WEEDS IN ORCHARDS – PROS AND CONTRAS

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(Received October 31, 2005/Accepted November 29, 2005)

ABSTRACT

A weed is most commonly defined to be any plant growing where or when it is not wanted. This definition emphasizes the negative nature of weeds and agrees with the point of view of growers and other people interested in different kinds of agricultural activity. However, weeds also sometimes play a positive role as natural components of the environment. This is why this paper is entitled "Weeds: pros and cons". The cons are well known to growers, so they will be touched upon only briefly in terms of their role in the competition for water, nutrients and light. More attention will be paid to the positive aspects of weeds, with special emphasis on orchards.

Key words: orchards, weeds, positives, negatives

There are no weeds as far as nature is concerned. A weed is defined as such solely in terms of human criteria based on its negative impact on yield and crop quality in cultivated plants. This was the predominant point of view for many years and it still is in countries where starvation is still a threat. In many of these countries, effective weed control is not carried out, which sometimes causes dramatic yield losses in crops such as rice, sugar cane and cotton. However, total elimination of weeds is no longer considered the best solution because it may have a negative impact on the growth of cultivated plants and on the environment. This is why this paper is entitled "Weeds: pros and cons". The cons are well known to growers, so they will be touched upon only briefly in terms of their role in the competition for water, nutrients and light. More attention will be paid to the positive aspects of weeds, with special emphasis on orchards.

The negative side of weeds in orchards and small fruit plantations is well known. Weeds compete with cultivated plants for water and nutrients. Weeds

often get the upper hand because they usually have denser and better developed root systems than young orchard plants. Uncontrolled weed growth around young trees is an excellent place for tree-damaging rodents to spend the winter (Tab. 1). In the spring, frost damage is higher on ground covered with weeds than on bare soil. Weeds can also provide some orchard pests with good conditions for development. Weeds make the mechanical lifting of young trees in the nursery much more difficult, and thus more expensive. *Convolvulus arvensis* L. and *Galium aparine* L. reduce the efficiency of mechanical harvesting on currant plantations because many berries either remain on the bushes or fall to the ground. On strawberry plantations, weeds can delay ripening because they restrict the amount of sunlight which reaches the strawberry plants. There may also be the allelopathic effects between weeds and cultivated plants. However, our knowledge of allelopathy is still very limited. Some weeds are poisonous and contain toxins such as alkaloids, glucosides and saponins. *Rhus toxicodendron* L., for example, is an extremely toxic and common plant in North American orchards. *Bryonia alba* L. is less toxic and is commonly encountered in orchards here in Europe. Fortunately, serious accidents do not happen very often.

Table 1. Rodent damage and soil management (Lipecki and Szwedo, 1996)

Soil management method	Percentage of apple trees damaged	Intensity of damage (0-5)
Hand hoeing*	15.4	0.64
Simazine	0	0
Polypropylene sheet*	11.8	0.29
Bark*	37.5	1.12
Rapeseed straw*	55.0	2.10
Foliar herbicides	0	0

*weeds were not fully eliminated before winter

Some weed control methods are more expensive than others are. Herbicides such as the triazine herbicide Simazine have commonly been used in orchards for many years simply because they were the cheapest and most effective way to control weeds.

There are many reasons why weeds are so troublesome and why it is so difficult to control them, including:

- weeds occur everywhere where agriculture is carried out.
- weeds can be easily propagated by both vegetative and generative methods, even when the plants are very young or just after the seeds ripen;
- weed seeds can survive for a long time in the soil and are resistant to unfavourable conditions such as being submersed in water or buried deep in the soil. They patiently await the best time to germinate and grow;

- some weeds produce prodigious amounts of seeds (Tab. 2). The seeds of some weeds are similar in shape and size to the seeds of cultivated plants, so their separation is sometimes almost impossible;
- many weeds have special mechanisms to facilitate seed dispersion, such as *Galium aparine* L., *Arctium tomentosum* L., and many species from the *Asteraceae* family whose seeds are dispersed by the wind;
- the vegetative parts of some plants can survive and regenerate new plants, even after having been buried in the soil. *Convolvulus arvensis* L. and *Equisetum arvense* L. are good examples.
- weeds can compete easily with cultivated plants because they generally have denser and better developed root systems which penetrate both superficial and deep soil layers. The leaves of weeds sometimes have higher nutrient contents that the leaves of orchard plants (Tab. 3).
- weeds can adapt to a wide variety of environmental conditions. They can develop mechanisms to counteract weed control methods, such as resistance to triazines and other herbicides.

Table 2. Number of seeds produced per plant (Pawłowski et al., cited by Świętochowski, 1996)

Species	Number of seeds	
	mean	Maximum
Galium aparine	375	584
Sinapis arvensis	1,981	6,565
Sonchus arvensis	2,716	7,793
Amaranthus retroflexus	9,254	668,520
Galinsoga parviflora	14,204	81,041
Papaver rhoeas	36,723	132,791

Table 3. Chemical composition of the above ground parts of some weed species growing in orchards (% of dry matter), means for 1987 and 1988 (Lipecki, 1993)

Species	N	P	K	Ca	Mg
Amaranthus retroflexus	2.46	0.64	2.79	1.28	0.22
Capsella bursa – pastoris	3.51	0.57	2.19	1.01	0.13
Chenopodium album	3.08	0.37	1.15	0.32	0.23
Convolvulus arvensis	2.99	0.31	3.35	0.60	0.15
Echinochloa crus – galli	2.39	0.48	3.31	0.20	0.17
Erigeron canadensis	3.60	0.61	2.53	0.42	0.12
Senecio vulgaris	3.06	0.41	2.07	0.57	0.13
Taraxacum officinale	3.55	0.34	1.97	0.50	0.17

Fruit growers strongly believe and even fear that all these negative effects may dramatically reduce yields, and have often attempted to eliminate all weeds from their orchards, mainly by using broad-spectrum herbicides. After a few years, herbicide use can itself become a problem by acidifying and degrading soils, leaching of important nutrients such as calcium and magnesium to deeper soil layers, worsening soil structure, and exposing the soil surface to heavy rains, erosion and mechanical compaction. Because of these negative side effects, the use of broad-spectrum herbicides is rapidly being abandoned.

