

CHANGING OF CHEMICAL WEED CONTROL OF GREEN PEA CONSIDERING ENVIRONMENTAL PROTECTION IN HUNGARY

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Introduction

Pea (*Pisum sativum* L.) is an important crop plant in Hungary both as a protein source and as a part of the crop rotation, because it is an excellent preceding crop. Its area is changing year by year, according to the economical situation. Important factor for an economical production is choosing the suitable pesticide and making a proper weed control.

Unsuitable using of pesticides may cause serious environmental pollution. Pesticides may contaminate soil, water and crop (Nádasyné 2004).

Changes in assortment of pesticides for pea are reflected in the changes of aspects of environmental protection and plant protection. Aim of our study was to compare range of herbicides permitted between 1987 and 2005 in a pea culture. To determine what like changes were made in using of herbicides, how much was supplemented or restricted the range of active ingredients and products and to study how successful was weed control in the practice.

Methods

Our investigation included analyzing of literature on weed control in pea crops. Data of publications issued by books "Növényvédő szerek, termésnövelő anyagok" 1987-2005.

Results and discussion

Assortment of pea's herbicides changed a lot in the last decades. Range of permitted herbicides in the eighties was relatively narrow. In 1987 nine products was allowed to use with eight different active ingredients. Most of them could be applied after emergence (post-emergence product), one of them in pre-sowing and one in pre-emergence form (Table 1.).

Table 1. Permitted herbicides in pea (1987)

Active ingredient	Product	Mode of application
benelín	Flubalex	pre-sowing
metolachlor	Dual 720 EC	pre-emergence
diclofop-metil	Illoxan 36 EC	post-emergence
dinoseb	Dinoseb	post-emergence
dinoseb-acetate	Aretit 40 WP, Aretit 50 EC	post-emergence
fluazifop-butil	Fusilade	post-emergence
fluazifop-P-butil	Fusilade S	post-emergence
MCPB	Sys 67 MB	post-emergence

Weed control of pea seemed to be worked out. A problem evoked when the herbicide dinoseb and dinoseb-acetate were cancelled from the list of permitted herbicides. Most of the difficulties evoked, by the schematic application of the methods practiced by using the well-proved Aretit. After its withdrawal from the list of authorized products, the using of permitted other products needed much more care, more special knowledge, and more precise technology (Kendi 1991).

The active ingredient dinoseb (a dinitrophenol derivative) may not be applied from 1988 on. The reason of its cancellation from the circulation is that it is very toxic to mammalian (LD₅₀ on rats is 58 mg/kg), it influences many life processes in plants and in animals. Dinoseb-

acetate is somewhat less toxic (LD₅₀ on rats 60-65 mg/kg), still it is a poisonous compound (Matolcsy *et al.* 1988).

The active ingredients, benefin is only one pre-sowing herbicide since that time until nowadays allowed using, though it is not really environment saving, because it can incorporate to the soil. Duration of residual activity in soil is c. 4-8 months. Using metolachlor is continuously allowed on a number of plant cultures.

List of permitted herbicides were considerable enlarged in the nineties (Table 2.). In 1996 20 different active substances were licensed, among them 10 active ingredients could be used post-emergence. Number of pre-emergence chemicals increased, too (in 1996 it was 9). However for this time it became obvious, that to achieve a continuous clear field, instead of only pre-emergence or post-emergence herbicide, a combination of the two types of herbicides is necessary.

Table 2. Permitted herbicides in pea (1996)

Active ingredient	Product	Mode of application
benefin	Balan, Benefex, Flubalex	pre-sowing
diflufenican	Brodal 500 SC	pre-emergence
imazethapyr	Pivot	pre-, post-emergence
lenacil	Adol 80 WP	pre-emergence
metobromuron+prometrin	Patoran Plus 50WP	pre-emergence
metolachlor	Dual 720 EC, Dual 960 EC	pre-emergence
metribuzin	Sencor 70WP	pre-emergence
pendimethalin	Stomp 330	pre-emergence
propizachlor	Proponit 720 EC, Proponit 840 EC	pre-emergence
terbutrin	Igran 500 FW	pre-emergence
bentazon	Basagran	post-emergence
cikloksidim	Focus, Focus Ultra	post-emergence
diclofop-metil	Illoxan 28 EC, Illoxan 36 EC	post-emergence
etoxifen	Buvirex 240 EC	post-emergence
fenoxaprop-p-etil	Furore S, Furore 9 EC	post-emergence
fluazifop-P-butyl	Fusilade S	post-emergence
MCPB	Tropotox	post-emergence
piridat	Lentagran WP	post-emergence
propaquizafop	Agil 100 EC	post-emergence
quizalofop-P-etil	Targa 10 EC, Targa Super	post-emergence

