DETERMINATION OF SOIL CATALASE POTENTIAL

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Summary: In the present paper, it has been studied the catalatic potential of soils under the influence of sulfonilureic substances such as chlorsulfuron (20, 40, 100 g/ha), amidosulfuron (60, 120 and 300 g/ha) and tifensulfuron (60, 120 and 300 g/ha). The studies were performed in field plots and also following laboratory models. The results of our determinations allowed us to conclude that all three substances and their applied doses had no relevant influence on catalase activity from soil.

Keywords: catalase, amidosulfuron, chlorsulfuron, tifensulfuron

INTRODUCTION

The conclusions drawn by the researchers concerning the influence of herbicides on soil relates to their inhibitory and stimulating effects that may be regarded as dangerous, stimulation in fact hiding toxic effects [1].

The rational use of herbicides represents a stringent problem in order to maintain the biologicalbalance of soils. When low air moisture is registered during herbicide treatments, the performed researches have emphasized the favourable effect of adding oils and non-ionic surfactants in order to accelerate chlorsulfuron efficacy [5], and also to reduce the doses by using similar herbicides from the same sulfonilureidine group [3].

Bibliographical data relating to enzymatic activity under the influence of herbicides are still very few [8].

After 30 days from applying amidosulfuron herbicide considering a reddish- brown soil and using the doses of 15, 22,5 and 45 g/ha, it has been observed a reduction of catalatic activity up to 28,90% in comparison with the control variant and a stimulating effect

It has been observed that one of the sulfonilureic herbicides induced a transient decrease of the catalatic activity when the doses exceeded with 100 folds the recommended doses for field conditions [6].

MATERIAL AND METHODS

The soil type considered for our studies is represented by a specific cambic black soil with samples taken from Amp horizon and that is found in the experimental plots of Plant Breeding Department within U.S.A.M.V.B. Timişoara

The sulfonilureic substances taken into our studies were: chlorsulfuron, amidosulfuron and tifensulfuron. The researches were performed in field and laboratory conditions.

The applied herbicide doses are comprised in the below tables.

Table1. Field variants

Phytopharmaceutical substance	**chlorsulfuron (a2)**	**amidosulfuron (a3)**	**tifensulfuron (a4)**
Variant/dose g/ha	V2 / 20 (b2)	V5 /60 (b2)	V8/60 (b2)
	V3 / 40 (b3)	V6/120 (b3)	V9/20 (b3)
	V4 /100 (b4)	V7 /300 (b4)	V10/300 (b4)
V1 – control , chemically non –treated variant (a1)			
b1 – 0 or non-treated variant; b2 –first dose; b3 –second dose and b4 – third dose			

Table 2. Variants used for the laboratory models

Phytopharmaceutical substance	**chlorsulfuron (a2)**	**amidosulfuron (a3)**	**tifensulfuron (a4)**
Variant/dose g/ha	V12 / 20 (b2)	V15 /60 (b2)	V18/60 (b2)
	V13 / 40 (b3)	V16/120 (b3)	V19/120 (b3)
Variant/dose/g/ha	V14 /100 (b4)	V17 /300 (b4)	V20/300 (b4)
V11 –control, chemically non-treated variant (a1)			
b1 – 0 or non-treated variant ; b2 –first dose; b3 –second dose and b4 – third dose			

For both field and laboratory modelled experiments it has been used a control variant or non-treated with herbicide solutions.

The method principle for catalase determination followed the one elaborated by König J., Hasenbäumer I., Copperath E. [2] and Kuprevici V.F. and Scerbakova T.A., [4], with several changes made by Ştefanic G., Beck Th., Schwemmer J., Hartmann F., Vărbanciu A. [7].

The chemical and enzymatic reaction occur consequently in the soil and therefore in order to estimate the value of the catalatic activity, this was performed separately using soil samples with inactivated enzymatic activity. The processes will take place in a thermostate chamber at 280 ^{0}C.

RESULTS AND DISCUSSIONS

Table 1. Evolution of catalatic potential in field conditions (cmc O_2 / 100 g sol s.u)

Herbicide/dose (g/ha)	Variant				$\overline{Xa}$
A/B	b_1	b_2	b_3	b_4	
a_1	403	a 403	a 403	a 403	a 403
a_2	403 a	a 423 a	a 329 a	a 373 a	a 382
a_3	403 a	a 447 a	a 370 a	a 419 a	a 410
a_4	403 a	a 346 a	a 430 a	a 453 a	a 408
$\overline{Xb}$	403 a	405 a	383 a	412 a	

D.L.P.	A	B	$\tilde{A}\,\overline{B}$	$\widetilde{B}\,\tilde{A}$
5%	87 *	78 *	136 *	135 *
1%	201	118	235	204
0.1%	641	189	508	328

Table 2. Evolution of catalatic potential (cmc O_2 / 100 sol s.u) in laboratory conditions

Herbicide/dose (g/ha)	Variant				$\overline{Xa}$
A/B	b_1	b_2	b_3	b_4	
A_1	427	a 427	a 427	a 427	a 427
A_2	427 a	a 337 a	a 442 a	a 344 a	a 374
A_3	427 a	a 343 a	a 422 a	a 408 a	a 391
A_4	427 a	a 249 a	a 389 a	a 376 a	a 338
$\overline{Xb}$	427 a	310 a	418 a	376 a	

D.L.P.	A	B	$\tilde{A}\,\overline{B}$	$\widetilde{B}\,\tilde{A}$
5%	72 *	125 *	190 *	218 *
1%	167	190	300	330
0.1%	531	306	542	530

The study of our obtained data that are summarized in table 1 and 2, indicated no statisitcally differences between natural field conditions and laboratory modelled conditions, the herbicides taken into our study having no influence at catalatic level and considering the applied doses.

CONCLUSIONS

In order to assess the inhibiting or stimulating effects of the considered substances, the variations that occurred at the vegetal layer had no relevance because the soil was maintained as “black field”.

It is well-known that in order to identify all phenomena that may occur at soil level, it is necessary to use higher herbicide doses than those required by the normal practices and in this regard we chose to increase the doses per hectare (2- normal dose and 5x normal dose).

The catalase activity is generally disturbed by the presence of chlorsulfuron, amidosulfuron and tifensulfuron herbicides.

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