

***Oxalis pes-caprae* F. *pleniflora* (Lowe) Sunding (Oxalidaceae), A New Record for the Flora of Turkey**

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Abstract: *Oxalis pes-caprae* f. *pleniflora* (Lowe) Sunding (Oxalidaceae), a naturalized invasive alien is recorded for the first time from Turkey. It has staminodes and double petals as different properties from *Oxalis pes-caprae* L. Sympatric variations occurred in the species populations could be the result of an accumulation of mutations or genome rearrangement. Invasive alien weed *Oxalis pes-caprae* and its infraspecific forma *pleniflora* are illustrated in photographs and the geographical distribution in Turkey is mapped.

Key words: Flora • Invasive alien species • New record • Variation

INTRODUCTION

The genus *Oxalis* L. is distributed worldwide and consists of approximate 800-950 species [1, 2] and in Turkey there are 4 of them: *O. acetosella* L., *O. pes-caprae* L. (both naturalized aliens), *O. corniculata* L. (cosmopolitan) and *O. articulata* Savigny (cultivated ornamental with pink flowers).



Fig. 1: The normal/typical flowers of *Oxalis pes-caprae* L

Oxalis pes-caprae L. (Fig. 1) scapose perennial herb, with a deep bulb emitting an underground stem bearing bulbils. Each bulb (usually smaller than 2,5 cm in size) is capable of producing over 20 small whitish bulblets each year. The trifoliate (clover-like) leaves all from the base, usually less than 12 cm long, leaflets obtriangular, deeply emarginate, each leaflet measures less than 3,5 cm in length. Scape exceeding the leaves, bearing an umbel of flowers at its apex. The petals 5, bright yellow, clawed, 15–25 mm in length; sepals 5, c. 5 mm. Stamens 10, connate below, obdiplostemonous. Styles 5. Fruit a capsule. Many species show floral trimorphism with respect to the filament and style lengths. Flowering time in spring. Described from Ethiopia (Hb, Linn. 600/13, photo!).

Oxalis pes-caprae, a small geophyte, a highly invasive weed in many parts of the world is a native of the Cape region of South Africa widely naturalized in the Mediterranean area [3].

MATERIALS AND METHODS

Oxalis pes-caprae f. *pleniflora* (Lowe) Sunding was collected in Adana city (C5 square) during the study of urban flora in 2008. It is not represented in the Flora of Turkey [3-5], but is reported in many literatures [6-8] as asexually reproducing aggressive species with double petals.

Oxalis pes-caprae f. *pleniflora* (Lowe) Sunding, in Cvad. Bot. Canar., 13: 17 (1971).

Syn: *Oxalis cernua* Thunb. var. *pleniflora* Lowe, Fl. Mad. P. 100, 1868.

Examined Specimens: C5 Adana: Balcalý Campus of Çukurova University, in disturbed urban and ruderal habitats, 143 m, 37°03'35'' N-35°21'33'' E, 15.03.2008, Türkmen 2807.

The cited specimen was stored in herbarium of Biology Department, Faculty of Science and Letters, Çukurova University. The authors of plant names follow Brummitt and Powell [9].

RESULTS AND DISCUSSION

An infraspecific taxon *pleniflora* of *Oxalis pes-caprae* L. was firstly collected and illustrated in photographs from Adana province, east Mediterranean Region of Turkey (Fig. 2, 3, 4). *Oxalis pes-caprae* f. *pleniflora* (Lowe) Sunding is a new record for the flora of Turkey. It has all morphological characters of *Oxalis pes-caprae* L. except for staminodes and double petals. *Oxalis pes-caprae* forma *pleniflora* abundance was greatest in disturbed urban and ruderal habitats, especially in the saw herbaceous places.

