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Objectives

- To model MTF from ND (optical and mechanical) measurement, taking into account:
 - > The data structure of ND measurements
 - > Relationship between ND measurements and MTF

Materials

Richlady peaches from 2 seasons (2006: n= 311, 2007; n=200)

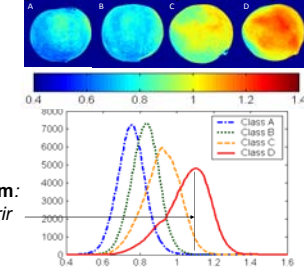


Instrumental methods

- > **Y, Destructive (D) variable to model: Magness Taylor Firmness (MTF)**
- > **X, Input non destructive (ND) variables used to model MTF:**

OPTICAL:

Fig. 680nm/800nm images and histograms



Chlorophyll related:

Spectral indexes

Ind 1, Ind 2, Ind 3, lad
(Combination of three wavelengths in the chlorophyll region)

Mode of 680nm/800nm image histogram:

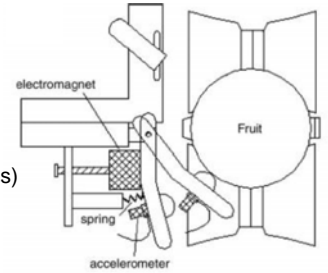
rir

Carotenoids: Icarot (Merzlyak et al. 2003)

MECHANICAL:

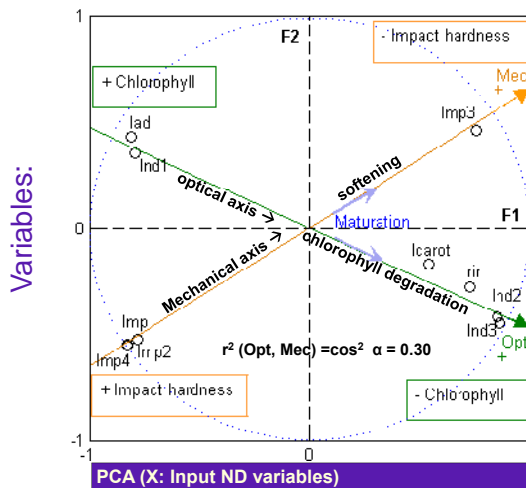
LPF low mass impact

- Imp1: Max. Acceleration (m/s²)
- Imp2: Slope (Imp1 / time)
- Imp3: Time for Max. Acceleration (μs)
- Imp4: Max. Deformation (μm)



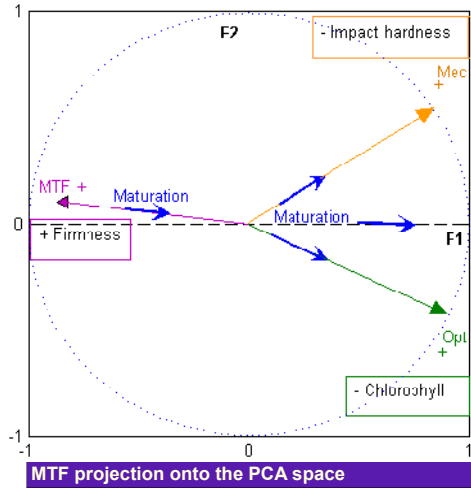
Analysis and results:

PCA and multilinear regression (MLR) is applied to handle ND measurements co-linearity:



✓PCA was performed using data from first season (n=311). The first two factors gathered 80.4% of the variance.

✓ND measurements can be summarized into two axis, optical and mechanical, 70% complementary.



✓MTF was explained on a 62% and 40% by Opt and Mec axis respectively (computed as the projection of MTF on the axis).

✓The response (MTF) is plotted between Mechanical and Optical axis → both should be preferably considered for the estimation.

Conclusions

Information about data structure was used for modeling MTF.

ND variables information was summarized in two new variables: Optical and mechanical axis.

Optical and mechanical (low mass impact) ND measurements were complementary to estimate MTF.

A model was built for MTF estimation: R² = 0.72 ; SEP = 5.73 N

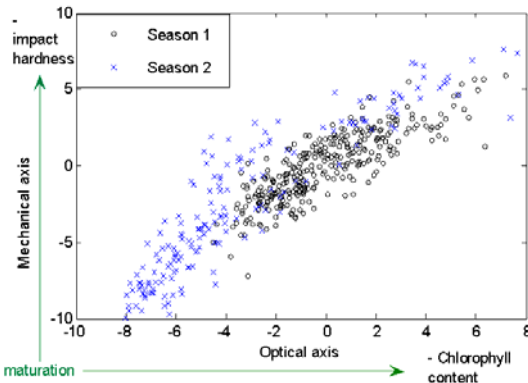
Acknowledgments

To Programa TAGRALIA; Comunidad de Madrid

To Isafruit EU project

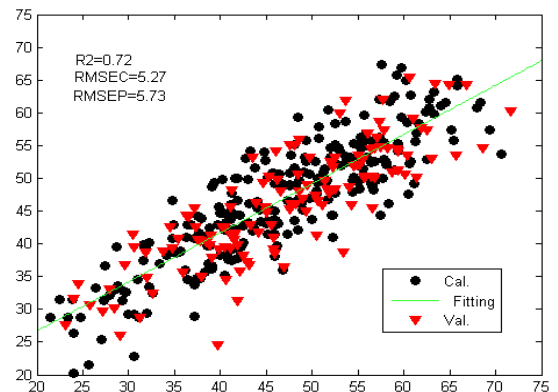
To F.Riqueme (CBAS-Csic)

Scores:



✓Heterogeneity between season 1 and season 2 datasets,

✓Both seasons were merged and then split into two sets: calibration, and validation, with similar MTF distribution.



✓MTF was modeled within commercial firmness ranges: 20N - 75N (EU regulations establish 65 N max. MTF). 120 samples from season 2 were excluded.

✓INPUT: Mechanical and optical axis:

✓R² was 0.72 and standard error of prediction 5.73 N MTF

$$A(n \times Nax) = X(n \times p) V(p \times k) U(k \times Nax)$$

Opt, Mec Data Loadings Coord. of new axes