YIELD OF EARLY POTATOES AS DEPENDED ON THE TERM OF NONWOVEN TEXTILE REMOVAL

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Introduction

Production of early potatoes in the CR makes an important part of the total production of ware potatoes. Farmers need to begin their harvest at the earliest term and they use pre-germinated potato seed of very early cultivars as well as irrigation, in order to obtain good yields already at the turn of May and June [Hamouz et al. 2006]. Growers in order to achieve an early harvest use many intensification factors in technology of early potato production, e.g. to advance harvest and ensure higher stability of yield, row covering of early potatoes with non-woven textiles [Hamouz et al. 2006] or perforated polyethylene foils [Demmler 1998] can be used.

Due to vegetation covered with plastic films (textile or foil) there is a difference in microclimatic conditions in plant and in soil. The plant can be exposed to stress temperatures i.e. in high level of insolation, when under the plastic film extreme temperatures could appear [Bizer 1994] which damage plant and forming tubers.

The covering of rows after planting with textile facilitates the increased yields of early potatoes and their stability in individual years. According to Jabłońska-Ceglarek and Wadas [2005] in the cultivation with textile covering, the yield of ware potatoes 60 days after planting (DAP) was higher by 23.34% on the average and 75 DAP by 10.92% in the six-year period of study, as compared to the cultivation without plant covering. In previous experiments by these authors [Wadas, Jabłońska-Ceglarek 2000] on covering with textile (Pegas Agro 17 UV) from planting to full emergence the marketable yield of tubers, on average increased by 33%.

Materials and methods

Precise field trials were performed at the locality of Přerov on Labem (on the

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cultivar test plot of the Central Institute for Supervising and Testing in Agriculture - CISTA) in Central Bohemia in the years 2006-2007. The locality is situated in lowland Polabí, where soil and temperature conditions are very favourable for the cultivation of early potatoes and precipitation deficiency is balanced by irrigation. In the experiment two terms of textile (white non-woven textile Pegas Agro 17 UV) removal were compared with the uncovered control variant. All variants were provided with four parallel determinations. Seed potatoes of Adora variety were pre-sprouted for 40 days. Industry compost Organic at the fertilization rate of 12 t·ha\(^{-1}\) in spring before planting was applied. Also mineral fertilizers in the dose of 130 kg N·ha\(^{-1}\), 35 kg P·ha\(^{-1}\), and 66 kg K·ha\(^{-1}\) were applied.

During vegetative periods air temperatures (AT) and soil temperatures (ST) were measured (every 15 minutes). ST was measured at the depth of 100 mm below the ridge top during the whole time of textile covered growth.

The recorded temperatures were used for the evaluation of growth conditions during vegetation (equation 1) by the observed variants (variants with textile removed 25\(^{th}\), 45\(^{th}\) DAP and control variant without textile). For this purpose „relative thermal index” (RTI) was used according to YUAN and BLAND [2005] with the equation \( r/R_{\text{max}} \), where \( r \) is the daily rate of growth (or development) at any temperature, \( T_{\text{opt}} \) is the optimum temperature, \( T_{\text{max}} \) is the maximum temperature, \( T_{\text{min}} \) is the minimum temperature, and \( R_{\text{max}} \) is the maximum rate of growth or development at \( T_{\text{opt}} \). For these transformations of ST an equation was assumed (1) that for the optimum (\( T_{\text{opt}} \)) was 16°C, the minimum (\( T_{\text{min}} \)) 6°C and the maximum (\( T_{\text{max}} \)) was 30°C.

\[
   r = R_{\text{max}} \left( \frac{T_{\text{opt}} - T}{T_{\text{max}} - T_{\text{opt}}} \right) \left( \frac{T - T_{\text{min}}}{T_{\text{opt}} - T_{\text{min}}} \right) \left( \frac{T_{\text{opt}} - T_{\text{min}}}{T_{\text{opt}} - T_{\text{max}}} \right)
\]

(1)

Plant samples (30 potato hills) for analyses were collected on 67\(^{th}\) DAP from every variants (7 June in 2006, 6 June in 2007). The monitored yield-forming components were analysed and evaluated in each hill from each replication.

