Fruit quality parameters of sweet cherry cultivars produced under rain protected plastic foil and general orchard conditions

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Summary

Due to global climate warming, frequency of negative weather effects (rainfall amounts, distribution, sortness) are increasing. Rainfall amounts and frequency has also great effect of sweet cherry fruit quality around fruit ripening. Determination of optimal technological basics (such as first class fruit quality and economic value) are an important task in dynamically growing sweet cherry production. This can be solved with introduction of a new intensive training system. One of the solutions can be rain protecting foil which can reduce fruit cracking and fruit rot. Without this option sweet cherry can not be grown in many countries. In this study, fruit quality parameters were compared from a 10 year old intensive (4 x 1m) sweet cherry orchard. The effect of rain protecting foil was tested in comparison with fruits from not covered tree

INTRODUCTION

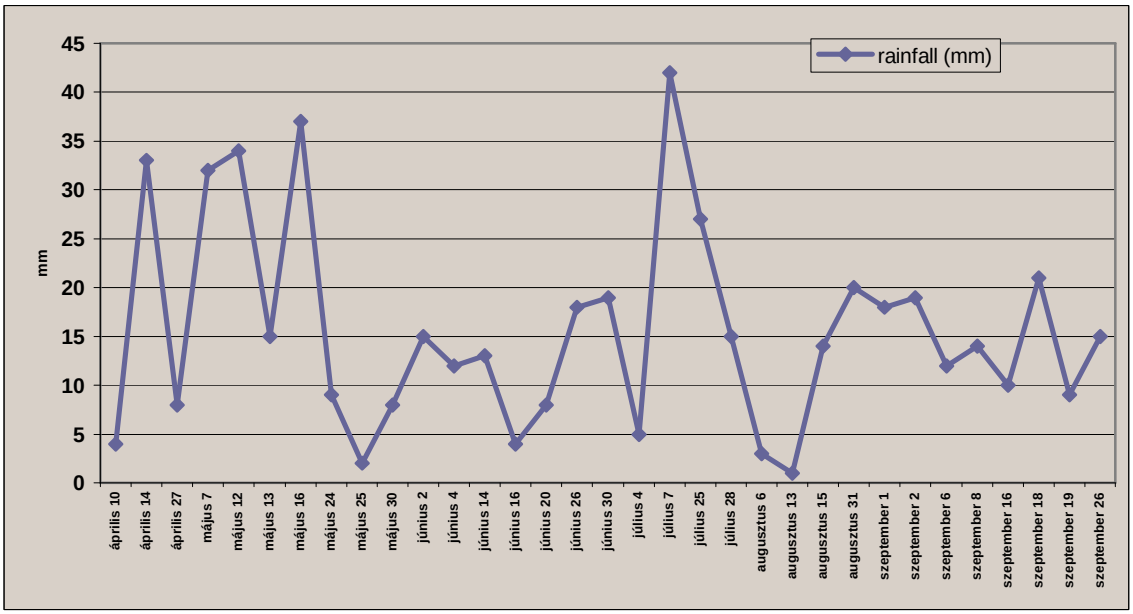
Due to global climate warming, frequency and unpredictability of negative weather effects are increasing. This jeopardizes the most the production safety so solutions against them are extremely important task. There was an extremely large amount of rainfall in the season of 2010 (516mm, between 10 April and 26 September). In addition this rainfall occurred during fruit ripening therefore fruit cracking and secondary fruit pathogens occurred on fruits. The fruit cracking sensitivity has strong relationship with brown rot susceptibility which can reduce fruit yield and quality under rainy and moist weather conditions (Holb, 2003, 2004). Horvitz et al. (2002) showed that gibbereline acid treatment can improves fruit weight, coloration, size, crisp and flesh/stone index as well as reduces the cracking tendency.
Quality of cracked fruits is not suitable even for industrial objectives.
In general, sweet cherry orchards have great value and produce large production value therefore it is worth to spend money for protecting them. We can hardly count on the favorable fruit characteristics reducing the damage caused by increasing frequency of extreme weather conditions (Soltész, 2010), therefore changing training system can be priority for the solution. This can be rain protecting for in case of sweet cherry. The foil can ensure uninterrupted fruit ripening, and we can reach quantity and quality benefit. After Soltész (1998), fruit quality influencing parameters are: outside appearance (size, shape, colour), inner content and inside morphological characteristics as well as biological and rheological characteristics. Consumers requirements are: large, crunchy, not rotting, green stem which indicated the freshness of fruit (Waterman, 2005).
Competitiveness is increased if outside appearance, inner content characteristics and other quality parameters are excellent (Thurzó, 2005).

