

Research regarding the weeding level in winter wheat and grain maize in Western Caras-Severin County (Romania)

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Abstract Research carried out in 2011 offers a whole image on the segetal flora in winter wheat and grain maize in the Caras-Severin County (Romania) (floristic inventory, share of different biological categories). *Veronica hederifolia*, an annual dicot weed species, has become a problem-weed in wheat, sharing 18.28% of the weeds in the Berzovia area and 20.19% in the Gradinari area. The weed group representative for maize is that of dicots represented by *Amaranthus retroflexus*, *Chenopodium album*, and *Polygonum lapathifolium*. We noted a massive infestation by annual monocots. Thus, *Echinochloa crus-galli* shares 11.72% of the weeds in Berzovia and 17.65% in Gradinari. Mean weeding was 98.5 plants/m² in winter wheat and 123.5 plants/m² in grain maize.

Key words

segetal flora, weeding degree, winter wheat, grain maize

The development of agriculture has brought about a continuous diversification of the weed species which have adapted to the new conditions of applied cultivation technology. The results of these permanent adaptations are the high survival rate of the weed species and the dynamics within each weed community.

Weed control as a basic and permanent concern of researchers and specialists in agriculture aiming at producing higher yields involves, among others, knowing the weed range from the points of view of weeding degree and weed frequency in each agricultural species and sole (5).

Weed mapping consists in establishing the quantitative and qualitative weeding degree of agricultural lands. Depending on climate conditions and on the agricultural system, the weeding degree of a certain area changes in time, and appreciations and decisions can be made only after analysing data regarding the weeding of each sole and plot apart over a longer period of years (3).

Compared to maize, air temperature in a wheat field is lower, soil is cooler, and relative air moisture is higher: these conditions favour the development of weed species, but are not favourable to other weed species, some of which are very damaging such as *Sorghum halepense* (1).

Winter wheat is infested 85-95% by annual and perennial dicot weed species, weeds that germinate mainly in spring or autumn.

In the hill areas, this share can be reduced by the presence of annual monocot weed species such as *Avena fatua*, *Aspera spica venti*, etc. (7).

Maize, as well as other crops that need weeding, are strongly invaded by weeds (2), no matter

the area where it is cultivated. The relatively wide area of nutrition allows weeds to invade maize plants during their first development phenol-phases (6).

Material and Method

In order to carry out the geo-botanical weed mapping, we used, besides the sole plans, other instruments such as determination frame (1 m²) and determiners.

Thus, we used, to determine weeding degree, the quantitative numerical method consisting in counting, per species, the weeds in a sample area. The square frame is placed in several points along the sole diagonal (4).

To be able to use data from the field, we mapped the weeds. To do so, we grouped weed species and established the ratio between dicots and monocots and the ratio between annual and perennial weeds (7).

The Commune of Berzovia, located at the North-Western extremity of the Caras-Severin County, is characterised by an annual mean temperature of 10.6⁰C, and the annual mean of precipitations is 631.0 mm. The soils in the area are brown argyle-alluvial, brown luvic, and albic luvisols.

The Commune of Gradinari is located in the Western Caras-Severin County. Annual mean temperature is 9.8⁰C, annual mean precipitations are about 800 mm, and predominating soils are black and brown compact argyllous.

Results and Discussions

Determining weeding degree in winter wheat and grain maize was done in 2011, in Western

Romania, in the Caras-Severin County, in the Communes of Berzovia and Gradinari, areas characterised by differences in soil and climate

conditions and in the infestation levels, in weed spectra and in weed dominance.

