Growth and fruit quality constitution in mango

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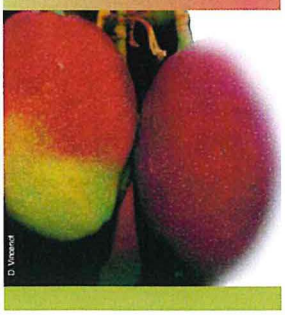


The effect of the availability of water and carbon on the physiological processes that are involved in the constitution of mango size and organoleptic quality was studied to contribute to explaining the strong variability of the quality of fruits on the same tree. Our approach (Figure 1) was aimed at:

- *analysing, under contrasted water and carbon supply conditions, the carbon and water supplies of mango that enable growth;*
- *incorporating these results in a model forecasting fruit characteristics at harvesting (fresh weight, taste quality, indicators of length of storage).*

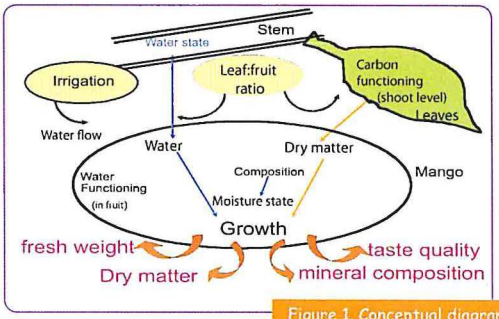


Figure 1. Conceptual diagram for analysis of the constitution of quality in mango.

Procedure

The procedure developed is aimed at incorporating in models knowledge gained from experimental work on physiological processes. The fruit-bearing shoot is chosen as the working scale as this bears the fruits and leaves in which uptake takes place. The effect of carbon availability on source-sink relations at fruit-bearing shoot level was studied experimentally and then modelled. The model incorporates the processes of photosynthesis, maintenance and growth respiration, the development of leaf and wood reserves and fruit growth.

Determination of the moisture state of mango pulp tissue and hourly variations in fruit growth made it possible to study and model the water functioning of mango by introducing variables related to elasticity and plasticity properties of the tissues. Variation laws are proposed for these variables for mango.

Results

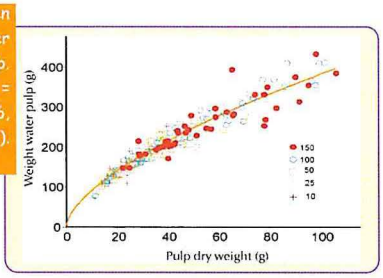
A descriptive approach was used to demonstrate a strong link between accumulation of moisture and dry matter in each part of the mango fruit (skin, pulp and seed) (Figure 2). It appeared that the pulp is the compartment that increases most with the leaf: fruit ratio. We showed that fresh weight and pulp dry mater are the main quality criteria to be influenced by the carbon supply (Table 1).

The moisture functioning model of mango shows the reversible and irreversible growth variations observed (Figure 3).

Tableau 1. Comparison of simulated and observed fresh weight and dry matter in mango.

Treatment	Fruit fresh weight (g)		Dry matter content (%)	
	observed	simulated	observed	simulated
25	373,2 ± 63,8	425,53	17,54 ± 3,62	17,1
50	436,4 ± 62,5	436,10	18,54 ± 2,21	17,47
100	587,2 ± 43,6	477,10	20,47 ± 0,83	18,38

Figure 2. Relation between the water and dry matter accumulation in mango pulp. ($Water_{pulp}$ = 20,5617.MS0,6336, R2 = 0.93; P_{value} < 0.01).



Conclusion

The models of carbon and moisture functioning were incorporated in an overall model for forecasting a quality profile; this gives fairly accurate simulation of the fresh weight (Figure 4), the dry matter content (Table 1) and the concentrations of the main biochemical compounds in the sweet and acid characters related to fruit conservation.

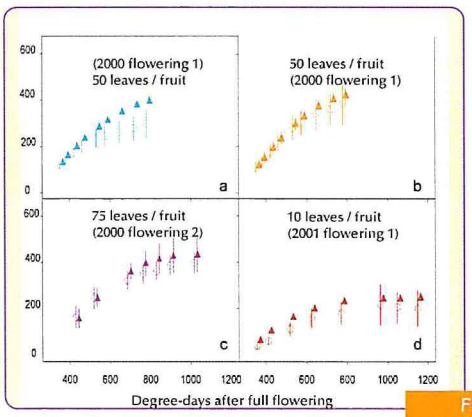


Figure 3. Simulated growth (Δ) and observed growth (○) in fresh weight of mango.

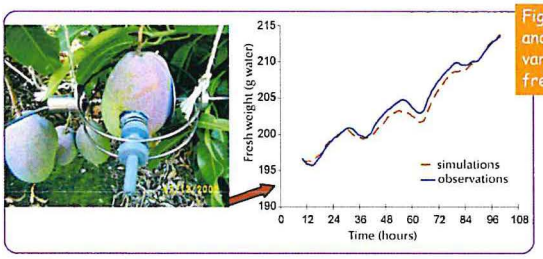


Figure 4. Simulated and observed variations in mango fresh weight.

Références

Léchaudel M. 2004. Croissance et qualité organoleptique de la mangue (*Mangifera indica*) : analyse expérimentale et modélisation de l'effet de la disponibilité hydrique et carbonée. Thèse, Institut national agronomique Paris-Grignon, Paris, France, 146 p.

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