

THE REMANENT EFFECT OF MERLIN DUO AND GARDOPRIM PLUS GOLD 500 SC HERBICIDES APPLIED TO SOYBEAN CROPS

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The remanent effect of herbicides was studied by many foreign researchers: Hurle 1980, Hime and coll. 1991, Wuerzer 1985. In Romania, the largest number of experiments regarding the remanent effect of herbicides based on atrazin and simazin upon various crops have been made by dr. Șarpe and his collaborators. During the past 10 years, studies have been also made regarding the remanent effect of dicamba and 2,4-D herbicides upon various crops, namely maize, sunflower, sugar beet and flax for linseed and linen.

The experiments regarding the remanent effect of Merlin Duo and Gardoprim Plus Gold 500 SC are the first ones of this type and unique in Romania – being carried out in the Flood Plain of the Danube river. In the years 2007-2008, experiments were performed at the Agrofam-Holding Agricultural Company from Fetesti, Ialomita County, situated in an area with alluvial soil specific to the aforementioned Flood Plain, the aim being to study the remanent effect of the herbicides Merlin Duo, which contains 37,5 g/l isoxaflutol + 375 g/l terbuthylazin, Gardoprim Plus Gold 500 SC, which contains 312,5 g/l S-metalochlor + 187,5 g/l terbuthylazin.

The Merlin Duo herbicide was applied in doses of 3 and 6 litres per hectare, and the Gardoprim Plus Gold 500 SC was applied in doses of 5 and 10 litres per hectare. Both herbicides were applied in July, after the wheat was harvested. After application, the herbicides were incorporated by disking 15-18 cm deep into the ground. In the spring of 2008, before sunflower was sowed, the land was laboured 10 cm deep by the disk and the combinator. Based on the observations made every month during the vegetation stage and on the yield obtained, the authors have reached the conclusion that the Merlin Duo and Gardoprim Plus Gold 500 SC did not present any remanent effects on the alluvial soil from the Flood Plain of the Danube river.

Key words: Merlin Duo, Gardoprim Plus Gold 500 SC, soybean, remanent effect

The remanent effect of herbicides has been studied by many foreign researchers. In France, Beraud and coll., quoted by Ghinea (1987), studied the effect of trifluralim herbicide applied to rape crops in doses of 1,000 and 2,400 g/ha and find out that wheat yield did not diminish in comparison with the wheat yield recorded in case of crops sowed after raped untreated with herbicides. Hurle,

K., Walker, A., (1980) studied the interaction of different herbicides with the soil. In Belgium, Salambier I. (1975) did not identify any toxic effects nor differences in terms of yield recorded in case of winter wheat crops sowed after potatoes treated with metobromuron, metriluzin, linuron + terbacil and linuron + cyanazin. Studying the persistence of some herbicides on a clayish soil from Italy on a few test plants: wheat, maize, sugar beet, lettuce and zucchini, Cesari and collab. (1975) assert that the herbicides based on simazin, atrazin, diuron and benztiazuron are the most persistent.

In Romania, the largest number of experiments regarding the remanent effect of herbicides have been made by Șarpe and his collaborators (1981, 1987).

The herbicide Gesaprim 50 WP, based on atrazin, applied in doses of 5 and 10 kg/ha to maize crops on the chernozem soil from Fundulea proved not to be phytotoxic for the winter wheat, rape, flax and sunflower crops. In his PhD. thesis, Mr Iulian Șarpe (2005) studied the remanent effect of several herbicides: Icedin Super, which contains 100 g/l dicamba + 300 g/l 2,4-D acid, Glean 75 DF which contains 75% chlorsulfuron and Grodyl, which contains 75% amidosulfuron. The remanent effect of the Glean 75 DF herbicide was extremely evident on sunflower crops, while no phytotoxic symptoms were observed as far as the herbicides Icedin Super and Grodyl are concerned. At the Șimnic Research Station, situated on a podzol soil type, the most powerful effect of the Glean 75 DF herbicide was on sugar beet. In the variant treated with 15 g/ha, the yield of biomass diminished by 90%, and in the variants treated with 25-35 g/ha doses, the biomass production was totally compromised. However, at the Teleorman Station, situated on a chernozem-type soil, much richer in humus, the remanent effect of the Glean 75 DF herbicide was very weak or it was practically absent. Thus, in case of winter wheat treated by 15 g/ha, after which sugar beet was sowed in the spring, a 42,300 kg/ha root yield was recorded, whereas the yield recorded with the reference plot was 42,380 kg/ha – the two values being practically equal.

