
**ASSESSING PESTICIDE RISKS TO NON-TARGET
TERRESTRIAL PLANTS**

**SECTION FOUR: NATIONAL AND WITHIN-FIELD DISTRIBUTIONS
OF KEY NON-TARGET PLANTS OF FARMLAND**

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4.1 INTRODUCTION

Species representative of a) habitat types, b) taxonomic groups, c) functional groups and d) soil types, in agricultural systems have been selected under Objective 1. Non-crop flora are associated with the crop as weeds, and with the range of associated non-crop habitats, which include grasslands, heathland, wetlands, tall herbaceous communities, scrub and woodland, all of which may be represented in field margins.

The location of plant species in the landscape can affect their exposure to pesticides. Species within arable or grassland fields will be exposed to pesticide treatments, depending on timing and growth patterns. Species in semi-natural habitats adjacent to areas of pesticide application will have variable exposure. Species of hedgerows are particularly likely to be exposed to drift (Longley *et al.*, 1997). Species of woodlands are less likely to be at risk. On a national scale, some plant species are at the limits of their geographical range. For example, some orchids are common in the Mediterranean, but rare in UK. The location of some species in predominantly southern or northern ranges may interact with the types of agriculture and therefore their risk of exposure to pesticides.

In this section, the national distributions the species are tabulated, based on floras (Clapham *et al.*, 1989; Fitter *et al.*, 1980; Fitter *et al.*, 1984; Stace, 1991), the Comparative Plant Ecology by (Grime *et al.*, 1988) and the BIDS EcoFlora database (Fitter & Peat, 1994). The within-field distributions of the 40 selected key species are tabulated, based on published and unpublished data.

4.2. NATIONAL DISTRIBUTIONS OF KEY PLANT SPECIES OF FARMLAND

Data from the Biological Records Centre, which holds records of occurrence of most flora and fauna in the UK, are summarised for plants in the EcoFlora database (Fitter & Peat, 1994). Numbers of 10 km grid squares each species has been recorded in since 1949 are held on the database for 16 regions. These data are summarised below as % occurrence (i.e. % of total grid squares per region) for the Great Britain regions.

Table 4.1. Percentage occurrence in 10km grid squares of key species in 13 regions of Great Britain, from EcoFlora (Fitter & Peat, 1994).

Species Nomen. Stace (1991)	SW Engl.	SE Engl.	SC Engl.	E Engl.	NC Engl.	S Wales	N Wales	NW Engl.	NE Engl.	S Scot.	E Scot.	W Highl.	N Scot.
<i>Agrostis stolonifera</i>	87.7	91.9	92.8	93.8	86.1	77.2	86.1	90.0	88.9	77.1	71.3	74.1	72.9
<i>Alliaria petiolata</i>	82.0	93.0	99.2	87.9	96.4	75.3	77.8	72.1	82.9	52.3	32.5	3.5	3.7
<i>Arum maculatum</i>	85.4	92.5	99.2	88.7	92.2	78.5	76.9	53.6	82.4	35.3	9.8	4.0	2.5
<i>Brachypodium sylvaticum</i>	87.0	89.2	98.8	78.6	86.7	79.7	76.9	72.1	83.9	60.5	37.0	74.6	28.1
<i>Carduus crispus</i>	40.2	82.3	90.8	68.1	67.5	39.2	35.2	30.7	48.7	37.2	11.7	7.5	0.7
<i>Centaurea cyanus</i>	18.4	31.2	37.8	30.4	16.9	15.2	6.5	21.4	10.1	13.5	11.7	3.5	4.7
<i>Centaurea nigra</i>													
	SW Engl.	SE Engl.	SC Engl.	E Engl.	NC Engl.	S Wales	N Wales	NW Engl.	NE Engl.	S Scot.	E Scot.	W Highl.	N Scot.

