

WEEDS WITH MAJOR ECONOMIC IMPACT ON AGRICULTURE IN REPUBLIC OF MACEDONIA

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ABSTRACT

*A study was conducted during 2005 and 2006 to investigate the weeds with major economic impact on agriculture in the Republic of Macedonia. For this purpose six different locations were targeted as a most important Macedonian agriculture centres. Studies revealed that 118 species were identified as problematic weeds in cereals, row crops, fodder crops, vegetables, orchards and vineyards. All weed species belong to 30 families 92 weeds are annuals, 2 weeds are biennial and 24 weeds are perennials. Most of the weeds belong to family Poaceae and Asteraceae. A majority of the weeds (107 species) are terrestrial plants, and a few (5 species) are aquatic weeds. Six of the species are parasitic weeds. *Avena fatua* *Alopecurus myosuroides* and *Bromus* spp. were found the most problematic weeds in small grain production. The harmful effects of *Chenopodium album*, *Amaranthus retroflexus*, *Echinochloa crus-galli*, *Sorghum halepense*, *Agropyron repen*, *Cynodon dacyilon* and *Cirsium arvense* were noticed on row crops, fodder crops, vegetable, orchards and vineyards. Tobacco, sunflower, tomato, alfalfa and clover are favoured hosts for obligate parasite weeds *Orobanche* spp. and *Cuscuta* spp.*

Key words: Agriculture, weeds, Republic of Macedonia

INTRODUCTION

The Republic of Macedonia is settled on the central part of Balkan peninsula-Central/Southern Europe. The territory lies between latitudes 40.5 and 42.2 north and longitude 20.3 and 23.0 east. After World War II 75% of the population was engaged in agriculture; today it is about a sixth is involved in agriculture, which accounts for about 20-25% of gross national product. Total agricultural land is 1.23 million hectares, 546.000 ha of which is arable, 39.000 ha is in

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vineyards and orchards, and the rest is meadows and pasture. Five percent is irrigated. The primary crops produced are cereals (wheat, barley, rice and maize) (204.000 ha) tobacco (18.500 ha), fodder crops (17.850 ha) and vegetables, mainly tomatoes and peppers (51.000 ha) (Anonymous, 2006).

Weeds are the oldest problem in agriculture, and since about 10,000 BC (Hay, 1974; Avery, 2006) have represented one of the main limiting factors in profitable crop production (Avery, 1997). They are the most complex and serious problems in natural resource management. Weeds cause significant losses each year in the agriculture, forestry, fisheries, water supply and a host of other human enterprises. They also impact the health and quality of life of people all around the world (Henderson and Anderson, 1966). Weeds are different from the other pests that pose problems in crop production because the presence of weeds is relatively constant, while outbreaks of insects and disease pathogens are sporadic (Gianessi and Sankula, 2003). Apart from the quantitative damage caused by weeds due to competition with water, light, nutrients (Coble and Ritter, 1978; Coble *et al.*, 1981; Jordan *et al.*, 1987), and to the antagonism (parasitism and allelopathy), weeds are also able to cause qualitative indirect damage due to unitary weight reduction, contamination of seeds (Anderson, 1983; Ashton and Monaco, 1991), slowing of tillage and harvesting practices and transmission of bad smells or tastes to milk or dairy products (King, 1966). Approximately 10% of all plant species are weeds, or a total of some 30,000 weed species. Of these, 1,800 cause serious economic losses in crop production, and about 300 species plague cultivated crops throughout the world (Ware and Whitacre, 2004). In North America weeds reduce the value of rangeland by US\$1 billion per year or 10% of total value (Pimentel *et al.*, 2000). Weeds with major economic impacts in South Africa are a significant problem, affecting almost 10 million hectares (8.28%) of the country, and spreading rapidly (Versfeld *et al.*, 1998). Estimates of the number of these weeds vary from 161 to 199 (Henderson, 1995). Shah and Khan (2006) revealed 63 weed species which are common in four major crops in District Manshera in Pakistan. Kojic *et al.*, (1996) found 962 weed species, of which 392 are weeds with major economic impacts on Serbian agriculture. In the Republic of Macedonia, according Lozanovski (1994), the weed flora is composed of 1125 weed species. A study was conducted during 2005 and 2006 to determine which weeds have a major economic impact on agriculture in the Republic of Macedonia. Our objective was to identify the weeds of major importance in several agricultural areas and to determine their association with various crops. In this paper we present scientific (Latin) and English names of 118 weeds with major

economic impacts in our agriculture, the plant families and the crops where these weeds are commonly found.