MATERIAL AND METHOD

At the Agrofam-Holding company from Fetești, situated in the Flood Plain of the Danube river, on an alluvial soil, which contains 3,5-4,0 % humus and 35-40% clay, the following herbicides were used to study the remanent effect on soybean crops:

1. Merlin Duo – which contains 37.5 g/l isoxaflutol + 375 g/l terbuthylazin.
2. Gardoprim Plus Gold 500 SC – which contains 312.5 g/l S-metalochlor + 187.5 g/l terbuthylazin.

After the winter wheat was harvested, a 15 to 18-centimeter-deep disking operation was performed by means of a BISO heavy disk. Both herbicides were applied by means of RAU equipment. After application, the herbicides did not incorporate into the soil. In spring, the soil was submitted again to a 15-cm-deep disking operation, and before sowing another 10-cm-deep intervention was made by means of a combinator machine. The type of soybean sowed for this experiment was the Opal hybrid produced at the National Institute for Agricultural Research from Fundulea.

The experiment was displayed by the linear method with 3 repetitions, because all the works were executed mechanically. After the soybean sprouted, the researchers monitored the plants and observed the level of phytotoxicity, conferring grades

according to the scale established by the EWRS (European Weed Research Society). At the same time, measurements were made to determine the density of the soybean plants and the bean yield per hectare, calculated according to the STAS humidity.

RESULTS AND DISCUSSIONS

In *table 1* we present the results regarding the density of the soybean plants, recorded for the Opal soybean variety.

Table 1

Determination of soybean plant density recorded for the Opal hybrid S.C. Agrofam Holding, Fetești, 2007-2009

Herbicides applied after the winter wheat has been harvested	Doses Litres / ha	Soybean plant density
In the 3-4 leaves stage		
1. Untreated (reference plot)	-	45,700 /ha
2. Merlin Duo	3,0	45,750/ha
3. Merlin Duo	6,0	45,800 /ha
4. Gardoprim Plus Gold 500 SC	5,0	45,700 /ha
5. Gardoprim Plus Gold 500 SC	10,0	45,700 /ha
In the 8-10 leaves stage		
1. Untreated (reference plot)	-	45,690/ha
2. Merlin Duo	3,0	45,750 /ha
3. Merlin Duo	6,0	45,780 /ha
4. Gardoprim Plus Gold 500 SC	5,0	45,700 /ha
5. Gardoprim Plus Gold 500 SC	10,0	45,690 /ha
In the 50%-in-blossom stage		
1. Untreated (reference plot)	-	45,690 /ha
2. Merlin Duo	3,0	45,750 /ha
3. Merlin Duo	6,0	45,780 /ha
4. Gardoprim Plus Gold 500 SC	5,0	45,700 /ha
5. Gardoprim Plus Gold 500 SC	10,0	45,690 /ha
Upon harvesting		
1. Untreated (reference plot)	-	45,685 /ha
2. Merlin Duo	3,0	45,730 /ha
3. Merlin Duo	6,0	45,780 /ha
4. Gardoprim Plus Gold 500 SC	5,0	45,790 /ha
5. Gardoprim Plus Gold 500 SC	10,0	45,690 /ha

Analyzing the data presented in *table 1*, we shall find out that the density of the plants in the 3-4 leaves stage in the variants treated by the herbicide Merlin Duo in doses of 3,0 and 6,0 litres per hectare was of 45,750-45,800 plants per hectare, and in the variant which was not treated the density recorded was of 45,700 plants per hectare. Similar results were also recorded in the variants treated by the herbicide Gardoprim Plus Gold 500 SC. In the plots treated by 5.0 litres and 10.0 litres per hectare, the density recorded in case of both doses was of 45,700 plants per hectare – the density being equal to the one recorded in case of the untreated reference plot.

The density recorded in the phase when the soybean plants had 8-10 leaves was not much different from the one recorded in the 3-4 leaves stage. Very small differences were recorded in case of the variants treated by the herbicides Merlin

Duo and Gardoprime Plus Gold 500 SC as compared to the untreated variant, in whose case the number of plants was 45,690 compared to the level of density of 45,700 plants recorded in the 3-4 leaves stage.

At the same time, in the in-blossom phase, the density recorded for the untreated variant was of 45,690 soybean plants per hectare. In the variants treated by the herbicides Merlin Duo in doses of 3.0 and 6.0 l/ha, the density was of 45,750-45,780 plants per hectare. In case of the variants treated by doses of 5.0 and 10.0 l/ha of Gardoprime Plus Gold 500 SC, the density of soybean plants was practically equal to the one recorded in case of the variant treated by the herbicide Merlin or of the untreated variant.

