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Stem End Rind Breakdown Of Citrus Fruit A New Postharvest Physiological Disorder Of Lemon Fruit In Tucuman (Argentina)

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Abstract

Lemon from packinghouses destined for exportation of the seasons 2008 to 2012 were surveyed. Fruits of lemon from Santa Lucia and Yacuchina (Monteros–Tucuman) exhibited unusual symptoms consisting in sunken brown spot around the stem of rind and later became dark during the packing process. The objective of this work was to determine the causal factor of these alterations. Affected tissue were collected and streaked onto PDA to identify possible causal pathogen agents. Meteorological data were analyzed from 2008 to 2012 of study area. No pathogen was isolated. Rain and relative humidity during the months previous to harvest (March to April) were lower, and temperature higher than the average values over the last 45 years. Based on symptoms and antecedent of other citric areas of the world a physiological disorder stem end rind breakdown of citrus (SERB) was determined. This disorder was found in thin-skinned fruit from humid, high rainfall areas and water stressed trees. Collapse of the rind tissue, and not discolored around the button (thick layer of natural wax of cuticle) were the first symptoms observed. Subsequently, the oil glands collapsed followed by a discoloration of the collapsed area. Postharvest management that reduced fruit desiccation lessens incidence and severity of SERB.

Keywords

lemon, meteorological data, physiological disorder

1. Introduction

The Province of Tucuman produces 95 % of the lemon of Argentina, being the main lemon producer and exporter on the world. In the 2012 season 1,264,000 tn were produced and 264,000 tn were exported as fresh fruit.
Physiological peel disorders reduce the shelf life and degrade the appearance of fresh citrus fruit. Most disorders do not affect the quality of edible portion of the fruit. However, cosmetic damage often reduces fresh fruit marketability and consequently motivates researchers to determine the cause of peel disorder and develop preventative strategies to reduce their severity. While the incidence of most disorders is typically low to triggering the problem, even under conductive conditions, economic losses can be substantial due to market pressure to produce defect blemish free fruit (Petracek, 2006).
Physiological peel disorders are define by multiple stress factors: nutritional imbalances, over maturation, rough handling during harvest and packing, chemical and fruit coating treatments, high or low humidity at harvest, and high or low temperature at harvest, during handling or storage.

A disease can be positively identified by isolating the causal pathogenic organism. Since much of diagnosis relies on visual inspection and knowledge of previous handling, the process of disorder diagnosis requires as much artisan experience as science.
Citrus production area of Tucuman is located between 26.8 and 28 south latitude (Palacios 2005). Its climate is characterized as sub humid – humid (Thornthwaite 1948). Soil of study area was classified as typic argiudol, coarse loam texture (Moscatelli et al 2005).
During the seasons 2008 to 2012 fruits of lemon from Santa Lucia and Yacuchina (Monteros–Tucuman) exhibited unusual symptoms consisting in sunken brown spot around the stem of rind and later became dark during the packing process, causing an important amount of fruit discarded and send to juice. The consequences were lower amount of fresh fruit exported.
The objective of this work was to determine the causal factor of this alteration.

2. Materials and methods

Lemon from packinghouses destined for exportation of the seasons 2008 to 2012 were surveyed. Affected tissue were collected and streaked onto PDA to identify possible causal pathogen agents. Fruits of Lisbon variety from Yacuchina and Santa Lucia (Monteros) were picked carefully and send to Pathology Lab. Fruit affected tissue were collected and disinfested for 20 sec with alcohol 70 % and for 1 min with sodium hypochlorite solution (5 %), rinsed three times with sterilized distilled water then streaked onto petri dishes with Potato Dextrose Agar (PDA) medium. Plates were incubated at 25 ℃ in stove, and after 7 days no pathogen was observed.
Meteorological data were obtained from Observatory of Experimental Station Famaillá of the National Institute of Agriculture (INTA). Rain was collected every day of pluviometer and temperature recoded by using a thermometer. Evapotranspiration was calculated with Penman Formula (Penman equation 1948, 1963 , Shuttleworth 1993).
Disorder diagnosis was based on visual inspection, knowledge of previous handling, and antecedent of other citric areas of the world.

