

SHORT COMMUNICATION

Common burdock (*Arctium minus*): a common weed of non-arable land in Orestiada, Greece

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Summary Common burdock (*Arctium minus*) is a common biennial weed of non-arable land in typical rural settings of Orestiada, Greece. The aim of this study was to describe the basic morphological traits of this species throughout the main phenological stages of its life cycle and to obtain some insight into its growth and productivity in Orestiada. Based on our observations, the plants occurred most commonly in moist and fertile soils, usually as isolated individuals or in small patches near the parent plants. The species is characterized by its large basal 'elephant-ear' leaves during the vegetative stage, appearing in alternate arrangement, with irregularly wavy and non-toothed edges, as well as with long hollow stalks forming a noticeable furrow on the top. By monitoring individual plants, it was found that flowering (in the second year of growth) mostly occurred from late June up to early August. The flowers were purple, occurring in bristly heads at the top of the stem. The bristly heads formed a fruit, containing small black seeds. The average number of capitula per plant, from randomly selected populations in Orestiada, was found to be 69.7 and 57.7 respectively, whereas the mean seed number per capitulum reached 30.3 and 33.3 seeds, respectively.

Additional keywords: biology, growth, identification, life cycle, morphology, seed productivity

Common burdock (*Arctium minus*) is a common biennial weed of non-arable land in typical rural settings (abandoned fields, roadsides, pastures, meadows, grazing plains, stream banks and woodland edges) of Orestiada, regional unit of Evros, in northern Greece. The species has been recorded by the authors also in the margins of corn fields in the rural area of Eordea, regional unit of Kozani, in western Greece. In fact, it is a common herb of the Greek flora and occurs throughout the Greek territory.

The genus name *Arctium* was derived from the Greek word for 'bear' and most likely refers to the scruffy and brown appearance of the plants' bristly heads (burs) at maturity. Common names of this weed

species in Greek include: 'kollitsida', 'arkoudovotano' and 'platanomantilida' (Anonymous, 2013). Common burdock is originated in Europe and was likely brought to North America by early French and English colonists (Gross *et al.*, 1980). Actually, common burdock is a successful global invader, present in Europe, North and South America, Australia and New Zealand (Nawrocki, 2010). Common burdock can grow in a wide range of soils from sandy clay to moist loam, most preferably in nitrogen-rich soils (Gross *et al.*, 1980; Van Vleet, 2009). Despite its wide distribution, limited data exist in the formal literature about the biology and the agronomic value of this weed; the available information is scattered in the so-called grey literature. The aim of this study was to describe the basic morphological traits of this species throughout the main phenological stages of its life cycle and to obtain some insight into its growth and productivity in Orestiada.

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In the spring of 2014, randomly selected populations of *Arctium minus* were studied either from abandoned fields or along roadsides near the Farm of Democritus University of Thrace in the rural area of Orestiada (41°30'N latitude, 26°32'E, 22 m asl). Two populations were sampled and certain morphological data (i.e. leaf shape, arrangement, structure and color, flower shape and color as well as fruit shape and color) were collected from three individuals per population. All capitula per sampled individual were collected in brown paper bags and brought to the laboratory. Three randomly selected capitula per individual were opened and the number of seeds was recorded. Information on seed productivity is important because common burdock is reproduced only by seeds (Wax *et al.*, 1999). The average number of capitula per plant, measured from randomly selected populations in Orestiada, was found to be 69.7 ± 12.50 and 57.7 ± 12.22 , respectively, whereas the average seed number per capitulum reached 30.3 ± 6.03 and 33.3 ± 2.08 , respectively. According to the literature, there is evidence of great variability in the seed productivity of plants (Reed and Stephenson, 1972, 1973; Gross *et al.*, 1980; Straw, 1985), which may be attributed to various factors, such as the genetic background of populations, the growth conditions and the level of insect predation of the seeds as proposed by other authors (Hawthorn and Hayne, 1978; Straw, 1985; Kambo and Kotanen, 2014). Therefore, more research on seed productivity is needed.

