

## A report on *Emex australis* Steinh.-An emerging weed problem of wheat at Faridabad region of Haryana

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### ABSTRACT

An invasive weed *Emex australis* Steinh. is native of Southern Africa and significant weed of Western Australia which belongs to family Polygonaceae. It is commonly known as 'doublegee', 'three corner jack' or 'spiny emex'. Wheat field was selected for field experimentation where the species was recorded from extensive survey of 25 villages of district Faridabad, Haryana. It was growing gregariously in small to large patches. It is monoecious winter herb, prostrate, annual and having three angled nut enclosed in spinescent perianth. The species is highly invasive and only reported in Jammu and Kashmir and was found as new record of Upper Gangetic Plains of some parts of Uttar Pradesh in India. The plant has tendency to spread rapidly and may become an aggressive weed of wheat crop. The maximum population density of *E. australis* was recorded 2.7 m<sup>-2</sup> in Chhainsa village and minimum at Kanaura village i.e. 0.5 m<sup>-2</sup> among 25 villages. The population densities of 25 villages, taxonomic description and ecological behaviour of *E. australis* are further described in this paper.

**Keywords :** *Emex australis*, invasive weed, survey and wheat

*Emex australis* Steinh. is a significant noxious weed of wheat in Western Australia which belong to the family Polygonaceae. Wheat (*Triticum aestivum* L.) is widely grown as winter cereal and is the leading source of vegetal protein in human food, having a higher protein content than the other major cereals maize and rice. Also, the largest crop area is devoted to wheat and the quantity produced is more than that of any other crop (Labar *et al.*, 2017). *E. australis* is vigorous annual herb with a strong tap root and a long, fleshy, hairless stem. Morphologically the cotyledons are hairless, elongated and club-shaped. Subsequent leaves are alternate, hairless and triangular with undulating margins. Ovate leaves form a prostrate rosette at early stages of growth but can assume a semi-erect habit in dense crop or pasture. Round, ribbed stems branching from the centre of the rosette may grow up to 600 millimetres (mm) in length. Clusters of very small, inconspicuous white flowers produce hard woody achenes with three sharp spines radiating from the apex.

It is a weed in South Africa and Australia (Yeoh and Scott, 2002). The only two species of genus *Emex* i.e. *E. spinosa* (L.) Campd. and *E. australis* Steinh. (Plant list, 2013) was reported globally. In India, both species was already been reported. Initially, *E. spinosa* (L.) Campd. has been recorded from Santhal, Bihar (Verma *et al.*, 1984) and *E. Australis* Steinh. from Jammu and Kashmir (Sharma and Jamval, 1987). *E. australis* native to Southern Africa where as *E. spinosais* native of the Mediterranean region and Asia Minor. *E. Spinosa* by having longer fruiting perianth. (Tripathi *et al.*, 2018). Both weed may co-exist in wheat field and are different to distinguish after cotyledonous leaf stage until fruiting

(Javaid and Tanveer, 2014). It is not invasive species in Pakistan (Siddiqui, 1973) but invasive species in South Africa (Smith, 1966), Hawaii (Julien & Griffith, 1998, Krauss, 1963 and Holm *et al.*, 1979).

The *E. Australis* was initially found growing in village Chhainsa of Faridabad district around the wheat crop, in form of small patches which later grew into substantial and voluminous patches. During field survey of 25 villages of Faridabad, the species was found growing at vast majority in comparison to other weeds. A report has been observed where the occurrence of *E. australis* was found immense in flora of Faridabad district of Haryana.

The main objective of this study was to analyse the population density of *E. australis* around the different villages of Faridabad in field of wheat crop and to study the density of *E. australis* which become a problematic weed and discuss its possible destructive impact of particular species on the ecosystem as an invasive species.

During field survey at various villages (Latitude 28° 25' 48.00N, longitude 77° 19' 12.00 E) of Faridabad, an *E. australis* weed of Polygonaceae family was found growing throughout the wheat growing season i.e. from January to April 2019 at Faridabad region. After wide review of regional flora such as Flora of Uttar Pradesh (Singh *et al.*, 2016), Flora of Ghaziabad (Vardhana, 2007) and Flora of Agra District (Sharma and Dharkre, 1995), it was observed that no species of Polygonaceae has been recorded with such type of morphological characteristics. Some other genera from family Polygonaceae like *Polygonum*, *Fagopyrum* and *Rumex* etc. are known. After detailed morphological

examination, the *Emex* species was identified as *E. australis* (e- Flora of Pakistan; e- Flora of North America and Bala and Kaul, 2011).

