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Examination of Different Earliness Effects on Harvest Point and Yield of Soybean (*Glycine Max*)

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Key words: soybean, earliness effect, yield

Abstract

In 2011 and 2012 a field experiment to study the influence of different earliness strategies on the yield of soybean was realized in Osnabrück, Northern Germany. This study was done in a randomized strip design with four repetitions, realizing two earliness strategies, dissolving film and fleece cover, and additionally the control variant.
In both years, it was possible to increase the germination rate of the plants. There were no statistically significant differences between the yield of the three variants. However, in 2012, differences between the protein concentrations could be detected. The protein concentrations of the variants which were realized with dissolving film and fleece cover were significantly higher than those of the control variant.

Introduction

Because of climate change and the associated rise in temperature there is the possibility of cultivating soybean in Northern Germany (JKI 2008). Soybean ripens in those areas where maize can also be cultivated and the soil and temperature requirements of the soybean are generally similar (Hoeft et al. 2000). One of the problems of cultivating soybean in Northern Germany is the slow juvenile development of the plants. In order to extend the possible vegetation period, the experiments with fleece cover and dissolving film were carried out. According to Lütke Entrup (2011) a minimum germination temperature of the soil of 8-10°C is extremely important. The use of either dissolving film or fleece cover causes the soil temperature to rise earlier and faster.
In Germany, there is an increasing demand for high-protein non- genetically modified soybean for human consumption (Taifun 2013). In order to satisfy this demand, the goal of the project is to expand soybean production in Northern Germany by examining earliness effects on soybean. Similarly to maize, where dissolving film and fleece cover are used to accelerate the growth of the plants, soybean should ripen and be harvested earlier.

Material and methods

The studies were accomplished in 2011 and 2012 at the experimental organic farm Waldhof (University of Applied Sciences Osnabrück) in a randomized strip design with four replications and were repeated in 2013. Currently, the results are not available because the harvest is still being processed. In this experiment, the variety Gallec 000/00 was cultivated. Apart from the control variant, dissolving films as well as a fleece cover were used in order to accelerate the growth of the plants.

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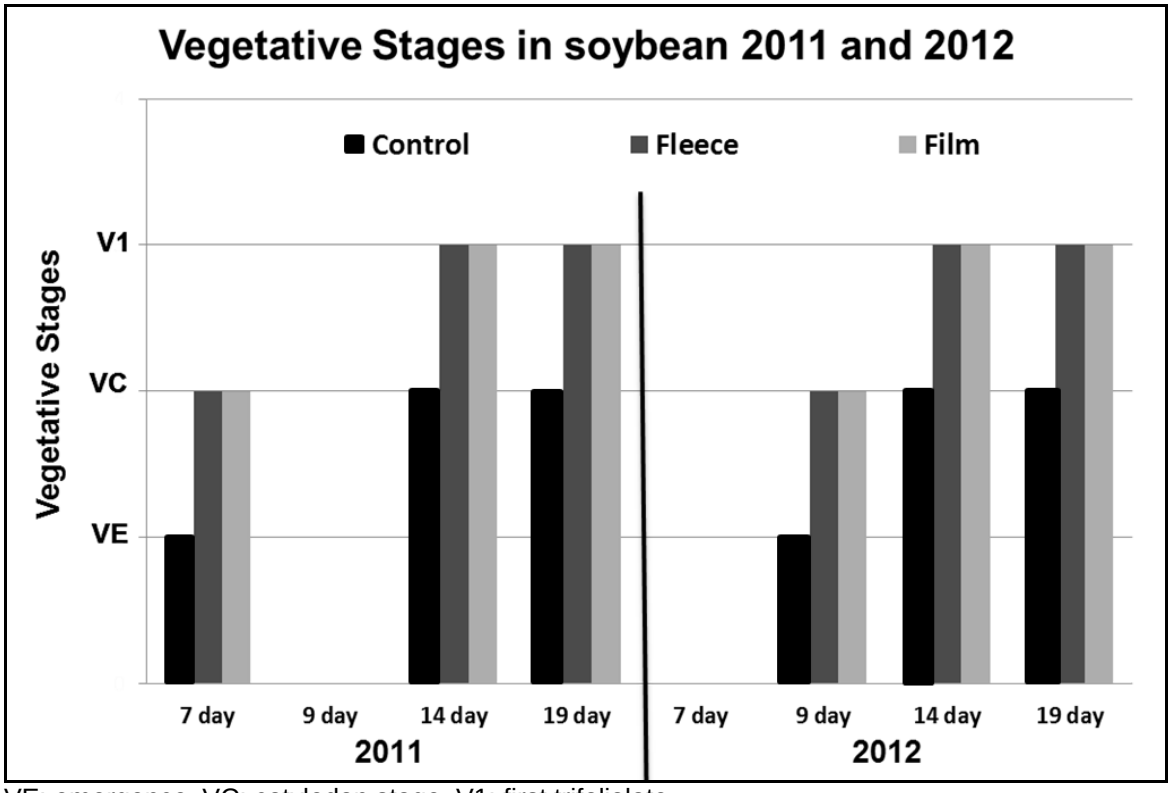
Table 1: Technical data in soybean production (2011 and 2012)

	2011	2012
Seedtime	27-04-2011	02-05-2012
Seeds per m²	65	70
Sowing depth Row distances	4cm 37,5cm	4cm 37,5cm
Germination rate	7 days with fleece and film 12 days in control	9 days with fleece and film 16 days in control
Removal of the cover	05-05-2011 8 days after seedtime	18-05-2012 16 days after seedtime

The three variants were investigated concerning germination rate and the yield of the different variants was measured.