The last density measurement was made before harvesting. For the variants treated by the herbicide Merlin Duo in doses of 3.0 and 6.0 l/ha, the density recorded was of 45,730-45,780 soybean plants per hectare, and in the variants treated by the herbicide Gardoprime Plus Gold 500 SC in doses of 5.0 and 10.0 l/ha the density was of 45,790-45,690, while in case of the untreated variant, the density recorded was of 45,685 sunflower plants per hectare. We can therefore draw the conclusion that the herbicides Merlin Duo and Gardoprime Plus Gold 500 SC did not reduce soybean plant density when applied to the Opal soybean hybrid.

The phytotoxic effect of the herbicides Merlin Duo and Gardoprime Plus Gold 500 SC was observed in 3 distinct stages of the soybean plants (3-4 leaves, 8-10 leaves and in the in-blossom stage). The results recorded are presented in *table 2* hereinbelow.

Table 2

The phytotoxic effect caused by the herbicides Merlin Duo and Gardoprime Plus Gold 500 SC, Agrofam Holding, Fetești, 2007-2009

Herbicides applied after the winter wheat has been harvested	Doses Litres / ha	EWRS grades
In the 3-4 leaves stage		
1. Untreated (reference plot)	-	1.0
2. Merlin Duo	3.0	1.0
3. Merlin Duo	6.0	1.5
4. Gardoprime Plus Gold 500 SC	5.0	1.0
5. Gardoprime Plus Gold 500 SC	10.0	1.0
In the 8-10 leaves stage		
1. Untreated (reference plot)	-	1.0
2. Merlin Duo	3.0	1.0
3. Merlin Duo	6.0	1.0
4. Gardoprime Plus Gold 500 SC	5.0	1.0
5. Gardoprime Plus Gold 500 SC	10.0	1.0
In the 50 %-in-blossom stage		
1. Untreated (reference plot)	-	1.0
2. Merlin Duo	3.0	1.0
3. Merlin Duo	6.0	1.0
4. Gardoprime Plus Gold 500 SC	5.0	1.0
5. Gardoprime Plus Gold 500 SC	10.0	1.0
EWRS grades: 1.0 without any phytotoxic symptom 1.5 very weak phytotoxic symptoms (insignificant) 9.0 a rate of plant destruction of 80-90%.		

Analysing the data presented in table 2, we can assert that the herbicides Merlin Duo and Gardoprime Plus Gold 500 SC did not have a phytotoxic effect upon the soybean plants. When assessing the level of phytotoxicity in the 3-4 leaves stage, and only in the variant treated by Merlin Duo in a dose of 6.0 l/ha, the EWRS grade conferred was 1.5, because some plants presented insignificant symptoms of phytotoxicity – leaves presenting a slight yellowish colour.

When assessing the level of phytotoxicity in the 8-10 leaves stage and in the in-blossom stage, these symptoms (yellowish leaves) have disappeared. We can therefore state that the herbicides Merlin Duo and Gardoprime Plus Gold 500 SC did not have any phytotoxic symptoms upon soybean plants.

The results regarding the soybean yield are more important. In table 3 hereinbelow, we present the bean yield recorded at the Opal soybean hybrid.

Table 3

Yield recorded at the Opal soybean crops S.C. Agrofam Holding, Fetești, 2007-2009

Herbicides applied after the winter wheat has been harvested	Doses Litres/ha	Yield	
		Kg/ha	%
1. Untreated (reference plot)	-	3,786	100.0
2. Merlin Duo	3.0	3,795	100.3
3. Merlin Duo	6.0	3,788	100.0
4. Gardoprime Plus Gold 500 SC	5.0	3,798	100.4
5. Gardoprime Plus Gold 500 SC	10.0	3,788	100.0
DL 5% = 192 kg /ha; DL 1% = 312 kg /ha; DL 0,1 % = 427 %			

The seed yield recorded in the variants treated by the herbicide Merlin Duo in doses of 3.0 and 6.0 l/ha was of 3,795-3,788 kg/ha, and in the untreated variant (reference plot), the seed yield was 2,786 kg/ha – which entitles us to state that the yields recorded were practically equal. Similar results were recorded for the plots treated by the herbicide Gardoprime Plus Gold 500 SC – the seed yield recorded in this case amounting to 3,798- 3,788 kg/ha.

CONCLUSIONS

1. Soybean plant density did not diminish pursuant to the treatments by application of the herbicides Merlin Duo and Gardoprime Plus Gold 500 SC. With both herbicides, the density was of over 45,000 soybean plants per hectare, being practically equal to the one recorded in case of the untreated variant (reference plot).

2. Neither of the aforementioned herbicides, namely Merlin Duo and Gardoprime Plus Gold 500 SC have caused any phytotoxic symptoms to the soybean plants.

3. The soybean yields recorded in case of both herbicides, namely Merlin Duo and Gardoprime Plus Gold, were practically equal to the one obtained from the untreated reference plot.

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