

The biology and non-chemical control of Parsley Piert (*Aphanes arvensis* L.)

W Bond, G Davies, R Turner

HDRA, Ryton Organic Gardens, Coventry, CV8, 3LG, UK

Parsley piert

(colickwort, field lady's mantle, parsley breakstone)

Aphanes arvensis L.

(*Alchemilla arvensis* Lamk.)

Occurrence

Parsley piert is a native winter or summer annual common throughout the UK on arable land and bare patches in grassland, mainly on dry soils (Clapham *et al.*, 1987; Stace 1997). It is recorded up to 1,700 ft in Britain and has been found in prehistoric deposits (Salisbury, 1961). It is sometimes plentiful in cornfields on dry, loamy, calcareous soils (Long, 1938). In early surveys of Bedfordshire, Hertfordshire and Norfolk, parsley piert was characteristic of light sandy soils but its occurrence on chalk was very variable (Brenchley, 1911; 1913). Parsley piert occurs in soils within the pH range of 4.0 to 7.5 (Grime *et al.*, 1988). It is very drought tolerant.

There is evidence that Parsley piert was a weed of crops in the Bronze Age (Greig, 1988). Somewhat more recently it was found to be plentiful in winter wheat but of little importance in spring barley (Brenchley & Warington, 1930; Brenchley, 1920). In a survey of weeds in conventional cereals in central southern England in 1982, parsley piert was found in less than 1% of winter wheat and not at all in winter barley and spring barley (Chancellor & Froud-Williams, 1984). In a study of seedbanks in some arable soils in the English midlands sampled in 1972-3, parsley piert was recorded in 72% of the fields sampled in Oxfordshire and 31% of those in Warwickshire (Roberts & Chancellor, 1986). In a seedbank survey in swede-turnip fields in Scotland in 1982, parsley piert was found in 31% of the fields sampled (Lawson *et al.*, 1982).

Tricotyledonous seedlings appear at a ratio of around 1 in 2,700 seedlings (Brenchley & Warington, 1936). Parsley piert has medicinal uses and is an important remedy for dissolving kidney stones (Barker, 2001).

Biology

Parsley piert flowers from April to October according to Clapham *et al.* (1987), and May to August according to Morse & Palmer (1925). It is an apomictic species (Salisbury, 1962). Seed is set from May onwards (Grime *et al.*, 1988). Parsley piert can be found in flower and fruit for 7 months of the year. The time from germination to fruiting is around 100 days (Guyot *et al.*, 1962).

Freshly shed seeds require a period of after-ripening and germination is delayed until at least the autumn (Grime *et al.*, 1988). There was 29% germination in alternating temperatures under a safe green light but just 12% in complete darkness (Grime *et al.*, 1981). In darkness under a constant temperature there was only 2% germination. Seeds naturally-occurring in field soil, concentrated down by washing and put into dishes, germinated best in conditions where temperature fluctuations were around 16°C (Warington, 1936). Seed germination was 60% lower when temperature

fluctuations were no more than 1°C. Seeds that did not germinate in the first year survived and were able to germinate in subsequent years. Transferring the dishes to the wider temperature fluctuations resulted in a marked increase in germination.

In the field, there is only limited emergence of parsley piert seedlings following spring cultivations. (Roberts & Ricketts, 1979). However, cultivations made from August onwards result in emergence of between 3 and 9% of the viable seeds in the upper 100 mm of the soil seedbank. Seeds sown in pans of field soil germinated only in autumn (Brenchley & Warington, 1930). Many of the seeds remained dormant for several years before emerging. In the field too the species showed a strong preference for germination in autumn and winter. Field emergence in plots cultivated at monthly, 3 monthly or yearly intervals or not at all extended from March to December with a small peak in March and the main flush in August-October (Chancellor, 1964). Most seedlings emerged in the plots cultivated at regular intervals. Seeds mixed in a 75 mm layer of soil in cylinders sunk in the field and cultivated 3 times each year, emerged mainly from August to November with odd seedlings appearing until April (Roberts & Boddrell, 1983). Most seedlings emerged in year 1 of the 5-year study then gradually reduced in number to year 5. Seed collected and sown on June 22nd germinated intermittently until a flush of seedlings emerged in November-December and again in January (Salisbury, 1962).

