

Efficacy of several strategies for reduction of herbicide application in sugar beet from 2003 to 2006

Introduction

Among all pesticides in sugar beet used, herbicides are the most important. They caused the highest costs. Additionally, herbicides are a main factor assuring yield stability. Therefore, the reduction of herbicide could bring considerable economical and ecological advantages for sugar beet producer. The Programme for Reduction of Chemical Crop Protection of the German Government is aimed at reducing the chemical crop protection to the Necessary Level. In order to determine the limits and possibilities of herbicide reduction in sugar beet, field trials were organised by the coordination board at the Institute of Sugar Beet Research (IfZ).

Material and Methods

Tab. 1: Experimental design, 2003-2006

treatment	variant / product	post-emergence treatment (kg/ha) ³⁾			amount of product (kg-l/ha) ⁴⁾
		1	2	3	
1	untreated control	no application			-
2	variant of adviser	site-specific application			3,40 - 8,00
3	non-selective ¹⁾	once-only post-emergence treatment			4,68 - 7,28 (12,00)
4	foliar application	site-specific application with only foliar active ingredient			1,95 - 4,20
5	reduction I				1,76
	Betanal Expert	0,175 (10 %)	0,175 (10 %)	0,175 (10 %)	
	Debut + FHS ²⁾	0,003 (10 %)	0,003 (10 %)	0,003 (10 %)	
	Spectrum	0,03 (20 %)	0,03 (10 %)	0,03 (7 %)	
	Rebell	0,17 (20 %)	0,17 (10 %)	0,17 (7 %)	
	Goltix SC	0,17 (17 %)	0,17 (9 %)	0,17 (9 %)	
	Lontrel	0,04 (10 %)	0,04 (10 %)	0,04 (10 %)	
Rako	1,0	2,0	2,0		
6	reduction II				3,48
	Betanal Expert	0,35 (20 %)	0,35 (20 %)	0,35 (20 %)	
	Debut + FHS	0,01 (33 %)	0,01 (33 %)	0,01 (33 %)	
	Spectrum	0,1 (67 %)	0,1 (33 %)	0,1 (22 %)	
	Rebell	0,3 (36 %)	0,3 (18 %)	0,3 (12 %)	
	Goltix SC	0,3 (30 %)	0,3 (15 %)	0,3 (15 %)	
	Lontrel	0,1 (25 %)	0,1 (25 %)	0,1 (25 %)	
Rako	1,0	1,0	1,0		

¹⁾ pre-emergence treatment was included ²⁾ FHS = formulation adjuvant

³⁾ the information in brackets refer to the maximum registered amount of the product per application time (exception Lontrel = 1/3 of the maximal accredited rate)

⁴⁾ without additive

The field trials in sugar beet were conducted from 2003 to 2006 in Germany on five sites per year using several strategies of herbicide applications (Tab.1). An untreated control was tested in comparison to five different treatments.

Following parameters were assessed:

- § Weed coverage of untreated control estimated by visual evaluation of covered ground by weed,
- § herbicide efficacy, estimated by visual evaluation and obtained of the untreated control,
- § yield and quality of sugar beet and
- § treatment costs.

Results

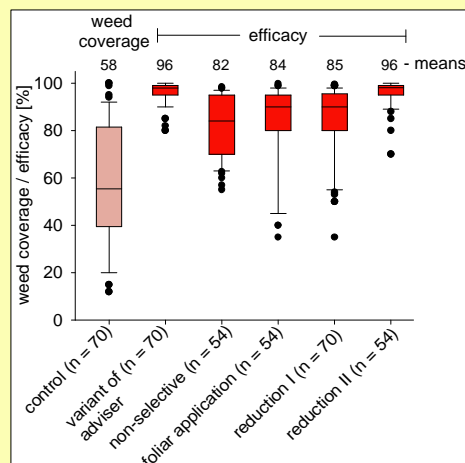


Fig. 1: Weed coverage of the untreated control and herbicide efficacy of several herbicide combinations at canopy closure of sugar beet, from 2003 to 2006; n = number of plots per treatment.

The amount of active ingredient of the different variants varied between 0,6 and 5,3 kg/ha.

Both, site-specific rate treatment (variant of adviser) and the mixture of reduced herbicide application ("reduction II"; reduction rate on average 75 %) showed the best weed control (efficacy: 96 %) (Fig. 1).

Herbicide reduction of approx. 90 % of the maximum registered application rate (reduction

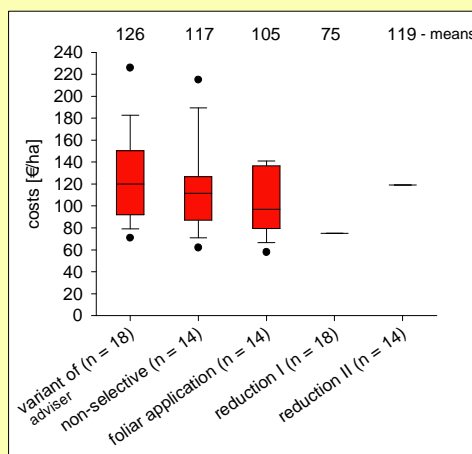


Fig. 3: Average costs of several herbicide-treatments in sugar beet, 2003 to 2006 (legal sales tax additionally); n = number of sites.

I) as well as the application of foliar herbicides only were insufficient for weed control (efficacy \leq 95 % averaged over all locations).

The highest average treatment costs had the variant of adviser (126 €/ha). The costs ranged from 71 to 226 €/ha (Fig 3). At the period from 2004 to 2006 the treatment costs of the variant „reduction II“ in 8 of 14 environments were higher than in the variant of adviser.



Fig. 4: Weed coverage of untreated control

The white sugar yield of all herbicide treatments was significantly higher compared to the untreated control, but not among the different treatments (Tab. 2).

Tab. 2: White sugar yield, 2003-2006

Variant 2003-2006	mean, [rel.]	significance
untreated control	49,2	b
variant of adviser	100,0	a
no-selective	95,7	a
foliar application	90,2	a
reduction I	92,2	a
reduction II	96,4	a
variant of adviser, absolute [t/ha]	11,7	

Conclusions

The possibilities of herbicide reduction in sugar beet combined with a high efficacy are existing. These can be achieved by application of herbicides at early weed developmental stage combined with good weather conditions. Both, site-specific and a mixture of reduced herbicide application with an amount of 3,48 l/ha showed the best weed control. The application of foliar herbicides showed insufficient weed control averaged over all locations.

Acknowledgment: We thank all participants in the trial series, especial the regional working groups of the coordination board for the organisation, preparation, and conduction of experiments.