Romanian Journal for Plant Protection, Vol. VII, 2014
ISSN 2248 – 129X; ISSN-L 2248 – 129X

ASPECTS OF INTERACTION BETWEEN WEEDS AND CROPS IN CONSERVATIVE AGRICULTURE

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Abstract

In agricultural rotation specific to agroforestry exploitations and Natura 2000 areas the weeds are considered ecologically as producers in agroecosystems. It is necessary to clarify what prevails, damage made by weeds that intercepts water and nutrients or service that it offer as producers of primary energy and what control methods are environmentally acceptable. The paper presents data on the interaction between weeds and crops in agricultural cropping adjacent to natural rezervation Comana, Giurgiu county.

Key words: *agrocoenoses, crops, crop rotations, relationships competition;*

INTRODUCTION

Integrated crop protection in specific crop rotations, determining weed species is not sufficient to achieve effective control, because data are required on biological peculiarities of weeds, features on agricultural ecosystems, biological framing, recognition in the early stages of vegetation, weed spring growth prognosis, and data on the relationships between weeds and crop plants. In conservative agriculture, weeds are not assessed as harmful, they are considered "partners" in an interspecific conpetition based on relationships that are established between the crop and weeds (Berca, 2004). This strategy aims at reducing pesticide dependence of agricultural production and substantial improvement to quality treatments and application techniques. The aim of this paper was to demonstrate that the relationships between weeds and crop plants shows besides the negative influences (high consumption of water and nutrients) and positive (decomposition of toxic compounds) favorable for the crop and soil. In this paper we present data on the interaction between weeds and crops in specific crop rotations adjacent to Comana natural reservation, included in the protected areas "Natura 2000".

MATERIALS AND METHODS

Conservative crop rotation

To alternate plants with different requirements to crop technologies and to highlight better relations between weeds and agricultural plants it was established a rotation consisting of wheat, rape and corn crops. Succeeding crops have different capacities to fight weeds.

Weed determination

Determination of segetal flora was performed on a square meter using metric frame. Were performed by two determinations for each culture: for wheat first determination was made at twinning and the second 3-4 weeks before harvest. For weeding crops first determination was made before first breeding and second 3-4 weeks before harvest.

For two dominant species, respectively *Capsella bursa – pastoris* from wheat crop and *Amaranthus retroflexus* from corn crop gravimetric method was used for their determination

RESULTS AND DISCUSSIONS

Relationships between weeds and crops occurs due to the interaction between environmental factors and trophic relationships that are established in agrocenoses. In general these relations are "relations of competition" for vegetation factors such as: light, moisture, nutrients, carbon dioxide, etc. Competition event depends on edaphic factors (natural fertility, structure, texture, soil pH), crop plants are more stressed than weeds when these factors are not in optimum parameters. Crop rotation is the most important strategy for reducing the number of weeds. To alternate plants with different requirements to crop technologies and to highlight better relations between weeds and agricultural plants it was established a rotation consisting of wheat, rape and corn crops. Succeeding crops have different capacities to fight weeds. To determine relationships between weeds and crop plants were determined segetal species present in specific cropping. Mapping weeds is necessary to know precisely the composition of flora on land and the density of weeds/m^2.

Much has been written about weed mapping and showed its importance (Badea & C. Chirila 1969;, V.V. Isaev, 1990; Berca & Tanase 2000, Slonovschi V. et al. 2001; C. Chirila, 2001).

In protected areas in the natural reservation Comana, Giurgiu county, were determined some of the most harmful weeds like: *Agropyron repens, Cirsium arvense, Cuscuta campestris.*, who are invading neighboring cultures.

In studied agrocenosis were determined 68 weed species, with high frequency and number weeds of the family: *Compositae* - 11 species, *Gramineae* - 10 species, *Cruciferae* - 10 species, *Labiatae* - 4 species, *Caryophyllaceae* - 3 species, *Chenopodiaceae* - 3 species, *Ranunculaceae* - 3 species, *Solanaceae* - 3 species, *Polygonaceae* - 2 species, *Amaranthaceae* - 2 species, *Leguminosae* - 2 species, and one species of the following families: *Primulaceae, Aristolochiaceae, Asteracee, Brassicaceae, Cuscutaceae, Convolvulaceae, Fumariaceaee, Rubiaceae, Geraniaceae, Malvaceae, Orobanchaceae, Papaveraceae, Portulacaceae, Scrophulariaceae and Violaceae* (Table 1).