3. Results and discussion

The results obtained in this work are shown in the following figures and tables:

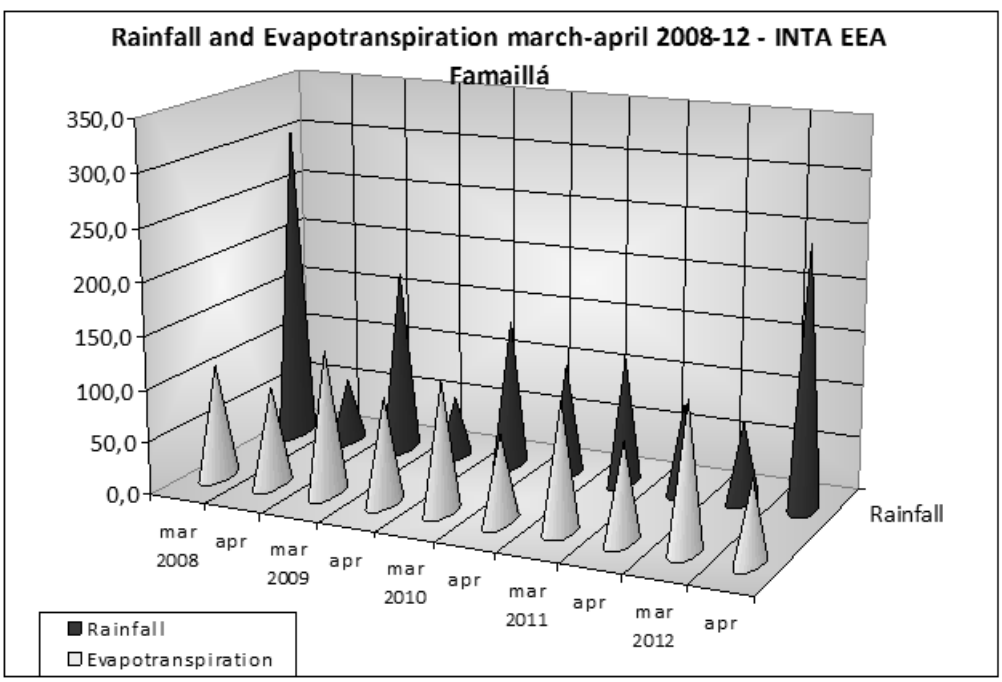

Figure 1.

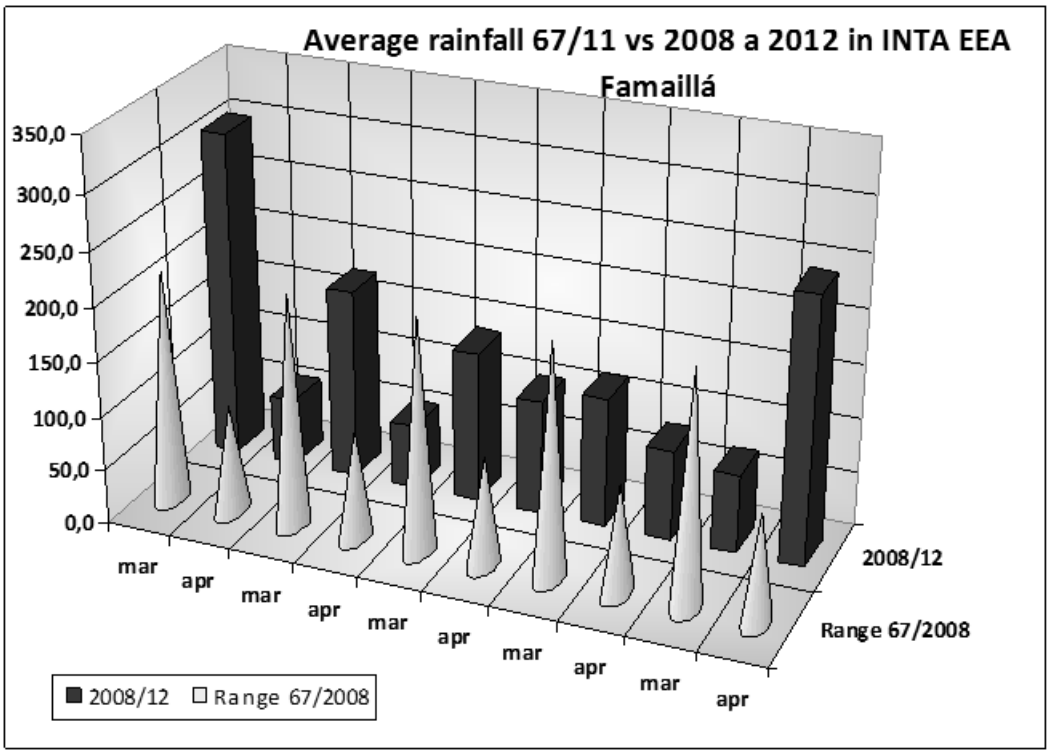

Figure 2.

