

# **THE ABSTRACT OF PHD THESIS CONTRIBUTIONS TO MAIZE HYGIENE IMPROVEMENT ON THE BLACK EARTH (CHERNOZEM) FROM MARCULESTI**

In the Romanian grain farming, maize crop hold the top position with the highest contribution in total production, although this crop represents 49-52% from the land cropped with cereals. The surface cropped with maize is divided on 70% in the south of the country (Oltenia, Muntenia, Dobrogea), 17% in Moldavia and 13% in Transylvania. In the south of Moldavia and the West Plain this crop found the best cropping conditions.

Weeds represent the main concern for the farmers from ancient times for food and crop protection.

Every year in any cropping system weeds break crops development starting with low weeding levels and finishing with total weeding. To limit the negative influence of weeds in the cropping systems, the researchers have been developed strategies for their control.

In Romania weeds determine annual losses which can be estimated to 4-5 mil. tones considering that total production is 18-20 mil. tones. Actually, the list of weeds from Romania includes 711 species. Is estimated that annually 15 to 50 weed species overrun highly the main crops.

The weeds proceed from wild plants, first as ruderal weeds and then as segetal weeds.

Is known that weeds named “plants in unfit place” represent the main problem that must be solved by humanity for food save goal.

Until last forty years the knowledge about weeds was a brief description. The damages produced by weeds are different from those of other biotic limiters from crop system.

In the climatically conditions of our country, characterized by rain fed in the cropping period, the water reserve from soil is diminished by direct weeds consumption in the critical cropping periods or by tillage (Berca, 2004).

The damages caused by weeds are multiple and influenced annually by a set of edaphological and social factors. Thus, the estimation of yield losses due by weeds has a large variation from one author to other (Mortimer, 1990).

From all biotical limiters (diseases, pests and weeds), the last ones determine the highest losses. Globally, the losses due by diseases and pests represent 9-12% and those determined by weeds 14-15% (Van Assche, 1989).

From all forty perennial weed species identified in Romanian crops only 19 are dangerous (Berca ;I Chirila, 1993].

*Cirsium arvense* and *Convolvulus arvense* have the highest weight, followed by *Sonchus arvensis*, *Lathyrus tuberosis* and *Rubus caesius*.

To limit the unfavorable influence of weeds to crops there were established specific control technologies, such as:

- Prophylactic (weeds spread avoidance, clean seed, clean irrigated water, weeds control on uncultivated plots, etc.).

- Agrotechnic (tillage, seedbed, quality drilled, crop rotation, etc.).

- Biological, Physical and Chemical.

The experiment leads on the black earth from Marculesti. The temperature data doesn't favor crop culture for few years (10%), while the rainfall regime express favorable conditions especially in the critical water requirements (June-August).

For all three experimental years, in every month during maize cropping period, the rainfalls were below multiannual average with the exception of August 2007, May 2008 and July 2009. Generally, all three years were droughty but the water lack was supplied by irrigation.

In 2007 the temperature was up to multiannual average for all maize cropping period. The 2008 and 2009 years were similar, with temperatures in June, July and August up to multiannual average.

The goal of the research was to emphasized the efficiency of simple and associated herbicides with isoxaflutole, terbutiazin, florasulfuron, isoxadifen-etil, mesatrione, metolacolor, florasulan and acid 2,4 D EHE to the maize specific weeds

under irrigated conditions on black earth from Marculesti, comparatively with no-tillage variant.

The variants were:

- isoxaflutole + terbutiazin = Merlin Duo 2,5 l/ha pre-plant and post-plant.
- florasulfuron + isoxadifen-etil = Equip 1,75-2,5 l/ha post-plant
- mesatrine + metolaclo + terbutiazin = Lumax 3,5 l/ha pre-plant and post-plant
- florasulan + acid 2,4 D EHE = Mustang 0,5 l/ha post-plant.

The main goal of the paper was to establish the optimum herbicides combination applied in three different stages: pre-plant, early post-plant (maize in 2-4 leaves) and post-plant (during cropping period) for the control of monocotyledonous and dicotyledonous annual and perennial weeds from maize crop. It was also determined the weeding degree and green total mass of weeds for each tested variant. The researches were done on black earth from ARDS Marculesti during 2007-2009 years.

