THE NON-WOVEN FLEECE AS AN IMPLEMENT FOR ACCELERATION OF EARLY POTATOES HARVEST*

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In the years 2001–2003 the effect of white fleece Pegas-agro 17 UV on the dynamics of yield formation in early irrigated potatoes (Adora and Impala varieties) was investigated in an early potato region of the Czech Republic. Use of the fleece significantly increased the yield of commercial tubers in early data of the harvest at the end of May and at the beginning of June (2001 on 134.9%, 2002 on 134.5% and 2003 on 563.2% in comparison with the control in average values of both varieties). Between varieties the greater yield effect was found in Impala variety in comparison with variety Adora. Favourable influence of the fleece on temperature air and temperature soil of ground layer was demonstrated and also heat insulating effect of the fleece during ground frosts was proved.

early potato; fleece; air temperature; soil temperature; variety; yield

INTRODUCTION

Early potatoes growers in the Czech Republic in traditional regions of southern Moravia and lowland region of Labe River have strived for early harvest of quality tubers since the end of May, which enables them to capture favourable exercise prices and to ensure a market spot. Consequently they use all technological measures which support early harvest – very early cultivars, pre-germinated seedling, early planting in close spacing and irrigation. Row covering by a fleece has pushed forward since 90th.

A fleece of type Agryl could advance early potatoes harvest by 7–10 days according to Jaša (1994) and increase a yield by 20% and more. Also other authors confirmed favourable influence of covering by polypropylene fleece on yield and better percentage of commercial tubers in early harvests (Bizer, 1994; Lutomirska, 1995; Prosba-Bialczyk, Mydlarski, 1998; Hamouz, Dvořák, 2004). Covering by Pegas-agro 17 UV from planting to full emergence increased the marketable yield of tubers by an average of 33% and increased the proportion of large tubers in the total yield (Wadas, Jablonska-Ceglarek, 2000). There are good experiences with the fleece used for vegetables and early potatoes abroad and in the recent years also in the Czech Republic. The fleece creates optimum climate for germination and plant growth and maintains more favourable temperature during cold weather (Bizer, 1997; Prosba-Bialczyk, Mydlarski, 1998). But as yet all the research findings are concerning influence of the fleece on microclimate under the fleece and on dynamics of early potatoes yield formation have been missing. Fleece costs are about 1000–1200 EUR.ha^{-1}, but with usual double use during operating tests it has still paid off to Czech growers (Hamouz, Dvořák, 2004). Favourable economical results for the fleece use for early potatoes were ascertained (Prosba-Bialczyk et al., 2000).

The aim of this work was to verify efficiency of the fleece for early potatoes under soil and climate conditions in lowland region of the Labe river, to evaluate its influence on dynamics of yield formation and on proportion of commercial tubers and to monitor influence of row covering on microclimate in crop – temperature, air moisture and soil temperature under the fleece. And finally to verify its efficiency against spring frost.

MATERIALS AND METHODS

Influence of white fleece Pegas-agro 17 UV on dynamic of watered early potatoes yield formation was monitored in precise field experiments during the years 2001–2003. At the Přerov nad Labem site (lowland region of the Labe River) very early cultivars Adora and Impala were cultivated according to methodology of Central Institute for Supervising and Testing in Agriculture. Fleece was placed on ridges immediately after planting (5. 4. 2001, 28. 3. 2002 and 3. 4. 2003) and removed during more continual increase of daily temperatures maximum above 20 °C (10. 5. 2001, 4. 5. 2002 and 17. 5. 2003). Herbicide Sencor 70 WP was applied on ridges in rate of 0.5 kg.ha^{-1} after planting and before fleece was placed. In 2001 five irrigation rates (in total 83 mm), in 2002 seven irrigation rates (in total 95 mm)

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and in 2003 six irrigation rates (in total 90 mm) were applied. Each year's samplings of plant in order to evaluate a level of yield components according to dates in Table 1. In the year 2003 air temperature and air moisture was measured every 15 minutes closely above soil surface in rows during vegetation period (sensors integrated in datalogger Minikin TH) and soil temperature in a ridge in the depth of 100 mm (dataloggers Tinytag ultra).

