

FACTORS AFFECTING THE MARKETABILITY OF AVOCADO FRUIT

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Several years ago, Jack Shepherd gave a talk titled "The Last Thirty Inches" at the annual meeting of the California Avocado Society. The thesis of the talk was: the average person's reach is thirty inches; if that person uses these thirty inches to pick a competing fruit or vegetable off the market shelf in preference to an unattractive avocado, all of the time, effort, and money that have gone into producing the avocado and getting it onto the market shelf have been wasted.

The average consumer, trying to decide whether to buy an avocado or pass it up is influenced almost entirely by eye-appeal. Therefore, it behooves growers, packers, and retailers to put the most attractive fruit possible within reach of the potential buyer.

There are two classes of factors which affect the sale and the always-important repeat sales of avocados: external and internal factors. The former is what the consumer sees when he looks at a fruit on the market shelf. The latter is what he discovers when he prepares the fruit for use.

External Factors

Fruit size. In California and much of the rest of the United States, fruit ranging from about 8 to 12 ounces are preferred, probably as the result of long exposure to 'Fuerte' and 'Hass', and perhaps also by the fairly high unit price. In some respects, this is unfortunate, for it has tended to shut many high yielding hybrid trees with fruit of excellent quality out of commercial production because the fruit is too large according to present standards. The prejudice against large fruit does not hold in Florida, Hawaii, and countries of Latin America and the Caribbean. In fact, there it usually is the large fruit that is preferred.

Fruit shape. Probably also influenced by 'Fuerte' and 'Hass', California consumers prefer pyriform or oval fruit, as the avocado "standard" associated with high quality. As with size, shape is not considered to be important in some other regions.

Skin color. At one time, avocados with green skins were thought to be better than those with purple or blackish skins, due, largely, to the superiority of 'Fuerte' in comparison with the polyglot collection of varieties that were grown before its ascendancy. This belief has been dispelled to some extent by the rise of 'Hass', but to some persons the notion persists that to be good an avocado has to be green, especially in winter.

Skin texture. The idea that smooth skin is a sign of quality was instilled in buyers'

minds with the ascendancy of 'Fuerte'. This idea is being dissipated, however, as the merits of the rough-skinned 'Hass' are becoming recognized more and more.

Crick-side (Fig. 1). This is a fruit shape defect that is characterized by various degrees of curvature toward the stem end of the fruit which distort it from its normal shape. In severe cases the incurved region may become deeply depressed. If a black area develops in the depressed region, the fruit may drop prematurely. In other cases the fruit develops to maturity but the deformity remains, rendering it unattractive for marketing. However, palatability is not impaired.