After detailed morphological examination and confirmation of the species an experiment were carried out to know the presence or absence of *E. australis* in field of wheat crop. An extensive survey had been carried out for 35 villages to find the presence and absence of *E. australis* in wheat field. Among 35 surveyed villages

of wheat field, the population density of *E. Australis* was positively found in the 25 villages of Faridabad. The population densities of *E. australis* were recorded by simple quadrat method (Weaver, 1919) by using quadrat of 1 m × 1 m square size. Ten observations for each of the quadrat were taken to record *E. australis* population. The population density of *E. australis* were calculated as per Curtis and McIntosh (1950) formula:-

$$\text{Density} = \frac{\text{Total numbers of individuals of the species in all sampling unit (S)}}{\text{Total numbers of sampling units studied (Q)}}$$

In an extensive survey at the 35 villages of Faridabad district, the 25 villages were identified for the presence of *E. australis* in wheat crop. The *E. Australis* was found mainly around the Farm of wheat field, a scanty population were also observed in middle of the wheat cropland. The highest population densities of *E. australis* were recorded in village Chhainsa *i.e.* 2.7m<sup>2</sup> and lowest in village Kanaura *i.e.* 0.5 m<sup>2</sup>m<sup>-1</sup> (Fig. 2). The population density 0.9 m<sup>2</sup>m<sup>-1</sup> were recorded in different villages *i.e.* Alawalpur, Bhatola, Fatehpur Billauch, Faridpur, Nachauli, Tigaon and Tilpat. Beside this, *E. australis* were not recovered from 10 villages such as Dhakhola, Dayalpur, Kabulpur, KhriJamalpur, Madalpur, Mangar, Paota, Rawajpur, Sadpur and Tajpur. Uncontrolled weeds were reported to cause up to 62 per cent reduction in wheat yield or even more depending upon the weed density, type of weed flora and duration of infestation (Shiland Paul, 2018).

**Botanical name:** *Emex australis* Steinh (Fig.1)

**Synonyms:** *Emex centropodium* Meisn.

#### **Taxonomic description**

It is annual monoecious prostrate herb found along with tap root. Stem are dichotomously branch at the nodes, purple shade appears on stem. (Fig. 1d) Branches of stem and cluster of leaves are scattered around the root. The leaves are ovate, triangular, hairless (5-8 × 2-6 cm), cordate at the base and obtuse apex. The basal leaves are larger as compare to upper leaves having long petiole. Flowers are unisexual, sessile, male flower arranged in terminal cluster; (Fig. 1 d and , e) tepals greenish yellow, female flower are also sessile in axillary cluster, stigma feathery and leathery, trilobed. Fruiting perianth, 7-10 mm long with sharp spreading spines at the apex (Fig. 1 h). The fruit of *E. australis* are known as 'achene'. It is hard, wooden dimorphic in nature and 4-8 mm long, indehiscent. These achenes contain a single trigonous seed, produced firstly in the rosette and then sequentially in leaf axile along with stem.

#### **Flowering and fruiting**

The flowering and fruiting of *E. Australis* were observed during December to April at Faridabad region.

#### **Ecological behaviour of *E. australis***

It is prostrate monoecious herb, found abundantly in and around the bund of wheat field and few populations were also observed in wheat cropland. Beside this *E. australis* is also observed around the other crops like cabbage, carrot, potato, cauliflower, mustard, pea and tomato. It is growing in sandy loam soil with slightly alkaline soil (Gilbey and Weiss, 1980). It can dominate at such habitats where environmental conditions such as drought or unseasonal rains can modify pasture composition (Gilbey, 1974; Lemerele, 1996). *E. australis* is an annual plant that can only be reproduced by seed. Their seedlings emerged within two weeks and were easily distinguished at cotyledonous leaf stages in mixed weed species treatments. Cotyledonous leaves of *E. australis* are of dull green ovate shape. The leaves are initially hairless and oval with obtuse apex and triangular heart shape base (Wilding *et al.*, 1986). It develops a long and thick tap root (Fig.1 g).

#### **Distribution**

*E. australis* distributed in India, Pakistan and Taiwan (CABI, 2018) in Asia and North America, Africa, Central America and Oceania. It has been widely introduced by interception in Japan (Kurokawa, 2001) and UK (Lousely and Kent, 1981).

#### **Invassivness of *E. australis***

It is considered as noxious weed in several countries like Australia, USA, Japan and New Zealand. The seed have potential to remain viable for many years within the soil enabling the species to persist through long period of unfavourable conditions. During favourable conditions, the plants are capable to produce more than 1100 seeds (Weis, 1978). Seeds potential to travel and impaled on rubber tyre, shoes or as contamination of

