The biology and non-chemical control of Henbit Dead-nettle (*Lamium amplexicaule* L.)

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Henbit dead-nettle

(chickweed, hen-bit, hen's bite)
***Lamium amplexicaule* L.**

Occurrence

Henbit dead-nettle is a small native annual or overwintering weed found throughout the UK on light and chalky ground (Long, 1938; Morse & Palmer, 1925). In an early weed survey of Bedfordshire and Hertfordshire, henbit dead-nettle was chiefly associated with light and sandy loams (Brenchley, 1913). It is recorded up to 1,500 ft in Britain (Salisbury, 1961). Henbit dead-nettle does not appear to have a natural habitat and is almost always associated with the activities of man (Dunn, 1903). It is a weed of arable land and waste places (Clapham *et al*., 1987; Stace 1997). It also occurs on roadsides, in pasture and turf.

Henbit dead-nettle is a common weed of winter cereals but causes little loss of yield (DeFelice, 2005). In a survey of weeds in conventional cereals in central southern England in 1982, henbit dead-nettle was found in 1% of winter wheat, and 2% winter barley and spring barley (Chancellor & Froud-Williams, 1984). Henbit dead-nettle seed was found in 2% of arable soils in a seedbank survey in Scotland in 1972-1978 (Warwick, 1984). In a comparison of the ranking of arable weed species in unsprayed crop edges in the Netherlands in 1956 and 1993, henbit dead-nettle moved from 28th to 25th (Joenje & Kleijn, 1994).

Henbit dead-nettle has caused mild neurological problems when consumed by sheep, sheep and horses grazing in infested pastures but these cases are rare (DeFelice, 2005). It has caused poisoning in cattle in Australia (Forsyth, 1968).

Biology

Henbit dead-nettle flowers from March to August and then again in September-October (Hanf, 1970). The flowers are visited by bees (DeFelice, 2005). It may also produce flowers that do not open and self-pollination is then inevitable (Salisbury, 1962). The number of seeds per plant is given as 200 by Hanf (1970). The average seed number per plant is 1,087 according to Pawlowski *et al.* (1970) and 1,000 according to Salisbury (1961). In field studies, the seed rain from plants emerging after a cultivation in April extended from mid-June to the end of July (Leguizamón & Roberts, 1982). Initial seed numbers in soil of red and henbit dead-nettles combined, increased from an initial 1,460 to a final 15,350 per m^2 within the upper 10 cm of soil. Approximately 10% of the shed seeds gave rise to seedlings.

Henbit dead-nettle is a summer annual in western Canada and a predominantly winter annual in southern USA (Blackshaw *et al.*, 2002). In Kentucky, USA, seeds germinate in spring (March-May) and autumn (August-October) (Baskin *et al*., 1986). Fresh seeds are dormant and they after-ripen at different rates and levels according to the ambient temperature (Baskin & Baskin, 1984). The higher the temperature the

faster and greater the release of dormancy. At lower temperatures the release is slower and seeds are only able to germinate at a lower range of temperatures. Seeds produced in the autumn and those remaining in the seedbank, after-ripen over the winter and can germinate in early spring but not once soil temperatures become higher. Seeds produced in late-spring and early summer and those already present in the seedbank at this time after-ripen over the summer and will then germinate in the autumn if conditions are favourable. At all times, light was needed for germination to occur (Baskin & Baskin, 1981). Seed that was tested after it had been stratified in soil overwinter gave almost complete germination in the light or in darkness with just a 5 second light flash (Andersson *et al.,* 1997). Less than 8% of seeds germinated in complete darkness.

In controlled conditions henbit seedlings emerged at temperatures of 5 to 25^{o}C but emergence was greatest at 15 to 20^{o}C (Blackshaw *et al.,* 2002). Emergence declined at low soil moisture levels and there was an interaction with temperature but temperature was the dominant factor.

Seed sown in pans of field soil showed no periodicity of emergence and was entirely exhausted after 12 months (Brenchley & Warington, 1930). Seed mixed into a 75 mm layer of soil in cylinders sunk in the field and cultivated 3 times in the year, emerged in two main flushes, March-April and July-October with the odd seedling emerging throughout the year (Roberts & Boddrell, 1983). Seedling emergence in Scotland recorded in field plots dug at monthly intervals began in April and continued through until October with peaks in summer and autumn (Lawson *et al.*, 1974).

In sandy loam soil, field seedlings emerged from the top 50-60 mm of soil with the majority coming from the upper 25-40 mm (Unpublished information). There was some evidence that under plastic covers seedlings could emerge from down to 75 mm.