The assortment of herbicides was largest in 2001. Farmers could have a choice from 26 active ingredients in 38 products. From these 13 could be used post-emergence, 11 pre-emergence, one in both form and one pre-sowing - benefin.

After the EU accession the number of active ingredients has decreased. Currently 17 active ingredients and their 25 products available to the farmers (Table 3.). From these 10 active ingredients could be used post-emergence, 6 pre-emergence, one pre-sowing.

Table 3. Permitted herbicides in pea (2005)

Active ingredient	Product	Mode of application
benefin	Benefex, Flubalex	pre-sowing
clomazon	Command 48 EC	pre-emergence
linuron	Afalon Dispersion	pre-emergence
metribuzin	Metripaz 70 WG, Sencor 70 WG	pre-emergence
pendimethalin	Panida 330 EC, Stomp 330, 400 SC	pre-emergence

propizochlor	Proponit 720 EC, Proponit 840 EC	pre-emergence
S-metolachlor	Dual Gold 960 EC	pre-emergence
bentazon	Basagran	post-emergence
cikloksidim	Focus Ultra	post-emergence
fluazifop-P-butil	Fusilade Forte	post-emergence
imazamox	Pulsar 40 SL	post-emergence
imazamox + pendimethalin	Master	post-emergence
cletodim	Select 240 EC, Select Super	post-emergence
MCPB	Butoxone M-40, Tropotox	post-emergence
propaquizafop	Agil 100 EC	post-emergence
quizalofop-P-etil	Leopard 5 EC, Targa Super	post-emergence
quizalofop-P-tefuril	Pantera 40 EC	post-emergence

The reason of withdrawal of some active ingredients can be attributed partly to environmental protection, partly to economical consideration.

A decade ago started the process of re-authorization of older active ingredients. This means, that data of the earlier permitted chemicals has to be completed to meet present requirements. (Eke 2004).

Presently, the product Pivot with its active ingredient imazethapyr is not allowed to use. This is a wide-spectrum herbicide, eligible for both pre- and early postemergence treatments, kills nearly every dicotyledons and many monocotyledons without any phytotoxic effect on pea (Pálfiy 1992). We know however, that despite its usefulness for the crop, it may not be used because of its residual effect. This means, that it remains in the soil for a long time without decomposition and this restricts the crop rotation. Just a few crops may follow Pivot. For example the sugarbeet, which is especially sensitive, may follow it only after three years. This herbicide is a great miss from the palette, because pea well tolerated it, better than many other herbicides (Nádasyné et al. 2004).

Also metobromuron were withdrawn because it is strong absorbed to the soil and its decomposition is very slow. This is the case also in groundwater and surface waters. In the cancellation of diclofop-metil its carcinogenic effect played a role (Darvas 2000).

Conclusions

Our investigations show, that herbicide assortment considerably changed during the last two decades. In the eighties some basic product was eligible to solve weed problems on a pea field. For the nineties, the earlier determining products were withdrawn and it became obvious, that because of appearance of herbicide-resistant weeds, a clean field can only be achieved by using combinations of herbicides or their application. Pre-emergence products became conspicuous, by which the competition of crop plant and weed can be eliminated in the critical early stage of the crop plant. Nowadays however environment protection considerations are more and more stressed out.

In the pre-sowing technology only the active ingredients benefit may be used from 1987 on. This herbicide has to be incorporated into the soil, and has a long-term effect. This is not an environment saving technology, is also expensive, therefore seldom implicated.

Pre-emergence basic treatment still has an importance, however in the future the using postemergence products are to be expected. We have to notice that a pre-emergence treatment has potentially stronger effects the environment. Because of this, permission of more products was withdrawn, which used to be applied pre-emergence. Advantage of post-emergence technology is, that at the time of application weeds are emerged, this products specific to the weed species can be applied.

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