It was found that weeds are different by biological group as in rotation each culture creates its agrophytocenoses. Thus in wheat group predominated annual spring weeds who can overwinter, annual fall weeds and less annual spring. The dominant species were: *Anthemis arvensis, Anagallis arvensis, Capsella bursa-pastoris, Centaurea cyanus, Papaver rhoeas Consolida regalis, Sinapis arvensis, Vicia sativa* and *Thlapsi arvense.*

For example the species *Sinapis arvensis* was found that is very harmful if weed seedlings appear in autumn after wheat sowing. Due to faster growth, *Sinapis arvensis*, inhibits the crop ,and because of this the wheat cannot pass the winter and in spring the crop is compromised. In literature this species is included in annual spring weed biological group, it was found that *Sinapis arvensis* due to climatic variation conditions within species formed biotypes which can overwinter.

Areas not covered by the crop during the vegetation period, different rates of growth and development, application technology failure is "ecological niches" for weed growth. Thus it was found that studied crop rotations, *Sorghum halepense* populations occupied, in particular, ecological niches created by low densities of weeding crops, and *Cirsium arvense* populations infested especially small grains due to fewer tillage.

Depending on the connections between biotic and abiotic factors in agro conservative relationships between weeds and crop plants change.

Early spring, when the consumption of nutrients by crop plants is not yet fully and microbiocenosis are already active and forms nutrients in the soil, weeds play a positive role. Weeds do not export nutrients from the field, everything remains in place, and having developed deep and horizontal roots , and bring in the depth root layer of plant many nutrients and break down some compounds that crop plants cannot absorb.

Regarding water, weeds play a negative role, because high water consumption. The greatest damage is recorded if the weeds come out at the same time with cultivated plant or very close to it, if weeds appear later when cultivated plants are submitted in vegetation, they do not suffer too much. Weed water consumption of 1 kg of dry matter equals or exceeds that of the most demanding crops, is generally 1.5-2 times higher than the crop. For example, the corn requires about 400 l of water used to synthesize 1 kg of dry matter and the weeds consumes between 600 and 1000 liters of water to achieve the same dry matter. (Berca, 2004).

Early spring ephemeral weeds don't damage crops from that year. Such species are: *Veronica persica, Draba verna, Stellaria media, Viola arvensis*, but they will bring autumn crop damage.

Other weed species due to the long period of vegetation, large vegetative mass, high consumption of water, nutrients, resistance to control measures, are very harmful to the crops, whether are fall or spring, such as: *Cirsium arvense, Cynodon dactylon, Sorghum halepense, Agropyron repens* etc.

Following determinations note that sometimes the number of weeds/m^2 does not say much about the degree of weed infestation, because at one species the weed infestation degree is very high but the weeds are very small and don't make problems in weed control, or contrary degree of weed is low but weeds are very vigorous, cover a lot of ground, create shade, consume water and nutrients and cause a lot of damage even if the number reduced. Based on these findings for two dominant species, respectively *Capsella bursa – pastoris* from wheat crop and

Amaranthus retroflexus from corn crop gravimetric method was used for their determination, weeds were counted, weighed chopped green of the parcel and then dried. (Table 2). Determinations have shown that when one species is found in a large number of small plants, and a small number of large plants, their weight is inversely proportional. (Slonovschi V. et al., 2001). For *Capsella bursa-pastoris* were determined 510 small plants were weighed 35 g/m^2, plants medium 450 weighed 150 g/m^2 and 18 large plants, vigorous which weighed 42 g/m^2. For the species *Amaranthus retroflexus* were counted 282 small plants were weighed 70 g/m^2, plants medium 150 weighed 170 g/m^2 and 40 large plants which weighed 160 g/m^2. Even a single species can cause huge damage. Therefore N. E. Ionescu et al. (1997) show that on average 3 years corn production decreased due *Echinochloa crus-galli* infestation, with coverage of over 88% with 4.8 t / ha. Gravimetric determination of weed has some drawbacks because a plant has more water in the morning than in the afternoon, and the fewer the plants/m^2, size and weight are larger and often there is a single vigorous weeds/m^2 which weighs as 20-25 pieces together and even more.

