is green; lamina obovate to spatulate or lanceolate, base petiole like, apex acute, sparsely hirsute, margin entire to shallowly dentate. Capitulum turbinate, solitary, 3-6 mm in diameter, axillary or terminally; peduncle unbranched, 3-7 cm long, with small bracts; involucre bracts linear, apex acute, margin hyaline, outer bracts ca. 0.5 mm long, pubescent; inner bracts glabrous to pubescent, 0.7-0.8 mm long, ray florets 2-seriate, pistilate, ligules whitish to pale yellow, ca. 0.7 mm long, disc florets bisexual, corolla 5-lobed, whitish to pale yellow, ca. 1.3 mm long, anthers ca.0.3 mm long; achene uniform, pubescent, pappus 1-seriate, thin, with fragile bristles, subequal to corolla.

4.12 *Galinsoga parviflora* Cav.

Herb, stem erect, glabrous to pubescence, green to reddish, 20- 80 cm. Leaves opposite; petiolate with a leaf stalk erect, branched, slender and striate stems (parallel ridged); lamina lanceolate to ovate, pale green. Upper leaves are often smaller, narrower and sessile (without a stalk). Flower is terminal with yellow disk/tubular florets in the center, surrounded by several (usually 5) small white ray florets. Peduncle slender and hairy. Flower head 4–7 mm, 2 or 3 rows of involucre bracts. Each of the five inner bracts houses a ray floret small and distinct from one another. Ray florets are three-lobed, milky white, 5 mm. Flower tube many, flower height 2-3 mm, crown color yellow, anthers brownish, stigmas yellow. Achene 2 mm long, slightly hairy and has or does not have a pappus of short bristles, pappus 1,5 mm with hairy-edged scales.

4.13 *Lactuca virosa* Habl.

Annual, biennial or perennial herbs, rarely shrubs with abundant latex and with tap roots, underground stolons or with fusiform tuberous roots. Stem is erect or ascending, 10–250 cm high, simple or branched, glabrous or with trichomes. Leaves are spirally arranged, basal ones usually in rosette, petiolate or sessile, undivided or pinnatisect; lamina lanceolate and less deeply cut or oblong-obovate, base sagittate-amplexicaul, margin spinose-ciliate. Cauline leaves are usually with auricles, sagittate or hastate at base, upper most cauline leaves are generally bract-like. Inflorescence is a corymbose, pyramidal or spike-like panicle. Heads few to numerous, composed of 4–25 florets. Involucre is cylindrical, bracts are in several

rows, the outer ones conspicuously short, at the top often anthocyanin-spotted, receptacle flat, without scales. Ligules are yellow, lilac or blue, rarely white. Beaked achenes re compressed, in most cases fusiform, with one to few ribs on each side, sometimes with winged margins. Length of achenes ranges between 2.8–15 mm. Achenes are creme, olive, narrowly obovate tapering sharply into the beak, strongly compressed, finely and evenly ribbed on both faces, greyish or pale brown to black in colour. Beak is short, not exceeding the body, concolorous, or filiform, longer than body and pale in colour. Pappus is white, yellowish or brown in colour, deciduous or persistent, formed of two equal rows of simple hairs, barbellate bristles.

4.14 *Sonchus wightianus* DC.

Perennial, herbs, with a taproot; stem branched from base or higher, glabrous below synflorescence, 30-150 cm. Basal and lower stem leaves oblanceolate to elliptic, 6-24 × 1.5-6 cm, undivided or pinnatifid to pinnatipartite, glabrous, base narrowed (in basal leaves) to auriculate claspings (in lower stem leaves), margin denticulate to mucronately dentate, apex obtuse to acute; lateral lobes if present 2-5 pairs, lanceolate, ovate, semiorbicular, or sometimes triangular-ovate; terminal lobe narrowly ovate to elliptic, ± large, apex obtuse to acuminate. Middle and upper stem leaves elliptic to lanceolate, smaller, otherwise similar to lower leaves. Synflorescence corymbiform, with several to many capitula. Capitula with very many (usually 180-300) florets; peduncle slender, apically white tomentose, densely glandular hairy or non-glandular. Involucre broadly campanulate, 1.2-1.5 cm, base ± white villous to tomentulose and glandular hairy or not. Phyllaries with or without glandular hairs, apex long acuminate; outer phyllaries lanceolate, 1-1.5 mm wide. Corolla 1.2-1.4 cm. Achene narrowly ellipsoid, 3.5-4.5 mm, moderately compressed, ± elliptic in cross section, weakly rugose, between lateral ribs and with 1(or 2) weakly prominent main rib(s) and several secondary ribs on either face. Pappus 6-9 mm, ± persistent.

4.15 *Synedrella nodiflora* (L.) Gaertn.