Persistence and Spread

Seeds remain viable in soil for 25 years (DeFelice, 2005). Seeds recovered from house demolitions and dated at 25 and 30 years old are reported to have germinated (Ødum, 1974). Seedlings from fresh seed mixed with soil in the field and stirred periodically continued to emerge over a 5-year study period (Roberts, 1981). Most seedlings emerged in the year after sowing and emergence had declined by year 5 but a few viable seeds were still present in the soil.

There is an elaiosome attached to the base of the seeds that is attractive to ants and this may aid with seed dispersal (Pemberton & Irving, 1990).

Management

Control is by surface cultivations in spring and autumn (Long, 1938). Seedlings are largely destroyed by spring cultivations and constant use of the hoe (Morse & Palmer, 1925). Henbit dead-nettle populations may increase under zero-tillage (Blackshaw *et al.,* 2002).

In a study of the effect of the residues from harvested crops, wheat and field pea residues promoted henbit germination and subsequent growth (Purvis *et al.,* 1985). There was there was some inhibition of seedling emergence by residues of oilseed rape, sunflower and sorghum. Wheat gluten meal (WGM) at 1 or 3 g.dm^{-2} dusted

over seeds put to germinate on moist paper reduced germination by 100 and 75% respectively (Gough & Carlstrom, 1999).

Henbit dead-nettle is susceptible to soil solarization. The germination of natural seeds in pots of moist field soil heated with warm air for 6 hours was reduced by 10% at 47°C, by 70% at 48°C and by 80% at 52°C (Laude, 1957).

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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.

Baskin J M & Baskin C C (1981). Seasonal changes in the germination responses of buried *Lamium amplexicaule* L. seeds. *Weed Research* **21**, 299-306.

Baskin J M & Baskin C C (1984). Effect of temperature during burial on dormant and non-dormant seeds of *Lamium amplexicaule* L. and ecological implications. *Weed Research* **24**, 333-339.

Baskin J M, Baskin C C, Parr J C (1986). Field emergence of *Lamium amplexicaule* L. and *L. purpureum* L. in relation to the annual dormancy cycle. *Weed Research* **26**, 185-190.

Blackshaw R E, Brandt R N, Entz T (2002). Soil temperature and soil water effects on henbit emergence. *Weed Science* **50**, 494-497.

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

Brenchley W E & Warington K (1930). The weed seed population of arable soil. I. Numerical estimation of viable seeds and observations on their natural dormancy. *The Journal of Ecology* **18** (2), 235-272.

Chancellor R J & Froud-Williams R J (1984). A second survey of cereal weeds in central southern England. *Weed Research* **24**, 29-36.

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

DeFelice M S (2005). Intriguing world of weeds – Henbit and deadnettles, *Lamium* spp.-archangels or demons. *Weed Technology* **19**, 768-774.

Dunn S T (1903). Origin of deadnettles in Britain. *Journal of Botany* **31**, 356-361.

Forsyth A A (1968). British poisonous plants. *MAFF Bulletin No.* **161**, HMSO, London.

Gough R E & Carlstrom R (1999). Wheat gluten meal inhibits germination and growth of broadleaf and grassy weeds. *HortScience* **34** (2), 269-270.

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.

Laude H N (1957). Comparative pre-emergence heat tolerance of some seeded grasses and of weeds. *Botanical Gazette* **119** (1), 44-46.

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.

Leguizamón E S & Roberts H A (1982). Seed production by an arable weed community. *Weed Research* **22**, 35-39.

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

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

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, Kapeluszny J, Kolasa A, Lecyk Z (1970). The prolificacy of weeds in various habitats. *Annales Universitatis Mariae Curie-Sklodowska Lublin-Polonia,* **25** (5), 61-75.

Pemberton R W & Irving D W (1990). Elaiosomes on weed seeds and the potential for myrmecochory in naturalized plants. *Weed Science* **38**, 615-619.

Purvis C E, Jessop R S, Lovett J V (1985). Selective regulation of germination and growth of annual weeds by crop residues. *Weed Research* **25**, 415-421.

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

Roberts H A & Boddrell J E (1983). Seed survival and periodicity of seedling emergence in ten species of annual weeds. *Annals of Applied Biology* **102**, 523-532.

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

Salisbury E (1962). The biology of garden weeds. Part I. *Journal of the Royal Horticultural Society* **87**, 338-350 & 390-404.

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

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