Does water stress improve fruit quality in open field grown strawberry ?

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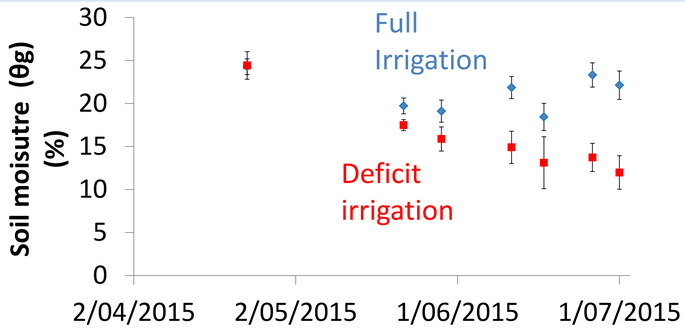
Strawberry *(Fragaria x ananassa)* yield is known to be sensitive to water stress. Even in the Belgian temperate climate irrigation is a necessity to ensure maximal yield in open field grown strawberry. Recent research, mainly in greenhouse experiments, shows how sugar/acid ratio and total soluble solids (TSS) are positively affected at a lower irrigation level (e.g. Borbonada and Terry, 2010)[1]. In 2015 and 2016 irrigation experiments were set up in two research locations in Belgium to test the effect of water stress on strawberry quality. One experiment was set up with a June-bearing variety and the other one with an everbearing variety. Two different irrigation regimes were applied in a randomized experiment with four replications.



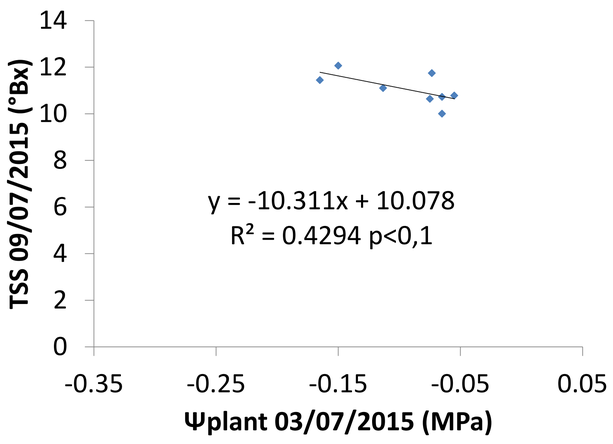
Gravimetric soil moisture measured in Meerle in 2015 Strawberry, June-bearing cv Elsanta (extended harvest), standard deviation over the four plots per treatment is indicated with the vertical bars

	Meerle (PCH)	Sint-Truiden (pcfruit)
Soil texture	Sand	Silt
Cultivar	June-bearing: Elsanta (extended harvest)	June-bearing: Elsanta Everbearing: Portola
Year	2015	2015, 2016

- Two irrigation treatments (Full irrigation irrigated according to 100% ETo and deficit irrigation receiving less than 50% of FI) monitored with soil moisture samples (θ)
- Monitoring of predawn plantwaterpotential (Ψ_{plant}) and strawberry yield and quality (TSS and fruit firmness) .

Results

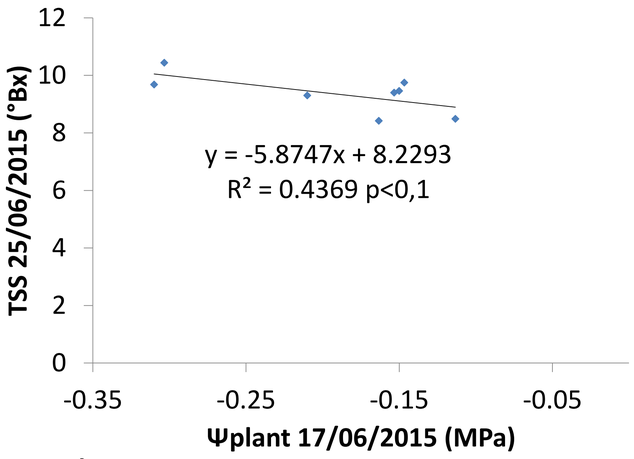
June-bearing Elsanta (extended harvest)
planted in Meerle 15/04/2015
2 harvest dates 1 time correlation ($p<0,1$) between Ψ_{plant} and TSS, no correlations with firmness

