The biology and non-chemical control of Common Hemp-nettle (*Galeopsis tetrahit* L.)

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

Common hemp-nettle

(bee-nettle, blind-nettle, day-nettle, dog-nettle, glidewort, holyrope)
***Galeopsis tetrahit* L.**

Occurrence

Common hemp-nettle is a native summer annual weed sometimes plentiful on arable land and cornfields on acid peaty and sandy or loamy soils (Long, 1938). It also occurs in damp places, waste ground, roadsides and woodland clearings, and is found throughout UK (Stace, 1997). In an early survey of Bedfordshire and Norfolk it was characteristic of lighter soils and rare on chalk (Brenchley, 1913). It likes nutrient rich, loamy, sandy or stony soils (Hanf, 1970). Vegetative and reproductive growth is reduced in dry conditions (O'Donovan & Sharma, 1987).

Common hemp-nettle seed was found in 9% of arable soils in a seedbank survey in Scotland in 1972-1978 (Warwick, 1984). It was also a common weed in a seedbank survey in swede turnip fields in Scotland in 1982 being found in 60% of the fields sampled (Lawson *et al.*, 1982). It was a serious weed in *Narcissus* crops because of its shading effect reducing bulb yield (Lawson, 1976). In a comparison of the ranking of arable weed species in unsprayed crop edges in the Netherlands in 1956 and in 1993, common hemp-nettle had moved up from 9th to 5th place (Joenje & Kleijn, 1994).

Common hemp-nettle is a very variable species in respect of flower colour and leaf shape (O'Donovan & Sharma, 1987; Frankton & Mulligan, 1970). It is said to have originated as a hybrid between *G. speciosa* and *G. pubescens* (McNeill, 1976).

The plant has some medicinal and therapeutic uses (Barker, 2001). The seeds are thought to be included in the diet of marsh and willow tits.

Biology

Common hemp-nettle flowers from July to September (Clapham *et al.*, 1987). It is a long day plant with regard to flower initiation (O'Donovan & Sharma, 1987). The flowers are self-fertile and mainly autogamous. Insect pollination is not required. Seed is set from August to October (Grime *et al.*, 1988). There is an average of 387 seeds per plant according to O'Donovan & Sharma (1987) but a plant may have 2,800 seeds according to Hanf (1970). The average seed number per plant in ruderal situations is given as 1,584 (Pawlowski *et al.*, 1967). In cereal crops the average seed number per plant ranged from 34 to 68 and in root crops from 580 to 717 (Pawlowski, 1966). In pure stands of the weed, seed number per plant was reduced as plant density increased but seed number for a given area was little affected (Légère & Deschênes, 1989). Early emerging plants have the potential to produce a greater number of seeds. Flowers near the top of the plant generally produce 4 mature seeds while those lower down may produce just a single seed. The seeds are shed as they mature.

Seeds from different populations show considerable variation in dormancy (O'Donovan & Sharma, 1987). Removal of the seed coat stimulates germination in dormant seeds. Dormancy is also broken by chilling (Grime *et al.*, 1988). There was 25% germination of seeds during a 10-month period of moist storage at 5°C (Grime *et al.*, 1981). Seeds kept outdoors in moist soil overwinter, exhumed in darkness and put to germinate in 12 hours light per day, in darkness following a 5 second light flash or in complete darkness gave 83%, 78% and 71% germination respectively (Andersson *et al.*, 1997).

Seeds germinate mainly at 5 to 40 mm depth in soil, few germinate on the soil surface (O'Donovan & Sharma, 1987). The first seedlings emerge in early spring with further flushes of emergence throughout the growing season. There may be a second flush of germination in the autumn (Grime *et al.*, 1988). Few of the seeds sown in a 75 mm layer of soil in open cylinders in the field and stirred periodically emerged in the autumn immediately after sowing in September (Roberts, 1986). In the following and subsequent years the main emergence period was from March to May. A high number of seedlings emerged in years 1 and 2, and a decreasing number of seedlings emerged over the rest of the 5-year the study. Over 9% of the seeds remained viable in the soil after 5 years. Seedling emergence in Scotland, recorded in field plots dug at monthly intervals, began in April and continued through until October (Lawson *et al.*, 1974).

The plant has a taproot with branched laterals (O'Donovan & Sharma, 1987).

Persistence and Spread

Thompson *et al.* (1993) suggest that based on seed characters, common hemp-nettle seed should persist longer than 5 years in soil. Some seed remained viable after 5 years in a cultivated soil (Roberts, 1986). Seed buried in soil in subarctic conditions had 46% viability after 2.7 years but no seed was viable after 6.7 years (Conn & Deck, 1995). Seed recovered from excavations and dated at 25 and 30 years old is reported to have germinated (Ødum, 1974).

The decline of seeds broadcast onto the soil surface and then ploughed-in was followed over a 6-year period of cropping with winter or spring wheat grown as commercial crops on a clay and on a silty loam soil. Every effort was made to prevent further seed return to the soil. Common hemp-nettle had a mean annual decline rate of 61% and an estimated time to 95% decline of 3 to 5 years (Lutman *et al.*, 2002).

Seed shed at maturity may be dispersed by wind and water (O'Donovan & Sharma, 1987). The seeds may float in water for 2 days (Grime *et al.*, 1988). Common hemp-nettle seed has been found in cattle droppings (Salisbury, 1961).

