The biology and non-chemical control of Cow Parsley (*Anthriscus sylvestris* (L.) Hoffm.

W Bond, G Davies, R Turner
HDRA, Ryton Organic Gardens, Coventry, CV8, 3LG, UK

Cow parsley

(wild chervil, hedge parsley, keck, wild beaked parsley)
***Anthriscus sylvestris* (L.) Hoffm.**
(*Chaerophyllum sylvestre, Cerefolium sylvestre*)

Occurrence

Cow parsley is an erect, pubescent perennial, native in grassy places, hedgerows and wood-margins, abundant through most of Britain (Stace, 1997). It is also described as an annual, biennial and a short-lived monocarpic or polycarpic perennial (Darbyshire *et al.*, 1999*)*. Cow parsley is most frequent in soils of pH 7.0 (Grime *et al.*, 1988). It does not occur in waterlogged soils or sites that suffer drought. Cow parsley can become dominant on moderately disturbed grassland such as roadside verges where it suppresses the grasses (van Mierlo & van Groenendael, 1991). Although common in hedge-bottoms and field edges it does not spread far into the arable field (Marshall, 1989). The majority of seeds of cow parsley (87%) in the field margins were dispersed within 1 m of the source (Rew *et al.*, 1996). The rest were observed up to 3 m from the source. Cow parsley is only found as seedlings on arable land (Grime *et al.*, 1988). Populations exhibit some variation in morphology.

The plant is palatable to and grazed by cattle, although it is of low nutritional value (Darbyshire *et al.*, 1999*)*. The willow carrot aphid (*Cavariella aegopodii*) can overwinter on cow parsley (Heathcote, 1970). *Liparius coronatus* is a nationally scarce species of weevil associated with cow parsley (Crofts & Jefferson, 1999). Its larvae are root feeders.

Biology

Cow parsley flowers from April to June (Barker, 2001). The flowers are insect pollinated (Grime *et al.*, 1988). The fruits mature in late-June to July and gradually fall off from July through to September (Darbyshire *et al.*, 1999*)*. Some can persist on the senesced flowering stem into the winter. There may be 800 to 10,000 seeds per plant

The embryos in ripe seeds are immature and require a period of after-ripening (Roberts, 1979). Seed is known to require a period of cold before germinating (Lovett Doust & Lovett Doust, 1982; van Mierlo & van Groenendael, 1991). Chilling over the winter results in synchronous germination in spring (Grime *et al.*, 1988). The seeds will germinate at a constant temperature between 0 and 20^{o}C (van Mierlo & van Groenendael, 1991). There was complete germination of cow parsley seeds during a 3-month period of moist storage at 5^{o}C (Grime *et al.*, 1981).

Seed sown in the surface 25 mm of soil in boxes outdoors and stirred periodically emerged mainly from January to April with odd seedlings emerging at other times (Chancellor, 1979). Seed sown in a 75 mm layer of soil in cylinders sunk in the field and stirred periodically emerged from January to May with no seedlings outside this

period (Roberts, 1979). The majority of seedlings emerged in the first year, a few in year 2 and virtually none from then to year 5, the end of the study. No viable seeds were recovered at that time. Seed sown into short turf in October emerged from February to May with a peak in late-February (Thompson & Baster, 1992). Only 11% of seedlings survived through the summer.

The seedlings form leaf rosettes but do not flower in the first year (van Mierlo & van Groenendael, 1991). Once they reach a minimum size, vernalisation can lead to flowering. During early growth a high proportion of resources are allocated to root development. The plant produces a thick tap root up to 2 m long (Darbyshire *et al.*, 1999*)*. The root and its crown overwinter. Cow parsley perennates by buds in the axils of the basal leaves (Grime *et al.*, 1988). These develop into new plants once the flower stem dies.

Persistence and spread

Cow parsley does not appear to establish a persistent seedbank in soil (van Mierlo & van Groenendael, 1991). Thompson *et al.* (1993) suggest that based on the seed characters, cow parsley seed is likely to persist less than 5 years. Freshly harvested seeds mixed with soil in the field and cultivated periodically, emerged predominantly in the year after sowing (Roberts, 1981). Just 1% of seedlings emerged in year-2 and none thereafter.

The seeds have no obvious dispersal mechanism (Darbyshire *et al.*, 1999*)*. Reproduction from seed occurs mainly after soil disturbance. The seeds do not float in water.

Vegetative reproduction occurs with the production of side rosettes from buds in the leaf axils of the root crown (Darbyshire *et al.*, 1999*)*. After flowering the main rosette dies but produces at least 2 side rosettes (van Mierlo & van Groenendael, 1991). These develop taproots and the new plantlets separate from the senescing parent plant. Dense populations can develop in this way and vegetative reproduction is more important than seed production in standing vegetation.

