RESEARCH ON CROP PROTECTION AGAINST WEEDS MADE ON AGRICULTURAL RESEARCH AND DEVELOPMENT STATION LIVADA

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Abstract

The paper presents, on decades, the main results achieved in weed testing and control, during 1962-2016. Experiments regarding the herbicide testing in field crops were performed in order to be released and recommended for using. During this decades, researches regarding the remanence of atrazine, simazine, trifluraline and imazetapir were been conducted.

O major concern was to establish the weed damages in various crops, relationship between soil weed reserve and crop weeding level. As part of three years crop rotation, the collateral effects of herbicide treatments on crop weeding level was tested. On the background of long-term experiments with fertilizers and amendments, the relationship between wheat yield on different backgrounds and weeding level was tested.

Key words: weed control,herbicides.

INTRODUCTION

There is no universally accepted definition of weeds. (Gus et al, 1998) highlights the following cases:

-The Oxford English Dictionary calls ,,worthless herbaceous plants that grow wild and stout covering the ground and disturbing the growth of superior plants.

The Romanian encyclopedic dictionary(1962) defines weeds as ,,a foreign plant on agricultural land that causes damage, consuming water and soil nutrients which leads to decrease of crop.

-Zimdhal RI(1993) by Gus at al.(1998) quotes several definitions over the time created by specialists of this field.

-Balatchley(1992) calls this as ,,plant that grows in places where it s not welcomed ,,

-Muenscher(1946); ,,this harmful plants grow in places where they are not welcomed, usually in places where something else should grow,,

-Salisbury(1961); ,, plants that grow in places where they are not welcomed,,

In the romanian literature there are lots of definitions ,Prodan I.(1946), Gh.Ionescu Sisesti(1955),Zahariadi C and Anghel Gh(1960), the most recent one of Budoi GH. and Penescu A. (1966), they define the weeds as ,,unwelcomed plants that grows on agricultural lands, parks, gardens, airports etc. causing huge damages and losses .

WEEDS : unwelcomed plants that grow on agricultural lands, parks , gardens airports etc . causing huge damages and losses.

The concept of weeds ;

Restricted selection; wild species.

-**segetal:** only on agricultural land

- ruderal :only on ditches and vacant land.

- segetal and ruderal

Larger selection: wild species and conditioned weeds

- conditioned weeds: plants that appear isolated in a certain types of land or crop land.

They are types of plants in certain geographical areas that are crop plants (*Sorghum halepense*, in north Africa) and in others are weeds.

Because of the importance of weed control and the need for active international exchange of information in this subject, the following international associations were created:

- in 1958-EWRC European Weed Research Control.
- in 1975-EWRC becomes EWRS, European Weed Research Society.

MATERIAL AND METHOD

The researches were conducted at Agricultural Research and Development Station Livada on a clay soil with varying degrees. The content of clay on arable layer is 22,4% of humus is 1.8% and pH of H_2O is 5,6.

For a better understanding, we divided the research from this period in 5 decades each representing a certain, well-defined activity.

-decade I 1962-1971
-decade II 1972-1981
-decade III 1982-1991
-decade IV 1992-2001
-decade V 2002-2016

The researches regarding testing of herbicides for their approval were and are absolutely necessary because climatic conditions are different from year to year and from decade to decade .

The results presented in this work have been published in research journals and magazines. Through this paper we want to bring to actuality some of the results from 1962-2016. The basic activity was to test herbicides for their approval, but in the same time it was analyzed the importance of the damages caused by the weeds, the reserve of the weed seeds in the soil due to the crop rotation, the fertilization and amendment effects over the weed infestation on agricultural lands during the long-time experiments, the collateral effects of herbicide use during a 3 year crop rotation.

RESULTS AND DISCUSSION

Damages caused by weeds.

Although the negative impact of weeds on crops is well-known, it is hard to estimate the real value of damage caused by them.

Summarizing the results of the experiences with herbicides, Vlăduţu and colab.(1988) they conclude that the maize yield significantly decreases as the weed infestation increases. On average over 25 years, the losses of grain maize are 35,48 kg for each 100 kg of weeds recorded at harvest. At ARDS Livada, Fritea (1988) had calculated the amplitude of maize yield losses at an infestation of 1 plant / square meter for several weed species.

Table 1

The amplitude of maize yield losses at an infestation of 1 plant per square meter for some weeds at ARDS Livada

Scientifically name	Popular name	Losses kg/ha
Eymus repens	Pir târâtor	161,0-3930,0
Amaranthus retroflexus	Ştir	103,5-1823,0
Setaria sp	Mohor	83,5-361,5
Convolvulus arvensis	Volbură	72,8-345,3
Chenopodium album	Lobodă	38,0-279,5
Cirsium arvense	Pălămidă	32,8-75,7

Worldwide, the global agricultural production losses are huge. For example in USA, Zimdahl(1993) estimates the losses caused by weeds at over 8 billon $.

The reserve of the weed seeds from the soil.

In the papers on this subject, the main source of weed infestation is represented by the reserve of weed seeds from the soil followed by the density and expansion of underground organs of certain species.

The reserve of weed seeds from the soil which has a continuing dynamics provides a sufficiently enlightening image over the potential of the weed infestation for the next coming years knowing the longevity and vitality of the seeds of weed species .

The variation of weed seeds in the soil it is conditioned mostly by the crop rotation and it is determined by the frequency and energy of terrain preparing activities for cultivated crops.

