EFFECT OF 1-MCP TREATMENT ON TOMATO PHOTOSYNTHETIC CHLOROPHYLL ACTIVITY DURING STORAGE

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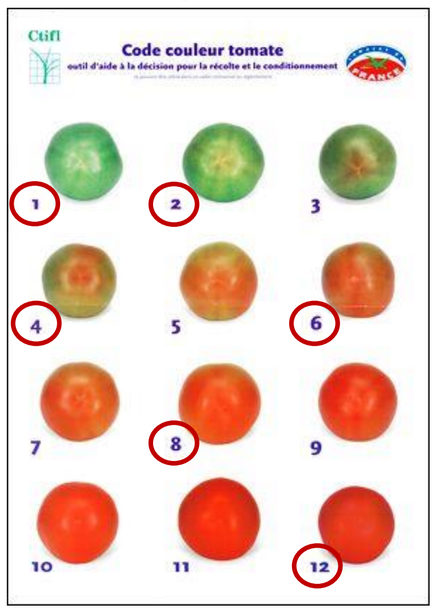
INTRODUCTION

Tomato is an important vegetable in Europe and in the whole world too. Due to the steadily growing demand for fresh tomatoes, there is a significant need to develop postharvest technologies, including anti-ripening treatments. The regulation, initiation or delay of fruit ripening usually depends on factors affecting ethylene production or action. 1-Methylcyclopropene (1-MCP) is an ethylene inhibitor that has been used to delay ripening in many fruits after harvest (Watkins, 2006). By binding to ethylene receptors, 1-MCP acts as an effective ethylene antagonist and its effects may persist for a long time (Sisler et al., 2003). Therefore, it may slow down the ripening process and fruit senescence (Sisler & Serek, 1997). According to some studies, chlorophyll fluorescence measurements can be used innovatively and at least as efficiently and reliably as tristimulus colorimetry classifying tomatoes based on maturity. Measurements were carried out by treating fresh tomatoes with 1-MCP at six different stages of ripening and studying the changes in chlorophyll content related quality during postharvest storage (two-week refrigerated storage at 15 °C followed by a two-week shelf life).

MATERIALS



Pitenza F_1 tomatoes at various stages of ripeness

Maturity status		Typical colour	Group
1	Mature green	Dark green	A
2	Breaker	Whiteish green, less than 10 % of the tomato is pink	B
4	Turning	10-30 % of the tomato surface is pink	C
6	Pink	30-60 % of the tomato surface is pink	D
8	Light red	60-90 % of the tomato surface is pink	E
12	Red	100 % of the tomato surface is red, full ripeness	F

METHODS

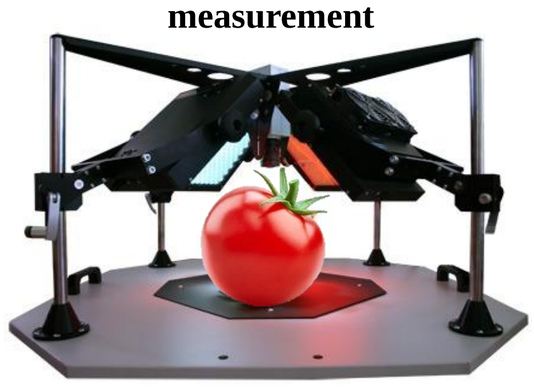
SmartFresh™, 1-MCP anti-ripening treatment

The standard for tomatoes is 12h, 15 °C, 625ppb

2 weeks cold storage at 15 °C

Chlorophyll fluorescence measurement

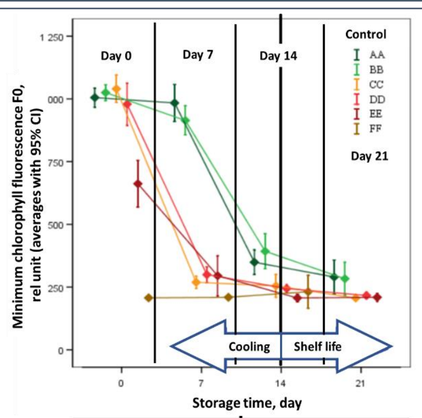
Sinteleia Vis/NIR DA-meter® (DA-index ®)

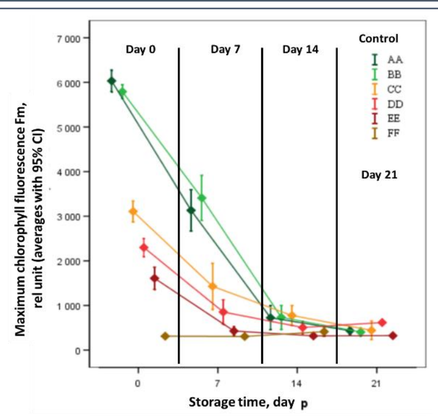


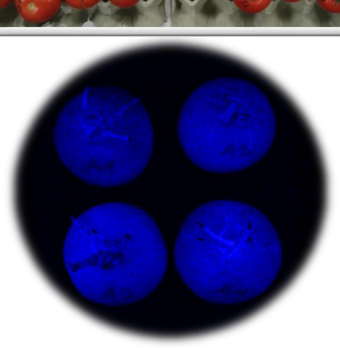
PSI Open FluorCam FC 800-O/2020 (F_0, F_m, F_v/F_m)

