

COMPARATIVE WEED INVESTIGATIONS IN WHEAT AND MAIZE CROPS CULTIVATED TRADITIONALLY AND TREATED WITH WEEDICIDES V. WEED VEGETATION OF WHEAT CROPS BASED ON THE RESULTS OF SURVEY IN 1961—1963 WITH ESPECIAL REGARD TO THE EFFECT OF CROP CHANGE AND PARTIAL MONOCULTURAL CULTIVATION ON THE WEED VEGETATION

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Summary

I repeated the weed surveys in wheat crops cultivated traditionally and treated with 2,4-D in 6 places each of the fields, altogether in 18 units of 12 state farms (resp. cooperative farms) in 1961 and 1963. The results of the surveys can be summarized as follows:

In comparison with the extensive smallpeasant economy (1950) as a result of modern large-scale agrotechnics the weed cover of wheat crops treated traditionally decreased by more than a half in the last 12—15 years. In 1961 — under crop-change — this decrease was much larger than in 1963 when the effect of partial monocultural cultivation was perceptible on the percentage of weed cover. This percentage is different in every single life forms resp. in their groups depending on the way of cultivation and amount of precipitation; it is on much larger scale at perennials than at annuals. Therefore within the actual much smaller general covering the rates changed for the advantage of annuals especially for that of group T₄.

The spraying with 2,4-D resulted further 39% decrease in the weed cover of wheat fields, especially annuals were hit.

Overgrowing with weeds is much stronger in monocultural cultivation under traditional as well as chemicalized circumstances. Spraying must be fulfilled earlier because the proper grain weeds (T₂ T₃) damaging first of all the crops in this period are still undeveloped therefore they react more sensibly upon the chemicals so higher weedcid-effect can be reached.

Introduction

Since the first country-wide weed survey (1947—1953) two of the numerous factors have had decisive role: the socialist reorganisation of agriculture resp. the corresponding modern large-scale agrotechnical processes, and the widening application of chemical weedicides. From the beginning of 60-as (between 1961—1965) investigations were carried out — according to these 2 points of view — in the two most important plough-land culture: in wheat and maize under large-scale farming conditions to establish numerically the weedicides modifying effect on the weedvegetation. The results of investigations were partly published (FEKETE, 1963, 1964 manuscript, some chapters published in 1973 1974a, b, 1975).

This paper (being one of the chapters of a larger synthetic work still in manuscript) contains the summary of weed surveys in traditionally and with Dikonirt treated wheat crops according to the treatments annually. Namely the data of annual surveys are suitable for the demonstration of the effect of monoculture and

crop change, on the other hand in 1963 — because of the limiting effect of traizine chemicals — the wheat was sown after itself.

Since then naturally these problems resp. their details were studied intensively by others too, moreover in 1969 (1971) the second country-wide weed survey of wheat and maize crops has been realized by the direction of Újvárosi, with the cooperation of more research workers. This survey deals only with traditional crops and is limited to the exposition of their weed-relations. Other data explain only weed vegetation of chemicalized wheat crops, so it is almost impossible to compare the data originated from the same place from the two kinds of crops (traditional and treated with weed-icides).

Places and methods of investigation

As places of investigation were chosen the same of fields which were particularly elaborated during the first country-wide weed survey.

The places of investigation (the results of the later were summarized and published annually) are the following: 1961: Bábolna, Martonvásár, Mátételke, Debrecen-Nyulas, Karcag and Pánd (surveying places No. 1.), 1963; Fehérgyarmat, Mezőnagymihály, Mezőhék, Enying, Lábod and Kaposvár (surveying places No. 2.). In 1963 more units of the state farms then enumerated were investigated. I surveyed the fields of cooperative farms near the enumerated places too in order to obtain a reliable picture about the weed vegetation of the fields. I compared the results of my surveys with the earlier data of ÚJVÁROSI (1950, 1961) originated from the same places in order to establish the changes in weediness during the last 15 years (with sign 1950, effect of agrotechnic) and the crops treated with chemicals were compared with the actual traditional cultures.