MATERIALS AND METHODS

During 2005 and 2006 we six visited various agriculture regions in the Republic of Macedonia to collect weeds with major economic impacts in our agriculture. The main target regions in Republic of Macedonia were Pelagonija, Polog, Skopje valley, Strumica valley, Ovce pole and Gevgelija-Valandovo valley. Scientific name, family, season of the weed and biological characteristics were recorded for every specimen. Weeds were collected in different growth stages. The collected plant material was pressed, dried and kept at room temperature and identified by using appropriate literature i.e. keys for identification (Kojic, 1981; Domac, 1984).

RESULT AND DISCUSSION

We recorded 118 species as weeds with major economic impacts. The species were common and dominant weeds in cereals, row crops, fodder crops, vegetables, orchards and vineyards. The weed species belong to 30 families 92 weeds (78,0%) are annual, 2 weeds are biennial (1,7%) and 24 weeds (20,3%) are perennial. The most of the weeds belong to Poaceae (22 species) and Asteraceae (18 species). Most of them (107 species) grow on the land as terrestrial weeds, and a few (5 species) in the water as aquatic weeds. One particular category are parasitic weeds (6 species). The terrestrial weeds were common in all crops, aquatic weeds were mainly in rice, and parasitic weeds were found on different host plants, but mostly on alfalfa, tobacco and sunflower. The losses caused to small grain crops by weeds like *Avena fatua* *Alopecurus myosuroides* and *Bromus spp.* are substantial. *Avena fatua* is ranked as the worst weed problem by wheat and barley producers in many states, including Macedonia. *Avena fatua* infests more than 28 million acres of small grain in the United States resulting in an estimated annual yield loss and prediction cost of \$304 million (WSSA Wild Oat Situation Report-1976)(cit. by Nelson et al., 1995). Wheat and barley yields are sharply affected by wild oat infestations. Ten wild oat plants per square foot can reduce spring barley grain yield by 10 to 30 percent, depending on production practices and environmental conditions (Nelson et al., 1995). Morishita and Thill (1988) reported barley yield losses of 40% with a wild oat density of 170 plants m^{-2} . In Australia, yield losses ranged from 30 to 50% when wild oat populations exceeded 100 plants m^{-2} (Chancellor and Peters, 1976) and yield was reduced 17% by 48 wild oat plants m^{-2} in France (Gournay, 1964). A particular problem in some target

regions in Macedonia are *Alopecurus myosuroides* and *Bromus spp.* Serious reductions of wheat yields (45%) due to competition with *Alopecurus myosuroides* have been reported (Koch and Walter, 1983; Cousens et al., 1985). Winter wheat yield reductions are often 20-40% at *Bromus spp.* densities, but can be as high as 90% with dense infestations (Rydrych, 1974; Blackshaw, 1993). The harmful effects of *Chenopodium album*, *Amaranthus retroflexus*, *Echinochloa crus-galli*, *Sorghum halepense*, *Agropyron repen*, *Cynodon dacyilon* and *Cirsium arvense* in Macedonian agriculture are very dramatic. They negatively affect the growth of on row crops, fodder crops, vegetable, orchards and vineyards. Yields of these crops are severely reduced by weeds competition. *Chenopodium album* is one of the most competitive annual broadleaf weed in many crops. In field corn and sugar beet, yield reductions of 11% and 48%, respectively, have been associated to interference by this weed (Beckett et al., 1988; Schweizer, 1983). In vegetable crops, season-long interference by *Chenopodium album* has resulted in 36% yield reduction in tomato (Bhowmik and Reddy, 1988). Uncontrolled *Amaranthus retroflexus* could result in as much as a 60 percent yield loss in potatoes, onions, cabbage, and watermelon production regions in Texas (Chenault et al., 1999). *Echinochloa crus-galli* is the most important weed in both transplanted and direct-seeded rice in all rice-production countries, including Macedonia. According Van Chin (2001) the competition of 25 *Echinochloa crus-galli* plants/m² causes approximately 50% yield loss. Also, crop yield losses due to *Echinochloa crus-galli* competition have been reported as 8 to 82% in corn (Spitters, et al., 1989) and 30 to 45% in cotton (Kempen, 1984). *Cyperus spp.* are among the most problematic weeds in the rice fields in the world, including Macedonia. According Johnson et al. (2004) estimated yield loss as a result of negative influence of these weeds was 47%. Two hundred plants of *C. esculentus* m⁻² coexisting for a period of 35 days reduced yield to 20.11% (Erasmio et al., 2003). *Sorghum halepense*, *Agropyron repen*, *Cynodon dacyilon* and *Cirsium arvense* are a major perennial weeds in the temperate regions of the world. *Sorghum halepense* can reduce soybean seed quality and yields by more than 50% (Elmore 1986, McWhorther and Anderson, 1981; Williams and Hayes, 1984), due to its prolific production of rhizomes and seeds, quick growth, and possible production of biologically active substances that interfere with the growth of the plant species (Black et al., 1969). Similar, *Agropyron repens* is vigorous in growth and is successful in establishing itself, largely due to its ability to generate new shoots from axillary's rhizome buds (Werner and Rioux, 1977). Ivany (1978) reported that light infestations (30% ground cover) of quackgrass reduced silage yield of corn when allowed to compete with corn for 6 week compared to a controlled check. Severe quackgrass

