California Avocado Society 1941 Yearbook 26: 64-65

The Relationship Between Ripening and Respiration of the Fuerte Avocado

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In the course of investigations conducted recently on the storage of avocados in the laboratory of the Division of Subtropical Horticulture of the University some interesting observations were made on the respiratory behavior of the fruit in relation to the softening process. Each respiration measurement involved the determination of the quantity of carbon dioxide given off by thirty avocados at the ripening temperature of approximately 60 degrees P and at the storage temperatures of 40 to 41 degrees F.

At the beginning of each experiment the fruit was horticulturally mature but of firm texture. It was found that immediately upon harvesting one pound of avocados produced as much as 30 milligrams of carbon dioxide per hour at 60 degrees F. This quantity is six to seven times higher than the amount of carbon dioxide evolved by lemons under identical conditions. It is well known, of course, that lemons have a much longer storage life than avocados. Moreover, the above mentioned rate of carbon dioxide evolution by avocados was observed only during the first few days after picking. It was followed by a continuously increasing rate until after several days a peak in respiration was reached which was two or three times higher than the initial value. After this maximum was attained a rather rapid decline in the respiratory activity ensued. As long as the quantity of carbon dioxide given off by the fruit was on the up grade the fruit was firm, but shortly after the maximum was reached the avocados became soft and entered the edible stage. The number of days elapsed between the peak in respiration and the beginning of softening was usually two or three. In all cases under investigation the maximum in carbon dioxide evolution preceded and never followed softening.

From these results it seems evident that one of the objectives in storing avocados is to postpone the rapid increase in respiration. This has been done by exposing the fruit to a storage temperature of 40 to 41 degrees F. Several tests conducted under these conditions have shown that the quantity of carbon dioxide produced at 60 degrees F was three to seven times higher than that evolved at 40 degrees F. However, as soon as the fruit was transferred from the lower to the higher temperature an immediate rise in the rate of respiration took place. In five days the maximum carbon dioxide output was reached and three days later the fruit started to soften, and shortly thereafter became edible. The storage period had a bearing on the rapidity with which the maximum was attained as can be seen from the following table.

Respiration at 60 Degrees F After Storage at 40 Degrees F

Date	Days in storage	CO_2 in mg kg. hr initial	CO_2 in mg kg. hr maximum	Days from Ini. to Max.
March 13	none	69.9	140.5	7
March 27	14	80.5	153.1	3
April 10	28	105.1	153.2	3
April 24	42	109.1	138.6	2
May 8	56	125.7	128.5	1

It can be seen clearly from this table that the longer the fruit is kept in storage the higher the respiration value when it is taken out. As a result it becomes softer sooner. Here, again, the maximum in carbon dioxide evolution preceded softening. However, no peak was observed at the storage temperature.

In addition to temperature other methods were used to prolong the storage life of the avocado. In one case the fruit was subjected to a preliminary treatment with pure carbon dioxide for forty-eight hours. The peak in respiration and onset of ripening were definitely delayed, but the final condition of the fruit was not satisfactory. Apparently, a carbon dioxide injury was produced by such treatment. On the other hand, some tests with gaseous atmospheres containing less oxygen and more carbon dioxide than air brought about a delay in the ripening process. The evidence accumulated so far is preliminary in character, but it does suggest further experimentation along this line.

—Los Angeles County Farm Bureau Monthly. Sept, 1941