Results and discussion

The results of field experiments proved the positive effect of the textile on removal 25\(^{th}\) DAP on total tuber yield (TTY) and the yield of ware potatoes (YWP) at the earliest harvest terms. The level of this trait in the experimental variant of textile removal on 25\(^{th}\) DAP, on average in both years showed non-significant values higher by 16.0% for TTY and higher values by 20.1% for YWP as compared to the variant of textile removal on 45\(^{th}\) DAP and by 16.0% for TTY, 16.1% for YWP as compared to the control variant without textile (Fig. 1).

The growth covered by textile (variant of textile removal on 25\(^{th}\) DAP and 45\(^{th}\) DAP) had faster emergence (by two days in both years), growth and development due to more favourable AT and ST. Using the textile increased AT (by 2.1 and 2.9°C) and ST (by 3.1 and 2.8°C) in the respective years (2006 and 2007).
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Fig. 1. Effect of covering with the textile, term of removement and years on the total tubers yield (t·ha⁻¹) and yield of ware potatoes (t·ha⁻¹) during harvest 67 days after planting.
In their experiments WADAS and JABŁOŃSKA-CĘGLAREK [2001], WADAS et al. [2004] founded that very early removal of textile (covering from planting to full emergence) resulted in a higher TTY by 31% and removing of textile in 150 mm height of plants (approximately it corresponds to variant 25th DAP) caused a higher TTY by 23% as compared to the variant without textile.

These results were also confirmed in our experiment, when the textile was removed on 25th DAP the highest YWP in both years (Fig. 1) was observed. The decrease of YWP in the variant 45th DAP was proved by the decrease of RTI values (Fig. 2, 3). From the course of RTI values (Fig. 2, 3) it could be concluded that the removal of textile in full emergence mention by WADAS and JABŁOŃSKA-CĘGLAREK [2005], WADAS et al. [2004] could have more favourable impact on YWP than textile removed 25th DAP.

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**Fig. 2.** Recorded temperatures in 2006 were used for transformations on „Relative thermal index” (RTI)

Rys. 2. Współczynnik termiczny „Relative thermal index” (RTI) podczas wegetacji w 2006 r.
Conclusion

1. The use of non-woven textile influenced the total tuber yield. Harvest on 67th DAP had higher yield by 9.2% (on average in both textile variants and years) as compared to control variant (without textile).

2. An earlier removal of textile (25th DAP) influenced the yield of ware potatoes. At harvest on 67th DAP it was higher by 20.1% (on average in both years) as compared to the variant with textile removed on 45th DAP.

3. The yield differences between years 2006 and 2007 were caused by different microclimate conditions. Transformation of soil temperatures on RTI confirmed that better growth conditions were in 2007 (especially from planting to full emergence).

References


Key words: early potato, yield, textile, term of remove, air temperature, soil temperature, relative thermal index

Summary

In the two-year field trials the effect of row covering of early potatoes were investigated on the total tuber yield and the yield of ware potatoes. Experiments were performed with cv. Adora at the Plerov on Labem locality in the Czech Republic. Row covering with textile positively influenced the yield of ware potatoes during harvest 67 days after planting (in the variant with the textile removed on 25th day after planting it was 20.1% higher as compared to the variant when the textile was removed on 45th day after planting).
PLONOWANIE WCZESNYCH ODMIAN ZIEMNIAKA
W ZALEŻNOŚCI OD TERMINU ODKRYWANIA AGROWŁÓKNINY

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Słowa kluczowe: ziemniaki wczesne, plon, agrowłóknina, termin odkrywu, temperatura gleby, współczynnik termiczny

Streszczenie


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