CONCLUSIONS

Biological diversity in crop rotation in specific agricultural areas adjacent to protected areas “Natura 2000 " is closely related to the technologies of conservative crop rotation.

The larger the land area studied, the more weed species is distinguished, and the information obtained is more appropriate to pedoclimatic conditions and to the agroecosystem studied.

Relations between weeds and crops occurs on the background of the interaction between environmental factors and trophic relationships that are established in agrocoenoses. In general these relations are “relations of competition” because with plant growth begins competition for vegetation factors: light, moisture, nutrients, carbon dioxide.

Crop rotation has an important role in weed control.

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Table 1. Weed species determined in conservative cropping

No.	Species	Family	Height (cm)	Biological group
(1)	(2)	(3)	(4)	(5)
1.	*Adonis estivalis* L.	*Ranunculaceae*	50	annual spring
2.	*Agropyron repens* (L.) P.B.	*Gramineae*	80 -100	perennial rhizomes
3.	*Agrostemma githago* L.	*Caryophyllaceae*	100	annual spring
4.	*Amaranthus albus* L.	*Amaranthaceae*	Branched (100 -1500)	annual summer
5.	*Amaranthus retroflexus* L.	*Amaranthaceae*	100 -150 (200)	annual summer-autumn
6.	*Anagalis arvensis* L.	*Primulaceae*	crawling	annual summer
7.	*Anthemis arvensis* L.	*Compositae*	50 - 60	annual spring
8.	*Aristolochia clematitis* L.	*Aristolochiaceae*	30 - 60 (100)	perennial rhizomes
9.	*Atriplex patula* L.	*Chenopodiaceae*	100	annual summer
10.	*Avena fatua* L.	*Gramineae*	80 - 130	annual spring
11.	*Brassica nigra* (L.) Koch.	*Cruciferae*	100 - 180	annual spring
12.	*Brassica campestris* L.	*Cruciferae*	40 – 60	annual spring
13.	*Capsella bursa-pastoris* (L.)	*Cruciferae*	10 - 50	annual spring
14.	*Cardaria draba* (L.) Desv.	*Cruciferae*	20 - 40	perennial with suckers
15.	*Cardus mutanns* L.	*Compositae*	50 - 100	annual summer
16.	*Centaurea cyanus* L.	*Compositae*	80 -100	annual spring can overwinter
17.	*Chenopodium album* L	*Chenopodiaceae*	50 - 150	annual summer-autumn
18.	*Cirsium arvense* (L.) Scop.	*Compositae*	100 - 150	perennial with suckers
19.	*Consolida regalis* S. F. Gray.	*Ranunculaceae*	40 - 60	annual spring
20.	*Convolvulus arvensis L.*	*Convolvulaceae*	Crawling (100 - 130)	perennial rhizomes
21.	*Cuscuta campestris* Yunck.	*Cuscutaceae*	-	parasitic
22.	*Cynodon dactylon* (L.) Pers.	*Gramineae*	Crawling	perennial with rhizomes
23.	*Datura sramonium* L.	*Solanaceae*	30 - 80 (110)	annual summer
24.	*Descurania sophia* (L.) Webb.	*Cruciferae*	30 - 50 (70)	annual spring
25.	*Digitaria sanguinalis* (L.) Scop.	*Gramineae*	50 - 80 (120)	annual spring-summer
26.	*Echinochloa crus-galli* (L.) P.B	*Gramineae*	40 - 120	annual summer-autumn
27.	*Erigeron canadensis* L.	*Asteraceae*	100 (150)	annual spring can overwinter
28.	*Erophila verna* (L.) Chev.	*Cruciferae*	10 - 15 (20)	annual spring (ephemeral)
29.	*Euphorbia helioscopia* L.	*Cruciferae*	20 - 30 (40)	annual summer
30.	*Fumaria schleicheri* Soy,-Will.	*Fumariaceae*	10 – 30	annual spring
31.	*Galeopsis tetrahit* L.	*Labiatae*	30 - 70	annual summer
32.	*Galinsoga parviflora* L.	*Compositae*	20 - 60	annual summer-autumn
33.	*Galium aparine* L.	*Rubiaceae*	100 -150	annual spring can overwinter
34.	*Geranium disectum* Jusl.	*Geraniaceae*	50	annual spring-summer
35.	*Hibiscus trionum* L.	*Malvaceae*	30 - 50	annual summer
36.	*Hyoscyamus niger* L.	*Solanaceae*	30 - 60	annual summer and biennial
37.	*Lamium amplexicaule* L.	*Labiatae*	10 - 25	annual spring (ephemeral)
38.	*Lamium purpureum* L.	*Labiatae*	10 - 25	annual spring (ephemeral)
39.	*Latyrus tuberosus* L.	*Leguminosae*	100	perennial with tuber
40.	*Matricaria chamomilla* L.	*Compositae*	10 - 50	annual spring
41.	*Orobanche cumana* Wallr.	*Orobanchaceae*	10 - 60	parasitic
42.	Panicum capillare L.	*Gramineae*	10 - 50	annual spring
43.	Papaver rhoeas L.	*Papaveraceae*	60	annual spring can overwinter
44.	*Polygonum aviculare* L.	*Polygonaceae*	crawling	annual summer