Weeds also have many positive aspects, even in orchards, including:

- weeds protect the soil against water and wind erosion, which is especially important on slopes, where many orchards are planted.
- Weeds protect the soil against mechanical compaction, which is very important in modern orchards with narrow alleyways where machinery usually moves along the same paths. Bare soil is much more prone to compaction than soil covered by plants. *Polygonum aviculare* L. is an example of a plant which grows very well on compacted soil.
- Weeds, especially legumes, are sources of organic matter and nitrogen for the soil, which improves soil properties. Nutrients absorbed by weeds are recirculated and returned to the soil.
- Weeds create a safe habitat for many beneficial organisms.
- Many weeds have medicinal value, for example, *Equisetum arvense* L. and *Erigeron canadensis* L. Others have ornamental value, including *Epilobium* sp. and *Solidago* sp.
- Some weeds are indicators of the chemical or physical properties of the soil. For example, *Papaver rhoeas* L. and *Lathyrus tuberosus* L. indicate neutral or even basic soil pH. *Chenopodium album* L., *Amaranthus retroflexus* L. and many other weeds indicate soils rich in nitrogen.
- Some weeds are already used as human or domestic animal food. Weeds such as *Amaranthus* sp. can grow under extremely unfavourable conditions, including drought, under which cultivated plants cannot be grown. These plants are called “alternative plants”.
- Weeds promote biodiversity and preserve the biological balance in orchards. They prevent many of the problems associated with monoculture, which is now considered very important for environment protection.
- Weeds can be used as phytoremediants to collect and remove toxic substances such as heavy metals from the environment.

Now that they know more about both the negative and positive aspects of weeds in the orchard and about the need to protect the environment, most farmers are willing to let weeds grow freely in their orchards as long as they do not harm orchard plants. They are less rigorous in carrying out weed control in older orchards, between tree rows, and in the autumn, although

rodent control has to be taken into account. In spring, weeds should be strictly controlled where they can successfully compete with cultivated plants, such as in young orchards and on small fruit plantations. Weeds can be controlled in many ways, depending mainly on the financial resources of the grower. Growers should realize, however, that none of the methods recently recommended for use in orchards is completely effective, cheap and easy to carry out. There is simply no one ideal way to control weeds. Foliar herbicides such as glyphosate or glufosinate ammonium are currently recommended because they are relatively environmentally safe. Various organic and synthetic mulches or mechanical weeders can be used to control weeds in plant rows. Soil in alleyways can be protected by cover crops consisting of annuals such as *Poa annua* L., perennials including grasses such as *Lolium perenne* L. and *Agropyron repens* L. (P.B.), and also some dicotyledons. They should be mown as often as necessary and then mulched.

The twenty weeds most often encountered in orchards in temperate climate zones throughout the world are listed in Table 4. This list is based on data from the world literature and also on the author's personal experience (Lipecki, 2005).

Table 4. Weed species predominating in orchards in moderate climate (Lipecki, 2005)

No.	Species
1.	*Convolvulus arvensis* L.
2.	*Agropyron repens* (L.) P.B.
3.	*Cirsium arvense* (L.) Scop.
4.	*Stellaria media* (L.) Vill.
5.	*Poa annua* L.
6.	*Chenopodium album* L.
7.	*Taraxacum officinale* Web.
8.	*Senecio vulgaris* L.
9.	*Cynodon dactylon* (L.) Pers.
10.	*Amaranthus retroflexus* L.
11.	*Echinochloa crus – galli* (L.) P.B.
12.	*Polygonum aviculare* L.
13.	*Capsella bursa-pastoris* (L.) Med.
14.	*Digitaria sanguinalis* (L.) Scop.
15.	*Erigeron canadensis* L.
16.	*Sorghum halepense* (L.) Pers.
17.	*Equisetum arvense* L.
18.	*Solanum nigrum* L.
19.	*Polygonum persicaria* L.
20.	*Plantago maior* L.

CONCLUSION

Wise weed management is based on maximizing the positive effects of weeds while minimizing their negative effects. We should also remember that one of ways that the term "weed" has been defined is "a plant whose virtues have not yet been discovered" (Emerson, 1912, quoted in Zimdahl, 1993).

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CHWASTY: ZA I PRZECIW

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STRESZCZENIE

Chwasty są to rośliny rosnące w miejscu i czasie, w których nie są pożądane. Definicja ta podkreśla negatywne aspekty występowania chwastów i jest zgodna z opinią większości producentów. Wydaje się jednak pożądane zwrócenie uwagi na pozytywną rolę, jaką mogą one odgrywać w środowisku, którego są naturalnym składnikiem. Ponieważ ujemne następstwa obecności chwastów w sadach są powszechnie znane, w niniejszym artykule podkreślono głównie dodatnie efekty ich występowania.

Słowa kluczowe: sady, chwasty, pozytywy, negatywy