Management

To prevent cow parsley seeding, mow hay early and cut cow parsley down in pasture (Morse & Palmer, 1925). Cow parsley increases when aftermath grazing lapses in hay meadows (Backshall *et al.*, 2001). In roadside verges, increased cutting frequency reduced the incidence of cow parsley (Parr & Way, 1984; 1988). Repeated cutting, 3-6 times per year, may give a measure of control.

In grassland, cow parsley is favoured by liming and increased levels of potassium (Williams, 1976). The species increases in abundance at higher nitrogen levels and where cutting is infrequent (Crofts & Jefferson, 1999). Three or more cuts per year, preferably with one cut prior to the onset of flowering can reduced the abundance of cow parsley. Cutting of immature flowering stems in early May stimulates the production of flowering shoots from axillary buds and depletes food reserves in the roots (van Mierlo & van Groenendael, 1991). The result is less vegetative reproduction and plant numbers decline. Cutting at flowering induces side shoot production but no secondary flower stems develop, reserves are allocated to vegetative reproduction and the plant population increases.

Spring grazing will decrease cow parsley populations. The plant is also sensitive to trampling (Grime *et al.*, 1988). Due to its relatively large seeds, cow parsley is able to establish in grassland even where disturbance is minimal (Burke & Grime, 1996).

Acknowledgement
This review was compiled as part of the Organic Weed Management Project, OF 0315, funded by DEFRA.

References

Backshall J, Manley J, Rebane M (2001). *The upland management handbook.* English Nature, Peterborough, UK.

Barker J (2001). *The medicinal flora of Britain and Northwestern Europe,* Winter Press, West Wickham, Kent, UK.

Burke M J W & Grime J P (1996). An experimental study of plant community invasibility. *Ecology* **77** (3), 776-790.

Chancellor R J (1979). The seasonal emergence of dicotyledonous weed seedlings with changing temperature. *Proceedings of the EWRS Symposium – The influence of different factors on the development and control of weeds*, 65-72.

Crofts A & Jefferson R G (eds) (1999). *Lowland Grassland Management Handbook.* 2nd Edition, English Nature/The Wildlife Trusts.

Darbyshire S J, Hoeg R, Haverkort J (1999). The biology of Canadian weeds. 111. *Anthriscus sylvestris* (L.) Hoffm. *Canadian Journal of Plant Science* **79**, 671-682.

Grime J P, Hodgson J G, Hunt R (1988). *Comparative Plant Ecology*, Unwin Hyman Ltd, London, UK.

Grime J P, Mason G, Curtis A V, Rodman J, Band S R, Mowforth M A G, Neal A M, Shaw S (1981). A comparative study of germination characteristics in a local flora. *Journal of Ecology* **69**, 1017-1059.

Heathcote G D (1970). Weeds, herbicides and plant virus diseases. *Proceedings of the 10th British Weed Control Conference*, 934-941.

Lovett Doust J & Lovett Doust L (1982). Life-history patterns in British Umbelliferae: a review. *Botanical Journal of the Linnean Society,* **85** (3), 179-194.

Marshall E J P (1989). Distribution patterns of plants associated with arable field edges. *Journal of Applied Ecology* **26**, 247-257.

Morse R & Palmer R (1925). *British weeds their identification and control*. Ernest Benn Ltd, London.

Parr T W & Way J M (1984). The effects of management on the occurrence of agricultural weeds in roadside verges. *Aspects of Applied Biology* **5**, *Weed control and vegetation management in forests and amenity areas*, 9-18.

Parr T W & Way J M (1988). Management of roadside vegetation: The long-term effects of cutting. *Journal of Applied Ecology* **25**, 1073-1087.

Rew L J, Froud-Williams R J, Boatman N D (1996). Dispersal of *Bromus sterilis* and *Anthriscus sylvestris* seed within arable field margins. *Agriculture, Ecosystems and Environment* **59**, 107-114.

Roberts H A (1979). Periodicity of seedling emergence and seed survival in some Umbelliferae. *Journal of Applied Ecology* **16**, 195-201.

Roberts H A (1981). Seed banks in soils. *Advances in Applied Biology* **6**, 1-55.

Stace C (1997). *New Flora of the British Isles*. 2nd edition. Cambridge University Press, Cambridge, UK.

Thompson K, Band S R, Hodgson J G (1993). Seed size and shape predict persistence in soil. *Functional Ecology* **7**, 236-241.

Thompson K & Baster K (1992). Establishment from seed of selected Umbelliferae in unmanaged grassland. *Functional Ecology* **6**, 346-352.

van Mierlo J E M & van Groenendael J M (1991). A population dynamic approach to the control of *Anthriscus sylvestris* (L.) Hoffm. *Journal of Applied Ecology* **28**, 128-139.

Williams E D (1976). Components of the vegetation of permanent grassland in relation to fertilizers and lime. *Annals of Applied Biology* **83**, 342-345.