infestations reduce corn grain yields up to 58% (Young *et al.*, 1984). Yield losses due to *Cynodon dactylon* competition (200 and 400 stems m^{-2} from planted rhizomes) have been reported as 50 to 74% in cotton, and 30 to 46% in corn, respectively (Vasilakoglou *et al.*, 2005). *Cirsium arvense* causes yield losses of 15 to 60%, depending on the weed density and crops. For instance, in cereal crops, densities of 6 to 20 *Cirsium arvense* plants per square metre result in 18 to 30% loss in grain yield (Bailey *et al.*, 2000). Estimated average losses in alfalfa seed yield were 34% and 48% at *Cirsium arvense* densities of 10 and 20 shoots per square metre, respectively (Moyer *et al.*, 1991). *Orobancha spp.* and *Cuscuta spp.* are widespread parasitic weeds in the world, in Macedonia, too. Tobacco, sunflower, tomato, alfalfa and clover are favoured by these parasites. There are areas in Greece where *Orobancha ramosa* is the most serious weed in at least 60% of the tobacco fields. In some years this weed causes complete yield loss (Lolas, 1986). In Spain this species recently infested about 100,000 and 350,000 ha in the central and southern parts of the country, respectively (Garcia-Torres *et al.*, 1994). *Cuscuta spp.* attack many important crops, particularly alfalfa and clover. According Kokovic and Obradovic (1969) *Cuscuta spp.* infests about 90% of the perennial fodder crops in some areas in Serbia. Unfortunately, in Macedonia still no data exist on the loss of crops yield due to mentioned weeds.

Table- 1. List of weeds with major economic impact on agriculture in Republic of Macedonia.

Weed Species	English Name	Family	Habit	Crops					
				*Small grain	*Row crops	Rice	*Fodder crops	Veg.	Orchards and Vineyards
<i>Abutilon theophrasti</i>	Velvetleaf	Malvaceae	Annual	-	+	-	-	-	-
<i>Agropyrum repens</i>	Quackgrass	Poaceae	Perennial	-	+	-	+	-	++
<i>Agrostema githago</i>	Corn cockle	Caryophyllaceae	Annual	+	-	-	-	-	-
<i>Adonis aestuvalis</i>	Summer adonis	Ranunculaceae	Annual	+	-	-	-	-	-
<i>Allium vineale</i>	Wild garlic	Alliaceae	Perennial	-	-	-	-	-	+
<i>Alopecurus myosuroides</i>	Slender foxtail	Poaceae	Annual	++	-	-	+	-	-
<i>Amaranthus albus</i>	Timble pigweed	Amaranthaceae	Annual	-	+	-	-	+	-
<i>Amaranthus blitoides</i>	Spreading pigweed	Amaranthaceae	Annual	-	+	-	-	+	-
<i>Amaranthus retroflexus</i>	Redroot pigweed	Amaranthaceae	Annual	-	++	-	-	+	-
<i>Anagalis arvensis</i>	Scarlet pimpernel	Primulaceae	Annual	-	+	-	-	+	-
<i>Anthemis arvensis</i>	Field chamomile	Asteraceae	Annual	+	-	-	+	-	-
<i>Anthemis austriaca</i>	Austrian chamomile	Asteraceae	Annual	+	-	-	+	-	-
<i>Anthemis cotula</i>	Stinking chamomile	Asteraceae	Annual	+	-	-	+	-	-
<i>Apera spica-venti</i>	Loose silkybent	Poaceae	Annual	+	-	-	-	-	-
<i>Atriplex patula</i>	Wild orache	Chenopodiaceae	Annual	-	+	-	-	+	-
<i>Avena fatua</i>	Common wild oat	Poaceae	Annual	++	-	-	-	-	-
<i>Avena ludoviciana</i>	Winter wild oat	Poaceae	Annual	++	-	-	-	-	-
<i>Bifora radians</i>	Wild bishop	Apiaceae	Annual	+	-	-	-	-	-
<i>Bromus arvensis</i>	Field brome	Poaceae	Annual	+	-	-	+	-	-
<i>Bromus mollis</i>	Soft brome	Poaceae	Annual	+	-	-	+	-	-
<i>Bromus secalinus</i>	Rye brome	Poaceae	Annual	+	-	-	+	-	-
<i>Bromus sterilis</i>	Poverty brome	Poaceae	Annual	+	-	-	+	-	-
<i>Capsella bursa-pastoris</i>	Shepherd's purse	Brassicaceae	Annual	+	-	-	+	+	-
<i>Caucalis daucooides</i>	Small bur-pursley	Apiaceae	Annual	+	-	-	-	-	-
<i>Caucalis latifolia</i>	Great bur-pursley	Apiaceae	Annual	+	-	-	-	-	-
<i>Centaurea cyanus</i>	Cornflower	Asteraceae	Annual	+	-	-	-	-	-

