

COLOUR AND TEXTURE EVALUATION OF WHOLE TOMATOES (*LYCOPERSICON ESCULENTUM* L.) AT DIFFERENT RIPENING STAGES

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Objectives

To define the best colour CIE Lab parameters and texture conditions to performed a Texture Profile Analysis (TPA) test, that distinguish tomatoes at different ripening stages.

Introduction

Tomatoes (*Lycopersicon esculentum* L.) are a popular and nutritious fruit that is most commonly consumed as salad, juice, soup or ketchup. From the producers and consumers point of view, colour and texture are the most important tomatoes quality attributes. Colour is the parameter that has a first impact on consumer's preference. However, the final decisive factor to purchase tomatoes is firmness. Consumers usually use finger to test tomato firmness at the time of selection. These two quality parameters are highly correlated.

Material and methods



Pink



Red

Colour

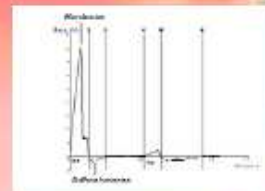
- Minolta CR-300,
- CIE Lab System, hue angle ($^{\circ}h$), total colour index (TCI, Eq.1) and colour difference with true red (DE, Eq.2)

$$TCI = 2000x \left(\frac{a^*}{L^* C^*} \right) \quad (\text{Eq.1})$$

$$DE = \sqrt{(L^* - 50)^2 + (a^* - 50)^2 + b^{*2}} \quad (\text{Eq.2})$$

Texture

- TA.HDi Texture Analyzer,
- TPA test, 50N load, constant distance of penetration (7.5 mm), cylinder probe (2 and 5 mm), deformation rate (1 and 3 mm.s⁻¹),
- Hardness, chewiness (Eq. 3), adhesiveness and cohesiveness (Eq. 4).



$$\text{Chewiness} = \text{Hardness} \times \text{cohesiveness} \times \frac{\text{Time of 4.5}}{\text{Time of 1.2}} \quad (\text{Eq.3})$$

$$\text{Cohesiveness} = \frac{\text{Area 2}}{\text{Area 1}} \quad (\text{Eq.4})$$

Results and Discussion

Colour

Colour parameters of pink and red tomatoes are shown in Table 1.

Table 1 – Colour parameters of pink and red tomatoes (mean \pm standard deviation)

	L*	a*	b*	C*	h	a*/b*	TCI	DE
Pink	48.80 \pm 2.81	1.51 \pm 0.36	18.25 \pm 1.94	19.58 \pm 3.04	85.57 \pm 9.57	0.08 \pm 0.17	0.30 \pm 0.68	61.73 \pm 5.36
Red	41.36 \pm 1.22	15.24 \pm 1.72	18.39 \pm 1.38	23.94 \pm 1.51	59.41 \pm 9.80	0.83 \pm 0.12	3.08 \pm 0.30	49.16 \pm 1.66

The colour parameters of red tomatoes revealed the higher value of a*, a*/b*, TCI and lower value of L*, h and DE, which represent an advanced ripening stage.

All colour parameters were significantly different (p<0.05) and higher correlation was found between a* and C* (r=0.94, p<0.05), while h was inversely correlated with a* (r=-0.90, p<0.05). The a*, h and TCI were the best parameters to distinguish tomatoes at different ripening stages.

Texture

Fig 1 shows tomatoes maximum force results.

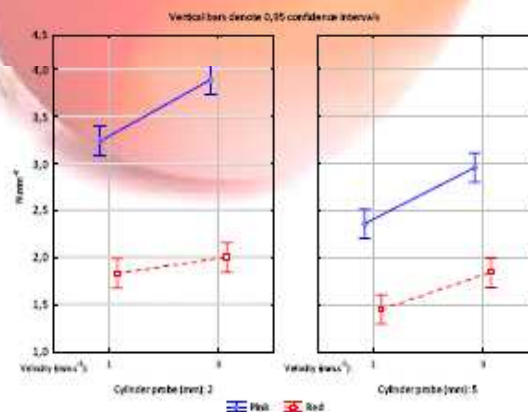


Fig 1 – Maximum force (N.mm²) of pink and red tomatoes.

The conditions selected for the evaluation of tomato texture were 2 mm – cylinder diameter probe and 3 mm.s⁻¹ – test speed. Pink tomatoes chewiness was higher than observed in red tomatoes. This fact was expected, since the energy required to masticate pink tomatoes was higher than red tomatoes (advanced ripening stage). No differences (p>0.05) were detected between adhesiveness and cohesiveness of pink and red tomatoes.

Conclusions

Colour parameters (a*, h and TCI) and texture conditions (cylinder diameter probe - 2 mm; deformation rate - 3 mm.s⁻¹) revealed to be able to discriminate tomato samples.

The results of this study can be readily applied at industrial level to separate different ripening stages of tomatoes.

Acknowledgements:

The author Joaquina Pinheiro would like to thank Fundação para a Ciência e a Tecnologia (PhD grant SFRH/BD/24913/2005).