EFFECTS OF MECHANICAL WEED CONTROL IN ORGANIC SOYBEAN CULTIVATION ON WEED BIOMASS AND DIVERSITY IN LUXEMBOURG

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INTRODUCTION

The interest in soybean

Soybean (*Glycine max* (L.) Merr.), a member of the family *Leguminosae*

Protein content: 40 % + optimal amino acid composition

Main feed protein source in animal nutrition

Soybean in Luxembourg

100 % imported (about 17 000 to 29 000 tons per year) and 75 % GMO's

Identified knowledge gaps in mechanical weed control in organic agriculture

A project dedicated to soybean cultivation

Sustainable and resource-efficient protein production testing various mechanical weed control methods in grain legume cultivation, **using soybean as an example**

Project duration: 10/2017 – 09/2020

MATERIALS AND METHODS

Experiment settings

2 sites: Manternach and Hostert

Years **2018** and **2019**

Exact one factorial field trial with **4 replicates**

Soybean variety: **Merlin (000)**

Weeds' assessments

Biomass

-> before weed control & at flowering

Counting
Identification } Shannon index calculation

->before and after each weed control & at flowering

Treatment	Weed control strategy
A	Blind harrowing + Harrow
B	Interrow cultivator with Duck-foot shares
C	Interrow cultivator with Duck-foot shares + Finger weeder
D	Combination of treatments A and C
E	Intercropping Soybean-Camelina + Harrow
F	Negative control (no weeding)
G	Positive control (maintained weed-free by hand)

MECHANICAL RUNS

Experimental year	Weed control	Site	Manternach							Hostert						
		Treatment / Method	A	B	C	D	E	F	G	A	B	C	D	E	F	G
2018	1. date	Blind harrowing	X			X	X			x			x	x		
	2. date	Harrowing	X				X			x				x		
		Duck foot share		X	X	X					x	x	x			
		Finger weeder										x	x			
2019	1. date	Blind harrowing	X			X	X			x			x	x		
	2. date	Harrowing	X				X			x				x		
		Duck foot share		X	X	X					x	x	x			
		Finger weeder										x	x			
	3. date	Harrowing	X							X						
		Duck foot share									X					
		Finger weeder										X	X			

Photos: IBLA

FINDINGS (1)

Biomass (g m^{-2})								
Treat.	Manternach 2018		Manternach 2019		Hostert 2018		Hostert 2019	
A	9.2	a	32.2	ab	344.1	d	67.0	c
B	8.9	a	33.2	ab	276.9	bc	16.6	b
C	10.0	a	32.3	ab	293.1	bcd	13.2	b
D	15.0	a	16.2	a	254.7	b	13.3	b
E	19.2	a	64.0	bc	333.9	cd	80.1	cd
F	0.0	a	0.0	a	0.0	a	0.0	a
G	101.2	b	82.1	c	411.6	e	109.3	d

- The use of the **interrow cultivator** (in B, C and D) tends to reduce more the biomass of weeds than harrowing (in A and E)
- A **combination of methods**: blind harrowing, harrowing, interrow cultivating and finger weeding, tends to lower the most the weeds' biomass

FINDINGS (2)

Shannon Index								
Treat.	Manternach 2018		Manternach 2019		Hostert 2018		Hostert 2019	
A	1.3	b	0.8	bc	1.4	b	1.9	cd
B	1.3	b	1.1	cd	1.6	bc	1.4	bc
C	1.3	b	0.6	b	1.8	c	1.1	b
D	1.3	b	0.8	bc	1.6	bc	0.8	b
E	1.4	b	1.4	d	1.4	b	1.7	cd
F	0.0	a	0.0	a	0.0	a	0.0	a
G	1.3	b	1.5	d	1.5	b	2.0	d

- In 2019, for both sites, the use of the **interrow cultivator** tends to reduce more the Shannon index

CONCLUSIONS

- Using machines with **different spectra of action** generally reduces the most weed‘s biomass.
- The **effects of the harrow are more variable** than for the interrow cultivator
- It is necessary to proceed **mechanical weed control several times** in the growing cycle of soybean
- The **diversity** of weed species is **negatively affected** by mechanical weeding
- The lower is the weed biomass, **lower the Shannon index** is.
- **Low abundant species are more likely to disappear** while the most abundant remain abundant.

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