The survey was carried out by the territory-expressive coenological method of BALÁZS mainly (on 8 from the 12 investigated places) on open country adobe and partly on sandy adobe resp. sandy soil. The basic surveys (1950) as well as the 1961—1963 surveys were carried out in June. I made *separated survey series* in all of the places of investigation — regarding as separated places every single unit too — in crops treated traditionally and sprayed with weedicides and this survey-series were considered according to the treatments. In these survey-series the number of surveys is 10 on every investigated place in 1961; every treatment and every survey was made on separated plots. From 1963 the number of surveys is changing depending on the size of the surveyed territory and the composition of weed vegetation: between 300—500 cadastral yoke 10, 500—1000 c. y. 20, over 1000 c. y. 30 and on one plot generally 2 surveys were carried out. Where the weed vegetation wasn't identical enough the number of surveys was doubled. Average value from the series of surveys was taken in every investigated place according to each treatment then the average values were summarized annually (surveying places No. 1. and 2., 1950, 1961, 1963) and in the average of the two years (1950; average of the years 1961—1963).

The whole investigated material was statistically measured: I reckoned t-test between the data from 1947—1951 (with sign 1950) and data from 1961—1963 — annually and summarized too — concerning the whole weed cover, the number of occurring weed species, the individual life forms and their groups, moreover concerning the quantitative relations of weed species occurred in large number under traditional circumstances and treated with chemicals including the period of monocultural cultivation.

It is characteristic of the distribution of precipitation, that during the first country-wide survey (in the years 1947, 1950, 1951) the weather was mainly dry or even droughty with 200—250 mm falling behind the many (40) years average during the breeding season. The survey of 6 places from the 12 investigated fields was carried out during these droughty years that of the other 6 places during 1948 and 1949 which were years with average precipitation. The precipitation relations in 1961 were similar to those of the mentioned dry years, while 1963 was a year with average precipitation and relatively dry spring. In the summarized average of the 12 investigated places in both cases consequently, (in 1947—1951 resp. 1961—1963) the data of years with similar relations of precipitation were compared.

Naturally the relations of precipitation on every occasion had a great influence on the appearance of weed vegetation its quantitative and qualitative combination and — to a certain extent — on the effectiveness of weedicide Dikonirt with the agent 2,4-D too.

The preparation of the soil for sowing, the sowing and the following works moreover the dispersion of weedicides on the area treated with chemicals were carried out in optimal or approximately optimal time in proper quality in every farm. The dose of Dikonirt is 1,2—1,3 kg/c.y. The date of sprayings were the middle resp. second part of April in 1961, in 1963 — because of the late coming of spring — between 5th and 10th May. The spraying was carried out by aeroplane.

Results and discussion

The annual summary of 1961 and 1963 surveys was carried out to see how great differences can be caused in the quantity of weeds and in the mass ratio of every single weed group resp. species by the different conditions of cultivation and different amount of precipitation.

Naturally besides the above mentioned other factors also took part in the rise of these great differences. So for example the effect of premanent cold ($-28-29^{\circ}\text{C}$) at the end of February 1963 was very disadvantageous and what's more in some places Italian wheats were cultivated being especially sensitive to cold. As a result of these in 1963 the wheat crops were everywhere thinner and so much more weedy than for example in 1961. On the other hand summing up the results of the two years — the quantitative differences of weed vegetation formed by the mentioned effects partly are compensated, at the same time the data become more reliable and more suitable for generalization. Actually the summarized average of the two years (1961—1963) shows the rate of changes in weed vegetation of wheat crops partly under traditional and partly under chemicalized circumstances during the last 12—15 years passed since the first country-wide survey. According to these results the data of the 30 most frequent weed species were listed in the suitable columns of Table 1. and 2. At the bottom of the Tables are given the total weed cover, the number of weed species and the value of S.D. The distribution of weed vegetation according to life forms — in the same grouping — is shown by Figures 1, and 2.

1. The effect of large-scale agrotechnics on the formation of weed vegetation in wheat crops

From the data of Table 1. occurs that in 1961 on the surveying places No. 1. — under crop change — the weed cover has decreased with 60% as compared to that of 1950. In 1963 on the surveying places No. 2. in partial monocultural cultivation the overgrowing with weeds was much more intensive and the degree of decrease is only 50%. Summarizing the data from the surveying places No. 1. and 2. the weed cover of wheat crops has reduced to one half as a result of the application of modern large-scale agrotechnics (in Table 1. the surveying places No. 1. and 2. columns of 1950 and 1961—1963).

On the other hand, the number of species has slightly increased: in the dry year of 1961 moderately but in the wet year of 1963 considerably. Summarizing the results of surveying places No. 1. and No. 2. the increase in number of species wasn't considerable.

