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First record of *Cotula australis* (asteraceae): addition to the alien flora of Pakistan

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ABSTRACT

Cotula australis (Sieber ex Spreng.) Hook.f. of family Asteraceae is first time reported as new record in the exotic flora of Pakistan. *Cotula australis* is reported growing in the turf and lawns of district Lahore of the Province Punjab, Pakistan. This plant species is widely distributed and reported as a weed of lawns, recreational parks as well as field crops. *Cotula australis* is an annual plant that starts germination in early winter and completes its life cycle in early summer in areas around Lahore. The detailed description with illustrations, geographic distribution, economic importance, resemblance to other species, invasive potential and management approaches of this species are discussed.

Key words: Annual button weed, alien species, naturalized plant, exotic flora.

INTRODUCTION

The genus *Cotula* of Asteraceae comprises of about 80 species and most of them are widely distributed in New Zealand and South Africa. Some species are also extended to Australia, Asia, South America, North Africa and New Guinea (Van Royen and Lloyd 1975). Only two species are reported previously in Pakistan; *Cotula hemisphaerica* Wall. and *Cotula anthemoides* L. A new record, *Cotula australis* (Sieber ex Spreng.) Hook.f. is first time described from Pakistan. It is a prostrate herb, commonly known as button weed, was collected from the city of Lahore, Pakistan. The main distinguishing characteristics of *C. australis* are its capitula which present on a long 5 cm stalks and dimorphic pedicellate achenes present on 1mm stalk attached at the base of head.

The native range of *Cotula australis* is Australia (Grierson 1980) but it is naturalized in many regions of the world. In New Zealand, *C.*

australis was first reported from Red Mercury Island (Lynch *et al.* 1972) and now it has become fully naturalized in urban Auckland (Esler and Astridge 1987). Recently, *C. australis* was reported from Cheeseman Island and Egeria Rock Kermadec Islands in New Zealand (de Lange 2014, 2015). In India, *Cotula australis* was first reported from northern India in 1970. Later on, its distribution was extended to many other areas in India where it is now regarded as a common weed (Ansari 1984; Dakshini and Vijayaraghavan 1970; Srivastava and Kumar 1996; Vaid and Naithani, 1970). In USA, this plant was first reported from California in 1865 (Brewer *et al.* 1876), where it is now widespread and naturalized in many parts of the State (Drost and Junak 2009). Recently, *C. australis* was observed growing in an urban area of Surrey, United Kingdom (Hounsborne 2014). In addition, this species is also listed in the alien plants of Mexico (Villaseñor and Espinosa-Garcia 2004),

Japan (Mito and Uesugi 2004), Hawaii (Wester 1992), Argentina (Söyrinki 1991) and Belgium (Verloove 2006). *Cotula australis* has naturalized in Northern Taiwan (Jung *et al.* 2009) and Spain (Verloove 2005). Its recent report from the Province of Seville shows its fast spread in Spain (Serrano and Melero 2015).

Cotula australis has been reported as a serious weed of wheat and pea crops in Rolling Pampa, Argentina (Poggio *et al.* 2004). It is included in the exotic and invasive flora of Portugal (de Almeida and Freitas 2001) and also considered as a weed of Christchurch in New Zealand (Horne *et al.* 2005) and of New South Wales, Australia (Lemerle *et al.* 1996). In Pakistan, *C. australis* was found abundantly growing in the public parks, gardens and playing grounds of Lahore (Table 1).

MATERIALS AND METHODS

The specimens of *C. australis* were collected from different play grounds in University of the Punjab, Quaid-e-Azam Campus, Lahore during 2015-16 (Table 1). The necessary measurements and photographs of plant specimens were taken at each site in the field. All the plant specimens were brought back to the Ecology and Environmental Management Research Laboratory where morphological characters (both vegetative and reproductive) were recorded. For accurate identification and minute details (corolla, style, stamens, achenes, trichomes etc.) specimens were studied under stereo-microscope. A complete specimen of the species was preserved on a herbarium sheet and submitted to the MS Zahoor Herbarium, Department of Botany, University of the Punjab, Lahore.

Table 1: Some ecological attributes of *C. australis* in Pakistan.

Species	Status	Locations	Habitat	Common associations
<i>Cotula australis</i>	Naturalized (alien)	University of the Punjab, Quaid-e-Azam Campus, Lahore. 31°29'45.45"N 74°17'39.87"E Elevation 690 ft	Turf, gardens, public parks, disturbed places	<i>Soliva pterosperma</i> (Juss.) Less., <i>Oxalis corniculata</i> L., <i>Cynodon dactylon</i> L., <i>Malvastrum coromandelianum</i> (L.) Garcke, <i>Medicago polymorpha</i> L., <i>Lepidium didymus</i> L.