RESULTS AND DISCUSSION

Achieved results confirm distinctly positive influence of the fleece on tuber yield in early harvesting terms (Fig. 1). Tables 1 and 2 indicate that in option with fleece tuber yield statistically confirmatively exceeded tuber yield of control option.

Our results are consistent with published data (Bizer, 1994; Lutomirska, 1995; Prosba-Bialczyk, Mydlarski, 1998; Jaša, 1994; Hamouz, Dvořák, 2004).

Favourable influence of white fleece on the yield level at early terms of potatoes harvest was connected with artificially created microclimate conditions, which advanced sprouting by seven up to ten days compared to control and accelerated further growth and crops development when weather conditions were less favourable for early potatoes. It is confirmed by results of temperature measurements in ground layer in the year 2003 (Figs 2 and 3). Significantly higher values are apparent for daily temperature maximums and also higher values of minimums for crops under fleece (ground temperature average during crops shielding from 3. 4. to 17. 5. 2003 was 8.4 °C and for unshielded crops it was 5.8 °C). Our results concerning soil temperature under the fleece correspond well with findings of Prosba-Bialczyk, Mydlarski (1998); we did not find comparative results for air temperature under the fleece.

During three experimental years 2001–2003 the fleece had in the first term of harvest the highest yield effect in the year 2001 (except for the year 2003), that on average of both cultivars yield gain was compared to control in the year 2001 34.9%, in the year 2002 34.5% and in the year 2003 563.2%. Results from the year 2003 were influenced by cold weather with frequent ground frosts in the first and second decade of April (9. 4. and 10. 4. minimums around –7 °C) when soil temperature in depth of 100 mm (without the fleece) decreased three times under 0 °C (potatoes were not emerged). Major quantity of sprouts on tubers of control variant freezed, crops emerged with large interspace and were irregular, other hills emerged with delay (some of them even in the middle of May). On the other hand crops under the fleece emerged properly closed with regular hills; in days with minimums around –7 °C and especially on 12th, 13th and 14th of April 2003 heat insulating effect of the fleece manifested itself significantly when temperature under the fleece was nearly by 3 °C higher and above freezing point compared to unprotected crops.

Tables 1 and 2 indicate that higher yield effect of fleece was in cultivar Impala (during the years 2001–2002 was in cultivar Impala on average of two years yield increment for Impala compared to control variant was 44.25% and for Adora it was 25.1%).

Contradictory result in the year 2003 is distorted by damage of control crops by spring frosts. Different yield effect of the fleece for various cultivars in an experiment with four cultivars found also (Wadas, Jablonska-Ceglarek, 2000). From the point of view of yield-formation elements higher yield in option with the fleece in the first terms of collection is related to higher average tuber weight because differences in tuber quantity for both variants were inconclusive.

Favourable heat insulating effect of the fleece against ground frosts confirm also (Jaša, 1994; Bizer, 1997). For emergence and other growth and development of the crops it was important that the fleece very positively influenced temperatures in the ridge in depth of 100 mm (increased their values – Fig. 3). During first harvest collection on the 4. 6. 2003 yield of commercial tubers for cultivar Adora under the fleece was 17.8 $t.ha^{-1}$,

Table 1. Ware size tuber yield for cultivar Adora

Date of harvest	Yield ($t.ha^{-1}$)			$LSD_{p\ 0.05}$	F/C (%)
	control (C)	fleece (F)	difference F – C		
7. 6. 2001	18.96	24.04	5.08	2.89	126.8
31. 5. 2002	19.11	23.59	4.48	2.21	123.4
4. 6. 2003	3.44	17.84	14.40	1.95	518.6

Table 2. Ware size tuber yield for cultivar Impala

Date of harvest	Yield ($t.ha^{-1}$)			$LSD_{p\ 0.05}$	F/C (%)
	control (C)	fleece (F)	difference F – C		
7. 6. 2001	12.74	18.21	5.47	1.97	142.9
31. 5. 2002	12.67	18.45	5.78	2.02	145.6
4. 6. 2003	2.45	14.89	12.44	2.12	607.8

while yield in control variant was only 3.4 $t.ha^{-1}$; in cultivar Impala it was 15.0 $t.ha^{-1}$ under the fleece and in control variant it was 2.5 $t.ha^{-1}$ (in control crops during first collection some of the tubers still were not set).