continued table

(1)	(2)	(3)	(4)	(5)
45.	*Polygonum convolvulus* L.	*Polygonaceae*	100	annual spring-summer
46.	*Portulaca oleraca* L.	*Portulacaceae*	crawling	annual summer-autumn
47.	*Ranunculus sardous* Cr.	*Ranunculaceae*	10 – 40	annual spring-summer
48.	*Raphanus raphanistrum* L.	*Cruciferae*	30 - 60	annual spring
49.	*Salsola kali* L.	*Chenopodiaceae*	10 - 60	annual summer
50.	*Senecio vulgaris* W.et. K.	*Compositae*	20 - 60	annual spring can overwinter
51.	*Setaria glauca* (L) P.B.	*Gramineae*	60 - 80	annual summer-autumn
52.	*Setaria verticilata* (L) P.B.	*Gramineae*	50 - 90	annual summer-autumn
53.	*Setaria viridis* (L) P.B	*Gramineae*	60 - 80	annual summer
54.	*Sinapis arvensis* L.	*Cruciferae*	100	annual spring can overwinter
55.	*Sisymbrium officinale* L.	*Brassicaceae*	-	annual spring can overwinter
56.	*Solanum nigrum* L.	*Solanaceae*	20 - 50	annual summer-autumn
57.	*Sonchus arvensis* L.	*Compositae*	100 -150	perennial with suckers
58.	*Sonchus asper* (L.) Hill.	*Compositae*	100	annual summer-autumn
59.	*Sorghum halepense* (L.) Pers.	*Gramineae*	120 - 200	perennial with rhizomes
60.	*Spergula arvensis* L.	*Caryophyllaceae*	20 - 40	annual spring can overwinter
61	*Stachys annua* L.	*Labiatae*	20 - 40	annual spring-summer
62	*Stellaria media* (L.) Cyr.	*Caryophyllaceae*	crawling	annual spring can overwinter
63	*Taraxacum officinale* Weber.	*Compositae*	50 -70	perennial
64	*Thlapsi arvense* L.	*Cruciferae*	20 - 40	annual spring
65	*Veronica hederifolia* L.	*Scrophulariaceae*	crawling 30	annual spring-summer
66	*Vicia sativa* L.	*Leguminosae*	climbing 80	annual spring
67	*Viola arvensis* Murr.	*Violaceae*	30	annual spring
68	*Xanthium strumarium L.*	*Compositae*	100	annual summer-autumn

Table 2. The size and weight of the plants of a species when dominant

Specification	***Capsella bursa - pastoris* (sun-dried)**		***Amaranthus retroflexus* (sun-dried)**	
Size	pcs/m^2	g /m^2	pcs/m^2	g /m^2
Small	510	35	282	70
Medium	450	150	150	170
Large	18	42	40	160
Total	**978**	**227**	**472**	**400**