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Influence of soil herbicides on the growth of potato

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Characteristic for the weed population of potato fields in Hungary are annual weeds like for example *Amaranthus* spp., *Chenopodium* spp. *Ambrosia elatior* L., *Echinochloa crus-galli* L., *Setaria* spp. and many other weeds. From among perennial plants *Cirsium arvense* L. Scop. and *Convulvulus arvensis* L. can cause problems. (Reisinger 2000). According to the National weed mappings in Hungary these weeds are the most important and widespread weeds.

Weed control is one of the most important factors for a successful crop production and therefore the prevention of weed-crop competition at an early stage plays a very important role. From the beginning of the growing season until a plant height of 25-30 cm potato is very susceptible to weed infestation. The traditional and the modern potato growing technologies do not apply mechanical weed control although possible during the growing season (Kádár 2001). For chemical weed control the knowledge of variety specific sensitivity is of interest since different varieties react in different ways to herbicides (Lehoczky et al. 2000). Therefore the effect of three preemergent herbicides was examined: PATORAN 50 WP (metobromuron), SENCOR 70 WG (metribuzin) and COMMAND 48 EC (chlomazon) (Hunyadi and Béres 2000). Five Hungarian potato varieties and a candidate were tested.

Materials and Methods

Varieties tested

Lilla: candidate. Medium early main crop. Long oval, big sized, pale red skin, creamy flesh, and shallow eyes with dark purple coloration. Dry matter content 17-19%.

White Lady: state qualified variety (1994). Medium early. Round oval, pale yellow skin and flesh, medium-size with shallow eyes and high dry matter content (20-21%).

Hópehely: state qualified variety (1997). Medium early. Round oval, large-medium large, brownish white skin, with pink eyes around the top, white flesh. Dry matter content 19-20%.

Százszorszép: state qualified variety (1992). Medium early. Oval-round, oval, red skin, pale yellow flesh, medium-size with shallow eyes and high dry matter content (22-23%).

Góliát: state qualified variety (1995). Medium early main crop. Oval-round, oval, red skin, yellow flesh, big sized tubers with moderately high dry matter content (18-20%).

Kánkán: state qualified variety (1991). Medium late. Oval, red skin with shallow eyes and moderately high dry matter content (19-20%).

The sensitivity of the plants was examined in a pot experiment under greenhouse conditions. Tubers were planted on 10th of May and herbicide treatments were applied on 14th of May. The soil used was Eutric cambisol from Keszthely. Three tubers were planted in 12 l containers filled with 11 kg air dry soil. NH_4NO_3 (1.54 g/pot) and K_2SO_4 (1.63 g/pot) fertilizers were applied at the same time. Herbicides were applied in a 200 ml spray/container. Treatments were replicated four times.

The plants were grown until ripening then different growth parameters were evaluated (number of leaves, shoot length, fresh and dry shoot weight, tuber weight). The experimental results were analysed by using SPSS (Standard Package of Statistical Software, Version 7.5).

Results

Number of leaves

Some differences between varieties occurred concerning the number of leaves. In case of Góliát and Százszorszép the number of leaves was significantly lower with all herbicide treatments compared to the control.

Herbicides were well tolerated by Hópehely but SENCOR 70 WG caused a non-significant decrease in number of leaves in this variety, too. Kánkán variety showed the slightest response to the herbicides.

Shoot length

COMMAND 48 EC decreased the shoot length of Hópehely, Százszorszép, Góliát and Kánkán, which was significant for Százszorszép and Kánkán. Shoot lenght of White Lady and Lilla were nearly corresponding to the control. In case of Lilla and White Lady SENCOR 70 WG decreased the shoot length significantly. The variety Kánkán had the highest shoot length of all tested varieties, but expressive decrease was measured with all herbicide treatments.