In a sandy loam soil, field seedlings emerged from the top 30 mm of soil with 89% in the upper 15 mm and 60% in the surface 5 mm (Unpublished information). Parsley piert occurs mostly as a winter annual with many seeds germinating in autumn. The seedlings are frost tolerant and overwintering plants form cushion-like tussocks.

Persistence and Spread

Parsley piert is able to form a large persistent seedbank (Grime *et al.*, 1988). The seed is reported to persist for 3-5 years in soil (Guyot *et al.*, 1962).

Viable seed has been found in cattle droppings (Salisbury, 1961).

Management

Parsley piert is not normally a troublesome weed and surface cultivations will usually keep it down as will a dense crop stand (Long, 1938). Hoeing in root crops will prevent seeding (Morse & Palmer, 1925). Parsley piert appears to dislike lime. It is said to increase in continuous cereals (Horne, 1953). In a comparison of different tillage regimes in winter cereals, parsley piert was favoured by reduced cultivations (Pollard & Cussans, 1981).

Seed numbers in soil were reduced by 50% with a 1-year fallow and by 70% if this was extended for a second year (Brenchley & Warington, 1933). The land was ploughed, disked and harrowed during this time. Seed numbers were reduced but to a lesser extent by cropping with winter wheat for the same period. The lengthy seed dormancy allowed some seeds to survive in the soil over the fallow period. Fallowing at 5 year intervals over a 15 year period did not reduce seed numbers in soil at the first or second fallowing but at the third, seed numbers were reduced by 30% (Brenchley & Warington, 1945). Seed numbers were able to increase in the intervening cropped years.

Parsley piert is generally avoided by rabbits (Tansley, 1949).

Acknowledgement

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

References

- Barker J** (2001). *The medicinal flora of Britain and Northwestern Europe*, Winter Press, West Wickham, Kent, UK.
- Brenchley W E** (1911). The weeds of arable land in relation to the soils on which they grow. *Annals of Botany* **25**, 155-165.
- Brenchley W E** (1913). The weeds of arable soil III. *Annals of Botany* **27**, 141-166.
- Brenchley W E** (1920). *Weeds of Farm Land*. Longman, Green & Co., London, UK.
- 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.
- Brenchley W E & Warington K** (1933). The weed seed population of arable soil. II. Influence of crop, soil and method of cultivation upon the relative abundance of viable seeds. *The Journal of Ecology* **21** (1), 103-127.
- Brenchley W E & Warington K** (1936). The weed seed population of arable soil. III. The re-establishment of weed species after reduction by fallowing. *The Journal of Ecology* **24** (2), 479-501.
- Brenchley W E & Warington K** (1945). The influence of periodic fallowing on the prevalence of viable weed seeds in arable soil. *Annals of Applied Biology* **32** (4), 285-296.
- Chancellor R J** (1964). Emergence of weed seedlings in the field and the effects of different frequencies of cultivation. *Proceedings 7th British Weed Control Conference*, Brighton, UK, 599-606.
- 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.
- Greig J** (1988). Traditional cornfield weeds – where are they now? *Plants Today* (November-December 1988), 183-191.
- 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.
- Guyot L, Guillemat J, Becker Y, Barralis G, Demozay D, Le Nail Fr** (1962). *Semences et Plantules des Principales des Mauvaises Herbes*. Association de Coordination Technique Agricole, Paris.
- Horne F R** (1953). The significance of weed seeds in relation to crop production. *Proceedings of the 1st British Weed Control Conference*, Margate, UK, 372-399.
- 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.

- 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.
- Pollard F & Cussans G W** (1981). The influence of tillage on the weed flora in a succession of winter cereal crops on a sandy loam soil. *Weed Research* **21**, 185-190.
- Roberts H A & Boddrell J E** (1983). Seed survival and seedling emergence in ten species of annual weeds. *Annals of Applied Biology* **102**, 523-532.
- Roberts H A & Chancellor R J** (1986). Seed banks of some arable soils in the English midlands. *Weed Research* **26**, 251-257.
- Roberts H A & Ricketts M E** (1979). Quantitative relationships between the weed flora after cultivation and the seed population in the soil. *Weed Research* **19**, 269-275.
- 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.
- Tansley A G** (1949). *The British Isles and their vegetation*. Volume 1, Cambridge University Press.
- Warington K** (1936). The effect of constant and fluctuating temperature on the germination of the weed seeds in arable soil. *The Journal of Ecology* **24** (1), 185-204.