FACTORS AFFECTING FRUIT QUALITY

W. F. WARDOWSKI

INTRODUCTION

The 1988 "Factors Affecting Fruit Quality" Short Course is production oriented. Citrus fruits are affected by the growing conditions and production practices, and the effects can be seen at harvest as well as during handling, transportation and marketing of fresh fruit. Indeed, the consumer observes these effects, but rarely understands the reasons. This Short Course will bring together the best current knowledge of factors affecting fruit quality. Ten presentations follow: eight on production through harvesting, one on fruit decay and one on transportation and marketing.

There is only one reason to grow, pack and market citrus. That reason is to make money. Everyone from the grower through the marketer needs to make a reasonable profit in order to make the system function. If anyone fails to make a profit in citrus, they would be out of business and everyone from the grower through the consumer would suffer.

POSTHARVEST CONSIDERATIONS

This paper will summarize some material relating to the fresh fruit industry: life of citrus fruit, degreening, grade standards, packingline design and machinery, and evaluation of mechanical damage.

Life of Citrus Fruit

The citrus fruit is alive before and after harvest. This life is maintained or threatened by how the fruit is treated. Citrus fruit should not be thrown on the ground, walked on, subjected to hostile environments or otherwise abused. Most of the tree fruits found in the marketplace are climacteric (e.g. apple, avocado, banana, kiwifruit, mango, peach, pear) whereas a few are not (e.g. citrus, lychee, olive) [Fig. 1]. The postharvest life of climacteric and non-climacteric fruit are very different. A great deal of confusion occurs because people do not understand these differences. The rate of respiration in Fig. 1 represents the speed at which the fruit uses its stored carbohydrates (including sugars) and other organic materials. During respiration oxygen is used and carbon dioxide is released. In other words the fruit uses stored reserves after harvest. The eating quality of non-climacteric fruits never improve after harvest and modified or controlled atmosphere storage will not extend the storage life. Climacteric fruits have increased respiration rates during ripening whereas the respiration rates of non-climacteric fruits do not change after harvest.

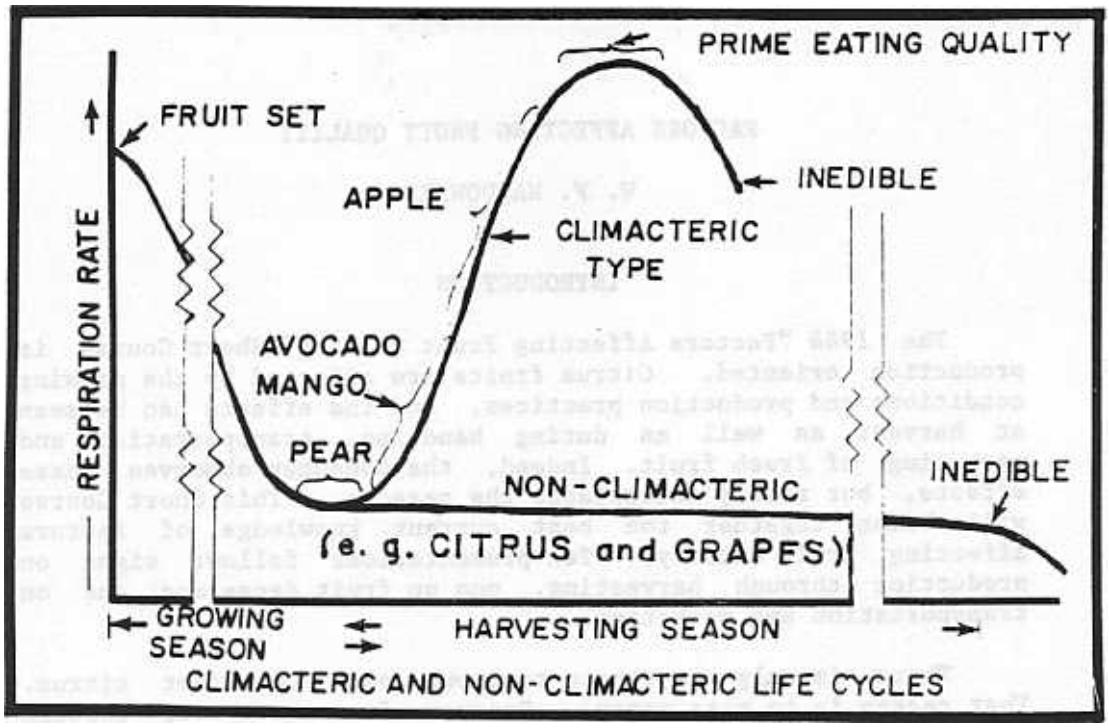

Figure 1. Climacteric and non-climacteric life cycles for fruits.

Degreening

Degreening is a process which exposes early season citrus to very low ethylene concentrations (5 ppm), a temperature of 85°F, and very high humidity (over 95%). This procedure is of little or no value to regreened fruit late in the season becuse of a different type of chlorophyll present at that time. The change in peel color from green to yellow or orange is cosmetic, but the internal quality is not affected. One of the degreening hazards is that certain types of decay are enhanced by degreening conditions.

