

The effect of three production systems on the postharvest quality and phytochemical composition of 'Orléans' strawberry

Li Fan^{1,2}, Cui Yu³, Chengquan Fang¹, Maojun Zhang⁴, Marta Ranieri⁵, Claudine Dubé², and Shahrokh Khanizadeh²

¹Research Institute of Pomology, Chinese Academy of Agricultural Sciences, Xingcheng, Liaoning, P.R. China, 125100; ²Horticulture Research and Development Centre, Agriculture and Agri-Food Canada, 430 Gouin Boulevard, St-Jean-sur-Richelieu, Quebec, Canada, J3B 3E6; ³Industrial Crops Institute of Hubei Academy of Agricultural Sciences, Wuhan, Hubei, P.R. China, 430064; ⁴Pomology Institute, Jilin Academy of Agricultural Sciences, 303 Kemao Street, Gongzhuling, Jilin, P.R. China, 136100; ⁵Agriculture Research Council – Fruit Culture Research Unit, Forlì, Italy, 47100.

Introduction

Strawberry (*Fragaria × ananassa* Duch.) has been shown to possess high antioxidant activity positively correlated with the polyphenolic compound content.

Plasticulture offers benefits of extended season, better weed control, improved fruit cleanliness and ease of harvest.



The objective of the present study was to evaluate the effect of two selected production systems 1) plastic mulch (PM) and 2) plastic mulch with row covers (PMRC) vs the conventional matted row system (MRS) on postharvest quality, shelf life, soluble solids content (SSC), titratable acidity (TA), total phenolic content (TPC) and total antioxidant capacity (TAC) of 'Orléans' strawberry.

Materials & methods

The experiment was established under three production systems: MRS, PM and PMRC, in 2007, at Agriculture and Agri-Food Canada, L'Acadie Experimental Farm (longitude: 73° 35' W; latitude: 45° 32' N), in L'Acadie, Quebec, Canada.

Shelf life, SSC, TA, TPC and TAC were measured on strawberry fruits harvested from different treatments at three harvest times.



Results & discussion

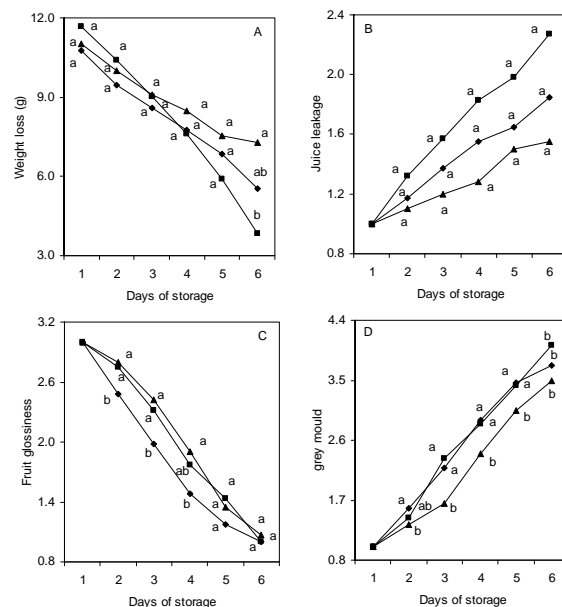


Fig. 1. The effect of PM, PMRC and MRS on fruit weight loss (A), fruit juice leakage (B), fruit glossiness (C) and incidence of grey mould (D) on 'Orléans' strawberry fruits during 6 days of storage.

Note: Each point is the average of three replicates using data from 2008 and 2009. Means with the same letter within the same day were not significantly different at 0.05 level. ◆, MRS; ■, PM; ▲, PMRC.

PMRC accelerated fruit maturity by 7 to 10 days and produced larger fruits compared to the MRS. Production systems significantly changed TPC and TAC, but the effect varied during the harvest season. Fruit weight loss, juice leakage and presence of grey mould during storage were lower and fruit glossiness was higher for those harvested under PMRC compared to those from MRS. No significant differences were observed for firmness, pH, TA and SSC between the three production systems.

Table 1. TPC and TAC of 'Orléans' strawberry fruits at early, mid and late harvests

Treatments	Early Harvest		Mid Harvest		Late Harvest	
	TPC (µg GAE g ⁻¹)	TAC (µmol g ⁻¹)	TPC (µg GAE g ⁻¹)	TAC (µmol g ⁻¹)	TPC (µg GAE g ⁻¹)	TAC (µmol g ⁻¹)
MRS	1537.9b	15.6b	1472.8b	15.0b	1378.8b	13.6c
PM	1461.0b	15.1b	1711.7ab	15.9b	1691.9a	15.5b
PMRC	1714.0a	17.1a	1873.1a	17.8a	1643.0a	16.7a
LSD _{0.05}	155.1	1.5	279.3	1.5	241.5	1.0

Note: TPC is expressed as micrograms of gallic acid equivalent (GAE) per gram of fresh-frozen weight; TAC is expressed as micromoles of Fe2SO4·7H2O equivalent per gram of fresh-frozen weight.

Conclusions

Fruit consumption is associated with a healthy diet and consumers are interested in ingesting natural health compounds, such as antioxidants. PMRC not only accelerates fruit ripening and extends the season but also ameliorates fruit quality by improving postharvest quality and nutritional value by increasing the TPC and TAC levels. Therefore, it seems that PMRC could be an alternative production system for growers, especially in cooler climates that not only allows an early income by producing off season crop but also improves the nutraceutical value of the fruits.

References

- Khanizadeh, S., Rekika, D., Ehsani-Moghaddam, B., Tsao, R., Yang, R., Charles, M. T., Sullivan, J. A., Gauthier, L., Gosselin, A. and Potel, A. M. 2009. Horticultural characteristics and chemical composition of advanced raspberry lines from Quebec and Ontario. *LWT-Food Sci. Technol.* 42: 893-898.
- Moor, U., Karp, K. and Poldma, P. 2004. Effect of mulching and fertilization on the quality of strawberries. *Agric. Food Sci.* 13: 256.
- Wang, S. Y., Zheng, W. and Galletta, G. J. 2002. Cultural system affects fruit quality and antioxidant capacity in strawberries. *J. Agric. Food Chem.* 50: 6534-6542.