Results

The application of dissolving films and fleece covers led to a tendency of earliness effects in the years 2011 as well as 2012. However, the control variant was able to catch up with the other variants due to the growth conditions. In 2011 the harvest of the variants with dissolving film and fleece covers was brought in a few days earlier than the control. This effect could also be observed in 2012, where the control variant was ripe one week later than the other two variants. In spite of this, the harvest had to be brought in at the same time due to the weather conditions. As shown in figure 1, in both years the yield of all three variants was similar, but there is a noticeable tendency that the yield of the control variant was slightly lower.



VE: emergence, VC: cotyledon stage, V1: first trifoliolate

Figure 1. Vegetative stages in soybean in Osnabrück 2011 and 2012

Concerning the protein concentration, no statistically significant differences between the different variants in 2011 could be measured. In 2012 it is obvious that the protein concentration of the control variant was somewhat lower than that of the other variants. This might be caused by the fact that the soil of the control variant was less warm than the soil that was covered by the dissolving film or fleece. Additionally, in 2012, the air temperature which was measured during the two-weeks period from May 1 to May 15 after the seeding was in averaged 1.5°C higher than the year before.

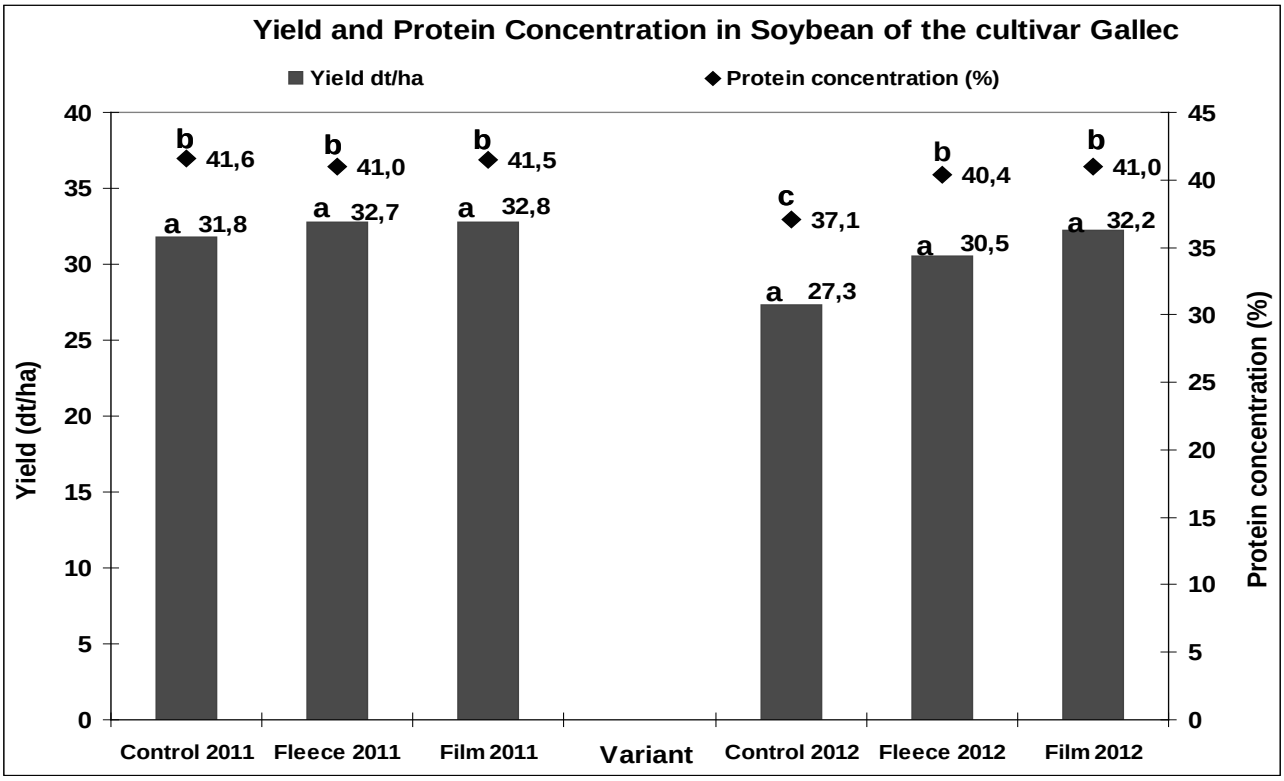


Figure 2: Yield and protein concentration in soybean of the cultivar Gallec

Discussion

The application of dissolving films and fleece covers in soybean shows an earliness effect and furthermore protects the plants from feeding damage.
There were no significant differences concerning the yield of the different variants, but in 2012 a difference in the protein concentration could be detected. This might be due to the fact that the average air temperature in 2012 was lower than one year before. These lower temperatures might have been the reason why the soybean profited from the application of dissolving film and fleece covers. In 2011 the average temperatures could have been high enough that neither fleece cover nor dissolving film had any earliness effects on the development of the plants.

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