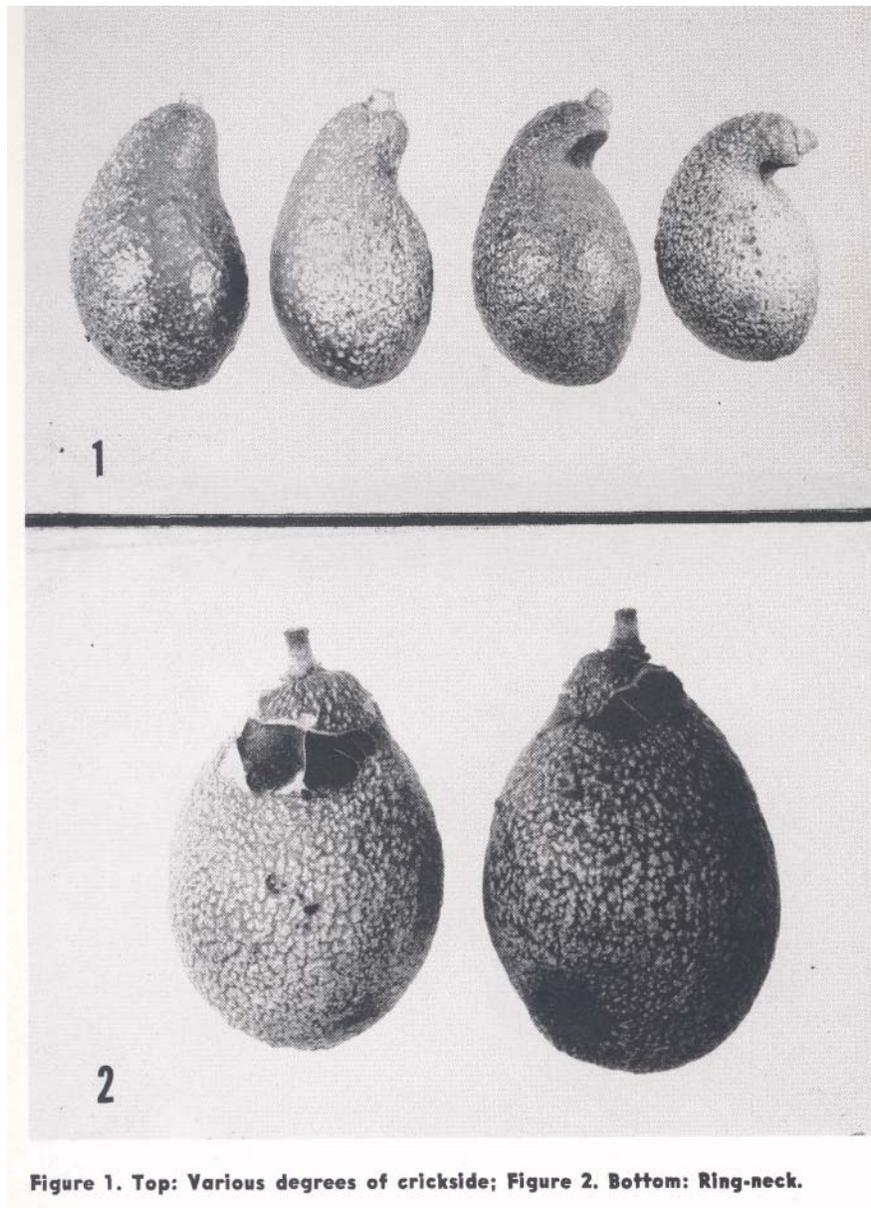


Figure 1. Top: Various degrees of crickside; Figure 2. Bottom: Ring-neck.

Crick-side is reported as having been seen mostly in trees bearing heavy loads of fruit.

However, it can also be found in trees having sparse crops. Furthermore, it may occur in any variety.

It has been suggested that crick-side may be caused by high temperatures or temporary water stress. A more plausible supposition would seem to be that it is caused by air pollution, especially the "smog" of the Los Angeles Metropolitan Basin. This hypothesis is supported by several observations: 1. Its incidence is greatest in the Los Angeles Basin. It is virtually unknown in San Diego, Ventura, Santa Barbara, San Luis Obispo, and Kern counties. 2. It has increased in severity and become more widespread since first observed, coinciding with the increase in air pollution. 3. It can be seen both in heavily loaded and sparsely loaded trees. 4. Almost invariably, incurving occurs on the side of the fruit away from the tree. This suggests a photochemical factor which inhibits growth on the exposed side whereas growth proceeds normally on the shaded side. 5. Fruits on the outer periphery of the tree exposed to bright sunlight show more distortion than those hanging in the shady portions of the tree.

Ring-neck (Fig. 2). Areas of the skin toward the stem end of the fruit dry and peel off, exposing the underlying flesh. Sometimes it may involve the pedicel. It is found only infrequently. The cause is unknown.

Sunburn (Fig. 3). This usually occurs when fruits previously pretty well shaded are exposed to full sunlight by drooping of the branches due to a heavy crop, loss of a protective branch, or the blowing off of shade-giving leaves by high winds. It appears as a darkened, sometimes sunken area on an exposed convex surface, most frequently toward the stem end of the fruit. In severe cases, the area may break down when the fruit matures or ripens.

End-spot (Fig. 4). This is a manifestation of cork formation in the areolar region around the base of the style at the apex of the fruit: It is an inherited characteristic. However, it is more expressed under certain climatic conditions. 'Zutano' and 'Bacon' as well as certain other varieties carry the genetic potentials for it. In Riverside, San Bernardino, and Los Angeles counties, climatic conditions favor its development, and it is found in various degrees on virtually every fruit from those counties. In Santa Barbara, San Luis Obispo, Kern, Tulare, and San Diego counties it seldom appears on the fruit. In ordinary cases it is evident as a rather unsightly brown spot on the fruit apex. Ordinarily, the quality of underlying flesh is not impaired. In severe cases, however, it may result in cracking of the skin and breakdown of the underlying flesh.

Lenticel corking (Fig. 5). This is usually referred to as corking or russetting. As the name implies, it is characterized by cork development in the lenticels of the skin. It may be slight and restricted to the lenticels, or it may spread and involve the entire fruit surface. Like end-spot, it is a hereditary character. Furthermore, it is expressed in the same climates as end-spot. So it may be severe in a certain variety in western Riverside County, but not appear at all in San Luis Obispo County. Ordinarily, flesh quality is not impaired.