The changes taken place in the mass-weediness of wheat crops were totally verified by mathematical statistical analyzis.

Figure 1. demonstrates the main groups of weed vegetation of wheat crops according to their life forms in each year and the summarized average of the two years; so the degree of change at the two most important life forms resp. at their groups can be established. Comparising the data of 1961 and 1963 can be estimated the effect of

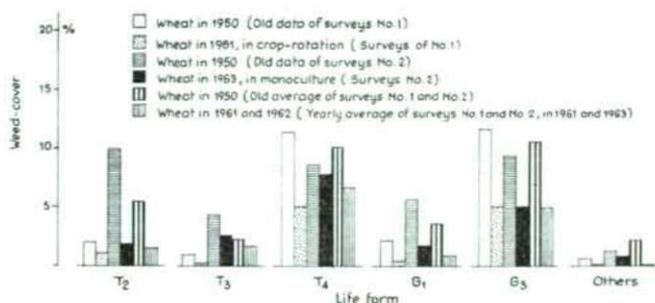


Fig. 1. Effect of large-scale agrotechnics on the formation of weed vegetation of wheat crops according to life forms.

crop change and partial monocultural cultivation on the weed vegetation too. Obviously the degree of decrease is on much larger scale in crop change than in partial monocultural cultivation. In partial monoculture the almost unchanged amount of late summer annuals (T_4) is most conspicuous compared with that of 1950, but the species belonging to the group T_3 occur with greater cover than in 1961. So as compared to the 60–70% decrease of other weed-groups in the latter case only moderate reduction appeared. As a result of this, at present the cover is much smaller and the rates shifted to the advantage of annuals, within them to that of the late summer annuals.

Mathematical statistical analysis shows 70–90% significant differences in the cover changes of every single life forms resp. their groups in each year resp. in the summary of the two years; it marks occasional differences as well, and 30–80% value of S.D. for the species belonging to every single group as compared with the data of 1950.

Investigating into the quantitative distribution of weed species occurring most frequently in wheat crops can be established a significant decrease during the last 12–15 years at the majority of species. In the same time multiplication is demonstrable at some species first of all at annuals for example in the case of *Anthemis arvensis*, *Matricaria inodora*, *Apera spica-venti*, *Avena fatua*, etc. It must be emphasized that their multiplication was perceptible only in that plots where crop change didn't happen and wheat was followed by wheat possibly earlier also wheat was sown. This calls the attention to the fact that we have to take into account the multiplication of the mentioned species or that of other species too in case of the increased expansion of monocultural cultivation. Their multiplication in monoculture can be explained on the basis of weed coenological and other knowledges. Present investigations carried out between 1963–1965 verify this fact having been established by the data of the second country-wide weed survey (ÚJVÁROSI, 1973) too.

2. The effect of spraying with Dikonirt on the formation of weed vegetation of wheat crops

The use of Dikonirt wasn't wide-spread in the early 60-s so in order to reduce the sources of error the weed vegetation of wheat crops treated with Dikonirt will be compared only with supposedly untreated crops. Places of investigation were as follows: in 1961 Bábolna, Martonvásár, Mátételke, Debrecen (surveying places No. 1);

Table 1. Percent cover-values of more frequent weed species of wheat crops on the basis of 1961 and 1963 surveys, compared with the data of the first country-wide survey (1947—1951)

