Influence of cover crop management on sugar beet production

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Context

Cover crop = source of organic matter → Maintain soil fertility

The aim of our project is to understand all major processes involved in cover crop management in the soil-water-plant systems in silty loam soil and temperate climate.

In this context we focus on beat production from two different experimental field and weather conditions (2013 and 2014).

Methods

Two field with same protocol but delayed by one year. Contrast cover crop managements :

- Time of intervention
- Intensity of tillage
- Cover crop destruction mode
- Main crop soil preparation
- Crop residue placement

Winter ploughing
Spring ploughing
Decomposition & Shallow tillage
Strip tillage

Influence of cover crop management

Cover crop

2013: 1.4 t/ha buried in winter ploughing. 1.1 t/ha in other treatments → frost
2014: 1 t/ha buried in winter ploughing. 2 t/ha in other treatments → mild winter

Results

Weather conditions

2013: cold spring and dry summer
2014: warm and dry spring, rainy summer

Germination rate

No effect of modalities in both year BUT rate higher in 2013 and differences in the dynamics.

In 2014: 7 mm of rain in two days → crust formation particularly in ploughing plots.

Yield

Decomposition & Shallow tillage
Strip tillage
Spring ploughing
Winter ploughing

Beets yield (t/ha)
Sugar yield
Sugar yield (t/ha) at 16%
Sugar (%)
C/N
K
Na

Significant codes : P < 0.001 *** , P < 0.01 ** , P < 0.05 *

Weeds

2013:
- Difference between decompaction (low) and ploughing (high)
- Importance of rotation on rapeseed occurrence
- Diversity in weeds higher in strip tillage

2014:
- Slight effect (P=0.055) of tillage on weed occurrences.
- Higher quantity in strip tillage

Conclusions

- Weather conditions and soil humidity are crucial during sowing period
- Strip tillage is quite technical, not user friendly
- Weather conditions have major impact on crop production
- Difference observed on sizes and shapes on beets during growing season did not impact yield
- Higher yield in winter ploughing in 2014
- No significant differences in 2013
- Tillage has great impact on weed occurrences → importance of knowing cultural past.

In order to fully understand the impact of cover crop management on crop production, further years of experiment are needed due to the high importance of weather on crop development.