Hereafter shoots of *Oxalis pes-caprae* and its infraspecific taxon arise from an underground bulbil. They flowers from January to March, but fruits and viable seed have not been observed. Each plant is capable of



Fig. 2: *Oxalis pes-caprae* f. *pleniflora* (Lowe) Sunding: the atypical double petals



Fig. 3: Bulblets of *Oxalis pes-caprae* f. *pleniflora* (Lowe) Sunding

producing over 20 bulbils annually. Bulbils can be moved by agricultural activities, vehicles, water, wind and may be dispersed by birds and other animals. It can forcefully suppress other ruderal weedy species [10, 11].

Rottenberg and Parker [7] noticed that *Oxalis pes-caprae* populations in Israel have no sexual reproduction by fruits and seeds due to unknown genetic diversity and the total dependency on vegetative dispersal by bulbils. They speculated the plants with double petals (*O. pes-caprae* f. *pleniflora*) could be the result of an accumulation of mutations or genome rearrangement.

Oxalis pes-caprae arrived in the central Mediterranean Basin at the end of the eighteenth century [12] and its rapid and vigorous vegetative reproduction and dispersal resulted in a high rate of colonization success. In the native region (South Africa) both wild populations and weedy races are found [6]. Asexual *Oxalis pes-caprae* and its f. *pleniflora* populations were found in the same locality of the research area.

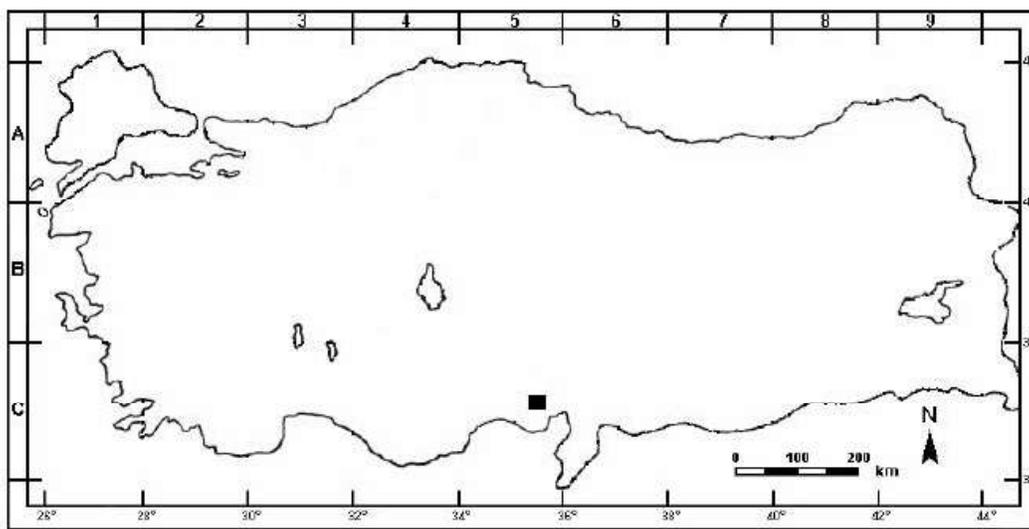


Fig. 4: The distribution of *Oxalis pes-caprae* f. *pleniflora* (Lowe) Sunding in Turkey (■)

Oxalis is known to accumulate oxalic acid in its leaves, which is toxic to herbivore vertebrates if eaten in large quantities [13]. The leaves contain oxalic acid, which gives them their sour flavour. A new type of nitrogen-fixing, oxalate-oxidizing *Azospirillum* sp. was isolated from the roots of *Oxalis pes-caprae* by Şahin [14]. Perfectly all right in small quantities, the leaves should not be eaten in large amounts since oxalic acid can bind up the body's supply of calcium leading to nutritional deficiency. The quantity of oxalic acid will be reduced if the leaves are cooked. People with a tendency to rheumatism, arthritis, gout, kidney stones or hyperacidity should take special caution if including this plant in their diet since it can aggravate their condition [8, 15].