The need for degreening is greatly influenced by climate. Citrus fruits grown in semitropical climates like Brazil, China, Florida and Mexico are very different from those grown in arid desert climates. Fruit characteristics for citrus fruits (especially grapefruit) grown in these two types of climates are shown in Fig. 2. Citrus fruits grown in the semitropics have distinct characteristics: blemished and scarred peel, fruit with a tendency for pale or green color (thus the need for degreening), thin peel, high sugar, and high juice content. There are other citrus growing climates, each producing characteristic internal and external fruit qualities. Good postharvest practices for one climate are not always the best for other climates.

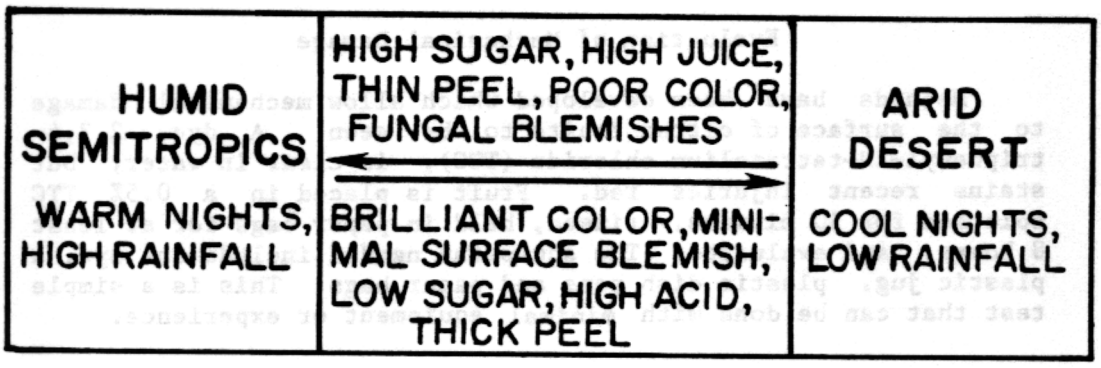

Figure 2. Effects of climatic extremes on citrus fruit quality.

Grade Standards

Internal grade standards for Florida citrus (sugar, acid, sugar/acid ratio and juice content) are among the highest in the world. That is because citrus fruit grown in our climate can meet these rigid standards. Florida external appearance standards are less rigid than for arid growing areas because our fruit has poorer color in addition to more wind scar and other blemishes than arid grown fruit. Sooty mold, the black superficial fungus on the surface of citrus fruit and leaves, deserves special attention. The amount of sooty mold varies from crop to crop and season to season, and in recent years it has been a particular problem to remove by washing. If you have groves relatively free of sooty mold or practice spray programs which reduce it, you have an advantage at the packinghouse and in the fresh fruit market. Florida will probably never produce a large volume of totally blemish-free fruit. However, if you pay close attention to the other papers in this short course, you will learn ways to help reduce grade-lowering surface blemishes. Fewer surface blemishes result in a higher fruit pack-out and more return for your fresh citrus.

Packingline Design and Machinery

Packingline machinery and processes sometimes damage citrus fruit, and sometimes the machinery and packinghouse treatments are blamed for damage caused elsewhere. Trash elimination has become a necessary part of the packingline. Fruit pickers (graders with clippers to remove stems and limbs) are found in most commercial citrus packinghouses. Sand, stems and trash are very damaging to citrus destined for the fresh fruit markets because the debris injures the fruit in ways that can cause decay in the markets. The packingline is full of hazards such as dumping, brushes, belts, turns, falls, heat, chemical applications, and tight packs. However, if citrus fruit is delivered in excellent condition, a well designed packinghouse can handle the crop with little or no damage.

Evaluation of Mechanical Damage

Methods have been developed which allow mechanical damage to the surface of citrus fruits to be seen. A dye, 2,3,4-triphenyl-2H-tetrazolium chloride (TTC), is clear in water, but stains recent injuries red. Fruit is placed in a 0.5% TTC solution for 30 minutes, rinsed, held in paper bags for at least 8 hours, and evaluated. The equipment needed include the dye, a plastic jug, plastic dish pans and paper bags. This is a simple test that can be done with minimal equipment or experience.

SUMMARY

Citrus fruits are subject to injuries and are influenced by climate and cultural practices. Further, after harvest the fruit responds differently depending on the preharvest conditions. In the case of injuries this carryover effect is obvious. The effect of climate and production practices are less apparent. The presentations during these two days will help to define and expain some of these factors. For the next two days remember that citrus fruit is alive before and after harvest. And always keep in mind the only reason to grow, pack and market citrus is to make a profit.

For more detail on factors affecting fresh fruit quality see the 1988 Proceedings of the Fresh Citrus Quality Short Course which was packer oriented, with eight presentations including harvesting and fruit decay, in addition to other important information.

REFERENCES

Kader, A. A., R. F. Kasmire, F. G. Mitchell, M. S. Reid, N. F. Sommer and J. F. Thompson. 1985. Postharvest Technology of Horticultural Crops. Univ. of Calif., Davis.

Sinclair, W. B. 1972. The Grapefruit, its Composition, Physiology and Products. Univ. of Calif., Riverside.

USDA Official Aids Handbook for Florida Citrus. 1973. The John Henry co., Lansing, Mich.

Wardowski, W. F. (ed.). 1988. Proceedings, Fresh Citrus Quality Short Course. Ft. Pierce, Fla.

Wardowski, W. F., S. Nagy and W. Grierson (eds.). 1968. Fresh Citrus Fruits. Avi. Publ. Co., Inc., Westport, Conn.