The experiences were evaluated in a randomized complete block design with four replications. Each plot was 25 m<sup>2</sup>. The herbicides were applied in three different stages: pre-plant, early post-plant and post-plant, when maize plants had 4-6 leaves and monocotyledonous annual weeds had 2-4 leaves, monocotyledonous perennial weeds had 15-20 cm high dicotyledonous annual and perennial weeds were in seedling stage.

The variants were:

1. Control I – 2 mechanical and manual weeding
2. Control II – no weeding
3. Merlin Duo (pre-plant)
4. Merlin Duo (early post-plant)
5. Merlin Duo (pre-plant) + Equip (post-plant)
6. Merlin Duo (early post-plant) + Mustang (post-plant)
7. Merlin Duo (pre-plant) + Equip (post-plant) + Mustang (post-plant)
8. Lumax (pre-plant)
9. Lumax (early post-plant)
10. Lumax (pre-plant) + Equip (post-plant)

- 11.Lumax (early post-plant) + Mustang (post-plant)
- 12.Lumax (pre-plant) + Equip (post-plant) + Mustang (post-plant)
- 13.Equip (post-plant)
- 14.Mustang (post-plant)

In the ARDS Marculesti area maize is sensitive to weeds infestation, especially when the control measures are inadequate.

It was observed that weeding degree is variable every year. The most common weed species were the annual monocotyledonous species with 25%, followed by perennial dicotyledonous species with 20% and perennial monocotyledonous species with 10-15%.

The climatically conditions influenced annually the weeding degree.

The weeds presented in maize crop for all three years are included in table no.1. The data showed that annual weeding infestation was very high. The most common weed presented in maize crop for all three years was *Echinochloa crus galli* with 30-40%, which means 120-156 plants/m<sup>2</sup>.

Generally, the weed species had a large variability as presence and quantity. All these weeds presented every year a high infestation degree, which demonstrate the necessity of any available control measures.

The large weed species presented every year in maize crop indicate the amount of weed seeds available in the soil.

For all three years 2007-2009, in the maize crop were presented 11 weed species, as follows: 8 annual and perennial dicotyledonous species (*Xanthium strumarium*, *Chenopodium album*, *Amaranthus retroflexus*, *Polygonum persicaria*, *Hibiscus trionum*, *Portulaca oleracea*, *Cirsium arvense*, *Convolvulus arvensis*) and three annual and perennial monocotyledonous species (*Echinochloa crus galli*, *Setaria glauca*, *Sorghum halepense*).

The annual weeding infestation was high also as species as well as weeds number /surface unit. The most common weed presented in maize crop during three years was *Echinochloa crus galli* with 30-40%, which means 120-156 plants/m<sup>2</sup>.

As average on 2007-2009 period the herbicides Merlin Duo 2,5 l/ha, Lumax 3,5 l/ha and Equip 1,75 l/ha presented a high control to annual and perennial monocotyledonous weeds with 95-100 %, recording a low efficiency to annual and perennial dicotyledonous weeds with 2-22%.

### The weeds identified in the maize crop during three years (2007-2009)

2007		2008		2009	
Weed species	%	Weed species	%	Weed species	%
ECHCR	30	ECHCR	35	ECHCR	40
SORHA	10	SORHA	10	SORHA	15
SETGL	10	SETGL	10	SETGL	5
CIRAR	10	CIRAR	10	CIRAR	15
XANST	10	XANST	10	XANST	10
CONAR	10	CONAR	10	CONAR	15
CHEAL	5	CHEAL	5	CHEAL	3
AMARE	5	AMARE	5	AMARE	2
POLPE	5	POLPE	5	POLPE	-
HIBTR	3	HIBTR	-	HIBTR	-
POROL	2	POROL	-	POROL	-
<b>TOTAL</b>	<b>100</b>		<b>100</b>		<b>100</b>
Annual monocotyledonous weeds	45	Annual monocotyledonous weeds	45	Annual monocotyledonous weeds	45
Perennial monocotyledonous weeds	10	Perennial monocotyledonous weeds	10	Perennial monocotyledonous weeds	15
Annual dicotyledonous weeds	25	Annual dicotyledonous weeds	25	Annual dicotyledonous weeds	20
Perennial dicotyledonous weeds	20	Perennial dicotyledonous weeds	20	Perennial dicotyledonous weeds	20
<b>TOTAL</b>	<b>100</b>		<b>100</b>		<b>100</b>

The herbicide Mustang 0,5 l/ha had a very good efficiency to control of annual and perennial dicotyledonous weeds (96-100%).

When the herbicides are used in complex, the weeds control is 100%.