Weed Species	English Name	Family	Habit	Crops					Orchards and Vineyards
				Small grain	Row crops	Rice	Fodder crops	Veg.	
<i>Chenopodium album</i>	Lambsquarters	Chenopodiaceae	Annual	-	++	++	++	+	+
<i>Chondrilla juncea</i>	Rush skeletonweed	Asteraceae	Perennial	-	-	-	+	-	+
<i>Cichorium intybus</i>	Chicory	Asteraceae	Perennial	-	-	-	+	-	+
<i>Cirsium arvense</i>	Canada thistle	Asteraceae	Perennial	++	+	-	+	+	++
<i>Convolvulus arvensis</i>	Field bindweed	Convolvulaceae	Perennial	+	+	-	-	-	++
<i>Cuscuta arvensis</i>	Field dodder	Cuscutaceae	Annual	-	-	-	++	+	-
<i>Cuscuta epityimum</i>	Clover dodder	Cuscutaceae	Annual	-	-	-	++	+	-
<i>Cynodon dactylon</i>	Bermudagrass	Poaceae	Perennial	-	+	-	-	-	++
<i>Cyperus rotundus</i>	Red nutsedge	Cyperaceae	Perennial	-	+	++	-	-	-
<i>Cyperus difformis</i>	Smallflower umbrella	Cyperaceae	Perennial	-	+	++	-	-	-
<i>Datura stramonium</i>	Thorn apple	Solanaceae	Annual	-	+	-	+	+	-
<i>Delphinium consolida</i>	Rocket larkspur	Ranunculaceae	Annual	+	-	-	-	-	-
<i>Delphinium orientale</i>	Oriental knight's-spur	Ranunculaceae	Annual	+	-	-	-	-	-
<i>Digitaria sanguinalis</i>	Large carbgrass	Poaceae	Annual	-	+	-	+	+	-
<i>Diplotaxis muralis</i>	Annual wallrocket	Brassicaceae	Annual	-	+	-	+	-	-
<i>Echinochloa crus-galli</i>	Barnyardgrass	Poaceae	Annual	-	++	++	++	+	-
<i>Echinochloa oryzoides</i>	Large cockspur	Poaceae	Annual	-	-	++	-	-	-
<i>Equisetum arvense</i>	Field horstail	Equisetaceae	Perennial	-	+	+	-	-	-
<i>Erigeron canadense</i>	Canadian fleabane	Asteraceae	Annual	-	+	-	+	-	+
<i>Fumaria officinalis</i>	Common fumitory	Fumariaceae	Annual	+	-	-	-	-	-
<i>Galeopsis tetrahit</i>	Common hemp nettle	Lamiaceae	Annual	+	-	-	-	-	-
<i>Galinisoga parviflora</i>	Smallflower galinsoga	Asteraceae	Annual	-	+	-	-	+	-
<i>Galium aparine</i>	Catchweed bedstraw	Rubiaceae	Annual	+	-	-	-	-	-
<i>Galium mollugo</i>	Smooth bedstraw	Rubiaceae	Annual	-	-	-	+	-	-
<i>Galium tricornis</i>	Rough corn bedstraw	Rubiaceae	Annual	+	-	-	-	-	-
<i>Heliotropium europeum</i>	Common heliotrope	Boraginaceae	Annual	-	+	-	-	-	-