In cereal seed samples tested between 1961 and 1968, common hemp-nettle was a contaminant in up to 1.4% of rye, 1.8% of oats, 1.1% of barley and 0.6% of wheat samples tested (Tonkin, 1968). In cereal seed sampled in the period 1978 to 1981, common hemp-nettle seed was found in up to 2% of wheat and up to 6% of barley samples tested (Tonkin, 1982). In a survey of weed seed contamination in cereal seed in drills ready for sowing on farm in spring 1970, it was found in 6% of samples

(Tonkin & Phillipson, 1973). Most of this was home saved seed. In 1991-1997 common hemp nettle seed was found in up to 0.4% of certificated barley seed samples but was found in over 5% of the pre-certification samples for 1996/97 (Don, 1997).

Management

Common hemp-nettle causes yield losses in spring barley (Scragg *et al.*, 1982). Relative time of crop and weed emergence is a major factor in determining the severity of loss.

Control is by surface cultivations in spring and autumn (Long, 1938). Regular hoeing in spring will destroy most seedlings (Morse & Palmer, 1925). Delayed crop drilling allows time for pre-sowing cultivations to kill the first flush of seedlings (O'Donovan & Sharma, 1987).

Acknowledgement

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

References

Andersson L, Milberg P, Noronha A (1997). Germination response of weed seeds to light of short duration and darkness after stratification in soil. *Swedish Journal of Agricultural Research*, **27**, 113-120.

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

Brenchley W E (1913). The weeds of arable soil III. Annals of Botany 27, 141-166.

Clapham A R, Tutin T G, Moore D M (1987). Flora of the British Isles, 3rd edition, Cambridge University Press, Cambridge, UK.

Conn J S & Deck R E (1995). Seed viability and dormancy of 17 weed species after 9.7 years burial in Alaska. *Weed Science* **43**, 583-585.

Don R (1997). Weed seed contaminants in cereal seed. *Proceedings of the Brighton Crop Protection Conference – Weeds*, Brighton, UK, 255-262.

Frankton C & Mulligan G A (1970). *Weeds of Canada.* Publication 948, Canada Department of Agriculture.

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.

Hanf M (1970). *Weeds and their seedlings.* BASF UK Ltd.

Joenje W & Kleijn D (1994). Plant distribution across arable field ecotones in the Netherlands. *BCPC Monograph No. **58**: Field margins: integrating agriculture and conservation*, 323-328.

Lawson H M (1976). The effects of spring-germinating weeds on Narcissus. *Annals of Applied Biology* **83**, 324-327.

Lawson H M, Waister P D, Stephens R J (1974). Patterns of emergence of several important arable weed species. *British Crop Protection Council Monograph No.* **9**, 121-135.

Lawson H M, Wright G McN, Smoktunowicz N T (1982). Weed seed populations in swede turnip fields in Scotland. *Proceedings VIIeme Colloque*

International sur la Biologie, L'Ecologie et la Systematique des Mauvaise Herbes, 33-42.

Légère A & Deschênes J-M (1989). Effects of time of emergence, population density and interspecific competition on hemp-nettle (*Galeopsis tetrahit*) seed production. *Canadian Journal of Plant Science* **69**, 185-194.

Long H C (1938). Weeds of arable land. *MAFF Bulletin* **108**, 2nd edition. HMSO, London, UK.

Lutman P J W , Cussans G W, Wright K J, Wilson B J, McN Wright G, Lawson H M (2002). The persistence of seeds of 16 weed species over six years in two arable fields. *Weed Research* **42**, 231-241.

McNeill (1976). The Taxonomy and evolution of weeds. *Weed Research* **16**, 399-413.

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

O'Donovan J T & Sharma M P (1987). The biology of Canadian weeds. 78. *Galeopsis tetrahit* L. *Canadian Journal of Plant Science* **67**, 787-796.

Ødum S (1974). Seeds in ruderal soils, their longevity and contribution to the flora of disturbed ground in Denmark. *Proceedings of the 12th British Weed Control Conference*, Brighton, UK, 1131-1144.

Pawlowski F (1966). Prolificacy, height and ability of producing shoots on some weed species growing among crop plants. *Annales Universitatis Mariae Curie-Sklodowska Lublin-Polonia,* **21** (9), 175-189.

Pawlowski F, Kapeluszny J, Kolasa A, Lecyk Z (1967). Fertility of some species of ruderal weeds. *Annales Universitatis Mariae Curie-Sklodowska Lublin-Polonia* **22** (15), 221-231.

Roberts H A (1986). Seed persistence in soil and seasonal emergence in plant species from different habitats. *Journal of Applied Ecology* **23**, 639-656.

Salisbury E J (1961). *Weeds & Aliens*. New Naturalist Series, Collins, London.

Scragg E B, McKelvie A D, MacKay J M, Birkinshaw N (1982). Investigations into the effects of annual broad-leaved weed competition on the yield of spring barley. *Aspects of Applied Biology* **1**, *Broad-leaved weeds and their control in cereals*, 233-238.

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.

Tonkin J H B (1968). The occurrence of broad-leaved weed seeds in samples of cereals tested by the official seed testing station, Cambridge. *Proceedings 9th British Weed Control Conference*, Brighton, UK, 1199-1205.

Tonkin J H B (1982). The presence of seed impurities in samples of cereal seed tested at the Official Seed Testing Station, Cambridge in the period 1978-1981. *Aspects of Applied Biology* **1**, *Broad-leaved weeds and their control in cereals*, 163-171.

Tonkin J H B & Phillipson A (1973). The presence of weed seeds in cereal seed drills in England and Wales during spring 1970. *Journal of the National Institute of Agricultural Botany* **13**, 1-8.

Warwick M A (1984). Buried seeds in arable soils in Scotland. *Weed Research* **24**, 261-268.