RESULTS

Cotula australis (Sieber ex Spreng.) Hook.f.

Description: Annual ascending herb, fresh green, spreading up to 40- 50 cm, stems much branched (Figure 1a), usually 20 cm long, 1-2 mm wide, prostrate, pilose throughout, weakly rooting at nodes. Leaves 5-6 cm long, 1.5-2 cm wide, alternatively arranged around the stem, 1-3 pinnately dissected blade, each segment 2-7 lobed (Figure 1b), hairy at both surfaces, petiole somewhat widen at base, leaf sheathing base present. Capitulum terminal, on a 5-7 cm long stalk, never present at base, solitary, flowering heads 3-4 mm and fruiting heads 5-7 mm in diameter. Ray and disk florets present; Central disk flowers 25-35, 1.5 mm long, pedicilate, bisexual, corolla 4-lobed (Figure 1c), cream to pale yellow colour, style forked, 4 stamens; Peripheral ray florets in 3-4 series, 30-50 pistillate flowers, fresh green, without corolla, compressed float shape, transparent glandular hairs present in centre at both sides (Figure 1d), forked style, all flowers on 1-1.2 mm stalk, stalk remain attach with receptacle after seed dispersal. Bracts involucre, green, 2- seriate, equal in size 2-3 mm long, curved

inside, towards ray florets, 15-20 bracts, hairy, margins non- green and membranous, margins dentate near bract apex (Figure 1e). Achenes dimorphic (Figure 1f); Peripheral achene winged, green flat, stalked, 1 mm long, 0.7 mm wide, glandular hairs at both sides, turns brown with cream wings at maturity; Central achene wingless, brown, obovate, stalked, 0.7-0.8 mm long, 0.5 mm wide, glandular hairs absent.

Common name: Annual button weed, bachelor's button, carrot weed

Flowering period: January to April (in Pakistan)

Native region: Australia

Habitat: Moist open grounds, parks, lawns, turf

Synonym: *Anacyclus australis*, *Soliva tenella*, *Cotula venosa*

Similarities with other species: In Pakistan, closely resembling species of *Cotula australis* are *Cotula hemisphaerica* and *Soliva pterosperma* (also a new record, under review). The bracts of *C. australis* are elliptical with entire membranous margins while *C. hemisphaerica* has oblong with membranous margins only at tip. Unlike *C. australis*, flowering head of *C. hemisphaerica* is bright yellow and peduncle is short. Leaves of *S. pterosperma* are very similar to those of *C. australis* but differences are present in their size,

capitula and achenes. Further, the heads of *C. australis* are not sessile, present on along stalk and produce dimorphic achenes as compare to *S. pterosperma* which have sessile heads along with spiny achenes. Heads of *S. pterosperma* are sessile

and produce one kind of achenes with spiny persistent style as compare to *C. australis* which have terminal stalked flower heads and produce dimorphic achenes without persistent style (Figure 1g).



Figure 1: *Cotula australis* habit (a) a plant showing its dissected leaves and fruiting head (b) flowering head showing disk florets with its 4 lobed corolla (c) female florets showing glandular hairs on ovary and forked style (d) capitulum showing bracts and remaining stalk attached after seed dispersal (e) dimorphic achenes of *C. australis* (f) difference in the size and morphology of two species, from left to right *C. australis* and *S. pterosperma*.

DISCUSSION

Cotula australis is first time reported from Pakistan generally growing in the parks, lawns and playing grounds within the turf grasses. *Cotula australis* is non-native, newly introduced into Pakistan and now naturalized in Lahore and surroundings. This species start growing in winter and spring mostly in

turf areas and die in early summer reflecting its preference to grow in moist habitats. The general mode of reproduction of this species is through seeds which are produced in large quantities and deposited in the soil after dispersal. In public lawns

and parks, the plant escapes from mowing and cutting because of its rosette habit, so it is difficult to control it only through physical strategies.

Cotula australis is reported as an alien plant species in many parts of the world. It has become naturalized in New Zealand, Taiwan, Belgium, Spain and California. This plant species moved from Australia to other regions of the world through imports of Australian grains (Grierson 1980). Trade and travelling activities are mainly responsible for the spread of this weed, for example this plant was introduced to Portugal through foreign wool (Pinto Da Silva, 1952).

This plant is a winter annual, low growing herb and known as common weed of turf areas. The presence of weeds affects the growth of turf grasses because they compete for space, moisture, light and nutrients. Therefore, effective management practices of turf grounds are mandatory to make the ground cover even and beautiful. Since this plant is a fast growing and rapid colonizer therefore, it is necessary to monitor its spread and movement to other areas in Pakistan. If measurements are not taken, then this species could become invasive weed of natural and agricultural ecosystems in Pakistan.

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