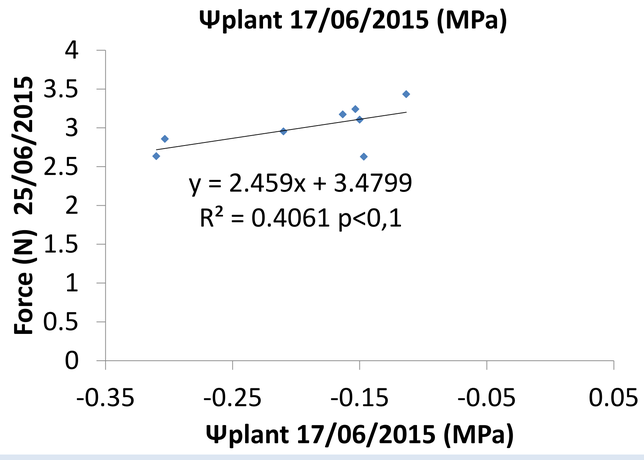


Strawberry yield	Full irrigation (kg/plant)	Deficit irrigation (kg/plant)
Sint-truiden 2015 June bearing	1.68 a	1.39 b
Meerle 2015 June Bearing	0.42	0.42
Sint-truiden 2016 everbearing	0.45	0.37

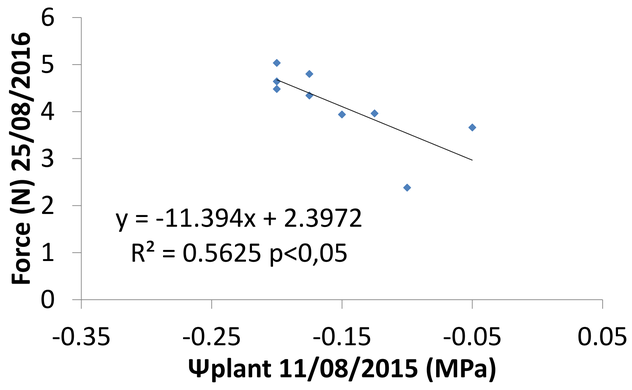
a, b denote significant difference according to p<0,05 according to ANOVA, Duncan

June-bearing Elsanta
planted in Sint-Truiden 20/08/2014
3 harvest dates 1 time correlation ($p<0,1$) between Ψ_{plant} and TSS, 2 with firmness





Everbearing Portola
Planted in Sint-Truiden 01/04/2016
4 harvest dates 1 time correlation ($p<0,05$) between Ψ_{plant} and fruit firmness, no correlation with TSS



Discussion

Strawberry is affected by water stress as shown by the relation between Ψ_{plant} and TSS and fruit firmness. Lower Ψ_{plant} was linked to higher TSS, confirming previous findings[1] in a greenhouse. The observed relationship between fruit firmness and water stress was less straightforward since relation was only observed in Sint-Truiden and not in Meerle. Furthermore relationship was positive in June-bearing Elsanta in 2016 but negative for everbearing Portola in 2016. In general relation between Ψ_{plant} and TSS, fruit firmness was weak with R^2 hardly exceeding 0.5, only on a part of the harvest dates. These findings are arguments to irrigate with care. However deliberately inducing low Ψ_{plant} by deficit irrigation poses risks since total yield can be affected, as in Sint-Truiden in 2015.

1: Bordonaba J.G. and Terry L.A. Manipulating the taste-related composition of strawberry fruits (Fragaria × ananassa) from different cultivars using deficit irrigation. Food Chemistry 122:1020-1026.

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