# BLACK POLYPROPYLENE NON-WOVEN TEXTILE AS MULCH IN ORGANIC AGRICULTURE

DVOŘÁK, P.[1], HAMOUZ, K.[1], KUCHTOVÁ, P.[1], TOMÁŠEK, J.[1] & ERHARTOVÁ, D.[1]

Key words: polypropylene black mulch, soil temperature, soil water potential, weed

## Abstract

*Black polypropylene textile was used in potatoes by organic agriculture and it had positive effect on soil temperature (in the depth of 100 mm). Slightly higher soil temperatures under black polypropylene mulch in the vegetation period after planting had favourable influence on earlier stands emergence. The soil water potential (in the depth of 250 mm) and also the soil water content have been beneficial for black polypropylene mulch. Significantly lower values of the soil water potentials have been found in the period after planting and at the end of vegetation. Black polypropylene mulch provided favourable temperatures and soil moisture.*

## Introduction

Black polyethylene mulches are used for weed control in a range of crops under the organic system. The use of black polypropylene woven mulch is usually restricted to perennial crops. Various colours of woven and solid film plastics have been tested for weed control in the field (Horowitz, 1993). White and green covering had little effect on weeds, whereas brown, black, blue or white on black (double colour) films prevented weeds emerging (Bond and Grundy, 2001). There are additional environmental benefits if the mulch is made from recycled materials (Cooke, 1996).

Aim of this research was found favourable growing procedure of the potatoes in organic agriculture. Foil or black mulches textile reduce weed biomass, increase soil temperature and soil water content but their application in praxis is exacting.

## Materials and methods

The trial was conducted in year 2008 at Experimental station of Department of Crop Production of the Czech University of Life Science Prague-Uhříněves. The altitude of the site is 295 m a.s.l., the average of annual temperature is 8.4 °C and annual precipitation is 575 mm (detailed information Table 1). The type of soil is brown soil with high nutrient reserve. Texture class of soil is clay loam. Organic matter content is 1.74–2.12 %.

For the experiments were used black polypropylene non-woven textile and comparison with bare soil (control treatment). Two varieties of early potatoes Finka and Katka were used.

[1] Czech University of Life Science Prague, Faculty of Agrobiology, Food and Natural Resources, Department of Crop Production, Kamýcká 129, 165 21 Prague-Suchdol, Czech Republic, E-Mail dvorakp@af.czu.cz, Internet www.czu.cz

All treatments were provided in four parallel determinations. Black polypropylene non-woven textile was covered on form ridges before hand-planting. During the planting were tubers set to prepared holes in demand of spacing (450 mm x 800 mm). Tuber yield with black textile mulch was by 1.4 t/ha lower than control (bare soil).

The results from weed control showed the positive effect of black polypropylene woven mulch on weeds biomass (by 89 % lowest weight of weed biomass in comparison with control variant.

**Tab. 1: Temperature and precipitation in experimental periods and longterm average.**

| Longterm average | Month | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | I. | II. | III. | IV. | V. | VI. | VII. | VIII. | X. | XI. | XII. |
| Air Temperature (°C) | -2.1 | -0.8 | 3.4 | 8.2 | 13.4 | 16.3 | 18.2 | 17.5 | 8.6 | 3.2 | -0.5 |
| Precipitation (mm) | 28 | 27 | 31 | 46 | 65 | 74 | 74 | 72 | 41 | 34 | 34 |

## Results and discussion

Black polypropylene mulch used in potato stand did not influence soil temperature in the depth of 100 mm (Table 2). Even though in certain periods (Fig. 1) the soil temperature was lower under black polypropylene mulch in comparison with non-mulch variant (control variant).

This is confirmed by results of the Ossom and Matsenjwa (2007) with black polythene mulch, where the highest soil temperature (in the depth of 100 mm) was found in non-mulch variant and the lowest soil temperature was found in grass mulch.

Slightly higher soil temperatures (after planting) under black polypropylene mulch influenced favourably earlier potatoes stands emergence.

