

WHEAT BIOMASS AND SOIL ORGANIC MATTER INFLUENCED BY DIFFERENT TILLAGE METHODS

A. UJJ – K. BENCSIK – P. MIKÓ – Cs. GYURICZA

Institute of Crop Production

Szent István University, 2103-H Gödöllő,

Corresponding author: Ujj.Apolka@mkk.szie.hu

Introduction

The goal of soil tillage besides creating proper circumstances for crop production is environment protection and soil characteristics improvement (Beke 2005). There must be high attention paid to physical and biological state of soils so as to be able to produce proper quality and quantity crop on a constant level (Hornok and Pepó 2005). One of the most important conditions of successful production is enriching soil with organic matter since this (both alive and inanimate) is one of the most valuable elements of soil (Kismányoky 2005). According to Gyuricza and Birkás (2000) soil moisture content is favourably influenced by tillage, in other words tillage is less dependant on climate. Organic matter of soil becomes more resistant for soil compaction and also extends the effects of soil loosening. Soil rich in organic matter becomes more draught resistant, it is able to store moisture for long period that is an indispensable feature knowing the Hungarian rainfall circumstances. In this current study the mass of wheat biomass as main crop was measured in different soil tillage methods and also the ration of mass of green plant and root was measured that contributes to soil organic matter supply in a great extent.

Methods

The area of the research was 312 x 150 m= 4, 68 hectares. The research was a four-time repeated, striped, randomly structured. The sizes of field lots were 13 x 75 m= 975 square meter.

A factor in the research covered six different tillage methods as follows:

- a1: ploughing (26-30 cm)
- a2: direct sowing
- a3: shallow cultivator applied tillage (12-16cm)
- a4: cultivator applied tillage (16-20 cm)
- a5: disc harrowing (16-20 cm)
- a6: loosening + disc harrowing (40-45cm -16-20cm)

The different tillage methods were chosen based on their beneficial, neutral or disadvantageous impact on soil condition. In case of five tillage methods the soil condition improving effects of tillage methods were the next: Wasteland stripping and treatment of the stripped wasteland; base tillage; seeding soil seedbed preparation; sowing. These steps were not applied in case of direct sowing; tillage is limited only to sowing.

Plant composition and sequence used in the research was the following:

2002: white mustard (*Sinapis alba* L.), (protection plant)

2002/03: winter wheat (*Triticum aestivum* L.), breed: Mv Kucsma, II. propagation level

2003/04: rye (*Secale cereale* L.), (intermediate protective- and mulch-plant + forage)

2004: peas (*Pisum sativum* L.), (mulch plant)

2004/05: winter wheat (*Triticum aestivum* L.), breed: Mv Verbunkos

The green peas sowed in 2004 were utilized as green manure turned into the soil before wheat production. Following this, base tillage was completed on September 13, 2004, and seedbed preparation was done on October 04, 2004.

Determination of ratio of green mass and root mass of wheat

There were samples taken twice for the biomass amount measurement of wheat sowed in 2004 via using a 0.25 square meter quadrat. The green mass and root mass were measured right after removing soil from the samples. The measurement was repeated following a drying process completed in a drying cabinet.

Results and discussion

It can be concluded that based on the total mass measured after shooting of wheat the greatest results were achieved following the loosening + disc harrowing (a6) treatment (3,41 t/ha), while the smallest yield was gained following direct sowing (a2) treatment (1,5 t/ha). Results of the research are shown in Figure 1. Considering the total mass of ploughing treatment of wheat as 100% it can be stated that the shallow cultivation tillage (a3) and loosening + disc harrowing (a6) treatments are more favorable for wheat total mass production. Nevertheless the ratio of green mass and root mass must be taken into consideration that can be seen in Figure 2. It can be concluded that the green mass and root mass ratio of low total mass wheat examined after shooting is similar independently from tillage method. The ratio was about 50-50%. This can be explained by the shallow rooting of wheat, in other words the differences caused by the different tillage methods are not obvious in the early stages of growing.

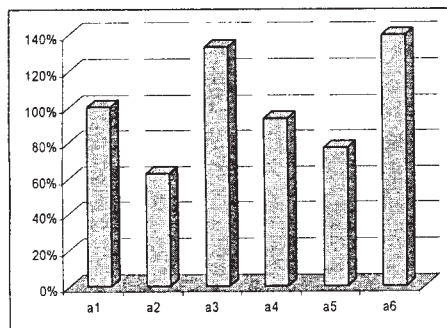
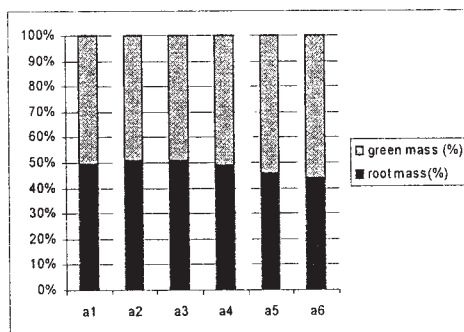


Figure 1. Biomass of the wheat (Józsefmajor, November, 2004)



the root mass (Józsefmajor, November, 2004)

Figure 2. The rate of green- and root mass was measured another time, in May during wheat growing. Results of measurement can be seen in Figure 3 and 4. Studying total mass we can say that the highest amount of total mass was gained in shallow cultivation tillage (a3) (58,94 t/ha) besides ploughing (a1), while in case of direct sowing total mass did not reach 37,92 t/ha. Considering ration of green and root mass, the green mass is higher than root mass in case of ploughing treatment (a1) while it is the opposite in case of direct sowing (a2). Knowing the yield results it can be stated that the amount of yield is changing in parallel to the amount of green mass, though considering soil condition preservation, regarding organic matter supply, direct seeding is considered favorable.

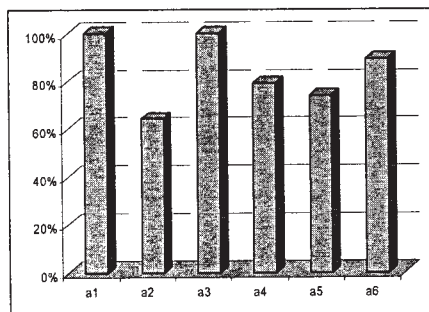


Figure 3. Biomass of the wheat (Józsefmajor, May, 2005)

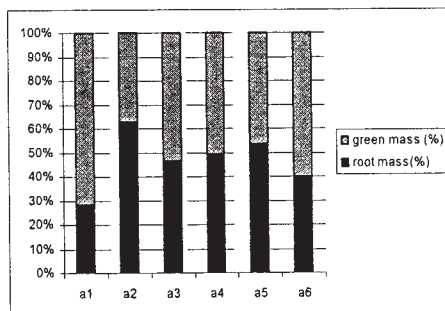


Figure 4. The rate of green- and the root mass (Józsefmajor, May, 2005)

Conclusions

The different tillage methods did not have an impact on green mass and root mass ratio in the early stage of growing of wheat. Although considering total mass growth of wheat was weaker in the early stage in the direct sowing treatment (a2) and delay in development was not made up even later. The most effective treatment out of the six tillage methods were ploughing (a1) and shallow cultivation tillage (a3), while regarding soil condition preserving and organic matter improving direct sowing was also excellent.

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