Oxalis pes-caprae represents one of the most significant alien among the invaders in Turkey. It was shown that its expansion results in the exclusion of all other species in the grassy and understory vegetation of sparse groves and it, therefore, reduces habitat for native species, something that would be critical at least for the rare or sparsely distributed species of the native flora. Due to high landscape fragmentation and degeneration, the elimination of some populations would be important for species conservation at least at the regional scale [16, 17].

REFERENCES

1. Marks, G.E., 1956. Chromosome Numbers in the Genus *Oxalis*. New Phytologist, 1: 120-129.
2. Woodson, R.E., R.W. Robert, J.R. Schery and L. Lourteig, 1980. Flora of Panama. Part IV. Family 84. Oxalidaceae. Annals of the Missouri Botanical Garden, 67: 823-850.
3. Cullen, J., 1967. *Oxalis* L. In: Davis PH, ed. Flora of Turkey and the East Aegean Islands. 2. Edinburgh: Edinburgh University Press, pp: 488-490.
4. Davis, P.H., R.R. Mill and K. Tan, 1988. *Flora of Turkey and the East Aegean Islands*. 10 (Suppl. 1). Edinburgh: Edinburgh University Press, pp: 31-32.
5. Güner, A., N. Özhatay, T. Ekim and K.H.C. Başer, 2000. *Flora of Turkey and the East Aegean Islands*. 10 (Suppl. 2). Edinburgh: Edinburgh University Press, pp: 29-41.
6. Ornduff, R., 1987. Reproductive systems and chromosome races of *Oxalis pes-caprae* L. and their bearing on the genesis of a noxious weed. Annals of the Missouri Botanical Garden, 74: 79-84.
7. Rottenberg, A. and J.S. Parker, 2004. Asexual populations of the invasive weed *Oxalis pes-caprae* are genetically variable, Proceedings of the Royal Society of London. B (Suppl.). 271: S206-S208.
8. Castro, S., J. Loureiro, C. Santos, M. Ater, G. Ayensa and L. Navarro, 2007. Distribution of Flower Morphs, Ploidy Level and Sexual Reproduction of the Invasive Weed *Oxalis pes-caprae* in the Western Area of the Mediterranean Region. Annals of Bot., 3: 507-517.
9. Brummitt, R.K. and C.E. Powell, 1992. Authors of plant names. Kew: Royal Botanic Gardens.

10. Vilà, M. and I. Gimeno, 2006. Potential for higher invasiveness of the alien *Oxalis pes-caprae* on islands than on the mainland. *Plant Ecology*, 183: 47-53.
11. Gimeno, I., M. Villa and P.E. Hulme, 2006. Are islands more susceptible to plant invasion than continents? A test using *Oxalis pes-caprae* L. in the western Mediterranean. *J. Biogeography*, 33(9): 1559-1565.
12. Rappa, F., 1911. Osservazioni sull *Oxalis cernua* Thunb. *Bollettino del Orto Botanico Palermo*, 10: 142-183.
13. Hulme, P., 2004. Islands, invasions and impacts: a Mediterranean perspective. In: Fernández-Palacios J.M., Morici C., eds. *Island ecology* (Asociación Española de Ecología Terrestre, La Laguna, Spain), pp: 337-361.
14. Şahin, N., 2005. Isolation and characterization of a diazotrophic, oxalate-oxidizing bacterium from sour grass (*Oxalis pes-caprae* L.). *Research in Microbiology*, 156: 452-456.
15. Bown, D., 1996. *Encyclopaedia of Herbs and their Uses*. Dorling Kindersley, London.
16. Soulé, M.E., A.C. Alberts and D.T. Bolger, 1992. The effects of habitat fragmentation on chaparral plants and vertebrates. *Oikos*, 63: 39-47.
17. Petsikos, C., P. Dalias and A.Y. Troumbis, 2007. Effects of *Oxalis pes-caprae* L. invasion in olive groves. *Agriculture, Ecosystems & Environment*, 2-4:3 25-329.