Wind scarring (Fig. 6). This was named "carapace spot" by Prof. W. T. Home in 1929 because of its resemblance to the carapace or back of a turtle. It is an area of irregular corky growth, and is caused by the young fruit rubbing against a leaf, twig, or branch as it develops. The quality of the underlying flesh is not impaired.

Anthracnose spot. This is a brown, circular, usually somewhat shrunken spot caused by a fungus (*Colletotrichum gloeosporioides*). It spoils the flesh immediately below and around it. It is rare in California, but does sometimes appear on certain varieties when these are produced in the humid coastal districts.



Figure 3. Top left: Sunburn; Figure 4. Top right: Moderate end-spot; Figure 5. Bottom left: Lenticel corking; Figure 6. Bottom right: Wind scarring or carapace spot.

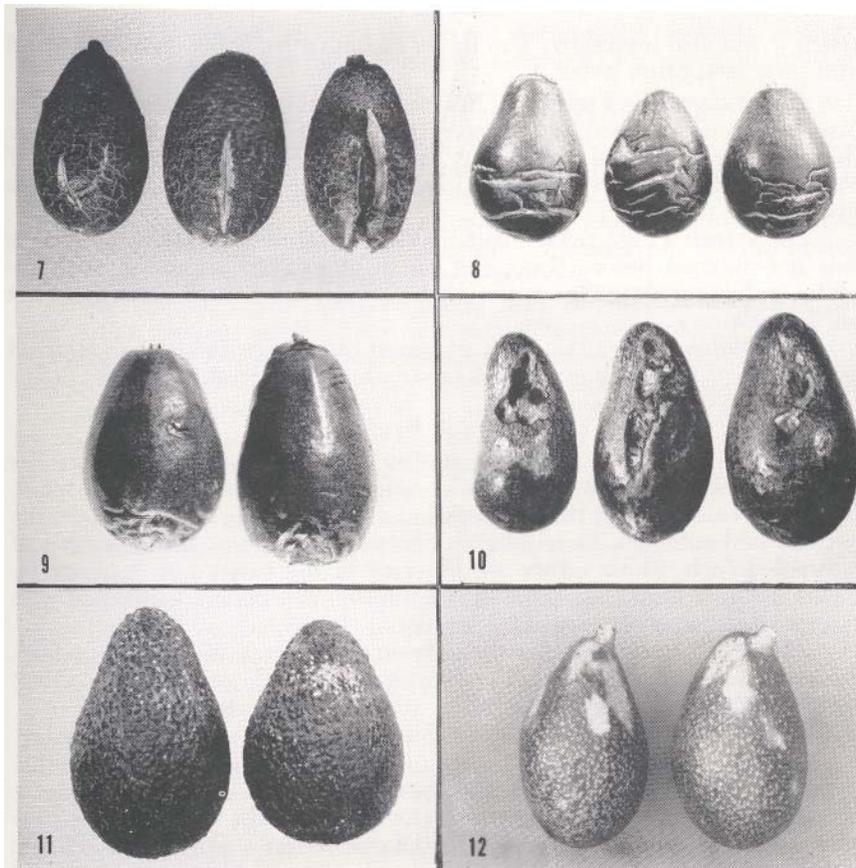


Figure 7. Top left: Split fruit with severe corking or russeting; Figure 8. Top right: Cross-checking due to over maturity; Figure 9. Center left: Blossom end breakdown due to over maturity; Figure 10. Center right: Insect damage caused by omniverous looper; Figure 11. Bottom left: Scale insects on uncleaned fruit; Figure 12. Bottom right: Sunblotch.

Split fruit (Fig. 7). The cause of fruit splitting is unknown, but a supposition is that it may be fluctuations in soil moisture available to the tree while the fruit is developing. Depending on variety, splitting may or may not be accompanied by heavy lenticel corking.

Cross-checks (Fig. 8). This is characterized by cracks running more or less horizontally around the fruit. It is an indication of the fruit's having been allowed to remain on the tree past the time of optimum maturity when it should have been picked.

End breakdown (Fig. 9). This is characterized by cracking, darkening, and deterioration of the blossom end of the fruit. It is a sign of the fruit's having been left on the tree well beyond the time when it should have been picked. The flesh of such fruits generally has a strong cheezy taste, and often is quite hard or lumpy around the region of breakdown.

Shrivelled fruit. This is an indication that the fruit was picked when it was still immature. The flavor of immature fruits usually is bland and poor, and often sweet.