MATERIAL AND METHODS

The study was performed In University of Debrecen, Horticultural Experimental Station, Pallag in 2010. The orchard soil was sandy soil (under 1% humus content). The orchard was established in 2000 with 4 x 1m distance with string spindle crown form. Structure of rain protecting foil was established in 2005. Parameters of foil frame were: width: 8 m, length: 20m, height: 4,5 m. The foils was put up on May 2010 and take down end of July 2010. In our case the covering was partitional only the upper part of the orchard was covered and the lateral part remained open. In this study cultivars of 'Linda', 'Axel' and 'Germersdorfi3' was examined on *Prunus mahaleb* rootstock. Objectives were to show the effect of rain protecting foil on fruit yield and quality.

Fruit size was determined through fruit diameter (x), fruit height (z) and fruit width (y) with veriner calliper (Kinex, Atest, Czech Republic). Fruit and stone weight was measured with laboratory balance (Radwag WPS 210/C/2, Random, Poland) and dry matter content and total acid content with digital refractometer (Atago, PAL series, Japan). Amount of rainfall was much larger in 2010 than previous years mean which influenced fruit cracking and brown rot susceptibility. Rainfall distribution was determined by local agrometeorological station (Figure 1.).

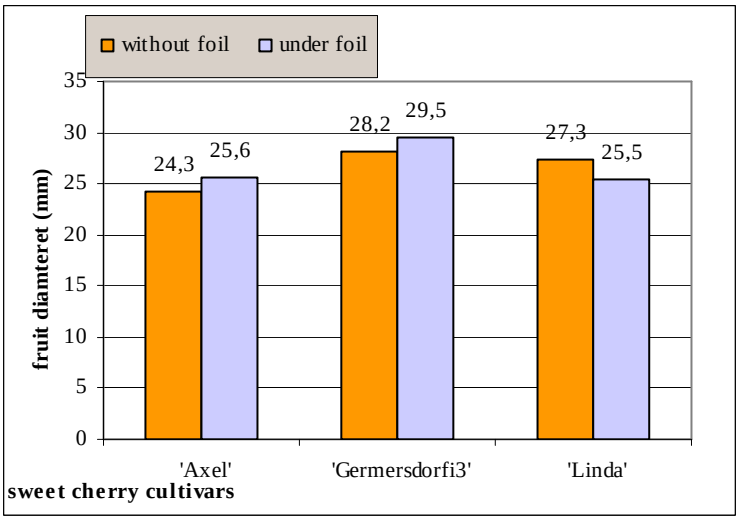
Figure 1: **Rainfall amount in 2010 (Debrecen-Pallag, 2010)**



RESULTS

Fruit diameter is one fop the most important fruit quality parameter in sweet cherry production. Larger fruit can be sell with a very good price in fruit market.

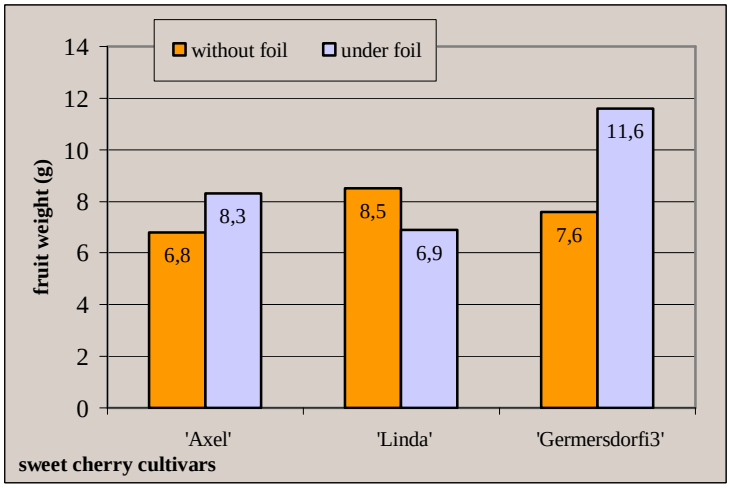
Figure 2: **Fruit diameter of sweet cherry under rain protected foil and without foil (4 x 1 m distance, Debrecen-Pallag, 2010)**



Rain protecting foil resulted in larger fruit size except for cultivar ’Linda’. In case of ’Axel’ and ’Germersdorfi’ fruit size increased with 1,3-1,3 mm under the rain protection foil compared to without the foil. This caused a 5% size difference. In case of cultivar ’Linda’ the fruit size was reduced in the rain protected trees compared to trees without foil. Tendency for fruit width and height was similar to fruit size.