During third collection in the last decade of June differences between experimental and control variant in individual years nearly equalized (except for the year 2003), did not exceed a limit of statistical significance and in the years 2001 and 2002 the control variant for cultivar Adora had higher yield compared to experimental variant.

Our results show that the fleece was important only for yield increase of crops intended for early harvest while during good weather control crops have started to

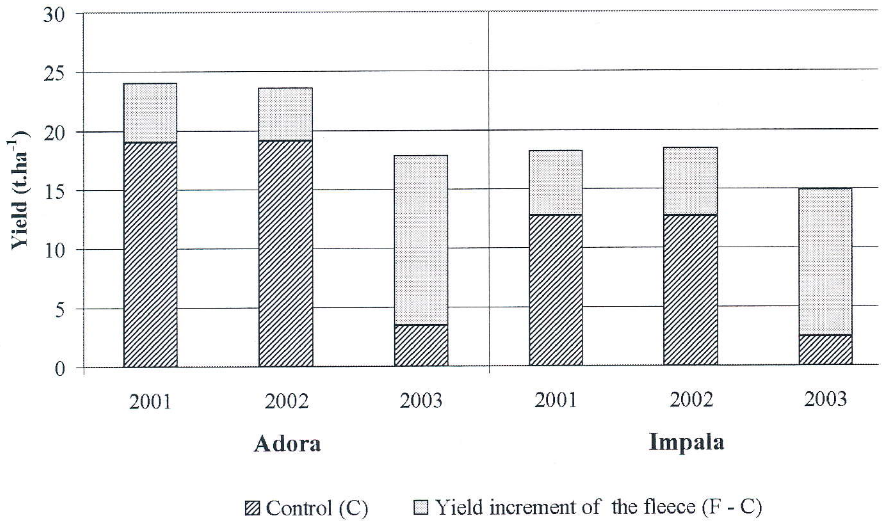

Fig. 1. Yield effect of the fleece, varieties and seasons during harvest (7. 6. 2001, 31. 5. 2002, 4. 6. 2003)

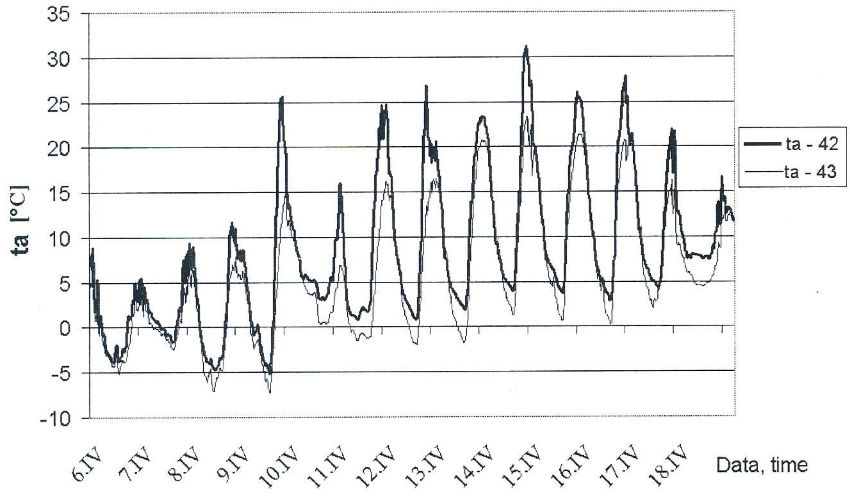

Fig. 2. Air temperatures for uncovered potatoes (ta-43) and for potatoes covered with fleece (ta-42) in the year 2003