<i>Chamerion angustifolium</i>	83.1	91.9	100.0	97.3	100.0	89.2	88.0	92.9	95.5	91.7	91.7	62.7	39.7
<i>Chenopodium album</i>	87.7	96.2	103.2	97.3	103.0	86.7	84.3	80.0	84.9	76.3	61.1	35.3	26.1
<i>Chrysanthemum segetum</i>	38.3	33.9	49.0	55.3	45.8	39.9	37.0	47.1	18.6	41.7	42.6	50.7	37.9
<i>Cirsium arvense</i>	90.8	95.7	100.0	97.7	100.0	92.4	95.4	94.3	96.5	93.6	92.5	80.1	64.8
<i>Convolvulus arvensis</i>	85.1	93.5	98.8	97.7	85.5	75.3	68.5	60.0	65.3	32.3	17.0	11.9	3.9
<i>Corylus avellana</i>	86.6	90.9	99.6	87.5	98.8	89.2	90.7	82.9	95.0	81.6	68.7	83.6	42.9
<i>Crataegus monogyna</i>	90.0	94.1	99.6	97.7	100.0	91.8	93.5	93.6	96.5	92.1	80.0	76.6	30.3
<i>Dactylis glomerata</i>	90.8	94.1	99.2	97.7	100.0	92.4	95.4	94.3	95.5	93.2	90.9	86.1	58.1
<i>Daucus carota</i>	75.5	94.1	94.4	89.9	71.7	50.6	63.9	52.9	31.7	24.4	10.9	43.3	27.8
<i>Digitalis purpurea</i>	86.6	80.6	70.3	48.2	95.8	89.9	93.5	92.1	86.9	88.0	92.1	87.1	54.9
<i>Dipsacus fullonum</i>	68.6	92.5	96.8	76.7	62.7	41.8	24.1	30.7	27.1	18.8	2.6	0.0	0.0
<i>Festuca rubra</i>													
<i>Galium aparine</i>	90.4	94.1	99.6	97.7	99.4	92.4	95.4	90.7	95.5	90.6	78.1	81.1	58.9
<i>Galium mollugo</i>	86.2	95.7	98.4	64.6	44.0	25.3	19.4	48.6	43.7	22.6	12.5	5.0	4.4
<i>Heracleum sphondylium</i>	90.0	93.5	99.2	97.3	99.4	91.1	93.5	94.3	96.5	91.7	91.3	78.6	60.3
<i>Hyacinthoides non-scripta</i>	89.7	88.7	98.8	72.0	97.0	89.2	90.7	86.4	89.9	79.7	59.2	81.1	39.4
<i>Lamium galeobdolon</i>	59.4	79.6	83.9	39.7	86.7	44.9	37.0	11.4	25.1	8.3	1.1	1.5	0.0
<i>Lamium album</i>	78.2	93.0	100.0	97.3	95.8	46.2	50.9	65.7	81.9	53.8	26.0	10.4	4.4
<i>Leucanthemum vulgare</i>	89.7	90.9	99.6	93.8	98.2	92.4	88.9	87.1	92.0	85.7	75.5	70.6	44.3
<i>Lotus corniculatus</i>	91.6	95.2	99.6	97.3	100.0	92.4	95.4	94.3	96.0	93.6	97.0	91.5	80.3
<i>Lychnis flos-cuculi</i>	84.3	79.0	95.2	79.8	97.6	79.7	86.1	83.6	86.9	87.2	74.3	78.6	63.1
<i>Matricaria recutita</i>	41.8	82.8	68.7	66.9	77.1	26.6	30.6	35.0	29.6	9.0	3.4	6.5	0.2
<i>Papaver rhoeas</i>	73.6	90.9	98.4	97.7	85.5	38.0	28.7	42.9	67.3	36.1	9.4	2.0	2.5
<i>Polygonum aviculare</i>	22.2	24.2	31.7	17.9	22.3	13.3	13.9	15.7	14.6	13.5	8.7	8.5	7.1
<i>Primula vulgaris</i>	90.0	89.2	96.4	75.5	87.3	82.3	88.0	79.3	86.4	85.0	83.4	90.0	69.5
<i>Ranunculus repens</i>	90.8	94.1	99.2	97.7	99.4	91.8	95.4	94.3	96.5	93.2	95.5	88.1	75.9
<i>Rubus fruticosus</i>	90.0	94.1	98.8	96.5	99.4	91.1	95.4	92.9	93.0	86.8	74.0	84.6	42.1
<i>Tamus communis</i>	84.3	88.7	99.2	80.5	85.5	63.3	65.7	29.3	48.2	0.4	0.4	0.0	0.0
<i>Taraxacum officinale</i>													
<i>Torilis japonica</i>	85.1	90.3	95.6	95.7	97.6	80.4	83.3	79.3	82.4	71.4	45.7	26.4	10.6
<i>Trifolium repens</i>	90.4	94.1	100.0	97.7	100.0	91.8	95.4	94.3	96.0	93.6	96.2	91.0	82.3
<i>Urtica dioica</i>	89.3	94.1	100.0	98.1	100.0	92.4	95.4	93.6	96.5	93.6	95.8	90.0	74.6
<i>Vicia sativa</i>	75.1	88.7	89.6	84.8	75.3	57.0	52.8	51.4	39.7	31.2	20.8	13.4	9.9
<i>Vicia sepium</i>	80.5	89.2	98.8	73.2	99.4	81.0	75.9	90.7	96.0	89.8	89.4	78.1	57.6

The majority of the species are ubiquitous, such as *Urtica dioica* (stinging nettle). Other species have a southerly distribution, such as *Tamus communis*. Others are more common

in the south and east of Britain, notably *Daucus carota* and *Dipsacus fullonum*. Data are not given for three species listed, as there are taxonomic difficulties with two and data are not available in the database for the third, *Centaurea nigra*.

