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ORCHARD WEEDS IN LUBLIN REGION TWENTY YEARS ON – PRELIMINARY REPORT

Janusz Lipecki

University of Agriculture, Department of Pomology
Leszczyńskiego 58, 20-068 Lublin, POLAND

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A B S T R A C T

In the summer of 2003 observations on weed occurrence in herbicide strips in orchards in the Lublin region were performed and the results were compared with similar studies carried out almost 20 years ago in the same area. The most important change in the weed flora stated in this period was a decrease in the ocurrence of perennial plants such as field bindweed (*Convolvulus arvensis* L.) and an increase of annuals, mainly barnyard grass [*Echinochloa crus-galli* (L.) P.B.] and common lamb`s quarter (*Chenopodium album* L.). Similar tendencies were reported in world literature. They are connected mainly with the application of foliar herbicides instead of those residual.

Key words: orchards, weed, tendencies of changes

INTRODUCTION

During 1984-1987 weed occurrence in herbicide strips in several orchards in the Lublin region (eastern Poland) was evaluated (Lipecki and Szwedo, 1988). Triazine herbicides (simazine and/or atrazine) were then commonly applied, however, their use is nowadays limited because of environmental reasons (Lisek, 2002). They are replaced by foliar herbicides with glyphosate, glufosinate or MCPA as an active substance. In the summer of 2003 similar studies were performed in 10 orchards in the some region. In some cases the orchards were located in the same area as almost 20 years ago, but trees were planted in the second half of the 1990s. The same method was used as in earlier studies: occurrence of individual species (= frequency) as well as the area of plots covered by each of them were evaluated on 200 plots in each orchard. Plot area was equal to the distance between trees in the rows x 1 m

(width of plot). The purpose of the study was to find out any possible changes in weed species spectrum and occurrence intensity in the herbicide strips in comparison with the research results obtained in 1984-1987.

RESULTS

Fewer plots free of weeds were found in 2003 (9.1%) than during 1984-1987 (25.4%). The number of weed species was, however, similar: 85 in 1984-1987 and 77 in 2003. There were clear changes in the weed spectrum. The only species occurring in all the orchards each year during 1984-1987 was field bindweed (*Convolvulus arvensis* L.). It was then found on 18.8% of plots, whereas recently it appeared in 80% of orchards and only on 5.3% of plots (Tab. 1). In 2003, the following plant species were found in all the orchards: *Echinochloa crus-galli* (L.) P.B., *Senecio vulgaris* L. and *Chenopodium album* L., which previously occurred in 84, 14 and 28% of orchards, respectively. In 2003 in addition to the species mentioned above, *Stellaria media* Vill. and *Taraxacum officinale* Web. were very common, growing in 90% of orchards and on 27.4 and 27.7% of plots, respectively. The corresponding proportions for these species in 1984-1987 were: 24% (orchards) and 0.6% (plots) for *Stellaria media* Vill. and 8.7 and 19.1% for dandelion. Apart from bindweed, in 2003 in 80% of orchards I found plants of *Capsella bursa-pastoris* (L.) Med. (previously in 43%) and *Epilobium adenocaulon* Haussk., which in the 1980s appeared only sporadically and recently, its frequency reached 11.9% of plots. In 2003, an important role in herbicide strips was also played by the followed weeds found in 70% of orchards: *Geranium pusillum* L. (3.0% of plots), *Cirsium arvense* (L.) Scop. (2.7%) and *Vicia* sp. (1.2%).

In 2003, the area covered by plants of particular species was in most cases smaller than in the 1980s. There were, however, some exceptions such as *Stachys* sp., *Fallopia convolvulus* L., *Epilobium adenocaulon* Haussk., *Trifolium repens* L., *Veronica* sp. and *Galinsoga parviflora* Cav. (Tab. 1). Relatively smaller changes were found in the area covered by *Stellaria media* Vill., *Echinochloa crus-galli* (L.) P.B., *Chenopodium album* L. and *Viola arvensis* Murr. Instead, *Convolvulus arvensis* L., *Urtica dioica* L., *Equisetum arvense* L., *Taraxacum officinale* Web., *Erigeron canadensis* L., *Sonchus* sp., *Lamium* sp., *Cirsium arvense* (L.) Scop., *Polygonum aviculare* L. and *Setaria* sp. showed a clear decrease in plot coverage.

