Optimization of mango post harvest treatment using NIRS and One-class classifiers



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Problematic:

- How to face the diversity and heterogeneity of agricultural product and optimize their processing into food product?
- Can we best direct the fate of a fruit eg a mango to a consumption as fresh fruit or to processed fruit using a nondestructive measure?



Why?

- To facilitate and optimize choice of raw materials in regard to consumers.
- To help limit losses and wastes, with less rejected products (before or after processing)

Specific Objectives:

- Estimate the homogeneity of the batches at each stage of the process using the NIR spectra.
- Check that the spectral fingerprint is representative of the transformation step.
- Predict the behavior of a fruit during the process using the NIR fingerprint.



Experimental design

3 Harvests (# dates) with 36, 33 et 32 fruits. One variety one orchard

T0: Harvest

T1: (+18 days)

T2: (+22 days)





Overall observations about the # data sets



Overall observations about the # data sets



The Spectral fingerprint changes with the level of transformation

Step 1 Learning: PCA, and H² distances using batches 1 & 2 (n = 69) at + 22 Days







Batches 1 & 2, + 22days

Batch 3 (+22 days) projection Onto the B1 & B2 space. Fisher Confidence ellipse 95%

Step 2 Learning: Calibration PLS regression using Scores (3 PCs) batches 1 & 2 at Harvest







Calibration scores
Predicted scores



Step 3 Validation: Prediction batch 3, Harvest spectra





Step 4 Validation: Classification



	Hotelling limits		
IC	PC-1	PC-2	PC-3
0.10%	12.02	15.83	19.17
0.50%	8.55	11.84	14.72
1%	7.13	10.18	12.86
5%	4.04	6.46	8.62
10%	2.82	4.91	6.81
25%	1.37	2.92	4.40



Validation extern: 3 fruits # stages of maturity



Conclusion

It was possible to construct multidimensional spaces characteristic of the homogeneity of fruit's batches at different steps of the maturation process.

This approach makes it possible to envisage an early selection of the samples presenting the required quality potential (thus the physiological state) for treatment.

In other words, this method makes it possible to orient the post-harvest treatment of the fruits.

- It is a guarantee of
- Reduction of losses.
- Homogenization of the quality of fruit.
- Optimization of post harvest procedures.

Thanks for your attention