Further data, taken from UK floras, for these species are summarised below in Table 4.2.

Table 4.2. Distribution of three key plant species in the British Isles for which there is no data in the EcoFlora database.

BI=British Isles; Wa=Wales; En=England; Sc=Scotland; N=North; W=West; S=South; C=central;

Species	Stace (1991)	Grime <i>et al.</i> (1988)	Rose (1981)	Fitter <i>et al.</i> (1984)
<i>Centaurea nigra</i>	Whole of BI	Whole of BI	Clay soils	
<i>Festuca rubra</i>	Throughout BI	Whole of BI		Whole of BI
<i>Taraxacum officinale</i>	Throughout BI	Whole of BI	BI	

The data compiled in Tables 4.1 and 4.2 indicate that all the identified target species occur throughout England and Wales, in suitable habitats. Several species are less common in Scotland, for example *Alliaria peteolata* and *Torilis japonica*, while *Centaurea cyanus* is rare across the British Isles. The one climber species selected, *Tamus communis*, is largely absent from Scotland. A useful alternative species, included in Table 4.1, might be *Rubus fruticosus*, the bramble.

4.3. WITHIN-FIELD DISTRIBUTIONS OF KEY PLANT SPECIES

A number of studies on the locations of plant species in farmland, relative to field margins, have been made and some unpublished data is held. Initial studies indicated that the numbers of plant species found in the uncultivated field boundary in arable land that colonised the adjacent crop is small (Marshall, 1985; Marshall, 1989). Further studies have shown that the flora of the field centre and crop edge is largely unrelated to the flora of the boundary (Marshall & Arnold, 1995), though adjacent field operations can affect the boundary flora.

Data on the location of the key plant species identified under Objective 1 are presented in Table 4.3, in terms of location in the field centre, crop headland or in adjacent semi-natural habitat (primarily field boundaries). Data are taken from published sources (Marshall, 1985; Marshall, 1989; Marshall, 1992; Marshall & Arnold, 1995; Wilson & Aebischer, 1995) and unpublished data (EJP Marshall).

Table 4.3. Location of key plant species in farmland in relation to arable field boundaries.

Species	Field boundary	Headland	Field centre
<i>Agrostis stolonifera</i>	+++	+	+
<i>Alliaria petiolata</i>	+++	+	
<i>Arum maculatum</i>	+++		
<i>Brachypodium sylvaticum</i>	+++		
<i>Carduus acanthoides</i>	+++		
<i>Centaurea cyanus</i>		+	+
<i>Centaurea nigra</i>	+++		
<i>Chamerion angustifolium</i>	+++		
<i>Chenopodium album</i>	+	+	+++
<i>Chrysanthemum segetum</i>		+	++
<i>Cirsium arvense</i>	+++	+	+
<i>Convolvulus arvensis</i>	++	+	+
<i>Corylus avellana</i>	+++		
<i>Crataegus monogyna</i>	+++		
<i>Dactylis glomerata</i>	+++		
<i>Daucus carota</i>	+++		
<i>Digitalis purpurea</i>	+++		
<i>Dipsacus fullonum</i>	+++		
<i>Festuca rubra</i>	+++		
<i>Galium aparine</i>	+++	+	+
<i>Galium mollugo</i>	+++		
<i>Heracleum sphondylium</i>	+++	+	
<i>Hyacinthoides non-scripta</i>	+++		
<i>Lamium album</i>	+++		
<i>Lamium album</i>	+++	+	+
<i>Leucanthemum vulgare</i>	+++		
<i>Lotus corniculatus</i>	+++		
<i>Lychnis flos-cuculi</i>	+		
<i>Matricaria recutita</i>	+	+	+++
<i>Papaver rhoeas</i>	+	++	+++
<i>Polygonum aviculare</i>	+	++	+++
<i>Primula vulgaris</i>	+++		
<i>Ranunculus repens</i>	+++	+	
<i>Rubus fruticosus</i>	+++	+	
<i>Tamus communis</i>	+++		
<i>Taraxacum officinale</i>	+++		
<i>Torilis japonica</i>	+++		
<i>Trifolium repens</i>	+++		+
<i>Urtica dioica</i>	+++	+	
<i>Vicia sativa</i>	+		
<i>Vicia sepium</i>	+		

Most species are represented in non-cropped habitat, in the field boundary, though five species are typical of cultivated ground (annual arable weeds). Arable weeds are exposed directly to pesticides applied to the crop, while other species may be influenced by drift to non-target areas.

4.4. REFERENCES

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