Treatment:	Traditional					
	Surveying places No. 1.		Surveying places No. 2.		Average of surveying places No. 1. and 2.	
Place of surveys:						
Time of surveys:	1950	1961	1950	1963	1950	1961—1963
<i>Equisetum arvense</i>	—	—	3.618	0.689	1.644	0.413
<i>Consolida regalis</i>	0.780	0.050	1.398	0.222	1.061	0.153
<i>C. orientalis</i>	0.042	0.018	0.686	0.041	0.335	0.032
<i>Rubus caesius</i>	1.598	0.737	0.700	0.919	1.189	0.860
<i>Vicia hirsuta</i>	0.002	0.003	1.936	0.080	0.881	0.049
<i>V. grandiflora</i>	0.020	0.018	0.836	0.012	0.385	0.015
<i>Lathyrus tuberosus</i>	0.130	0.192	0.862	0.269	0.463	0.238
<i>Convolvulus arvensis</i>	5.812	2.722	5.862	2.579	5.848	2.551
<i>Ajuga chamaepitys</i>	0.828	0.200	0.002	0.242	0.453	0.225
<i>Stachys annua</i>	2.028	1.170	0.484	0.926	1.326	1.157
<i>Papaver rhoeas</i>	0.185	0.157	0.382	0.022	0.275	0.076
<i>Fumaria schleicheri</i>	0.030	0.003	0.012	0.033	0.022	0.021
<i>Sinapis arvensis</i>	0.370	0.272	1.012	0.769	0.662	0.570
<i>Diploaxis muralis</i>	0.698	0.048	—	0.037	0.381	0.041
<i>Raphanus raphanistrum</i>	0.300	0.003	0.012	0.517	0.078	0.311
<i>Lepidium draba</i>	1.407	0.635	1.168	0.138	1.298	0.337
<i>Ambrosia elatior</i>	—	—	2.026	2.141	1.013	1.070
<i>Matricaria inodora</i>	0.013	0.007	0.014	0.492	0.013	0.298
<i>Cirsium arvense</i>	1.785	0.780	1.142	1.453	1.500	1.184
<i>Centaurea cyanus</i>	0.462	0.530	2.400	0.695	1.343	0.629
<i>Scleranthus annuus</i>	—	0.002	2.194	0.708	0.997	0.425
<i>Chenopodium polyspermum</i>	—	—	0.014	0.492	0.006	0.295
<i>C. album</i>	1.303	0.427	0.924	0.400	1.131	0.424
<i>Polygonum lapathifolium</i>	0.340	0.050	0.082	0.139	0.223	0.103
<i>P. aviculare</i>	0.622	0.130	1.336	0.330	0.946	0.252
<i>Bilderdykia convolvulus</i>	1.675	0.867	1.572	0.739	1.628	0.790
<i>Agropyron repens</i>	1.405	0.017	0.012	0.168	0.772	0.107
<i>Echinochloa crus-galli</i>	0.010	0.243	0.418	0.379	0.194	0.325
<i>Setaria glauca</i>	0.402	0.525	0.308	0.073	0.359	0.254
<i>S. viridis</i>	1.067	0.115	0.520	0.173	0.776	0.150
Total weed cover (%)	28.245	11.867	38.324	19.260	32.830	16.300
Number of weed species:	90	99	116	136	142	154
S. D. concerning the total weed cover:		99%		99%		differs
concerning the number of all weed species:		70%		70%		60%
S. D. between the surveys of 1961 and 1963:				95%		
				20%		

in 1963 Fehérgyarmat—Csholc, Mezőnagyimihály, Mezőhék, Lábod—Nagybaráti and Lábod—Nagykorpád (surveying places No. 2). Table 2. contains the average cover values of frequent weed species occurred in wheat crops treated traditionally as well as sprayed with Dikonirt in the mentioned farms according to each year and summarizing the data for the two years. Table 2. shows the distribution of weed vegetation according to life forms.

According to the data of Table 2, further remarkable decrease of weed cover has taken place in wheat crops treated with Dikonirt under the influence of weedicide (Table 2). At the same time it is shown that in 1961 traditional wheat crops cultivated in crop change were more free from weed than in 1963 the wheat crops cultivated in partial monoculture and treated with Dikonirt.

Table 2. Percent cover values of more frequent weed species of wheat crops treated with Dikonirt (2.4-D) according to the surveys in 1961 and 1963 compared with the data of traditional cultures of the same places