**Tab. 2: Average month soil temperature (°C) and soil water potential (kPa) in vegetation period 2008 Prague-Uhříněves.**

| Month | Soil Temperature (°C) | | Soil Water Potential (kPa) | |
|---|---|---|---|---|
| | Bare soil (control) | Black polypropylene woven mulch | Bare soil (control) | Black polypropylene woven mulch |
| IV. | 12.4 | 12.5 | 5.7 | 4.9 |
| V. | 15.9 | 15.6 | 25.8 | 21.4 |
| VI. | 18.2 | 18.0 | 69.3 | 66.7 |
| VII. | 19.2 | 19.3 | 44.0 | 37.5 |
| VIII. | 23.0 | 22.8 | 61.2 | 33.3 |
| Average | 17.7 | 17.6 | 41.2 | 32.8 |

The soil water potentials measured in the depth of 250 mm have been according to monthly averages always lower under the black polypropylene mulch (Table 2). Lower soil water potentials signify higher soil water content and use of black polypropylene mulch increased soil water content. Similarly as in soil temperature, also in soil water potentials, there have been periods with more significant differences among experimental variants, i.e. in the period after planting and at the end of vegetation (Fig. 2).

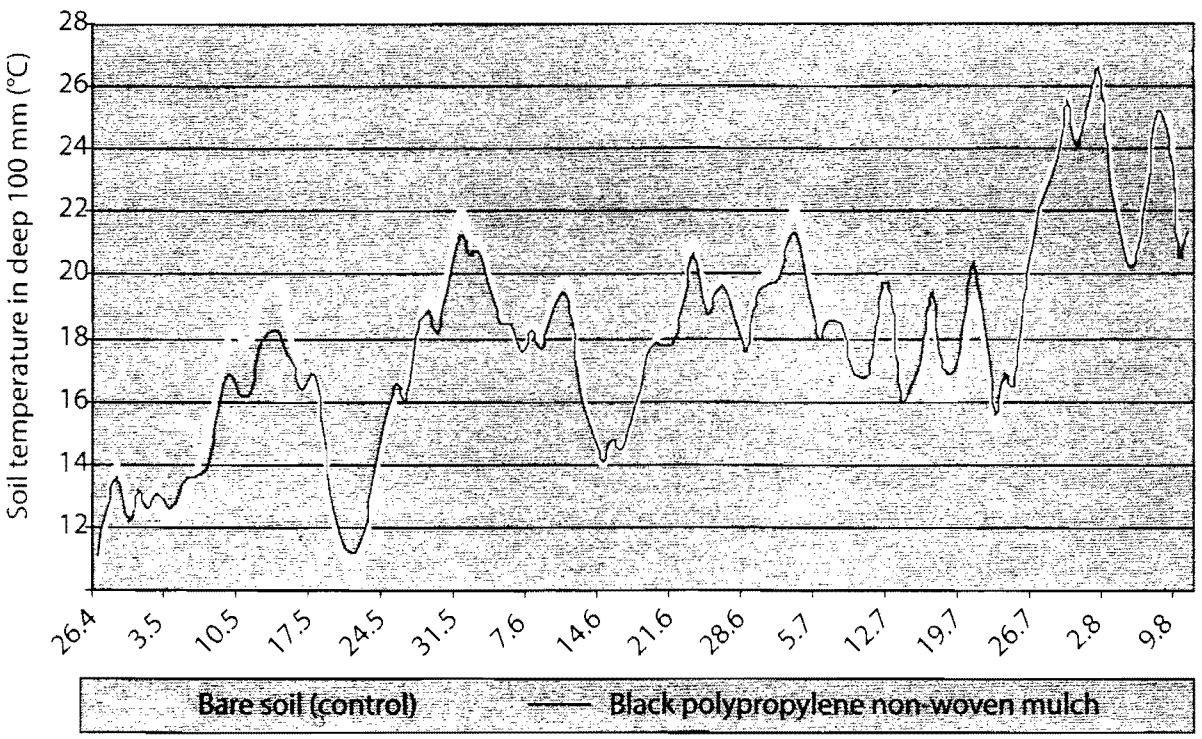


Figure 1: The course of the soil temperatures (°C) in deep 100 mm in crop of potatoes

