The biology and non-chemical control of Corn Marigold (*Chrysanthemum segetum* L.)

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Corn marigold

(Golden cornflower, Guild weed, Yellow daisy, Yellow ox-eye)
***Chrysanthemum segetum* L.**

Occurrence

An annual weed of acid arable soils, probably introduced to Britain in the Neolthic period. Corn marigold is locally common throughout the UK but decreasing (Clapham *et al*., 1987; Stace, 1997). It was confined to light land (Thurston, 1976). It was most troublesome on loamy and sandy soil (Long, 1938). It was said to like acid conditions and is thought to be an indicator that soils are low in calcium but other factors may be involved. It is not recorded above 1,100 ft in the UK (Salisbury, 1961).

In early surveys of Bedfordshire, Hertfordshire and Norfolk it was confined to non-calcareous sands, it was locally dominant but not very frequent elsewhere (Brenchley, 1911; 1913). Although absent to rare in most areas it was still common to abundant at 18% of sites when surveyed with other arable weeds in 1971-73 (Chancellor, 1977). Corn marigold seed was found in 1% of arable soils in a seedbank survey in Scotland in 1972-1978 (Warwick, 1984). In trials in Denmark from 1969-1988, corn marigold was common in spring-sown arable crops (Jensen, 1991).

There is evidence that corn marigold was a weed of crops in the Iron Age (Greig, 1988). More recently it was one of the worst weeds in cornfields on sands and lighter loams and there were laws in Scotland and Denmark that obliged farmers to root out the weed. Seed cleaning, liming and herbicides were thought to be responsible for the decline. Corn marigold is now described as vulnerable in the BSBI species status list 2005.

Biology

Corn marigold flowers from June to September (Salisbury, 1961), or even into October (Long, 1938; Hanf, 1970). The average number of seeds per flower head is 176 and there is an average of 7 flower heads per plant. Guyot *et al.* (1962) give the seed number per plant as 1,000 to 2,000. Seed numbers on isolated individuals can be very high, 13,500 seeds have been recorded on a single plant (Long, 1938). Corn marigold plants will continue to ripen seeds even when uprooted. The time from germination to fruiting is around 100 days (Guyot *et al.*, 1962).

In Petri-dish tests with seeds given alternating or constant temperatures in diffuse light, light had no effect on its own but interacted with alternating temperature to promote germination (Vincent & Roberts, 1977). The response was improved in the presence of nitrate and after chilling but germination was not 100%.

In the field, seeds germinate in the autumn and spring but the main seedling emergence period is March to April. Seed sown in a 75 mm layer of soil in cylinders

sunk in the field and stirred periodically emerged from March to October (Roberts & Neilson, 1981). Seedling emergence was greater in year 2, then declined to year 5 when around 7% of seeds still remained. In plots dug into a grass sward and cultivated at monthly intervals, corn marigold seedlings emerged mainly from February to October with a slight peak in April-May (Chancellor, 1986).

In a sandy soil, the majority of seedlings emerged from the top 30 mm of soil with the odd seedling emerging from depths down to 70 mm (Chancellor, 1964).

Persistence and Spread

Seed retained 12% viability after 5 years burial in soil. The decline of seeds broadcast onto the soil surface and then ploughed to 20 cm was followed over a 6 year period of cropping with winter or spring wheat (Lutman *et al*., 2002). Every effort was made to prevent further seed return to the soil. Corn marigold had a mean annual decline rate of 67% and an estimated time to 95% decline of 3 years. The decline of seeds under a grass sward was monitored after 1, 2, 3, 19 and 20 years (Chancellor, 1986). Corn marigold showed a mean annual decline of 36% and a half-life of 1.5 years. Dry stored seed gave 75% germination after 1 year and 11% after 5 years storage (Kjaer, 1940).

Seedlings have been raised from the excreta of various birds (Salisbury, 1961). It is said that corn marigold seeds can pass through the digestive system of horses without loss of vitality (Long, 1938). The seeds are light and may be distributed by the wind. In a survey of weed seed contamination in cereal seed in drills ready for sowing on farm in spring 1970, corn marigold seed was found in 1% of test samples (Tonkin & Phillipson, 1973). Most of this was home saved seed.

Management

It was said to be a difficult weed to eradicate (Long, 1938; Morse & Palmer, 1925). Control is aided by sowing only pure crop seed. Hand pulling of large plants and inter-row hoeing in two successive root crops should prevent seeding and reduce future populations. Corn marigold prefers soils deficient in lime, so liming will help to reduce it (Long, 1938; Clapham *et al*., 1987).

Corn marigold seeds may occur in threshing waste and this should be thoroughly steamed to destroy viability if it is being fed to stock, otherwise it should be burnt (Long, 1938; Morse & Palmer, 1925).

Over an 11 year period of cereal cropping in one particular field, corn marigold declined from being 50% of the weed population at 148 plants /m^2 to being just 1% at 1 plant/m^2 (Chancellor, 1976). This was due to a combination of herbicide use and fallowing that prevented seeding, together with liming of the soil at 5 t/ha that raised the pH from 6.0 to 6.8.

Small seedlings are susceptible to flame weeding but large plants are not (Ivens, 1966).

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