

Effect of different plastic mulches on yield and fruit quality of strawberry plants grown under high tunnels

Y. Medina, Y. Desjardins*, R. Harnois**, L. Gauthier*** and S. Khanizadeh****, A. Gosselin *



Introduction

The strawberry culture is one of the most widespread fruit production in the world. In Canada the culture of day neutral strawberries prolongs harvesting from July to October (Parent, 2003). Growing the day neutral strawberries on plastic mulches optimizes the culture and increases the profitability. Plastic mulches stimulate growth of young plants, increase soil temperature, reduce evapotranspiration and restrain heat loss during cold nights (Lieten, 1991). Some mulches may have a positive effect on photosynthesis (Atkinson et al., 2006), on young plant development and on early production and on fruit quality (Orzolek et al., 1993).

Objective

Determine the effects of various plastic mulches on microclimate conditions, growth, yields and fruit quality of day-neutral strawberry grown under high tunnels.

Materials and methods

1. Plant material and treatments

- Strawberry plug were planted under high tunnels constructed by Harnois(www.harnois.com) on April 15 and on April 10. The transplant was done on May 05 2006 and on May 12 2007, respectively.
- Each experimental unit consisted of 26 strawberry plants Cv Seascape.

- Six plastic mulches (www.ginegar.com): white, black, green, grey on grey, grey on black, and grey on brown under the high tunnels (www.harnois.com), were compared to an installed outdoor black mulch in 2006 and all plastic mulches in 2007. Each treatment was repeated four times.

2. Soil and air temperatures

Soil temperatures at a depth of 10 cm and air temperatures at a height of 20 cm were measured with Hobo temperature sensors.

3. Plant growth and productivity

- Fruits were harvested three times per week under high tunnels and outdoors.
- Marketable fruits were separated from the unmarketable by the presence of fungus, small fruits or physical damage. Numbers of marketable and unmarketable fruits were recorded, and yield per treatment was calculated.

- Growth was measured periodically; numbers of leaves, crowns, and runners per plant were determined. Leaves, shoots and roots were dried at 70° C for 72 h, and total shoot and root biomass were determined.

4. Fruit quality

- Strawberry fruits were crushed and the obtained juice was used to measure °Brix using a hand refractometer (Atago Co., Ltd). The lyophilized strawberries were used to measure the total phenols and the antioxidant activity by HPLC.

Data were analyzed using the ANOVA procedure of SAS (SAS Institute, 1990). Differences among means were tested by Fisher's protected least significant test using LSD (P=0.05).



Fig. 1 and 2. Plastic mulches installed in high tunnels and outdoors.



Fig. 3. Fruit production in white plastic mulch



Fig. 4. Fruit size. Fruits produced in green plastic mulch

Results

Table 1. Marketable yield and fruit size of strawberry grown under high tunnels and outdoors.

Treatments	Marketable yield (T/ha)	Fruit size (g/fruit)
High tunnels	20.3	12,4
Outdoors	14.2	8,4
t 0.05	**	**

Table 2. Trolox equivalent antioxidant capacity (TEAC) and total phenols of strawberries fruits of plants cultured in different plastic mulches.

Plastic mulches	TEAC (µg/ml equi TROLOX)	Total Phenols (mg EAG/g fresh)
Green	6.7	2.1
Grey on grey	6.5	2.8
White on black	6.7	3.2
Black	5.9	2.9
LSD 0.05	NS	NS

Table 3. Fruit sugar content of strawberries grown with different plastic mulches in high tunnels and outdoors conditions.

Plastic mulches	Environment	°Brix
Green	High tunnel	6.8
Grey on grey		6.6
White on black		6.9
Black		6.9
Green	Outdoors	6.5
Grey on grey		6.2
White on black		6.4
Black		6.3
LSD 0.05		**

Interaction Trait vs Environment NS

Conclusion

1. The best yields were obtained with the green and black on white plastic mulches.
2. The white on black plastic mulch increased the total phenols contents. (your result is higher but not significantly different) _ please remove this or use a lower confidence level e.g. P<0.1
3. High tunnels enhanced the content of sugar in the fruits. (see my above comment)
4. High tunnels prolonged the growing season of strawberry plants, increased yield and improved fruit quality.

Literature Cited

- [1] Atkinson, C.J., Dodds, P.A.A., Ford, Y.Y., Le Mièrè, J., Taylor, J.M., Blake, P.S. and Paul, N. 2006. *Annals of Botany* 97: 429-441.
- [2] Lieten, P. 1991. *Grower* 116 (25): 9-10.
- [3] Parent, S. 2003. <http://www.agrireseau.qc.ca/petitsfruits/Documents/fraise%20climat%20nordique.PDF>
- [4] Orzolek, M. D. and Murphy, J. H. 1993. *Proceedings 24th of National Agricultural Plastics Congress*. 24:157-161.

ACKNOWLEDGEMENTS

The authors thank Les Industries Harnois and Les Fraises de l'Île d'Orléans inc. for their technical and financial assistance.