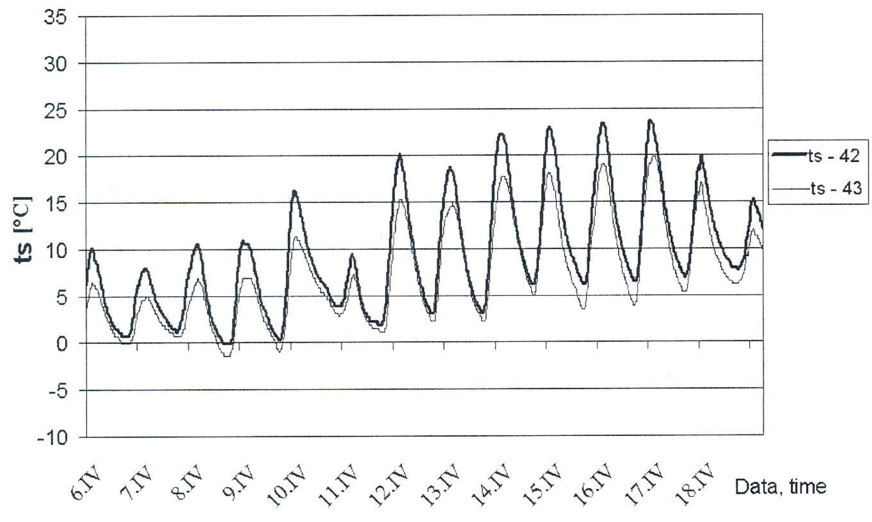

Fig. 3. Soil temperatures for uncovered potatoes (ts-43) and for potatoes covered with fleece (ts-42) in the year 2003

have higher quality and during June nearly compensated yield deficiency. The year 2003 was an exception, when in consequence of control crops damage by spring frosts difference between control variant and variant with the fleece at collection on the 26th of June was decreased, but still was highly conclusive (Tables 1 and 2).

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Bílá netkaná textilie jako prostředek pro uspíšení sklizně raných brambor.

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V přesných polních pokusech se čtyřmi opakováními byl v letech 2001–2003 sledován vliv bílé netkané textilie Pegas-agro 17 UV na výnos raných zavlažovaných brambor při časné sklizni na přelomu měsíců května a června. Na stanovišti Přerov nad Labem (v ranobramborářské oblasti Polabské nížiny) byly pěstovány podle metodiky ÚKZÚZ velmi rané odrůdy brambor Adora a Impala. Textilie byla na řádky natažena bezprostředně po výsadbě a sejmuta při vzestupu nejvyšších denních teplot nad 20 °C. Po dosažení konzumní velikosti hlíz u kontrolní varianty (do 60 dní od výsadby) byly provedeny odkopy 40 trsů z každé varianty. Nakrytí porostů netkanou textilií ve všech letech statisticky průkazně zvýšilo výnos hlíz tržní velikosti (tab. 1 a 2). Výnosový efekt textilie je prokazatelně ovlivňován povětrnostními podmínkami ročníku (větší efekt v letech s chladným počasím na jaře). Z obou odrůd potvrdila větší ranost odrůda Adora, ale na textilii reagovala vyšším přírůstkem výnosu odrůda Impala (obr. 1).

V roce 2003 byla po celou dobu vegetace každých 15 minut pomocí dataloggerů registrována teplota vzduchu v přízemní vrstvě vzduchu a teplota půdy v hloubce 10 cm. V tomto roce byl zjištěn příznivý vliv netkané textilie na průběh teplot v přízemní vrstvě vzduchu i v půdě po celé období nakrytí porostů (obr. 2 a 3). Dále byl zjištěn významný tepelněizolační efekt textilie v období jarních mrazíků. Z pokusů je zřejmé, že netkaná textilie má značný význam při pěstování raných brambor pro časné sklizně, neboť urychluje vzcházení i další růst a vývoj porostů a navíc značně snižuje riziko poškození porostů jarními mrazíky.

rané brambory; netkaná textilie; teplota vzduchu; teplota půdy; odrůda; výnos

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