Table 1

Results concerning weeding degree in winter wheat

Weed species	Locality				Mean	%
	Berzovia		Gradinari			
	Weeds/m ²	%	Weeds/m ²	%		
<i>Veronica hederifolia</i>	17	18.28	21	20.19	19	19.29
<i>Viola arvensis</i>	14	15.05	10	9.61	12	12.18
<i>Stellaria media</i>	11	11.83	14	13.46	12.5	12.69
<i>Polygonum convolvulus</i>	10	10.75	5	4.81	7.5	7.61
<i>Convolvulus arvensis</i>	8	8.60	4	3.85	6	6.09
<i>Sinapis arvensis</i>	8	8.60	7	6.73	7.5	7.61
<i>Fumaria officinalis</i>	6	6.45	4	3.85	5	5.08
<i>Centaurea cyanus</i>	4	4.30	7	6.73	5.5	5.58
<i>Capsella bursa pastoris</i>	4	4.30	3	2.88	3.5	3.55
<i>Consolida regalis</i>	3	3.23	5	4.81	4	4.06
<i>Sorghum halepense</i>	2	2.15	4	3.85	3	3.05
<i>Cirsium arvense</i>	2	2.15	5	3.03	3.5	3.55
<i>Chenopodium album</i>	2	2.15	5	4.81	3.5	3.55
<i>Amaranthus retroflexus</i>	1	1.07	4	3.85	2.5	2.54
<i>Galium aparine</i>	1	1.07	3	2.88	2	2.03
<i>Xanthium strumarium</i>	-	-	2	1.92	1	1.01
<i>Rubus caesius</i>	-	-	1	0.96	0.5	0.51
Total weeds	93	100	104	100	98.5	100

Analysing data in Table 1, we can note that, in both Berzovia and Gradinari, the most important weed species in winter wheat are *Veronica hederifolia*, *Viola arvensis*, *Stellaria media*, *Polygonum convolvulus* and *Convolvulus arvensis*, all of which are monocots.

In Berzovia, weeding degree during research was high – 93 plants/m².

Veronica hederifolia, an annual dicot weed species, has become a problem-weed in wheat with a share of 18.28%. *Viola arvensis* also has a high share – 15.05%, as well as *Stellaria media* – 11.83%, *Polygonum convolvulus* and *Convolvulus arvensis* – 10.75% and 8.60%, respectively.

Among weeds specific to wheat crops, some have diminished and have almost disappeared. *Agrostemma githago*, a problem-weed in the past, has a decreasing share of weeding due to the modernisation of agriculture and to the use of herbicides. This weed species has not been identified in our trial soles.

The frequency of creeping thistle (*Cirsium arvense*) reaches a maximum of 2.15% and the share of general weeding is sub-unitary.

Galium aparine, a weed species dominant in the past in winter wheat, does not go above 1.07%, which could be explained by the replacement of herbicides to which the weed species had developed resistance with other herbicides that can control weeds in this crop.

In Gradinari, weeding degree reached 104 plants/m²; the highest share was in the dicot weed species *Veronica hederifolia* – 20.19%. *Convolvulus arvensis*, an annual dicot, fell to almost half of the previous share in the Gradinari area, with only 3.85%, while in Berzovia it reaches 8.60%. There is increased frequency in the weed species *Stellaria media*, *Viola arvensis*, and *Sinapis arvensis*.

The frequency of rough cocklebur (*Xanthium strumarium*) reaches 1.92% and its share is sub-unitary, but in Berzovia this weed species has not been identified in either of the mapped soles. Another weed species identified only in the Gradinari area is *Rubus caesius* (0.96%), an acidophilic weed species present in albic peluvosoil hill areas.