Weed Species	English Name	Family	Habit	Crops					Orchards and Vineyards
				Small grain	Row crops	Rice	Fodder crops	Veg.	
<i>Hibiscus trionum</i>	Venice mallow	Malvaceae	Annual	-	+	-	-	-	-
<i>Hyosyamus niger</i>	Black henbane	Solanaceae	Biennial	-	+	-	-	-	-
<i>Lactuca scariola</i>	Prickly lettuce	Asteraceae	Annual	-	+	-	-	-	+
<i>Lamium amplexicaule</i>	Dead nettle	Lamiaceae	Annual	+	-	-	-	-	-
<i>Lamium purpureum</i>	Red dead nettle	Lamiaceae	Annual	+	-	-	-	-	-
<i>Lathyrus aphaca</i>	Yellow vetchling	Fabaceae	Annual	+	-	-	-	-	-
<i>Lathyrus tuberosus</i>	Earth nutpea	Fabaceae	Perennial	+	-	-	-	-	-
<i>Leersia orizoides</i>	Rive cutgrass	Poaceae	Perennial	-	-	++	-	-	-
<i>Lepidium draba</i>	Hoary peeperweed	Brassicaceae	Perennial	-	-	-	-	-	+
<i>Lithospermum arvense</i>	Corn gromwell	Boraginaceae	Annual	+	-	-	-	-	-
<i>Lolium temulentum</i>	Bearded darnel	Poaceae	Annual	+	-	-	+	-	-
<i>Matricaria chamomila</i>	Wild chamomile	Asteraceae	Annual	+	-	-	+	-	-
<i>Melampyrum arvense</i>	Field cow-wheat	Scrophulariaceae	Annual	+	-	-	-	-	-
<i>Melilotus officinalis</i>	Yellow sweet clover	Fabaceae	Biennial	+	-	-	-	-	+
<i>Millium vernale</i>	Wild millet-grass	Poaceae	Annual	+	-	-	-	-	-
<i>Myagrurn perfoliatum</i>	Bird's-eye cress	Brassicaceae	Annual	+	-	-	-	-	-
<i>Neslia paniculata</i>	Ball mustard	Brassicaceae	Annual	+	-	-	-	-	-
<i>Nigela arvensis</i>	Fennel-flower	Ranunculaceae	Annual	+	-	-	-	-	-
<i>Orobanche cumana</i>	Sunflower broomrape	Orobanchaceae	Annual	-	+	-	-	+	-
<i>Orobanche ramosa</i>	Blanketed broomrape	Orobanchaceae	Annual	-	+	-	-	+	-
<i>Papaver rhoeas</i>	Corn poppy	Papaveraceae	Annual	+	-	-	-	-	-
<i>Phragmites communis</i>	Common reed	Poaceae	Perennial	-	-	+	-	-	-
<i>Plantago major</i>	Great plantain	Plantaginaceae	Perennial	-	-	-	+	-	-
<i>Plantago lanceolata</i>	Bruckhorn plantain	Plantaginaceae	Perennial	-	-	-	+	-	-
<i>Poa trivialis</i>	Rough bluegrass	Poaceae	Annual	+	-	-	-	-	-
<i>Polygonum aviculare</i>	Knotweed	Polygonaceae	Annual	+	-	-	+	-	-