From our observations in the field, it was found that the cotyledons are large, spoon-shaped, with a waxy surface. The first true leaves are stalked and ovate with entire and slightly wavy margins (Gross *et al.*, 1980) (Figure 1). In the first year of growth, the plant grows as a typical low-growing rosette of leaves (Figure 2) and then in the second year it produces a tall and erect flowering stem (Gross *et al.*, 1980). Rosette leaves are distinctive due to their large size (elephant ear), heart-shaped base, wooly undersurface and hollow leaf stalks (petioles) (Figures 3 and 4). Careful examination of the plants re-

vealed that the upper leaf surface is distinct green and coarse, whereas the underside is pale green to gray and wooly. Subsequent leaves are alternate, oval-shaped (elliptical), with short hairs, wrinkled between the veins and bitter tasting. Leaves gradually become smaller than the basal leaves, less heart-shaped and attenuated at both ends as their location progresses up towards the head of the stem. Additionally, their petioles become shorter and solid rather than hollow. Stem leaves are similar in shape to the rosette leaves but smaller than them.

Based on our observations in the field, the stem stays flattened and close to the soil surface during the rosette stage of growth. When flowering sets up, the stem elongates producing an erect flower stem that is much-branched, rough-hairy, hollow and angular (Figure 5). Flower heads are located at the ends of the branches or at leaf axils on the flower stem and are comprised of a bur with hooked bristles appearing beneath a closely packed cluster of tubular purplish flowers (Figure 6). Each head has purple disk flowers with involucrel (covering) bracts modified into narrow hooked bristles. Through this structure a bur is formed that aids in dispersal of common burdock seeds by animals and humans. Indeed, the weed is best known for the hooked bristles on its burs that stick to fur and clothing (Figure 7). The seeds within the bur are oblong, smooth and mottled. In each bur, there are



Figure 1. Young seedling of *Arctium minus* soon after emergence (original photo by Theodore Webster, USA).



Figure 2. Young seedling of *Arctium minus* in a rosette form.



Figure 5. Plant of *Arctium minus* at the flowering stage.



Figure 3. Characteristics of basal leaves (size, shape, arrangement and color) of *Arctium minus*.



Figure 6. Flower details (flowering stage) of *Arctium minus*.



Figure 4. Grown plant of *Arctium minus* at the vegetative stage.



Figure 7. Fruit (achene) details (maturity stage) of *Arctium minus* (original photo by Bob Osborn, UK).

many single-seeded, brown, oblong, angular fruits having a short, stiff bristle at one end. Flowering stems emerge in June and flowers are formed from late June up to October in Orestiada. Flowering usually takes place during the second year, but occasionally flowers are not formed until the third or fourth year of growth (Gross and Werner, 1983). When burs dry, their hooked bristles attach to fur or clothing and the bur separates from the plant, thereby dispersing the seeds. Dispersal of burs and seeds begins in September and continues throughout winter and into the following spring.

Common burdock can be often confused with other species in various growth stages. To avoid confusion with other species, the following information should be taken into account. At the cotyledon stage, common burdock may show some similarity with giant ragweed (*Ambrosia trifida*) at the same growth stage, but the cotyledons of giant ragweed are obviously smaller (Alex, 1992). At the seedling stage, common burdock can be easily confused with broadleaf dock (*Rumex obtusifolius*) and curly dock (*Rumex crispus*), but these two species do not have hairs on the underside of the leaves (Alex, 1992). At the rosette stage, common burdock resembles a popular garden vegetable, i.e. the cultivated rhubarb (*Rheum rhabarbarum*), but the leaves of the latter do not have wooly undersides and its petioles are solid and tinged red (Alex, 1992). Common burdock flowers are similar to those of bull thistle (*Cirsium vulgare*), but the stems and leaves of the latter have spines and its leaves are deeply lobed (Alex, 1992). Common burdock is similar in appearance to great burdock (*Arctium lappa*), except that the latter grows taller, has larger flower heads arranged in clusters with flattened upper surfaces and the petioles of basal leaves are not hollow (Alex, 1992).

Common burdock is not considered to be a serious weed in cropland, because it can be easily controlled by cultivation, particularly in the first year of growth. Gross et al. (1980) and Van Vleet (2009) reported that the plant does not tolerate frequent cultiva-

tion (Gross et al., 1980; Van Vleet, 2009). However, as more farmers adopt no-till farming practices, this weed can become important, even causing yield losses, if not controlled. Other areas of economic damage by common burdock reported include the reduction of wool value, when the dry heads of the plant cling to the fur of sheep and the bitter taste of milk, when the cows eat large quantities of the plant (Gross et al., 1980). In addition, certain microorganisms can grow on common burdock, with two of them having major economic importance: i) *Erysiphe cichoracearum* (powdery mildew) that usually affects squashes and cucumbers as well as many species of Asteraceae, such as *Dahlia*, *Helianthus* and *Chrysanthemum*, and ii) *Phymatotrichum omnivorum* (root rot) that attacks mainly cotton and secondarily numerous other crops. Root-knot nematodes of the genus *Meloidogyne*, which attack many cultivated plants and especially legumes, have been reported from *A. minus* (Gross et al., 1980).