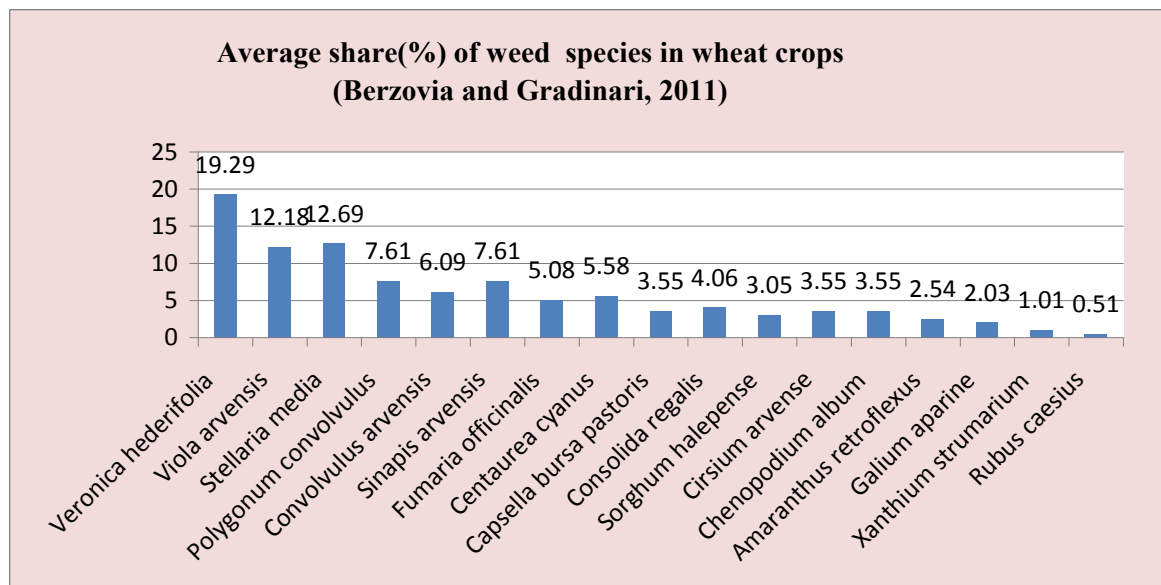


Fig.1 Average share(%) of weed species in wheat crops (Berzovia and Gradinari, 2011)

The weeding degree was 98.5 plants/m² in 2011. This weeding mean might be due to the high level of precipitations that was very favourable to weed growth.

As for the mean share of the weed species in winter wheat, the weed species *Veronica hederifolia* reaching the highest value, 19.29%, and *Rubus caesius* has a share of only 0.51%.

Table 2

Results concerning the weeding degree in grain maize

Weed species	Locality				Mean	%
	Berzovia		Gradinari			
	Weeds/m ²	%	Weeds/m ²	%		
<i>Echinochloa crus-galli</i>	15	11.72	21	17.65	18	14.57
<i>Setaria glauca</i>	13	10.16	8	6.72	10.5	8.50
<i>Amaranthus retroflexus</i>	12	9.38	16	13.44	14	11.34
<i>Sorghum halepense</i>	10	7.81	6	5.04	8	6.48
<i>Chenopodium album</i>	9	7.03	11	9.24	10	8.10
<i>Cirsium arvense</i>	9	7.03	4	3.36	6.5	5.26
<i>Polygonum persicaria</i>	9	7.03	8	6.72	8.5	6.88
<i>Atriplex Patula</i>	8	6.25	9	7.56	8.5	6.88
<i>Convolvulus arvensis</i>	8	6.25	7	5.88	7.5	6.07
<i>Polygonum lapathyfolium</i>	7	5.47	5	4.20	6	4.86
<i>Agropiron repens</i>	7	5.47	4	3.36	5.5	4.45
<i>Xanthium strumarium</i>	6	4.69	7	5.88	6.5	5.26
<i>Hibiscus trionum</i>	5	3.91	6	5.04	5.5	4.45
<i>Chenopodium polyspermum</i>	4	3.12	3	2.52	3.5	2.83
<i>Galinsoga parviflora</i>	3	2.34	2	1.68	2.5	2.02
<i>Sonchus arvensis</i>	3	2.34	2	1.68	2.5	2.02
Total weeds	128	100	119	100	123.5	100

Weeds in grain maize are either specific to this crop, or common to other crops as well, their share of general weeding depending also on the pre-emergent crop (tiller crops or straw crops).

Examining the mean share of weed species in grain maize on the trial soles in 2011 in both Berzovia and Gradinari areas, we have come to the conclusion that the following 16 weed species can be considered problem-weeds: *Echinochloa crus-galli*, *Chenopodium album*, *Amaranthus retroflexus*, *Setaria glauca*, *Cirsium arvense*, *Sorghum halepense*, *Galinsoga parviflora*, *Convolvulus arvensis*, *Sonchus arvensis*, *Polygonum lapathifolium*, *Polygonum persicaria*, *Hibiscus trionum*, *Agropiron repens*, *Xanthium strumarium*, *Atriplex patula* and *Chenopodium polyspermum*.

Analysing the data in Table 2, we can see that dicots are the representative weed group in grain maize on the trial soles: *Amaranthus retroflexus*, *Chenopodium album*, *Polygonum lapathifolium*,

Hibiscus trionum, *Polygonum convolvulus*, *Xanthium strumarium*, *Chenopodium polyspermum*, *Galinsoga parviflora*, and *Sonchus arvensis*.