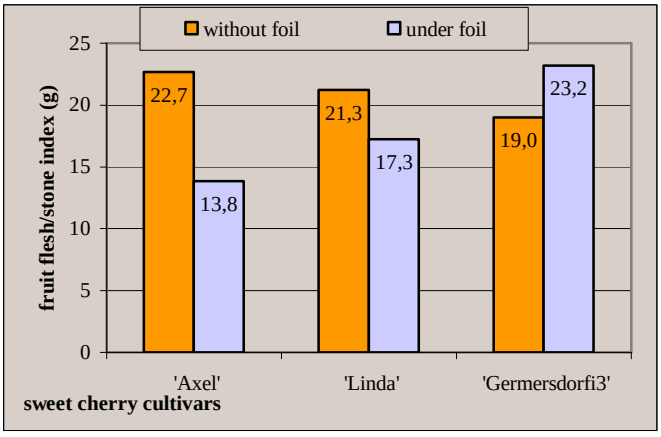
Fruit weight – similarly to size – was larger on trees protected with foil (Figure 3).

Figure 3: **Fruit weight of sweet cherry under rain protected foil and without foil (4 x 1 m distance, Debrecen-Pallag, 2010)**



Weight difference was outstanding on cultivar ’Germersdorfi3’, the difference was 52% larger on trees covered with foil. The cover of cultivar ’Axel’ resulted in 22% 52% larger on trees covered with foil. However, cultivar ’Axel’ produced larger fruit on trees without foil covering.
Fruit flesh/ stone index is shown in Figure 4.

Figure 4: **Fruit flesh/ stone index of sweet cherry under rain protected foil and without foil (4 x 1 m distance, Debrecen-Pallag, 2010)**



The most favorable parameters were on cultivar ’Axel’ without foil cover and on cultivar ’Germersdorfi3’ under foil cover. The stone seed weight was the lowest on these cultivars. As well as on these cultivars we experienced that negative effect i.e. increase of fruit size resulted in increase of stone seed index. Size of stone seed was the same for tree with foil cover and without cover.

Table 1

Total soluble dry matter (Brix %) and total acid content of sweet cherry under rain protected foil and without foil (4 x 1 m distance, Debrecen-Pallag, 2010)

Sweet cherry cultivars	Without foil	Under foil	Without foil	Under foil
	Brix %		**Total acid%**	
'Axel'	*11,8*	*16,9*	*0,25*	*0,76*
'Linda'	*12,2*	*14,4*	*0,38*	*0,57*
'Germersdorfi3'	*13,6*	*14,6*	*0,44*	*0,51*

Brix % content is larger on trees covered with foil compared to those without foil cover (table 1). Extremely large Brix % was measured on cultivar 'Axel' tree covered with foil, 43% larger total dry matter content compared to control trees.
In case of total acid, tendency was similar. Trees with foil cover showed larger values. Cultivar 'Germersdorfi3' showed 14% larger values while the largest differences (300%) was shown by cultivar 'Axel'. According to figures 4 and 5, trees with foil cover showed larger inner content values compared to control trees.
Table 2 shows tree and hectare yield results.

Table 2

Yield of sweet cherry under rain protected foil and without foil (4 x 1 m distance, Debrecen-Pallag, 2010)

Sweet cherry cultivars	Without foil	Under foil	Without foil	Under foil
	tree/kg		**t/ha**	
'Germersdorfi3'	*4,7*	*8,8*	*11,7*	*22,2*
'Linda'	*4,5*	*7,7*	*11,2*	*19,3*
'Axel'	*0,5*	*6*	*1,2*	*15,0*

Trees under foil cover shows larger yield. Cultivar 'Axel' showed very low yield on trees without foil. This was due to late ripening characteristics of cultivar (2nd decade of July). Due to rainy weather (Figure 1) brown rot incidence was large. Yield composed on hectare showed extremely large differences between foil covered and not covered trees. Under foil coverage, yield can be 70-90% more as well as inner content can be better compared to not covered tree.

CONCLUSIONS

According to our study fruit study can be different on trees with rain protecting foil compared to trees without this foil. Both fruit size and inner content parameters were larger on trees with rain protecting foil compared to trees without this. This can be explained by the microclimatic differences as well as eliminating negative environmental conditions. Fruit ripening are good in these trees as the circumstances for ripening are more favorable. Consequently, foil coverage gives stabile fruit yield and quality which results in economic value.
In addition, rain protecting foil can be solution against fruit cracking and consequent plant protection problems. Nowadays the use of rain protection foils can be additional value against extreme weather condition even if this is a spend surplus. This can be important if we know that additional 1 cm fruit size increase results in 1 euro additional fruit prize.

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