Insect damage (Fig. 10). Fruit surfaces sometimes are damaged by insects, especially

when two or more fruits rest against each other. Similar damage may be caused by nibbling animals and garden snails. Damage of various kinds is caused by scale insects, thrips, spider mites, and other insects.

Dirty fruit (Fig. 11). Fruit may be unattractive simply because it was not cleaned before being put on display. Dust, cobwebs, scale insects, and other detractants should be wiped off before the fruit is set out for sale.

Sunblotch (Fig. 12). This is caused by a virus and is characterized by whitish or light yellowish sunken streaks on the fruit.

Internal Factors

The responsibility for flesh quality and other internal factors lies primarily with growers who should only use varieties of proven merit. Once the fruit is out of the grower's hands, the responsibility shifts to the packers and retailers. As will be recounted below, there are a number of internal defects which either are inherent in the variety itself or are induced by poor handling. Some of the internal defects are associated with external defects, others are not.

Since the buyer sees only the outside of the fruit, he accepts on faith the expectation that it is sound and palatable. And sound and palatable it should certainly be, for this is where repeat buying comes in.

Some of the factors relating to internal quality are as follows.

Flavor. This is the most important factor, for it more than any other is the one that determines whether or not a first-time buyer is going to become a repeater. This means that the grower must supply the packer only with cultivars of proven quality, harvested at the time of optimum maturity. Varieties that have too bland a flavor, or a bitter aftertaste, and various other odd or unpleasant flavors, should be judiciously avoided. Nor should fruits be picked prematurely, i.e. ahead of the season for best flavor, for such fruits usually are insipid.

In some respects, United States consumers are not quite so discriminating in the matter of taste as are the consumers in Hawaii, Puerto Rico, and countries of Central and South America, and the West Indies. This is because most consumers in the United States use avocados for making guacamole, in mixed fruit or vegetable salads, in seafood cocktails, and in various other ways which generally include the use of vinegar, oils, spices, and other flavors that tend to mask the full avocado flavor. In other lands the fruit is usually eaten *au natural* from the "half-shell", or with a little salt, vinegar, or lemon or lime juice.

To some extent, flavor goes hand-in-hand with oil content of the flesh, i.e. the higher the oil content the richer the flavor. But high oil content is no assurance of good flavor.

Some varieties, e.g. 'Fuerte' which has a season extending from November to June in Southern California, are quite good when the oil content reaches 8% at the beginning of the season; yet they become decidedly better as the season advances and the oil content increases to 12 or 15%, or higher. Other cultivars, e.g. 'Mayo', 'Clifton', 'Anaheim', may reach full maturity and drop from the tree without ever reaching 8% oil;

yet they may have wholly acceptable flavor.

There are several rules-of-thumb for determining avocado maturity in addition to one's knowing the variety and the season when quality may be expected to be acceptable. These are:

1. The seed coats are light to dark brown depending on variety.
2. Dark-skin varieties show some to full color.
3. Most cultivars are glossy green and slick before maturity. At maturity the color tends to become dull and the surface rougher.
4. Immature flesh usually is crisp and crackles and "breaks" when cut instead of cutting quietly and smoothly. Mature fruits tend to squeak when several are put into a box and jostled about.

Flesh texture. Most persons prefer firm, smooth, melting flesh texture. Other persons prefer the drier, nuttier texture, and still others the soft almost watery texture. To some extent, texture is a matter of the particular variety, but maturing in a wet or dry season may be a factor also.

Varieties which tend to produce stringy or discolored fibers are to be avoided. Prematurely-picked fruits often have flesh that remains rubbery in texture upon ripening.

Flesh color. Although butter-yellow flesh is most attractive, lighter and darker colors seem to have no marked effect on consumer acceptance. For instance, the pale flesh of 'Bacon' has not seemed to invoke any adverse reaction.

Seed size. Seeds should be small in relation to size of fruit. A seed ratio of 15% is good and 12% better. Although this does not seem to have become a major factor, reduced wastage can be expected to increase consumer satisfaction and repeat sales.

Seed germinating in the fruit. This is a sign of the fruit's having been left on the tree too long. The flesh surrounding roots often becomes hard and discolored.

Conclusion

Varieties that obviously have inherent defects should not be grown for the market. Defects induced by other causes often can and should be prevented.

The fruits of the important cultivars now grown commercially in California conform pretty well to the standards for attractive appearance and good internal quality. Fruits of good varieties harvested at the proper time from well-cared-for trees are quite amenable to reasonable handling. Even so, they should be handled with as much care as possible.

Ruination of perfect fruits between the time they picked from the trees and the time they are within reach of those last thirty inches is inexcusable.