The biology and non-chemical control of Common Orache (*Atriplex patula* L.)

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Common orache

(halbeardleaf orache, iron root, spreading orache)
***Atriplex patula* L.**

Occurrence

Common orache is a native, erect to procumbent summer annual found on disturbed and waste ground throughout the UK (Stace, 1997). It is found on all soils and has been recorded up to 1,500 ft in Britain (Long, 1938; Salisbury, 1961). It is a common weed on clays and heavy ground (Morse & Palmer, 1925). It occurs mainly on soils with a pH greater than 5.0 and prefers moist fertile sites (Grime *et al.*, 1988). Common orache can tolerate some salinity in the substrate (Bassett & Munro, 1987). Seed has been found in prehistoric deposits (Salisbury, 1961).

Common orache was thought to be discouraged by competitive crops like cereals (Brenchley, 1920). In a preliminary survey of arable weeds in the 1970's, common orache was absent to rare from some areas but common to abundant in others (Chancellor, 1977). It occurred in 37% of the areas surveyed. In a survey of weeds in conventional cereals in central southern England in 1982, common orache was found in 0.6% of winter wheat but not in winter or spring barley (Chancellor & Froud-Williams, 1984). In a study of seedbanks in some arable soils in the English midlands sampled in 1972-3, common orache was recorded in 34% of the fields sampled in Oxfordshire and 53% of those in Warwickshire but only in low numbers (Roberts & Chancellor, 1986). Common orache seed was found in 11% of arable soils in a seedbank survey in Scotland in 1972-1978 (Warwick, 1984).

Biology

Common orache flowers from June to August (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 ranges from 3,000 to 16,000 (Stevens, 1932; Stevens, 1957). The 1,000 seed weight is 2.15 g (Stevens, 1932). The seeds are polymorphic and vary in both size and colour (Long, 1938; Salisbury, 1961). The larger seeds are dull brown and compressed, and the smaller, more numerous ones are black, smooth and shiny (Bassett & Munro, 1987). Common orache can be found in fruit for 3 months of the year (Salisbury, 1962).

Seed dormancy is broken by chilling (Grime *et al.*, 1988). The level of germination increased from 0 to 90% following 2 months moist storage at 5^{o}C (Grime *et al.*, 1981). Germination was moderately high at alternating temperatures in darkness or under a green 'safe' light but was much lower at a constant temperature in darkness. Seed sown in pans of field soil emerged in winter and spring but did not appear at all in summer and autumn (Brenchley & Warington, 1930). The seed was almost entirely worked out in 2 years. 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 each year until year

5 when the study ended. Seedling emergence in Scotland recorded in field plots dug at monthly intervals began in April/May and continued through until September/October with peaks in June and August (Lawson *et al.,* 1974).

In the field, 90% of seedlings emerged from the surface 30 mm of a clay soil, with the odd seedling emerging from down to 70 mm (Chancellor, 1964). In a sandy loam soil, field seedlings emerged from the upper 45 mm of soil with most emerging from the top 15 mm (Unpublished information).

Persistence and Spread

Seeds can retain viability for over 30 years (Salisbury, 1961). Seeds taken from soil under a 32 year old pasture have been found to germinate (Bassett & Munro, 1987). The black seeds can remain viable for long periods even in cultivated soil. Seedlings from fresh seed mixed with soil in the field and cultivated periodically, continued to emerge over a 5-year period (Roberts, 1981). Viable seeds were still present in the soil after 5 years.

In cereal seed samples tested in 1961-68, common orache seed was one of the most frequent contaminants being found in up to 1.7% of rye, 4.7% of oats, 4.3% of barley and 3.1% of wheat samples tested (Tonkin, 1968). In a survey of weed seed contamination in cereal seed in drills ready for sowing on farm in spring 1970, it was found in 8% of samples (Tonkin & Phillipson, 1973). Most of this was home saved seed. In the period 1978-1981, it was found in up to 9% of wheat and 6-7% of barley seed samples tested (Tonkin, 1982). In cereal seed samples tested in 1986-97, common orache seed was a contaminant in 0.1% of barley samples and none of the wheat and oat samples tested (Don, 1997). Common orache seed was found in 11% of red clover seed samples tested in 1951-52 and 10-16% of samples of English origin in 1960-61 (Gooch, 1963). In red clover seed from Canada and New Zealand, it was found in 2 and 4% respectively in samples tested in 1960-61. Common orache seed was found in less than 1% of white clover seed. It was also found in 4% of leek, 7% of carrot and 5% of mustard seed samples tested.

Seed has been found in cattle droppings and seedlings have been raised from the excreta of various birds (Salisbury, 1961). Seed has been recovered from irrigation water in the USA (Kelley & Bruns, 1975).

Management

Control of common orache is by surface cultivations in spring with light harrows (Long, 1938). In root crops, vigorous and frequent hoeing of seedlings in hot weather is effective. Large plants may need to be hand pulled to prevent seeding. Spring cultivation, hoeing and harrowing will destroy most seedlings (Morse & Palmer, 1925). Introduction of the weed through contaminated crop seed should be avoided.

Common orache is largely absent from grazed and trampled sites (Grime *et al.,* 1988). However, it is generally avoided by rabbits (Gillham, 1955).

Seed numbers in soil were reduced by 70% following a 1-year fallow and by over 80% if this was extended for a second year (Brenchley & Warington, 1933). The land was ploughed, disked and harrowed during this time. Seed numbers were also reduced but to a lesser extent by cropping with winter wheat for the same period.

Numbers remained low in the first crop after fallowing but odd seedlings may have survived within the crop and were able to flower and set seed in the stubble that remains after harvest (Brenchley & Warington, 1936). Seed numbers in soil were reduced by successive fallowing, 1 year in 5, over a 15-year period (Brenchley & Warington, 1945). Numbers were reduced by 70% after the first fallow and by over 95% in the second. This level was maintained after the 3rd fallow period too.

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