

EFFECT OF GRASS MULCH APPLICATION ON TUBERS SIZE AND YIELD OF WARE POTATOES IN ORGANIC FARMING

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Key words: grass mulch, potato, yield, soil

Abstract

The aim of this experiment was to evaluate influence of mulching on the tuber yield and on the number of ware potatoes. In organic farming grass mulch for potatoes was used in 2008. For the experiments different ways of mulching (grass mulch after planting, grass mulch after second hoeing) were used and compared with bare soil (control variant). The results showed that grass mulching had positive effect on the yield of ware potatoes and some of the yield-forming components. The yield of ware potatoes was significantly higher by 9.3 t/ha in comparison with control variant. The highest number of ware potatoes was found out in the variant with grass mulch after planting.

Introduction

The effect of organic mulch on tuber yield can have been variable, and this was mainly attributed to differences in climatic conditions. While increase of the yield through straw mulch was frequently found under hot and dry summer conditions (Bushnell and Welton, 1931; Singh et al., 1987). Decrease of the yield under straw mulch has also been reported and was attributed to below-optimum soil temperature (Opitz, 1948) and reduced soil nitrate levels (Scott, 1921). Increasing of the quantity of applied mulch increases the effects on soil moisture and temperature (Scott, 1921; Russel, 1940). Therefore, large application rates of mulch (10 t/ha and more), which were common in previous studies and practice; appear to increase the risk of yield reduction in cooler climates.

Materials and methods

In 2008 field trial was conducted at Experimental station of Department of Crop Production of the Czech University of Life Science Prague-Uhřetěves (sugar beet growing region, 295 m a.s.l., average of annual temperature 8.4 °C and annual precipitation 575 mm). Clay-loam cambisol has topsoil deep 250–300 mm, with neutral pH, organic matter content 1.74–2.12 %.

The experimental station in Uhřetěves is certified for carrying out the experiments in organic farming.

For the experiments, two pre-germination varieties of early potatoes Finka and Katka were used in the different ways of mulching (grass mulch after planting, grass mulch after second

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hoeing) and in the control variant without mulching (bare soil). All variants were provided in four parallel repetitions.

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The manual harvest was done 118 days after planting. Harvested tubers were sorted out into four size fractions (under 40, 40–55, 55–60 and above 60 mm).

Post harvest analyses were focused on the determination of the yields from each variant. Summary statistics of the effect of mulching and variety on tubers yield were obtained using Statgrafic Plus 5.1. Statistical analyses were performed using the ANOVA. Means were compared using Tukey test at the level of significance $\alpha = 0.05$.

Results and discussion

The results showed that mulching had affected the yield of ware potatoes and some of the yield-forming components. The highest numbers of ware potatoes were found out in variant with grass mulch after planting (Table 1). In trials of Döring et al. (2005) tuber size fractions were not significantly affected by straw mulching.

These results with grass mulch do not go along with recent experiments with the effect of straw mulch, which did not show any significant yield response of potatoes to straw mulch (Stoner et al., 1996; Edwards et al., 2000).

Tab. 1: Influence of grass mulching on the number and size of tubers (on average of varieties).

| Variants | Structure of tubers under hill | | | | | | | |
|---------------------------------|--------------------------------|-----|------------|-----|------------|-----|-------------|-----|
| | under 40 mm | | 40–55 mm | | 55–60 mm | | above 60 mm | |
| | weight (g) | No. | weight (g) | No. | weight (g) | No. | weight (g) | No. |
| Bare soil (control) | 164.0 | 7.7 | 580.8 | 6.9 | 124.7 | 0.8 | 89.0 | 0.4 |
| Grass mulch after planting | 195.2 | 8.8 | 682.0 | 7.5 | 214.2 | 1.5 | 223.9 | 1.2 |
| Grass mulch after second hoeing | 124.1 | 5.0 | 624.0 | 7.5 | 183.6 | 1.3 | 129.4 | 0.6 |

The results from precise field experiment proved the significantly positive effect of grass mulch applied after planting on the yield of ware potatoes (Fig. 1). The yield of ware potatoes from the plots with grass mulch used after planting was significantly higher by 9.3 t/ha in comparison with control variant (without mulch). Whereas Döring et al. (2005) show that response of the tubers yield to straw mulch were not significant in any experiments and the trends of mulching effects on yield were evenly distributed (positive trend in five experiments, negative trend in six experiments).

Higher yields under grass mulch have mostly been attributed to increased soil moisture, similarly as shown for straw mulch under arid and semiarid conditions (Singh et al., 1987; Saha et al., 1997; Chandra et al., 2002).

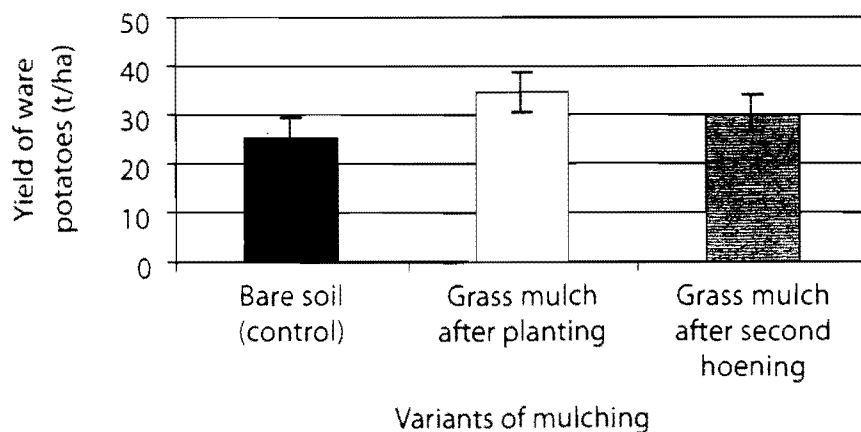


Figure 1: Effect of mulching on the yield of ware potatoes

Note: vertical lines represent minimum significant difference ($HSD_{0.05}$)

Conclusions

The results of the application of grass mulch on the ridge of potatoes from the first experiment year signify fair chance for organic farming because the yield of ware potatoes were significantly higher by 9.3 t/ha in comparison with variants without mulch.

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