

## **The biology and non-chemical control of Canadian Fleabane** (*Conyza canadensis* (L.) Cronquist)

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### **Canadian fleabane**

(bitterweed, horseweed)

***Conyza canadensis* (L.) Cronquist**

(*Erigeron canadensis*, *Leptilon canadense*)

### **Occurrence**

Canadian fleabane is an introduced weed naturalised in waste ground, waysides and on walls (Stace, 1997). Despite the name, this annual to biennial taprooted weed is thought by some to be native to Asia. However, it is said to be native to North America (Frankton & Mulligan, 1970). It was introduced from North America to Europe in the 17<sup>th</sup> century (Hanf, 1970). The fluffy seeds are reputed to have been introduced almost 300 years ago as the stuffing in bird skins mounted by taxidermists. Canadian fleabane was found on walls in London in the early 19<sup>th</sup> century, and by the end of that century had spread to waste ground throughout southern Britain. By 1942 it had spread to much of England and Wales. It is now a local weed of cultivated and uncultivated arable land on light soils (Clapham *et al.*, 1987; Brown & Whitwell, 1988). It prefers a sand or sandy-loam soil and can withstand dry conditions. It is intolerant of waterlogging (Weaver, 2001).

In the USA, Canadian fleabane numbers increased with the change to no-tillage growing systems (Buhler & Owen, 1997). It had previously occurred along roadsides and field edges but rapidly colonised uncultivated fields. In a survey of seeds in pasture soils in the Netherlands in 1966, while Canadian fleabane was uncommon in the sward it was well represented in the soil seedbank (Van Altena & Minderhoud, 1972).

Populations of Canadian fleabane resistant to triazine and to urea herbicides have been reported in vineyards in Hungary where the herbicides had been used regularly for 3 or more years (Pölös *et al.*, 1985). Populations with resistance to paraquat have also developed (Weaver, 2001; Putwain & Mortimer, 1989).

Canadian fleabane has been used medicinally as a diuretic (Barker, 2001). Several observers consider it can irritate the skin of individuals and the noses of grazing animals (Frankton & Mulligan, 1970). Smoke from the burning leaves is said to kill fleas and lice. The plants have been found to take up significant amounts of cadmium when growing on soil contaminated with heavy metals (Weaver, 2001). Canadian fleabane residues have been found to inhibit the growth of its own seedlings and those of other species.

### **Biology**

Canadian fleabane flowers from August to September (Clapham *et al.*, 1987), or June to October (Hanf, 1970). Each flower head is composed of many outer ray florets and inner disk florets (Weaver, 2001). Canadian fleabane is self-compatible and primarily self-pollinating although the flowers are visited by insects. A low level of outcrossing

is known to occur. Seeds mature 3 weeks after flowering. There may be 45 to 70 seeds per flower head. The average number of seeds per plant ranges from 38,000 to 60,000 according to Salisbury (1961), 25,000 to 32,000 according to Stevens (1957) and 200,000 according to Weaver (2001). Tall plants produce more seeds than short ones. The average seed number per plant in ruderal situations is given as 91,091 (Pawlowski *et al.*, 1967). The 1,000 seed weight is given as 0.052 to 0.072 g. Pot experiments suggest that overall seed production is reduced as plant density increases (Palmlad, 1968). The time from germination to fruiting is around 100 days (Guyot *et al.*, 1962).

There is no dormancy but seeds require light for germination (Thébaud *et al.*, 1996). In Petri dish tests with seed maintained under high or low light intensity or in darkness, seed germinated completely in the light but only 2% germinated in the dark (Grime & Jarvis, 1976). When seeds were put to germinate under a leaf canopy or in diffuse white light there was 10% germination under the canopy and 90% in the light (Górski *et al.*, 1977). The estimated base temperature for germination ranges from 12.52 to 12.99°C (Steinmaus *et al.*, 2000). It suggests that Canadian fleabane is intermediate between a summer and winter annual. In pot studies, seed germination was suppressed by increasing seed density (Palmlad, 1968).

Seedling emergence is mainly from the upper 10 mm of soil (Weaver, 2001). Crop residues delay emergence and reduce it by 80%.

Canadian fleabane a winter annual, it overwinters as a rosette of leaves ().

Spring emerging seedlings appear in April-May but low levels of emergence continue until mid-August before peak emergence begins in late-August-early-September. Spring emerging plants elongate rapidly, flower and set seed. When Canadian fleabane emerges in the autumn as a winter annual the seedlings form a rosette of leaves from which the flower stem develops in spring (Brown & Whitwell, 1988 Thébaud *et al.*, 1996). In the USA, it is usually considered a winter annual, although it can emerge in spring (Buhler & Owen, 1997). The winter survival rate of seedlings that emerged in the autumn was always greater than 59%. Larger rosettes, over 5 cm in diameter, survived better.

### **Persistence and Spread**

Viable seeds of Canadian fleabane were reported to occur in the seedbank of a 20-year old pasture despite its absence from the vegetation (Weaver, 2001). Seeds in dry storage gave 67% germination after 3 years (Comes *et al.*, 1978). Under laboratory conditions, seed longevity was 2-3 years according to Thébaud *et al.* (1996) and 4-5 years according to Guyot *et al.* (1962). Seed submerged in water for up to 9 months gave 1-2% germination (Comes *et al.*, 1978).

The seeds are light and have a hairy pappus that facilitates wind dispersal (Thébaud *et al.*, 1996). Seeds on tall plants are likely to be carried furthest by the wind (Weaver, 2001). Seeds are reported to travel distances of up to 122 m. Canadian fleabane seeds have been recovered from irrigation water (Kelley & Bruns, 1975).

## Management

Although it can colonise disturbed land Canadian fleabane becomes established only if there is no further tillage. Shallow cultivations prior to drilling were sufficient to prevent survival or establishment in autumn-sown cover crops (Brown & Whitwell, 1988). Where there was no cultivation and the crops were surface-sown, Canadian fleabane was present in moderate numbers. As a wind dispersed seed, Canadian fleabane is generally associated with zero tillage (Derksen *et al.*, 1993).

Seedlings that emerge in autumn or early spring are controlled by tillage (Weaver, 2001). Seedling emergence is prevented if crop residues cover the soil surface. Seed germination is reduced when residues of rye (*Secale cereale*) are present in the soil. Canadian fleabane seeds have some resistance to soil solarization. Seed viability is reduced but solarization does not prevent seedling emergence completely.

Phytoparasitic bacteria have been considered as potential biological weed control candidates for Canadian fleabane. Spray applications of *Pseudomonas syringae* with surfactant added have caused severe disease symptoms and plant death (Johnson *et al.*, 1996).

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