Based on reports from the so-called grey literature, common burdock can be controlled by the application of several types of herbicides, including atrazine, 2,4-D, 2,4,5-T, 2,4,5-TP and MCPA with treatments of plants preferably in the first year of growth (Nawrocki, 2010). Glyphosate-based herbicides are effective as well as other herbicides, such as clopyralid, clopyralid plus triclopyr, aminopyralid, picloram and dicamba when applied preferably between the rosette stage and the flowering stage (Klingman et al., 1983; Van Vleet, 2009). Also, mowing can assist in eliminating seed production, when repeated multiple times per season. Defoliated plants have been found to produce fewer seeds per head, fewer heads per plant and thus fewer seeds per plant (Reed and Stephenson, 1973). Infestations can be controlled by digging to remove the plant and as much of the taproot as possible. Plants will re-grow, unless the taproot is removed (Van Vleet, 2009).

In conclusion, this preliminary study could be a useful guide to determine common burdock occurrence in Orestiada,

where the species is abundant. In addition, given that information about this species is limited in the formal literature, certain attributes reported herein (such as seed production) could be first clues for better understanding of the species importance and also for the adoption of sustainable management strategies to control it. Obviously, more detailed information will be needed to design such strategies.

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ΣΥΝΤΟΜΗ ΑΝΑΚΟΙΝΩΣΗ

Κολλητσίδα (*Arctium minus*): ένα κοινό ζιζάνιο των μη καλλιεργούμενων εκτάσεων στην Ορεστιάδα

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Περίληψη Η κολλητσίδα (*Arctium minus*) είναι κοινό διετές ζιζάνιο των μη καλλιεργήσιμων εκτάσεων στον αγροτικό χώρο της Ορεστιάδας. Ο σκοπός αυτής της μελέτης ήταν η περιγραφή βασικών μορφολογικών γνωρισμάτων αυτού του είδους σε όλα τα φαινολογικά στάδια του κύκλου ζωής του και η απόκτηση στοιχείων σχετικά με την ανάπτυξη και την παραγωγικότητά του στην Ορεστιάδα. Με βάση τις παρατηρήσεις μας, τα φυτά εμφανίζονται πιο συχνά σε υγρά και γόνιμα εδάφη, συνήθως ως μεμονωμένα άτομα ή σε μικρές κηλίδες κοντά στα μητρικά φυτά. Το ζιζάνιο χαρακτηρίζεται από τα μεγάλα με-

γέθους φύλλα της βάσης (γνωστά ως 'αυτί του ελέφαντα') κατά το βλαστικό στάδιο, τα οποία εμφανίζονται κατ' εναλλαγή, φέροντα ακανόνιστα κυματιστή και μη-οδοντωτή περιφέρεια, καθώς επίσης και χαρακτηριστικά μακρύ και κοίλο μίσχο που σχηματίζει ευδιάκριτο αυλάκι στην κορυφή. Από την παρακολούθηση ατομικών φυτών βρέθηκε ότι η άνθηση (κατά το δεύτερο έτος της ανάπτυξης) λαμβάνει χώρα κυρίως από τα τέλη Ιουνίου έως και τις αρχές Αυγούστου. Τα άνθη είναι μοβ και εμφανίζονται σε αγκαθωτές κεφαλές στο πάνω μέρος του βλαστού. Οι κεφαλές σχηματίζουν τον καρπό, ο οποίος περιέχει μικρούς μαύρους σπόρους. Ο μέσος αριθμός κεφαλών ανά φυτό από δύο τυχαία επιλεγμένους πληθυσμούς στην Ορεστιάδα βρέθηκε να είναι 69,7 και 57,7 αντίστοιχα, ενώ ο μέσος αριθμός σπόρων ανά κεφαλή έφτασε τους 30,3 και 33,3 σπόρους, αντίστοιχα.

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