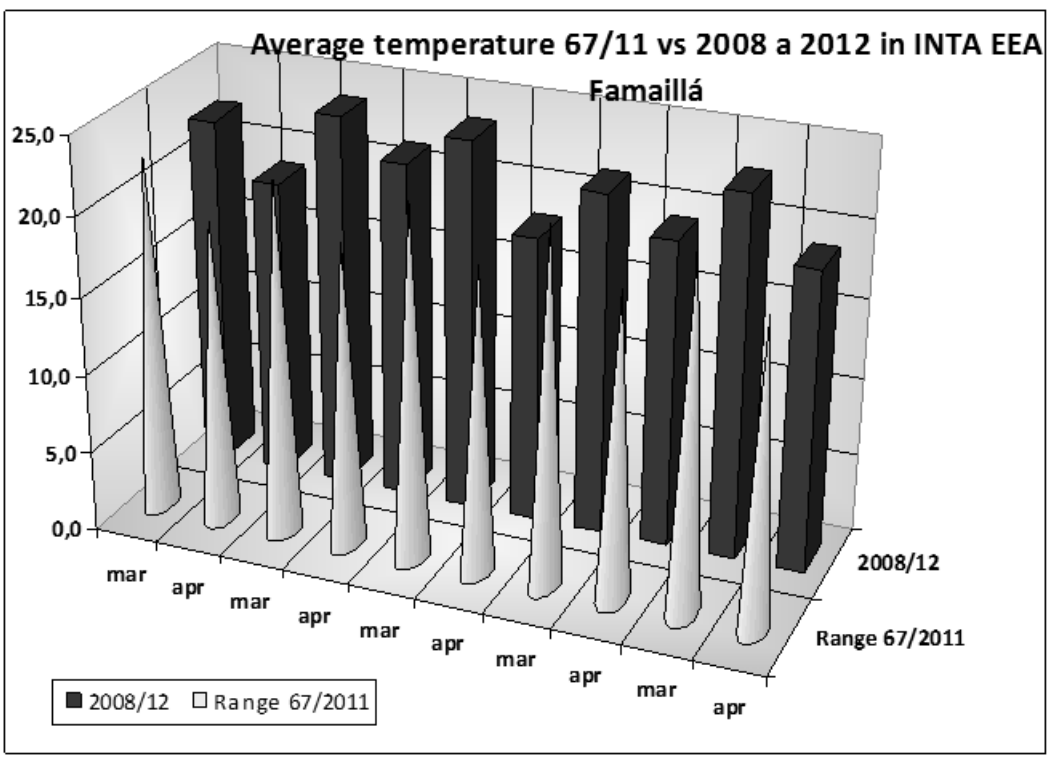

Figure 3.

Meteorological data were analyzed from 2008 to 2012 of study area. Rain and evapotranspiration during the months previous to harvest (March to April) were lower than the average (Figure 1) as well as rainfall was lower than rainfall average 67-2011 (Figure 2). The temperature was higher than the average values over the last 45 years.
Because the coarse loam soil has no capacity to accumulate water, the lemon plant presented hydric stress.
Since no pathogen was isolated, physiological disorders stem end rind breakdown of citrus (SERB) was evaluated based on symptoms and antecedent of other citric areas of the world. The disorder observed exhibited a thin-skinned fruit from humid, high rainfall area and water stressed trees. Collapse of the rind tissue, not discolored around the button (thick layer of natural wax of cuticle) were the first symptom observed. Subsequently, the oil glands collapsed followed by a discoloration of the collapsed area. Postharvest management that reduced fruit desiccation lessens incidence and severity of SERB.

Discussion

Grierson in Florida (1965) most clearly describes the symptom. This disorder is found primarily on citrus from humid high rainfall areas.

Figure 4. Stem end rind breackdown in lemmon

SERB is confined mainly oranges. Usually small oranges with thin smooth rinds are more susceptible than large oranges with thick, rough rinds. Collapse of the rind tissue around the button is the first symptom. The flavedo (exocarp) and possibly some albedo (mesocarp) tissues are affected, but the rind is not discolored and the oil glands are not affected. Subsequently the oil glands collapse and discoloration of the collapsed area follows. Severity of the breakdown varies with the orange variety, with growing conditions and from one season to another. (Eckert et al 1989).
The production lemon area of Tucuman is located between 26.8 and 28 south latitude (Palacios 2005). Its climate is characterized as subhumid – humid (Thornthwaite 1948). Soil of study area was classified as typic argiudol, coarse loam texture (Moscatelli et al 2005).
Lemon peel is smooth. Preharvest weather and cultural practices influence the fruits inherent susceptibility, postharvest conditions generally determine incidence and severity. (Eckert et al 1989).
As mentioned above, since the coarse loam soil has no capacity to accumulate water, the lemon plant presented hydric stress during study period.
This disorder was found in thin-skinned fruit from humid, high rainfall areas and water stressed trees.
These results led us to conclude that the physiological disorder determined was a stem end rind breakdown of citrus (SERB).

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