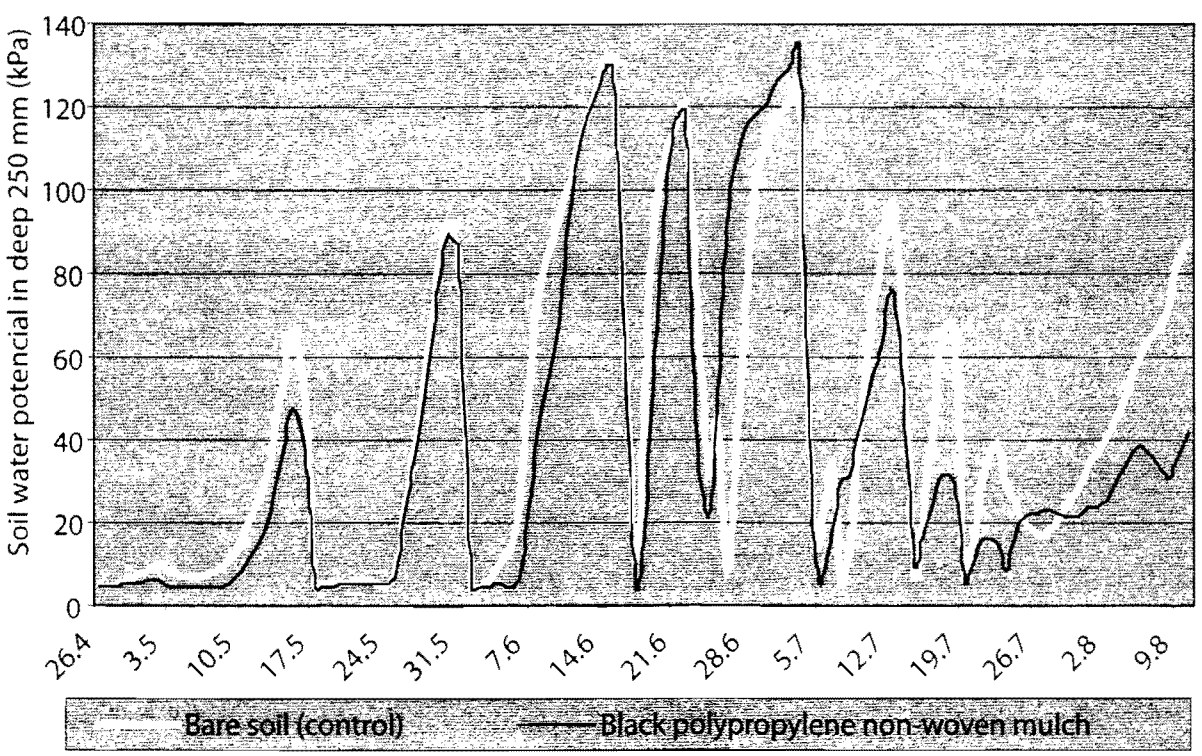


Figure 2: The course of the soil water potential (kPa) in deep 250 mm in crop of potatoes

From evaluated variants (no mulch, grass mulch, black polythene mulch, clear plastic mulch and newspaper mulch) the second lowest soil moisture was found in variant with black polythene mulch (Ossom and Matsenjwa, 2007).

Another important finding, i.e. for organic growers, is that mulch textile significantly regulates potatoes weeding. The results from weed control showed the positive effect of mulching on weeds biomass, where by 89 % lower weight of weed biomass was found in black polypropylene woven mulch in comparison with control variant (bare soil).

## Conclusions

Black textile mulch had positive effect on soil temperature (speed up emergence), soil water potential (average by 8.4 kPa lower water potential) and textile mulch thus decrease need of irrigation. Textile mulch significant ability to regulate weeding in the growing technology of potatoes. It is opens up a possibility of its wider use in the system of organic farming.

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