Place of investigations	Surveying places No. 1.		Surveying places No. 2.		Average of surveying No. 1. and 2.	
Year of investigation:	1961		1963		1961—1963	
Treatment:	Traditional	With Dikonirt	Traditional	With Dikonirt	Traditional	With Dikonirt
<i>Equisetum arvense</i>			1.238	0.940	0.619	0.470
<i>Consolida regalis</i>	0.075	0.025	0.146	0.028	0.110	0.026
<i>C. orientalis</i>	0.001		0.074	0.006	0.037	0.003
<i>Rubus caesius</i>	0.452	0.160	0.568	0.220	0.480	0.190
<i>Vicia hirsuta</i>	0.004	0.005	0.140	0.080	0.072	0.043
<i>V. gradiflora</i>			0.020	0.002	0.010	0.001
<i>Lathyrus tuberosus</i>	0.208	0.030	0.104	0.078	0.156	0.054
<i>Convolvulus arvensis</i>	1.894	1.747	2.636	2.610	2.265	2.178
<i>Ajuga chamaepitys</i>	0.159	0.120	0.238	0.004	0.198	0.062
<i>Stachys annua</i>	1.954	0.769	1.300	0.264	1.627	0.517
<i>Papaver rhoeas</i>	0.332	0.047	0.028	0.034	0.180	0.041
<i>Fumaria schleicheri</i>	0.008	0.350	0.056	1.272	0.032	0.811
<i>Sinapis arvensis</i>	0.207	0.102	1.342	0.044	0.675	0.073
<i>Diploaxis muralis</i>	0.033	0.016	0.030	0.008	0.031	0.012
<i>Raephanus raphanistrum</i>	0.001		0.922	0.006	0.461	0.003
<i>Lepidium draba</i>	0.232	0.075	0.248	0.002	0.240	0.038
<i>Ambrosia elatior</i>			1.618	1.124	0.809	0.562
<i>Matricaria inodora</i>	0.003	0.015	0.418	0.124	0.211	0.069
<i>Cirsium arvense</i>	0.966	0.756	0.798	0.664	0.882	0.710
<i>Centaurea cyanus</i>	0.346	0.025	0.936	0.518	0.641	0.271
<i>Seleranthus annuus</i>	0.006		1.250	0.734	0.628	0.367
<i>Chenopodium polyspermum</i>			0.488	0.020	0.244	0.010
<i>C. album</i>	0.293	0.397	0.612	0.598	0.453	0.498
<i>Polygonum lapathifolium</i>	0.161	0.025	0.098	0.098	0.129	0.061
<i>P. aviculare</i>	0.280	0.162	0.532	0.268	0.406	0.215
<i>Bilderdykia convolvulus</i>	0.904	1.018	0.896	0.468	0.900	0.743
<i>Agropyron repens</i>	0.006	0.022	0.212	0.566	0.109	0.294
<i>Echinochloa crus-galli</i>	0.084	0.082	0.472	0.430	0.278	0.256
<i>Setaria glauca</i>	0.859	0.305	0.126	0.026	0.492	0.165
<i>S. viridis</i>	0.298	0.146	0.264	0.580	0.281	0.363
Total weed cover (%)	11.656	7.394	21.292	14.140	16.517	10.767
Number of all weed species:	84	70	102	97	123	114
S. D. concerning the total weed cover:		99%		Differs		differs
concerning the number of all weed species:		70%		60%		60%
S. D. between the surveys of 1961 and 1963;				98%		95%
				20%		10%

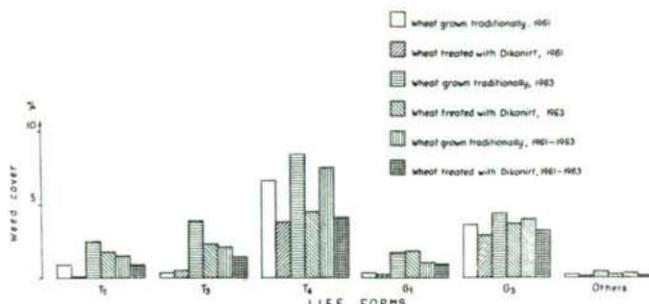


Fig. 2. Effect of Dikonirt-spraying on the formation of weed vegetation of wheat crops according to life forms.

Figure 2. demonstrates the effect of Dikonirt on every single weed group showing that it defeats first of all annuals. In connection with this it must be mentioned that in 1961 because of the early sprayings the damage of proper grain weeds (T_2) was much greater than in 1963 when because of the late coming of spring the time of spraying was postponed. In the latter case by that time of spraying the weeds of this group and part by weeds belonging to the group T_3 were in shooting state so they weren't so sensitive to the chemicals.

Investigating the quantity of every single species it can be established that Dikonirt caused a significant decrease at the majority of species, at the same time *Fumaria sleicheri*, *Agropyron repens* did it in smaller degree (Table 2). In monocultural plots like in traditionals — besides the mentioned other species increase was experienced. Practically all the problems of the 70-s occurred at this time though not so sharply expressed (BEA, 1973; CSANÁDY, 1972; KOROKNAI, 1976; MADARÁSZ, 1974; 1976).

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