The biology and non-chemical control of Spear-leaved Orache (*Atriplex prostrata* Boucher ex DC.)

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***Atriplex prostrata* Boucher ex DC**
(*Atriplex hastata* L.)
Spear-leaved orache
(hastate orache, halberd-leaved orache)

Occurrence

Spear-leaved orache is a summer annual with a prostrate habit that occurs on most soils (Long, 1938). It is found on waste ground and cultivated land including gardens throughout Britain (Stace, 1997). It is rarely a problem weed. Spear-leaved orache grows on sand, gravel, loam and clay soils and as a halophyte can tolerate some salinity and alkalinity in the substrate (Bassett & Munro, 1987). It can survive on roadsides where salt is spread. Spear-leaved orache is normally considered to be a nitrophilous plant but it has been seen to readily colonize fly ash, the fuel waste from power stations, which has a low nitrogen content (Weston, 1964).

In a preliminary survey of UK weeds in 1971-1973, it was rare or absent from most fields but common in 4% of the areas surveyed (Chancellor, 1977).

Plants are very variable both genotypically and phenotypically (Grime *et al.*, 1988).

Spear-leaved orache is rich in vitamin C and has been used as a vegetable (Barker, 2001). The plant is digestible by ruminants and in Canada has been grazed heavily by sheep (Bassett & Munro, 1987). However, it may be mildly poisonous to sheep if large amounts are fed to the exclusion of other forage.

Biology

Spear-leaved orache flowers from July to September (Clapham *et al.*, 1987). The flowers are primarily wind pollinated but are also visited by insects (Grime *et al.*, 1988). The seeds mature from August to October. The average seed number per plant is 13,760 and the 1,000 seed weight is 0.50 g (Stevens, 1932). The seeds are of 2 types (Bassett & Munro, 1987). The larger seeds are reddish-brown and flattened and the smaller, more numerous ones are rounded, black and glossy.

Seeds can exhibit dormancy in excess of 3 years but of the two seed types, the smaller black seeds exhibit marked longevity in the soil and the larger brown seeds show little delay in germination (Chepil, 1946). In germination tests the brown seeds gave 100% germination within 6 months. The black seed gave less that 10% germination in the same period. Scarification of the seed coat promotes immediate germination of the black seeds. Dormancy is broken by chilling (Grime *et al.*, 1988). The level of germination increased from 51 to 86% following a 3-month period of moist storage at 5^{o}C (Grime *et al.*, 1981). Diurnal fluctuations in temperature with an amplitude of 6.5^{o}C promote seed germination in the light (Thompson *et al.*, 1977). The seeds may have a light requirement for germination due to the retention of chlorophyll by the

maternal tissue that surrounds the developing seed (Cresswell & Grime, 1981). The chlorophyll filters the light that reaches the seeds. The germination of fresh seed is not promoted by light (Wesson & Wareing, 1969). Seeds germinated best when given alternating temperatures of 0/10°C to 5/25°C with 8 hrs light (Bassett & Munro, 1987). In darkness, seeds germinated best at alternating temperatures of 15/35°C to 15/40°C.

Freshly collected seeds mixed into the surface 75 mm of soil in cylinders sunk in the field and stirred periodically, emerged from March to May with a peak in April (Roberts & Neilson, 1980). Most seedlings emerged in the first two years of the trial but a few seedlings continued to emerge up to year 5.

Spear-leaved orache is a C_3 plant in terms of carbon fixation during photosynthesis (Baskin & Baskin, 1977; 1978).

Persistence and Spread

The dormant black seeds are able to survive in soil for over 5 years (Chepil, 1946).

Spear-leaved orache seeds can survive ingestion by cattle (Grime *et al.*, 1988).

Management

Control is by surface cultivation in spring, hoeing of root crops and hand pulling of larger plants to prevent seeding (Long, 1938). Spring cultivation, hoeing and harrowing, should destroy most seedlings (Morse & Palmer, 1925). The introduction of the weed through contaminated crop seed should be avoided.

Spear-leaved orache is largely absent from grazed and trampled sites (Grime *et al.*, 1988).

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References

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

Baskin J M & Baskin C C (1977). Productivity of C_3 and C_4 plant species. *Annals of the Association of American Geographers* **67** (4), 639-640.

Baskin J M & Baskin C C (1978). A discussion of the growth and competitive ability of C_3 and C_4 plants. *Castanea* **43**, 71-76.

Bassett I J & Munro D B (1987). The biology of Canadian weeds. 81. *Atriplex patula* L., *A. prostrata* Boucher ex DC., and *A. rosea* L. *Canadian Journal of Plant Science* **67**, 1069-1082.

Chancellor R J (1977). A preliminary survey of arable weeds in Britain. *Weed Research* **17**, 283-287.

Chepil W S (1946). Germination of weed seeds II. The influence of tillage treatment on germination. Scientific Agriculture **26** (8), 347-357.

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

Cresswell E G & Grime J P (1981). Induction of a light requirement during seed development and its ecological consequences. *Nature* **291** (5816), 583-585.

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.

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.

Roberts H A & Neilson J E (1980). Seed survival and periodicity of seedling emergence in some species of *Atriplex, Chenopodium, Polygonum* and *Rumex*. *Annals of Applied Biology* **94**, 111-120.

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

Stevens O A (1932). The number and weight of seeds produced by weeds. American *Journal of Botany* **19**, 784-794.

Thompson K, Grime J P, Mason G (1977). Seed germination in response to diurnal fluctuations of temperature. *Nature* **267** (5607), 147-149.

Wesson G & Wareing P F (1969). The role of light in the germination of naturally occurring populations of buried weed seeds. *Journal of Experimental Botany* **20** (63), 402-413.

Weston R (1964). Nitrogen nutrition in *Atriplex hastata* L. *Plant and Soil* **10** (2), 251-259.