Apart from 31 species listed in Table 1, the following plants were recorded in the studied orchards (in alphabetical order):

Acer sp. L. (seedlings), *Achillea millefolium* L., *Anagallis arvensis* L., *Anthemis arvensis* L., *Arabidopsis thaliana* (L.) Heynh., *Arenaria serpyllifolia* L., *Artemisia vulgaris* L., *Aster novi-belgii* L., *Bromus mollis* L., *Cerastium* sp. L., *Daucus carota* L., *Erodium cicutarium* (L.) L'Herit., *Euphorbia* sp. L., *Galeopsis*

tetrahit L., *Geranium* sp. L., *Glechoma hederacea* L., *Gnaphalium uliginosum* L., *Gypsophila muralis* L., *Heracleum sphondyllum* L., *Juglans regia* L. (seedlings), *Lapsana communis* L., *Leontodon autumnalis* L., *Linaria vulgaris* (L.) Mill., *Malva neglecta* Wallr., *Marchantia polymorpha* L., *Medicago lupulina* L., *Mentha arvensis* L., *Morus alba* L. (seedlings), *Myosotis arvensis* (L.) Hill., *Plantago lanceolata* L., *Plantago maior* L., *Polygonum nodosum* Pers., *Potentilla reptans* L., *Prunella vulgaris* L., *Ranunculus repens* L., *Rosa* sp. L. (seedlings), *Quercus* sp. L. (seedlings), *Sedum maximum* Sud., *Sinapis arvensis* L., *Sisymbrium loeselii* L., *Sisymbrium officinale* (L.) Scop., *Solanum nigrum* L., *Solidago serotina* Ait., *Tanacetum vulgare* L., *Veronica persica* Poir., *Viola odorata* L.

T a b l e 1 . Changes in frequency of weed species within orchards and plots and plot area coverage during 1984-1987 and 2003

Species	% of orchards the species was recorded		% of plots the species was recorded		% of plot area covered by plants	
	1984-1987	2003	1984-1987	2003	1984-1987	2003
Equisetum arvense L.	81	60	15.5	7.5	16.0	4.4
Urtica dioica L.	38	50	0.6	2.4	32.7	7.1
Polygonum aviculare L.	46	60	1.4	2.4	11.7	4.5
Fallopia convolvulus L.	9	60	0.1	1.4	4.0	6.7
Chenopodium album L.	28	100	0.9	10.4	7.7	5.0
Atriplex patulum L.	29	10	0.6	0.1	13.5	5.0
Amaranthus retroflexus L.	52	40	3.6	3.2	9.5	5.7
Stellaria media Vill.	24	90	0.6	27.4	7.5	7.8
Capsella bursa–pastoris (L.) Med.	43	80	5.1	7.6	11.7	5.1
Viola arvensis Murr.	18	50	0.4	1.7	5.5	3.8
Trifolium repens L.	*	30	*	1.7	*	6.8
Vicia sp.	11	70	0.1	1.2	7.2	4.7
Epilobium adenocaulon Haussk.	*	80	*	11.9	*	7.9
Geranium pusillum L.	14	70	0.3	3.0	6.0	3.3
Convolvulus arvensis L.	100	80	18.8	5.3	26.0	7.3
Veronica sp.	*	40	*	1.4	*	4.6
Lamium sp.	12	50	0.1	1.8	8.5	3.2
Stachys sp.	5	50	0.1	0.9	6.2	8.6
Galium aparine L.	48	40	2.7	0.3	19.5	7.1
Sambucus nigra L.	15	20	0.1	0.2	45.5	2.2
Erigeron canadensis L.	74	40	15.1	7.3	14.7	4.0
Galinsoga parviflora Cav.	*	40	*	0.8	*	3.6
Senecio vulgaris L.	14	100	0.6	16.6	7.0	3.6
Cirsium arvense (L.) Scop.	67	70	3.4	2.7	11.2	4.6
Taraxacum officinale Web.	87	90	19.1	27.7	12.7	5.8
Sonchus sp.	16	60	1.0	2.1	14.5	3.5
Echinochloa crus-galli (L.) P.B.	84	100	11.6	37.9	12.5	9.6
Setaria glauca (L.) P.B.	25	50	1.0	4.5	16.5	5.2
Poa annua L.	25	100	1.2	4.5	8.0	4.8
Lolium perenne L.	29	30	0.6	0.7	14.2	10.7
Agropyron repens (L.) P.B.	85	30	7.3	1.3	16.0	13.8

*means that the species occurred rarely in 1984-1987, thus it was not listed among the most frequent 34 weeds (Lipecki and Szwedo, 1988)

DISCUSSION AND CONCLUSIONS

Changes observed in the botanical spectrum of weeds growing in herbicide strips in orchards in 2003 as compared to the earlier research (1984-1987) resulted mainly from the alterations in weed control methods and natural processes occurring in plant populations. Elimination of triazine herbicides on behalf of foliar preparations based on glyphosate and/or MCPA (Lisek, 2002) caused a decrease in the occurrence of perennial species and plants resistant to triazines. *Convolvulus arvensis* is a good example: it can be controlled at least partially by auxin-like herbicides or glyphosate (Bailey and Davison, 1976; Swan, 1980). The only perennial species which occurred in 2003 more abundantly than in the previous study, was *Epilobium adenocaulon*; its expansive nature was earlier pointed out by Lipecki and Janisz (2000). This weed is relatively resistant to the herbicides recently used in orchards.