The yields obtained during the experimental years showed the superiority of herbicide treatments. The yields are correlated with maize herbicide selectivity and control weeds degree.

The herbicides Merlin Duo 2,5 l/ha, Equip 1,75 l/ha and Lumax 3,5 l/ha proved selectivity for maize crop and a high control for annual and perennial

monocotyledonous weeds (97-100%). These herbicides had a low control to annual and perennial dicotyledonous weeds, diminishing the yield very significant comparatively with the control with mechanical and manual weeding. The yield losses recorded by these variants ranged between 2818 kg/ha and 3322 kg/ha in 2007, between 2215 kg/ha and 4859 kg/ha in 2008 and between 2823 kg/ha and 5071 kg/ha in 2009.

When the herbicide Merlin Duo 2,5 l/ha was applied early post-plant the control weeds degree was 86% and the yield losses were lower 1997 kg/ha in 2007, 1710 kg/ha in 2008 and 1573 kg/ha in 2009.

When the herbicide Lumax 3,5 l/ha was applied early post-plant the yield losses were 2410 kg/ha in 2007, 1967 kg/ha in 2008 and 1873 kg/ha in 2009 due to the low effect of the herbicide in the control of annual and perennial dicotyledonous weeds.

The herbicide Mustang 0,5 l/ha applied during maize crop vegetation has a very good efficiency in the control of annual and perennial weeds (96-100%), but the yield losses were very high due to the annual and perennial monocotyledonous weeds. Thus, in 2007 the yield losses were 4172 kg/ha comparatively with the control, in 2008 -3207 kg/ha and in 2009-5726 kg/ha.

The combinations of herbicides used for the control of monocotyledonous and dicotyledonous weeds were tolerated in a high level and also had a large control to the annual and perennial monocotyledonous and dicotyledonous weeds (97-100%), but the yields were to the same level with the control. The yield losses were low and ranged between 137-252 kg/ha in 2007, 107-218 kg/ha in 2008 and 61-183 kg/ha in 2009.

As average on 2007-2009 the herbicides Merlin Duo 2,5l/ha (pre-plant and early post-plant), Lumax 3,5 l/ha (pre-plant and early post-plant ) and Equip 1,75 l/ha (post-plant) had a total control to annual and perennial monocotyledonous weeds leading to very significant yield decrease with 2618-4417 kg/ha.

The highest yields were obtained on the plots with both monocotyledonous and dicotyledonous weeds control.

The yield losses due to weeding degree comparatively with the variants with mechanical and manual weeding techniques were 6024 kg/ha as average on three years. The losses recorded between weeding plots and no-weeding plots were 71%.

Weeding control is maintained with mechanical techniques between row spaces and manually on each row. The highest yield is realized when both weeding control are used. Manual weeding control involves a lot of work and actually can be replaced more efficiently by herbicides.

Comparatively with the control variant without weeds control the variant with manual and mechanical weeds control beside to herbicides recorded the highest efficiency when is applied a herbicide early post-plant (Merlin Duo or Lumax) and one herbicide for annual and perennial dicotyledonous weeds during crop vegetation period (Mustang).

The differences between weeding techniques and herbicides application was insignificant (1-3%) leading to the recommendation to replace the manual effort.

As average on three years 2007-2009, the yields ranged between 2464 kg/ha (the control variant without weeding control) and 8488 kg/ha (mechanical and manual weeding control). The weeds control degree ranged between 0% (the control variant without weeding control) and 100% (manual + mechanical techniques +Lumax +Equip+Mustang). The correlation between these two elements is very close and the determination coefficient is 83%. Thus, the weeds control degree influences the yield with 83%. The increase of weeds control degree with 1% leads to 60 kg/ha yields increase. The weeds total mass ranged between 32 kg/ha (the variant with Lumax+Equip+Mustang) to 27114 kg/ha (the control variant without weeding control). The relation between these two elements is negative very close and the determination coefficient is 84%. The lineal regression shows that the increase of weeds total mass with 100 kg/ha leads to 21 kg/ha yield decrease.

The hybrid DKC 5143, the most delayed hybrid among all tested ones, recorded very significant increases of foliar mass weight for all variants comparatively with the control.

The hybrid DK 440 recorded a significant decrease of leaves weight/plant meaning that the herbicide application inhibits leaves development. Generally, the hybrid PR 37D25 recorded the lowest values of leaves total mass/plant. This parameter is influenced differently from one variant to other.