Researches that was conducted on the land of ARDS Livada show the influence of crop rotation over the weed seeds reserve from the soil. The most reduced values of weed seeds were determined on perennial crops or crops that need hoeing (Vlăduţu,1970, Şarpe and colab.1975). On a crop rotation experiment on clay soil in the north-west of Romania, Fritea and Ghinea (1995) performed herbicide treatments and agrophytotechnical activities on crop plants. The results showed important changes in the quantity and quality of the reserve of weed seeds.

At the beginning of the experiments in 1970 were determined weed seeds at 25cm depth for 7 species. In 1993 were found seeds from 23 weed species. In the mean time the reserve of seeds of *Polygonum lapathifolium* has decreased from 4200seeds /m^2 to 50-300 seeds /m^2 as a result of treatment carried out on maize crops. Interesting developments were recorded at species like *Matricaria inodora* and *Amaranthus reflexus*. In 1970, for these 2 weed species, the seeds were not determined until 1993 when these weed species were dominating the total reserve of seeds in soil. There is a very significant relationship (r=0,767***) between the number of weeds recorded before maize harvesting and the seed reserves in the soil. By increasing the weed infestation with 1 plant/ m^2, the seed reserve increases with 84 seeds/ m^2.

For *Amaranthus retroflexus* and *Chenopodium album* species, the seed reserve from the soil and the number of plants were influenced by the succession of herbicides treatments applied to the 2 crops in the crop rotation: maize and potato. The maize crop was treated with butyl+2,4 D and dicamba which favored the weed infestation with these species regardless the herbicides that were applied, thus at the potato crop, a reserve of 119.394 seeds/m^2 and 9,6 plants /m^2 was accumulated.

On clay soil rotation, in general at all weed species, the reserve of weed seed from the soil was determined by the energy with which they acted to help maintain the crop.

Reducing weeds through agrophytotehnical methods.

On arable land in the north west of Transylvania with acidic soil the weeds are dominated by acidic species, well adapted to oligotrophic soil.

Apart from certain species of podzolic soil such as *Sclaranthus annuus*, *Spergula arvensis*, *Gypsophila muralis*, *Muscarii comosum*, *Raphanus raphanistrum*, *Equisetum arvense*,etc. gradually through a series of improved technologies, the flora has increased with weed species of large ecological amplitude like: *Amaranthus retroflexus*, *Chenopodium album*, *Sinapis arvensis*, *Erigeron canadensis*, *Matricaria inodora* or *Solanum nigrum*.

This way we register a permanent, spatial and temporal dynamics recorded in almost all agricultural areas of Romania.(Berca and colab.2000, Ciocârlan and colab.2004, Fritea and colab.1996, Fritea 1998,Vlăduţu 1970)

The development and the implementation of alternative techniques in order to protect the crop cultures from the weed competition is and will be specific to every agricultural area.

For this, the sequence of plant crops in time, the tillage system activities, the fertilization, the pest control and other linked activities contribute and influence each other to reduce the negative effects of weed infestation over the yield crops.

In practice the accuracy and the level at which is done in the terms of crop requirements, the cultivation technology ensures competitive capacity of the crop plants over the weed infestation.

By determining the degree of weed infestation, performed before harvesting the winter wheat shows the very significant negative correlation between the quantity of weeds and the grain yield.

The correct integration of all agrophytotechnical measures highlighted for the conditions at ARDS Livada, how the weed infestation can be reduced to tolerance threshold for winter wheat.

Although in its early stages of vegetation grows slowly and the foliar surface is reduced comparing to the winter wheat, the fiber flax crop determines depending on the success of the crop culture the decrease of weed infestation.

The improvement of acid soils with limestone increasing the competitiveness of crop plants, it reduces drastically the total weed infestation with species that do not like calcium like: *Spergula arvensis*,

Rafphanus raphanistrum, *Gysophila muralis*, *Sceranthuus annuus*. A decrease of proportion of the weed associated biomass was registered at *Elymus repens* (Vlăduţu and colab. 1998).

Nitrogen fertilization by increasing soil acidity eliminates weed species that like calcium, but also increases the presence of the acidophile weeds. After unilateral fertilization with nitrogen and thus the increase of the soil acidity, only very strong acidophile weeds have survived.

Based on the accumulation from multiannual researches at Livada, depended by climate and agricultural features of the Nord -West of Romania, it were issued technological schemes for several agricultural crops or for different crop rotations.

The note of flexibility and reliability of these schemes is strictly correlated with operational and organizational framework of each unit, by the assured utilities and the existent financial support.

CONCLUSIONS

During the five decades, experiments have been performed regarding the selectivity and effectiveness of herbicides, the herbicide persistence and the collateral effects of herbicide use.

Over 25 years of experiments with maize crops, the average yield losses is 35,48 kg for every 100 kg of weed, recorded at harvest moment.

The soil reserve of weed seeds is influenced by the crop rotation. The smallest seed reserve was recorded in the three year crop rotation of alfalfa and the largest in the three year crop rotation: wheat, wheat, hemp.

During a three year crop rotation, the herbicide treatments have influenced the seed reserve in soil and the level of weed infestation.

The technology applied on wheat crops and flax crops influences the level of weed infestation. The increase of production induces a decrease of the level of weed infestation.

The increase of the pH-value till the value of 5,6 induces a decrease of the level of weed infestation, after that an increase of pH value induces an increase of the level of weed infestation.

The data obtained from the researches at ARDS Livada are an information source of great value for the elaboration of projects for future researches in order to improve the existing technologies.

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