Weed Species	English Name	Family	Habit	Crops					Orchards and Vineyards
				Small grain	Row crops	Rice	Fodder crops	Veg.	
<i>Polygonum convolvulus</i>	Black bindweed	Polygonaceae	Annual	+	+	-	-	+	-
<i>Polygonum lapathifolium</i>	Curlytop knotweed	Polygonaceae	Annual	-	+	+	-	+	-
<i>Polygonum persicaria</i>	Spotted ladythumb	Polygonaceae	Annual	-	+	+	-	+	-
<i>Portulaca oleraceae</i>	Common purslane	Portulacaceae	Annual	-	+	-	-	+	-
<i>Ranunculus arvensis</i>	Field buttercup	Ranunculaceae	Annual	+	-	-	-	-	-
<i>Raphanus raphanistrum</i>	Wild radish	Brassicaceae	Annual	+	-	-	-	-	-
<i>Rinanthus major</i>	Yellow rattleweed	Scrophulariaceae	Annual	+	-	-	-	-	-
<i>Rubus ceasius</i>	Dewberry	Rosaceae	Perennial	-	-	-	-	-	+
<i>Rumex acetosella</i>	Sheep sorrel	Polygonaceae	Perennial	-	-	+	+	-	-
<i>Sanguisorba minor</i>	Small burnet	Rosaceae	Perennial	-	-	-	+	-	-
<i>Scandix pecten-veneris</i>	Venus comb	Apiaceae	Annual	+	-	-	-	-	-
<i>Scirpus maritimus</i>	Alkali bulrush	Cyperaceae	Perennial	-	-	++	-	-	-
<i>Scirpus mucronatus</i>	Bog bulrush	Cyperaceae	Perennial	-	-	++	-	-	-
<i>Senecio vernalis</i>	Groundsell	Asteraceae	Annual	+	-	-	+	-	-
<i>Senecio vulgaris</i>	Common groundsell	Asteraceae	Annual	-	-	-	+	-	-
<i>Setaria glauca</i>	Yellow foxtail	Poaceae	Annual	-	+	-	-	+	-
<i>Setaria viridis</i>	Green foxtail	Poaceae	Annual	-	+	-	-	+	-
<i>Setaria verticillata</i>	Bristly foxtail	Poaceae	Annual	-	+	-	-	+	-
<i>Sinapis arvensis</i>	Wild mustard	Brassicaceae	Annual	+	-	-	-	-	-
<i>Sysimbrium sophia</i>	Flixweed	Brassicaceae	Annual	+	-	-	-	-	-
<i>Sysimbrium officinalis</i>	Hedge mustard	Brassicaceae	Annual	+	-	-	-	-	-
<i>Solanum nigrum</i>	Black nightshade	Solanaceae	Annual	-	+	-	-	+	-
<i>Sonchus arvensis</i>	Field milk thistle	Asteraceae	Perennial	+	+	-	-	-	+
<i>Sonchus asper</i>	Spiny milk thistle	Asteraceae	Annual	-	+	-	-	-	-
<i>Sonchus oleraceus</i>	Annual milk thistle	Asteraceae	Annual	-	+	-	-	-	-
<i>Sorghum halepense</i>	Johnsongrass	Poaceae	Perennial	-	++	-	+	-	++

Weed Species	English Name	Family	Habit	Crops					Orchards and Vineyards
				Small grain	Row crops	Rice	Fodder crops	Veg.	
<i>Stachys annua</i>	Hedge nettle betony	Lamiaceae	Annual	+	-	-	-	-	-
<i>Stellaria media</i>	Common chickweed	Caryophyllaceae	Annual	-	-	-	+	+	+
<i>Taraxacum officinale</i>	Common dandelion	Asteraceae	Perennial	-	-	-	+	-	-
<i>Thlapsi arvense</i>	Field peycress	Brassicaceae	Annual	+	-	-	-	-	-
<i>Tribolus terrestris</i>	Puncture weed	Zigophillaceae	Annual	-	+	-	-	-	-
<i>Vaccaria pyramidata</i>	Cowherb	Caryophillaceae	Annual	+	-	-	-	-	-
<i>Veronica agrestis</i>	Green field-speedwell	Scrophulariaceae	Annual	-	-	-	+	+	-
<i>Veronica hederifolia</i>	Ivy-Leaf Speedwell	Scrophulariaceae	Annual	-	-	-	+	+	-
<i>Veronica persica</i>	Persian speedwell	Scrophulariaceae	Annual	-	-	-	+	+	-
<i>Vicia melanops</i>	Black vetch	Fabaceae	Annual	+	-	-	-	-	-
<i>Vicia villosa</i>	Hairy vetch	Fabaceae	Annual	+	-	-	-	-	-
<i>Viola tricolor</i>	Field violet	Violaceae	Annual	+	-	-	-	-	-
<i>Xanthium italicum</i>	Italian cocklebur	Asteraceae	Annual	-	+	-	-	-	-
<i>Xanthium strumarium</i>	Rough cocklebur	Asteraceae	Annual	-	+	-	-	-	-

*Small grain (wheat, barley, rye, oat)

*Row crops (maize, sugar beet, sunflower, tobacco, soybean, potato)

*Fodder crops (alfalfa, sainfoin, clover)

Key: (++) very problematic

(+) problematic

(-) not found

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