Annual or short-lived perennial herb; stems erect or ascending or procumbent, pubescent, branched from bases or ± throughout, 10-80 cm tall. Leaves cauline, simple, opposite, petiolate; petioles obscure or to 2.5 cm long, commonly winged; lamina ovate to elliptic, 3-10 × 2-5 cm, both surfaces scabrid, usually 3-veined, apex nearly acuminate to obtuse, base cuneate to rounded to attenuate, margin subentire to somewhat serrate. Inflorescence of 1 to several heads clustered in leaf axils, subsessile or nearly so, rarely long - pedunculate. Capitula radiate, sessile or subsessile in axillary glomerules or capitula solitary; involucre cylindrical to campanulate, 3-6 mm in diam.; phyllaries persistent, 2-5+, 1(or 2)-seriate, lanceolate, herbaceous to papery; receptacle convex; paleae linear-lanceolate, scarious, flat or weakly cupped at bases. Ray florets 2-9, 1- or 2-seriate, female, fertile; corollas yellowish, ca. 2 mm; lamina ovate to linear, 2-4 mm. Disk florets 4-12+, bisexual, fertile; corollas yellowish, tubes ca. 4 mm, ± equaling slightly enlarged cylindrical throats, 4-lobed, orbicular-deltate. Achenes dimorphic; ray achenes 3-5 mm long, oblong-ovoid, flattened, winged, the wings deeply cut and grading into 2 stout pappus awns, the awns and the marginal teeth ca. 1 mm long; disk achenes ca. 3 mm long, obconic, slightly compressed, with 2(-3) stout divaricate awns, the awns to ca. 3 mm long.

4.16 *Tithonia diversifolia* (Hemsl) A.Gray

Annual, sometimes perennial; stem slender, pubescence, up to 3.5 m high. Leaves alternate, pseudo-petiolate: lamina ovate to obovate, deeply 3–5-lobed or unlobed in some upper

leaves, 6–23 cm long, 3–18 cm wide, base cuneate to attenuate, margins crenate to subentire, apex acuminate, scabrid above, pubescent to tomentose beneath; pseudo-petiole to 10 cm long, with 2 auricles 2–8 mm long at base. Involucral bracts in ± 4 series, inner with rounded, papery tips. Capitula terminal on side branches, solitary; stalks of individual capitula to 21 cm long, widening near apex and in extreme cases the widened part to 6 cm long and 1 cm across; involucre 4-seriate, 14–20 mm long; phyllaries 5–17 mm long; paleae ± 12 mm long, pubescent or glabrous. Annual or short-lived perennial herb or slightly scandent shrub 0.7–3 m, often branching; stems 4-angled, pilose but soon glabrescent. Fig. 1 (page 760). Achenes oblong, 5–6 mm long, 4-angled, pubescent; pappus of scales to 2 mm with 2 setae to 4 mm long. Ray florets 8–12, yellow or orange-yellow, tube 1.9–3 mm and pubescent, ray 40–75 mm long; disc florets cylindrical, 7.5–10 mm long, puberulous near base. Pappus of several short broad scales and 2 lateral awns, one much shorter than the other.

4.17 *Youngia japonica* (L.) DC

Annual, herb; stem solitary or few, erect, branched from base, middle, or only apically, glabrous or basally often hairy, leafy or leafless. Leaves obovate, oblanceolate, or rotund, lyrate or runcinate, the terminal segment mostly rotund, apically rounded, dentate, crenate or entire, the basal portion narrowed into a narrow, wingless petiole, or with more or less deltoid segments, to 6(-25) cm long, the midvein often reddish, evenly pubescent overall. Synflorescence corymbiform to paniculiform-corymbiform, usually with many to numerous capitula. Capitula with 10-20 florets; peduncle capillaceous. Involucre cylindrical, 4-7 mm. Phyllaries abaxially glabrous; outer phyllaries ovate to triangular, longest less than 1.5 mm, apex acute; inner phyllaries adaxially appressed pubescent, midvein subapically plane, margin \pm white scarious, apex acute. Anther tube dark green. Style branches yellow upon drying. Achene light brown to dark reddish or purplish brown, fusiform, 1.5-2.5 mm, ribs finely spiculate, apex strongly attenuate. Pappus white, 2.5-3.5 mm.

5 Conclusion

Based on our study, we found that there are 17 species, 15 genera and 9 tribes in the Padusan ecotourism and natural laboratory area, namely: *Acmella radicans*, *Acmella uliginosa*, *Ageratina riparia*, *Ageratum conyzoides*, *Artemisia vulgaris*, *Bidens alba*, *Bidens pilosa*, *Calyptocarpus vialis*, *Crassocephalum crepidioides*, *Elephantopus mollis*, *Erigeron sp.*, *Galinsoga parviflora*, *Lactuca virosa*, *Sonchus oleraceus*, *Syndrella nodiflora*, *Tithonia diversifolia*, *Youngia japonica*.

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