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OVER-MATURITY IN HASS AVOCADOS

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Mr. George Bowker reported that near the end of the Hass avocado season in Ventura County the fruit is subject to excessive decay and rancidity. A preliminary investigation of this problem was undertaken with fruit received from Santa Paula on November 12, 1969. Fruit was also received from the 1970 crop on September 28 and on November 4.

The 1969 fruit was in three categories which were designated ripe, intermediate, and green. There were 16 ripe fruit from Gooding Ranch (31-3206), J. L. Webster (32-9274) and Wolffers (39-9512); 24 intermediate fruit from Maraucher (39.—); 24 green fruit from Maraucher (39—.). The fruit was noted as being taken from field boxes as received at the packing house with a date of October 24, 1969, presumably indicating the date of selecting the ripe fruit. Inadvertent shifting of some of the ripe fruit in the tray made it necessary to consider this category as a single sample without distinction of orchard.

Tests made

Respiration measurements were made on 12 individual fruits: 4 each of ripe, intermediate, and green. After the respiration measurements were completed, oil contents were determined. Comparable fruits were analyzed for oil at the time of receipt. A test for volatile substances producing off-flavors was also tried.

Tests of the 1970 fruits included moisture content and pH of the edible portion of the fruit, but did not include respiration measurements.

Results

The respiration measurements of the 1969 fruits revealed normal responses in that the ripe category showed a typical post-climacteric decline. The intermediate group passed through a peak respiratory-rate after 80 hours. In the green category the fruits varied in the time of maximum respiration. One fruit reached the peak after 5 days, another after 6 days and the 2 others had not reached the peak after 7 days when the measurements were terminated.

The oil contents are shown in Table 1, together with information about the presence of off-flavors. It may be seen that the oil content ranged from a low of 16.7 percent to a high of 39.8 percent. This wide range in oil content indicates that the degree of over-maturity cannot be determined from oil content alone. Probably the fruits with off-flavors were the most seriously over-mature regardless of oil content.

Attempts to detect volatile substances which might impart off-flavors to the fruits were

made by freezing out constituents from the air passing over the fruits as they respired in closed containers. Aliquots obtained from the freeze trap were passed through a gas chromatography, but nothing was detected by this procedure.

While the 1969 sample showed that approximately half of the fruits which were ripened and could be tasted had off-flavors, the fruit harvested on September 22, 1970 had only 2 out of 22 fruits with any noticeable off-flavor (Table 2). The taste of the 1970 fruit was generally very good.

Because the sampling was earlier in the season in 1970 it was thought that possibly more off-flavor would develop in any fruits left on the trees for a longer time. Thus, a second sample of avocados was obtained on November 4, 1970 (Table 3). There were 24 avocados in the latter sample and when they were ripened it was found that all had a very good flavor and none was off-flavor. However, 4 of the fruits showed darkening of the vascular strands near the stem end. This darkening of the vascular tissue was an indication that the fruit was in an early stage of decay.

Conclusions

On the basis of a very limited data obtained from the Hass avocados grown in Ventura County and harvested late in the season (October and November) it appears that over-maturity as indicated by off-flavors and decay is not associated with an excessive oil content nor is it consistent in time of appearance each season. Volatile flavor factors were not found in the fruits with off-flavors, so no test could be developed on this basis.

It would appear that the most effective means of avoiding losses of Hass avocados due to off-flavors and decay late in the season would be to keep accurate records of the appearance of these troubles so as to anticipate the probability of their appearing on a given date. Further, it should be expected that over-maturity would tend to develop consistently in some orchards or districts before it would in others. (Slightly earlier harvesting would reduce the probability of losses and would improve consumer confidence in the fruit.)