In Berzovia, the weeding degree during the entire research period was high: 128 plants/m², while in Gradinari it reached 119 plants/m².

There was massive infestation by annual monocots in both areas. Thus, *Echinochloa crus-galli* had a share of 11.72% in Berzovia. In Gradinari, this weed species had a higher frequency – 17.65%.

Setaria glauca, *Amaranthus retroflexus*, *Sorghum halepense* and *Chenopodium album* are also frequent weed species in grain maize.

Galinsoga pasiflora, a dicot weed species, occurring in both tiller crops and straw crops, reaches 2.34% in Berzovia and 1.68% in Gradinari, sub-unitary values from the point of view of weeding share.

Sesame (*Sonchus arvensis*) also has a low frequency on the mapped soles: 3 weeds/m² and 2 weeds/m² in the two research areas.

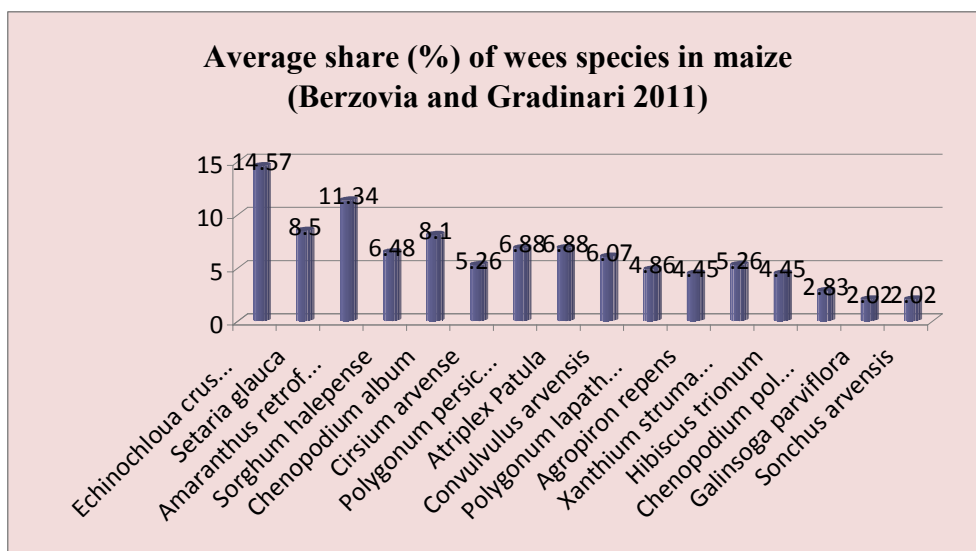


Fig. 2 Average share (%) of wees species in maize (Berzovia and Gradinari 2011)

Weeding mean during the research period was 123,5 plants/m². This mean could be explained by the rich precipitation regime in the hill area, which is very favourable to weeds.

The highest frequency in grain maize in both Berzovia and Gradinari is the monocot weed species *Echinochloa crus-galli* – mean share of 14.57% - while the lowest frequency was in the weed species *Sonchus arvensis* – mean share of 2.02%.

Conclusions

1. Controlling weeds involves well knowing the range of weeds from the perspective of weeding degree and

frequency in each agricultural crop and sole of an crop rotation.

2. Winter wheat is over 85-95% infested by different annual and perennial dicot weed species.

3. After weed mapping, we could see that the most important weed species in winter wheat are *Veronica hederifolia*, *Viola arvensis*, *Stellaria media*, *Polygonum convolvulus* and *Convolvulus arvensis*, weed species that are all dicots.

4. The most representative weeds in grain maize are dicots such as *Amaranthus retroflexus*, *Chenopodium album*, *Polygonum lapathifolium*, *Hibiscus trionum*, *Polygonum convolvulus*, *Xanthium strumarium*,

Chenopodium polyspermum, *Galinsoga parviflora*, and *Sonchus arvensis*.

5. The weeding mean was 98.5 plants/m² in winter wheat and 123.5 plants/m² in grain maize; it is possible that these values are the result of precipitations favourable to weed species growth, of soil type, and of cultivation technologies.

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