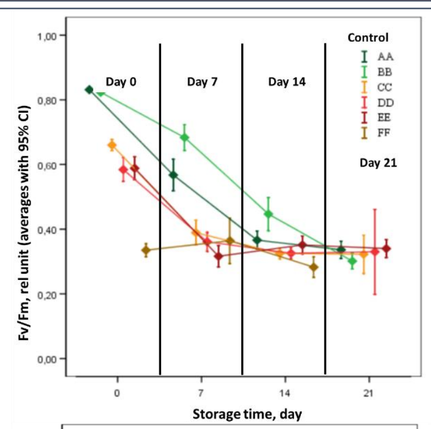
2 weeks storage at 20 °C

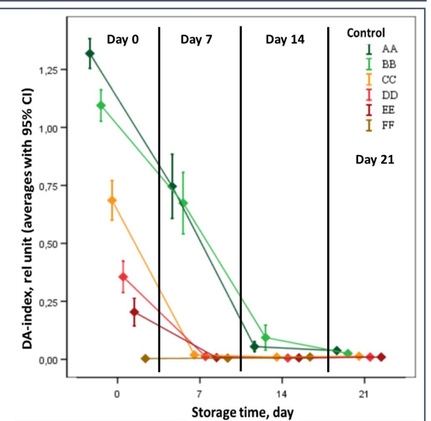
RESULTS

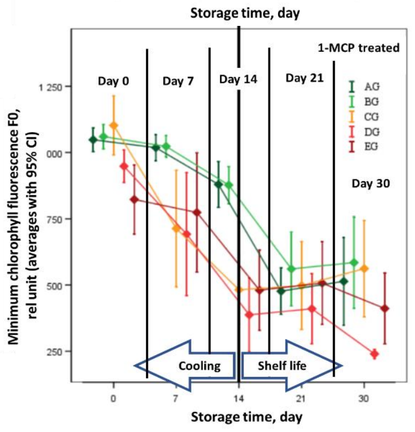


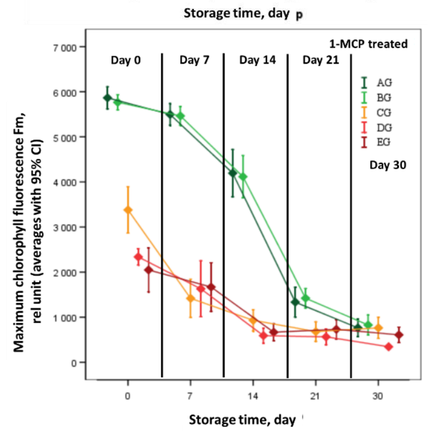


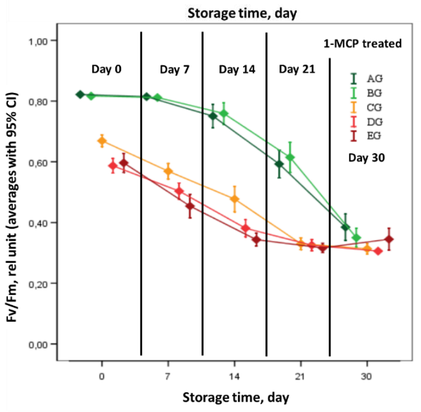


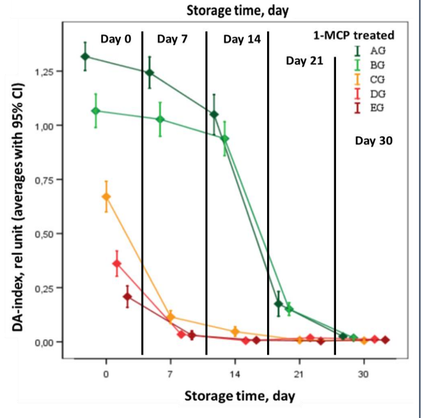












CONCLUSIONS

The chlorophyll fluorescence spectroscopy measurement method has been shown to be suitable for monitoring the postharvest ripening of tomatoes. Based on the results obtained, it was concluded that 1-MCP anti-ripening treatment had a positive effect on all stages of tomato ripening, but significantly slowing down the ripening process in the mature green (A) and breaker (B) tomatoes only, while prolonging the shelf life of the other three groups (C, D, E). While the treated samples could be tested for 30 days, the control samples were spoiled after 21 days. The results also show that the treated tomatoes were fully able to ripen after treatment. Additionally, the effectiveness of the treatment highly depends on storage temperature. A minimum degree of chilling can significantly prolong shelf life. Our results obtained with the DA-meter® also support the above findings, making this instrument suitable for monitoring the maturation process related color change.

REFERENCES

Sisler, E., & Serek, K. (1997). Inhibitors of ethylene responses in plant at the receptor level: Recent development. Physiologia Plantarum, 100, 577-582.

Sisler, E., Alwan, T., Goren, R., & Serek, M. (2003). 1-Substituted cyclopropenes: Effective blocking agents for ethylene action on plants, Plant Growth Reg., 40, 223-228.

Watkins, C. (2006). The use of 1-methylcyclopropene (1-MCP) on fruits and vegetables. Biotechnol. Adv., 24, 389–409.