Table 1. Herbicide treatments and doses.

herbicide	field doses [kg/ha, l/ha]	experimental doses
Patoran 50 WP (metobromuron)	4.0	28.17 mg/pot
Sencor 70 WG (metribuzin)	1.2	08.45 mg/pot
Command 48 EC	0.1	07.04 ml/pot
control	0.0	00.0 mg/pot

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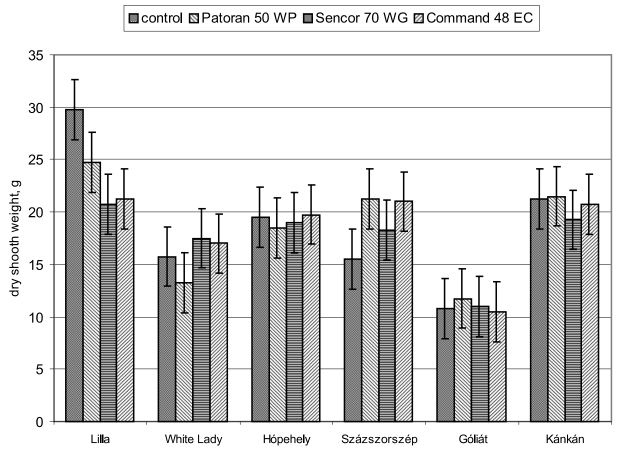

Figure 1. Effect of different preemergence herbicides on the shoot dry weight (mean of 3 plants) of six potato varieties.

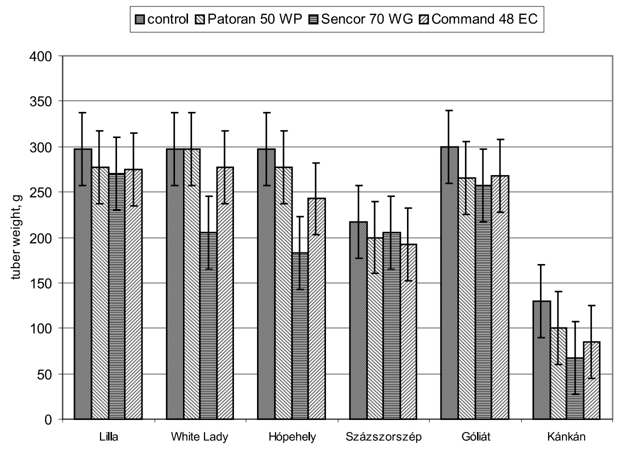

Figure 2. Effect of different preemergence herbicides on the tuber weight (mean of 3 plants) of six potato varieties.

Fresh and dry shoot weight

Differences could be found between varieties in fresh and dry weight too, while Góliát had the lowest shoot weight. The highest shoot weight was measured for Lilla. The herbicide-induced changes in dry weight were similar to those of the fresh weight. The shoot weight of Lilla decreased significantly with COMMAND 48 EC application. Hópehely and Kánkán varieties showed the lowest susceptibility against the tested herbicides (Fig. 1).

Tuber weight

Differences were found between the tuber weights of the varieties. The least tuber weights were found for Kánkán variety in control and herbicide treatments. The highest tuber weights were measured for White Lady. For Kánkán and Százszorszép tuber weight was 30-50% lower compared to the other three varieties tested in which tuber weight of the control was about 300 g/pot.

The slightest change of tuber weight induced by herbicide application was measured in Százszorszép and Lilla. SENCOR 70 WG caused significant decrease in White Lady, Hópehely, Góliát and Kánkán varieties. In case of Hópehely and Kánkán varieties also COMMAND 48 EC had a phytotoxic effect. Tuber weight was significantly lower than in control (Fig. 2).

Discussion

The results of the experiment showed different reactions of the selected varieties to the tested herbicides. Among the parameters examined the least changes occurred for the shoot length. The tuber weight showed the greatest changes and was therefore highly sensitive to the herbicide treatments.

The tested potato varieties showed different growth habits. Góliát variety showed the slowest growth, while Kánkán and Százszorszép had the least tuber weight.

Due to the application of SENCOR 70 WG the number of leaves and shoot length decreased in all varieties compared to control plants. In case of Lilla and Góliát fresh and dry shoot weight decreased with COMMAND 48 EC and SENCOR 70 WG treatments. Tuber weight decrease with COMMAND 48 EC and SENCOR 70 WP treatment in all varieties.

Based on these experiments all varieties showed susceptibility against the used herbicides. The results show that important differences occur in the sensitivity and tolerance of varieties against herbicides, which are con-sequently significant for practical crop protection.

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