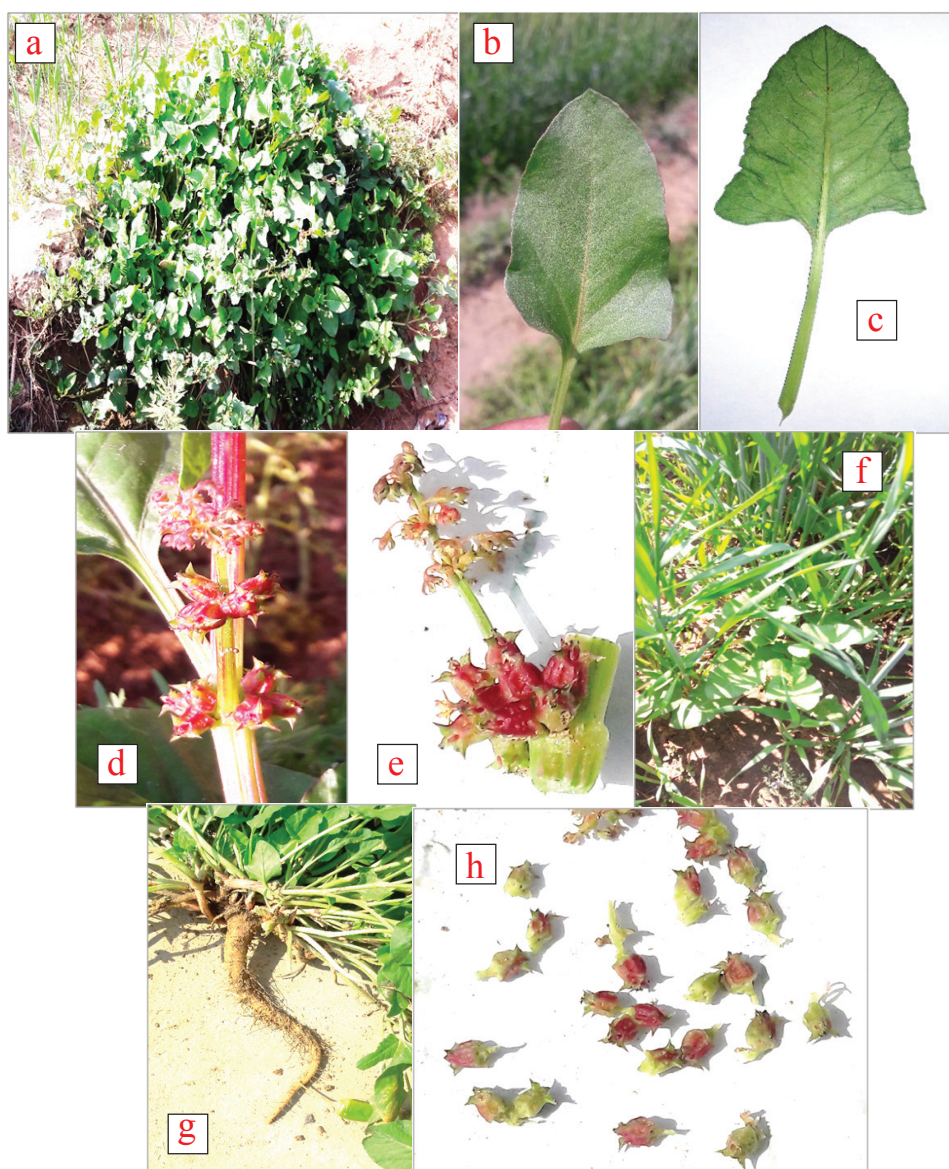


Fig.1: a. *Emex australis*- Habit ; b. Ventral view of leaf ; c. Dorsal view of leaf ; d&e. A twig showing male (on upper portion) and female flower (on lower portion); f. Vegetative stage of *E. australis* in wheat crop field; g. Tap root ; h. Female flowers with leathery stigma

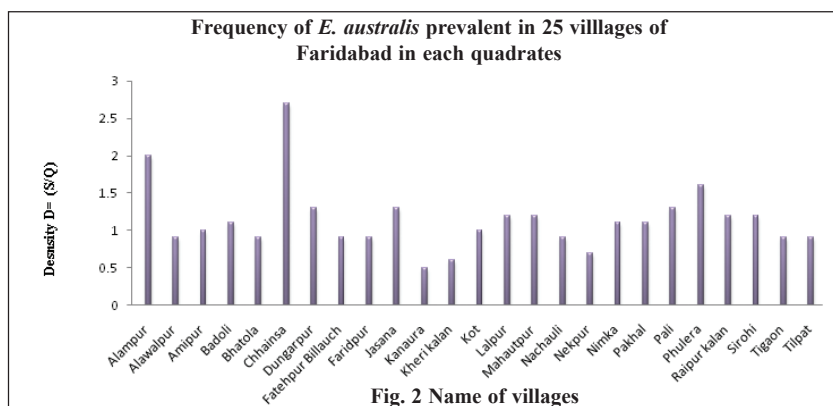


Fig. 2: Frequency of *E. Australis* found at 25 villages of Faridabad (quadrat wise)

agriculture produce for long distance due to achenes of *E. australis*. Sometime, it is attached to livestock or machinery (Gilbey, 1975).

*E. australis* may be considered to be an emerging weed problem in wheat crop of Faridabad and its adjoining districts of Haryana. These weeds have vigorous, prostrate growth and numerous branches and produce abundant biomass. A huge quantity of seeds production of these weeds when added to soil, leads to frequent weed germination under favourable moisture and temperature. It reduces the yield of wheat crop and possible become a havoc in near future. In present scenario, this weed needs to be controlled on the urgent basis to restrict its population, so that it could not become a nationwide problem.

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