The biology and non-chemical control of Field Forget-me-not (*Myosotis arvensis* (L.) Hill.)

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Field forget-me-not

(common forget-me-not, bird's-eye, blue mouse-ear, forget-me-not, scorpion grass)
***Myosotis arvensis* (L.) Hill**
(*M. scorpioides*)

Occurrence

Field forget-me-not is a native winter or summer annual, biennial or perennial weed found in open, cultivated and well-drained ground including gardens, roadsides, on dunes and in woods (Stace, 1997; Clapham *et al*., 1987). It is common throughout the UK and is recorded up to 1,600 ft (Salisbury, 1961). In an early survey of Bedfordshire and Norfolk it was of universal occurrence but was found chiefly on sand and loam soils and rarely on chalk (Brenchley, 1913). It is an indicator of loam (Hanf, 1970). In Europe it shows a preference for soils with low pH (Holzner & Immonen, 1982).

Field forget-me-not is found mainly in winter cereals (Hanf, 1970). It is more frequent in wheat than barley (Brenchley, 1920). In a survey of weeds in conventional cereals in central southern England in 1982, field forget-me-not was found in 7, 4 and 2% of winter wheat, winter barley and spring barley respectively (Chancellor & Froud-Williams, 1984). It was relatively common in a survey of spring cereal weeds in N E Scotland in 1985 (Simpson & Carnegie, 1989). In a study of seedbanks in some arable soils in the English midlands sampled in 1972-1973, field forget-me-not was recorded in 59% of the fields sampled in Oxfordshire and 50% of those in Warwickshire but only in low numbers (Roberts & Chancellor, 1986). Field forget-me-not seed was found in 7% of arable soils in a seedbank survey in Scotland in 1972-1978 (Warwick, 1984). In a seedbank survey of arable fields in France in 1983-85, it was relatively common in the seedbank and in the standing vegetation (Barralis & Chadoeuf, 1987). In a comparison of the ranking of arable weed species in unsprayed crop edges in the Netherlands in 1956 and in 1993, field forget-me-not had moved up from 13th to 9th place (Joenje & Kleijn, 1994). In trials in Denmark from 1969-1986 it was one of the most frequent weeds of autumn-sown arable crops (Jensen, 1991).

Field forget-me-not can carry economically important virus diseases some of which are seed borne (Heathcote, 1970).

Biology

Field forget-me-not flowers from June to August according to Long (1938), or April to September (Clapham *et al*., 1987), or May to July and then again from August to September (Hanf, 1970). The flowers are usually self-pollinated (Grime *et al.*, 1988). Seed is set from May onwards. There are around 700 seeds per plant. A large plant may produce 1,500 to 3,000 seeds (Salisbury, 1961). In spring cereals the average seed number per plant ranged from 93 to 102, in winter cereals from 154 to 243 and in

root crops from 310 to 386 (Pawlowski, 1966). The average seed number per plant in winter rape was 142 and in red clover 410.

In Petri dish tests with seed maintained under high or low light intensity or in darkness, seed germinated virtually completely in the light but only 4% germinated in the dark (Grime & Jarvis, 1976). Seed germination is increased by dry storage. Seed stratified outdoors in soil overwinter was exhumed and tested for germination in the light, in the dark and in the dark with a 5 second flash of light (Andersson *et al.*, 1997). Seed gave 37% germination in the light, 8% germination in the dark with a short flash of light and just 2% germination in complete darkness.

Seeds shed in summer do not germinate until the autumn (Grime *et al.*, 1988). Germination occurs in the upper 5 to 20 mm of soil (Hanf, 1970). Seed sown in pans of field soil germinated mainly in autumn and winter but also in spring (Brenchley & Warington, 1930). Seed mixed into a 75 mm layer of soil in cylinders sunk in the field and stirred periodically emerged mainly in March-April and August-November with odd seedlings emerging throughout the year (Roberts & Boddrell, 1983). In the 5-year study, seedling emergence was high in years 1 and 2 then gradually declined to year 5 with some viable seeds still remaining at that time.

Persistence and Spread

Most fresh seeds germinate in the autumn after shedding but some remain dormant for 2-3 years (Salisbury, 1961). Seeds recovered from excavations and dated at 30 years old have been reported to germinate (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 (Lutman *et al.*, 2002). The experiment was made on a clay and a silty loam soil. Every effort was made to prevent further seed return to the soil. Field forget-me-not seed had a mean annual decline rate of 40% and an estimated time to 95% decline of 5-8 years. Seedbank decline was also studied in a succession of autumn-sown crops (winter wheat & winter OSR) in fields ploughed annually for 3-4 years with seed return prevented (Wilson & Lawson, 1992). The annual rate of loss was 44%, the time to 99% decline was estimated at 6.1 years. Seedling emergence of field forget-me-not represented 1% of the seeds in the soil seedbank.

In a survey of weed seed contamination in cereal seed in drills ready for sowing on farm in spring 1970, field forget-me-not was found in 3% of samples (Tonkin & Phillipson, 1973). Most of this was home saved seed. In the period 1978-1981, it was found in 3-8% of wheat and 5-6% of barley seed samples tested at the Official Seed Testing Station (Tonkin, 1982). Field forget-me-not seed may occur as an impurity in clover and grass seed (Long, 1938). In grass seed of English origin tested in 1960-61, field forget-me-not seed was found in 2% of samples of Italian ryegrass seed of English, Irish and Danish origin (Gooch, 1963). It was found in 6% of samples of Scottish and English Timothy grass seed, 20% of Swedish Timothy and 6% of perennial ryegrass of Irish origin tested. Field forget-me-not seed was found in 12% of white clover of English origin and 18% of Danish white clover seeds tested. It was also found in 17% of samples of Danish rough-stalked meadow-grass seed tested.

Seeds that are retained in their spiky calyx may be carried on clothing and on animal fur (Salisbury, 1961). Seeds can survive ingestion by cattle and horses (Grime *et al.*, 1988).

Management

Control is by surface cultivations in spring and the inclusion of root crops in the rotation (Long, 1938; Morse & Palmer, 1925). Plants may regrow after decapitation (Grime *et al.*, 1988). In winter wheat, field forget-me-not is favoured by zero-tillage (Streit *et al.*, 2003).

Seed numbers in soil were reduced by 60% following a 1 year fallow and by 80% if that was followed by a further year of fallowing (Brenchley & Warington, 1933). The land was ploughed, disked and harrowed each year. Seed numbers increased considerably when the land was cropped with winter wheat for this period. Where fallowing reduced seed numbers, the numbers increased again in the first crop that followed (Brenchley & Warington, 1936). Fallowing every 5th year over a 15-year period reduced seed numbers in soil by 20% after the first fallow, 60% after the second and 75% after the third (Brenchley & Warington, 1945)

Field forget-me-not is not eaten by rabbits (Tansley, 1949).

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