Clear increase in the occurrence of annual weeds was found in 2003 – previously they were effectively controlled by triazines. Changes in the frequency of *Erigeron canadensis* and *Capsella bursa-pastoris* were observed earlier, probably as a result of natural processes (Lipecki and Janisz, 2000). It should be noticed that the same weed species predominated in orchards in other countries. At the time of our previous study (Lipecki and Szwedo, 1988), *Convolvulus arvensis* was a dominant orchard weed in several countries in different parts of the world. It was very common in Germany (Leiteritz and Thate, 1989; Rode and Paetzold, 1980), Spain (Zaragoza et al., 1989), France (Heinzle, 1981) as well as in Argentina (Conticello and Gandullo, 1991). Apart from bindweed, in Argentinean orchards *Taraxacum officinale* and *Polygonum aviculare* also commonly occurred, followed by *Chenopodium album* (Conticello and Gandullo, 1991), in Spain – *Chenopodium album* and *Amaranthus retroflexus* (Zaragoza et al., 1989), in Germany – *Chenopodium album* and *Stellaria media* and less abundant *Polygonum aviculare*, *Senecio vulgaris* and *Echinochloa crus-galli* (Leiteritz and Thate, 1989), in France – depending on the method of soil management in vineyards – *Stellaria media*, *Amaranthus retroflexus* and *Polygonum aviculare* (Heinzle, 1981). As early as the 1960s Ubrizsy (1968) pointed out the directions of changes in weed populations in Hungarian fruit plantations: as a result of the prolonged use of atrazine, predominating species were *Convolvulus arvensis* and *Echinochloa crus-galli*.

Recent studies proved that in orchards of South Korea (from species growing in Poland) the predominating weeds are *Chenopodium album*, *Capsella bursa-pastoris* and *Erigeron canadensis* (Jung et al., 1997) and *Echinochloa crus-galli* (Lee et al., 1997). There is a similar situation in Argentina, where *Chenopodium album* and *Galinsoga parviflora* are very

common (Novo et al., 2000). In Canada (Nova Scotia) experiments were started to control with high temperature such species as *Amaranthus retroflexus, Capsella bursa-pastoris, Chenopodium album, Echinochloa crus -galli, Polygonum aviculare* and *Taraxacum officinale* (Rifai et al., 2002). *Chenopodium album* and *Polygonum aviculare* are listed among the most common weeds in orchards in New Zealand (Harrington et al., 2002).

On orchards situated in the vicinity of non-cultivated fields I found plant species which before had not grown there. Examples are *Solidago serotina* Ait. and *Tanacetum vulgare* L. Several species of the genus *Solidago* occurred a long time ago in orchards in the USA (Skroch et al., 1975), but not on a large scale. *Taraxacum officinale* can be a problem in orchards in which glyphosate is commonly used (Falta and Pražak, 2001). The growing appearance of *Stellaria media* and *Poa annua* L. should be considered positive both for trees and soil, since they are less competitive than perennials, especially in older orchards. A similar role could be played by *Senecio vulgaris*, however, this species occurs in orchards periodically, rather rarely, and covers only limited areas. Seedlings of *Acer* sp. and *Juglans regia* L. relatively often grow in herbicide strips; the latter species is propagated by birds. As in the 1980s, also in 2003 I in orchards found seedlings of *Morus alba* L. and *Sambucus nigra* L., disseminated by birds.

Based on numerous observations carried out in many countries throughout the world and confirmed by this experiment, it could be stated that – apart from species specific for a given region – the same weeds predominate in orchards: *Convolvulus arvensis* was a good example in the 1980s and *Echinochloa crus-galli* and *Chenopodium album* nowadays.

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ZACHWASZCZENIE SADÓW W REJONIE LUBLINA PO DWUDZIESTU LATACH – OCENA WSTĘPNA

Janusz Lipecki

S T R E S Z C Z E N I E

Wykonano obserwacje występowania chwastów w pasach herbicydowych w sadach w rejonie Lublina i porównano zachwaszczenie w lecie roku 2003 z obserwowanymi w latach 1984-87. Najważniejszą zmianą we florze chwastów stwierdzoną w tym okresie było zmniejszenie występowania roślin trwałych, takich jak powój polny (*Convolvulus arvensis* L.) i wzrost chwastów rocznych, głównie chwastnicy jednostronnej [*Echinochloa crus-galli* (L.) P.B.] i komosy białej (*Chenopodium album* L.). Podobne tendencje opisane są w literaturze światowej. Wydają się one być głównie następstwem stosowania herbicydów dolistnych zamiast doglebowych.

Słowa kluczowe: chwasty w sadach, tendencje zmian