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Using The Soluble Solids Accumulation In Tomatoes From Fruit Setting Until Harvest For The Construction Of A Predictive Model By Hand-held NIR Spectroscopy

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Objective.
Develop a non-destructive measurement of SSC for in planta follow-up of tomato fruit during growing,

Applications.
Breeding programs,
Follow-up of fruit quality in planta under different environmental conditions,

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REFERENCE ANALYSES

NIRs & CHEMOMETRIC

Plant.
Variety: Endevour (DR)/Maxifort (DR)

Soluble solids content .
Fruit follow-up at two Seasons:
- March-May 2013 (spring)
- June-July 2013 (summer)

NIR Spectroscopy.
Phazir 10-18 (Polychromix, USA)

PLS-Regressions.
Effect of season:
            Spring
            Summer
            Spring + Summer

Effect of maturation step:
            Before maturation
            Maturation

Follow-up of tomato growth from fruit setting to harvest in greenhouse

Spectral Acquisition

+

Reference Data: SSC (%Brix)

SSC variability
{ 3.2 to 5.6 %Brix }

Chemometric analyses: PLS regression

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EFFECT OF GROWING SEASON …

EFFECT OF MATURITY…

Table. PLS parameters for SSC prediction

Season	Spring						Summer						Spring + Summer					
Subset	BM+M		BM		M		BM+M		BM		M		BM+M		BM		M	
Step	C	V	C	V	C	V	C	V	C	V	C	V	C	V	C	V	C	V
LV	9	9	6	6	5	5	7	7	8	8	6	6	10	10	6	6	8	8
R²-cal	0.8	0.7	**0.8**	**0.8**	0.5	0.2	0.5	0.4	**0.8**	**0.6**	**0.9**	**0.6**	0.6	0.5	0.6	0.5	0.9	0.7
RMSECV	0.2	0.3	0.2	0.2	0.1	0.2	0.3	0.4	0.2	0.3	0.1	0.1	0.3	0.4	0.4	0.4	0.1	0.2
RPD	2.3	1.9	2.3	2.2	1.5	1.1	1.5	1.3	2.2	1.6	2.6	1.6	1.6	1.4	1.5	1.4	2.7	1.8
RPIQ	4.5	3.0	4.4	3.2	2.3	1.6	1.9	1.6	2.9	2.0	4.4	2.8	2.4	2.2	1.9	2.0	4.4	3.1
RER	8.9	7.6	8.8	8.0	4.6	3.3	6.2	5.4	8.2	5.7	7.4	4.6	7.2	6.4	6.6	6.0	8.8	6.2
CV (%)	5.5	6.5	5.4	6.0	3.5	4.9	7.4	8.5	5.5	7.8	1.6	2.6	8.0	8.9	8.5	9.4	2.9	4.1
MIN	3.2	3.2	3.2	3.2	3.4	3.4	3.6	3.6	3.6	3.6	3.9	3.9	3.2	3.2	3.2	3.2	3.4	3.4
MAX	5.2	5.2	5.2	5.2	4.0	4.0	5.6	5.6	5.6	5.6	4.4	4.4	5.6	5.6	5.6	5.6	4.4	4.4
MEAN	4.1	4.0	4.2	4.2	3.7	3.7	4.3	4.4	4.4	4.5	4.2	4.2	4.2	4.2	4.3	4.2	3.9	3.9

EFFECT OF GROWING SEASON

EFFECT OF MATURITY

NO FIT

FIT improved
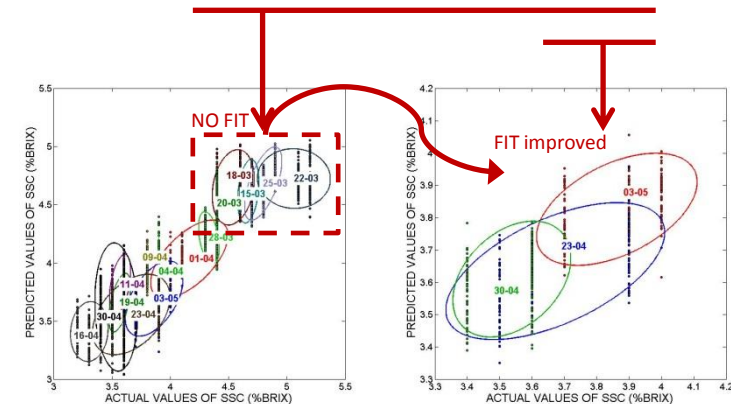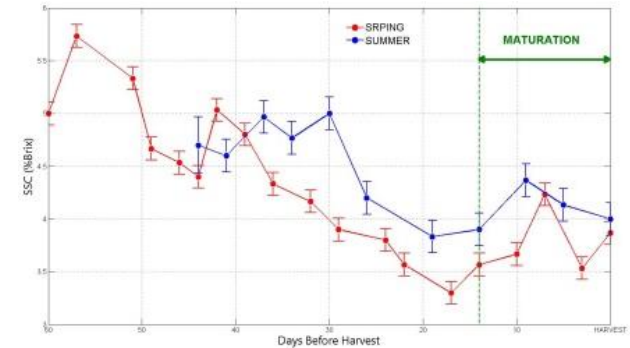
The variability inside a given tomato variety occurring during development (spring and summer) is an interesting way to develop NIR-based model for tomato fruit,

Season and level of maturity can affect the accuracy of SSC models

RMSE and R^2 indicators are correct but the ratio performance to deviation (RPD) and the ratio performance to interquartile (RPIQ) remain relatively low and must be improved,

Hand-held NIR spectroscopy is useful for on-site measurements, but the software associated with this device does not develop good chemometric models. Models presented in this poster were carried out with Matlab R2013,

Perspectives

Strengthen the firsts models developed in the present study by increasing the variability of SSC in the same tomato variety by (1) modifying the fertilization during growing or (2) using the variability occurring in tomato during post-harvest.