TABLE 1. OIL CONTENTS AND PRESENCE OF OFF-FLAVORS IN HASS AVOCADOS RECEIVED ON NOVEMBER 12, 1969, FROM VENTURA COUNTY

	Category of fruit when received					
	Intermediate		*Ripe*		*Green*	
Date of Analysis	*Oil, %*	*Off-Flavor*	*Oil, %*	*Off-Flavor*	*Oil, %*	*Off-Flavor*
November 12, 1969	28.2	no	31.2		24.5	
November 12, 1969	30.1	no	23.0		18.8	
November 12, 1969	21.7	yes	24.5	yes	29.0	
November 12, 1969	25.2	yes	34.0		17.7	
November 19, 1969	25.8	yes	29.2	no	18.9	yes
November 19, 1969	20.9	yes	22.6	no	25.1	yes
November 19, 1969	39.8	yes	31.1	no	17.0	no
November 19, 1969	23.7	yes	33.3	no	16.7	no

TABLE 2. QUALITY OF HASS AVOCADOS FROM VENTURA COUNTY, HARVESTED SEPTEMBER 22, 1970

District	*Color*	*Weight, g.*	*Date ripe*	*Taste*	*Moisture, %*	*pH of slurry*	*Oil %*
30	black	289	Oct. 8	very good	56.9	6.66	29.5
30	black	272	Oct. 8	very good	63.9	6.71	24.7
30	black	276	Oct. 8	very good	65.6	6.68	22.6
30	intermediate	301	Oct. 9	OK-sweet	66.7	6.61	23.2
30	intermediate	262	Oct. 9	OK-sweet	62.3	6.85	28.5
30	intermedaite	306	Oct. 9	slight off-flavor	66.5	6.80	20.3
30	green	301	Oct. 9	OK	71.2	6.48	21.3
30	green	234	Oct. 9	OK-sweet	66.1	6.58	24.3
30	green	249	Oct. 9	OK-sweet	67.9	6.71	20.0
31	black	236	Oct. 8	very good	63.4	6.64	25.6
31	black	227	Oct. 8	very good	62.0	6.77	28.2
31	black	265	Oct. 8	very good	62.3	6.70	24.6
31	intermediate	300	Oct. 8	very good	61.5	6.61	28.5
31	intermediate	287	Oct. 8	very good	69.6	6.70	20.6
31	intermediate	317	Oct. 8	very good	65.1	6.72	23.5
31	green	290	Oct. 9	off-flavor	67.0	6.68	22.3
31	green	274	Oct. 9	OK	66.1	6.56	23.8
31	green	322	Oct. 9	OK	65.1	6.71	21.7
32	black	241	Oct. 6	OK	67.5	6.65	19.0
32	black	345	Oct. 6	OK	70.0	6.80	20.0
32	black	258	Oct. 6	slightly flat	70.6	6.73	21.8
32	intermediate	261	Oct. 7	very good	76.4	6.79	12.7
32	intermediate	278	Oct. 7	very good	68.6	6.79	24.1
32	intermediate	258	Oct. 7	very good	64.5	6.78	26.7
32	green	357	Oct. 7	very good	67.5	6.61	30.7
32	green	246	Oct. 7	very good	67.8	6.72	24.7
32	green	287	Oct. 7	very good	68.9	6.61	22.9
39	black	296	Oct. 6	OK-sweet	66.9	6.69	23.5
39	black	258	Oct. 6	OK-sweet	67.0	6.79	23.0
39	black	347	Oct. 6	OK-sweet	63.0	6.82	25.8
39	intermediate	258	Oct. 7	very good	62.7	6.70	20.5
39	intermediate	247	Oct. 7	very good	67.6	6.73	20.2
39	intermediate	251	Oct. 7	very good	66.9	6.71	24.3
39	green	255	Oct. 7	very good	67.2	6.58	23.2
39	green	310	Oct. 7	very good	62.9	6.60	28.1
39	green	351	Oct. 7	very good	59.2	6.70	31.4

TABLE 3. QUALITY OF HASS AVOCADOS FROM VENTURA COUNTY RECEIVED NOVEMBER 4, 1970

Weight, g.	*Date Ripe*	*Darkened Vascular Tissue*	*Moisture, %*	*pH of Slurry*	*Oil, %*
200	Nov. 13		62.5		26.6
197	Nov. 13		61.3		31.2
227	Nov. 16		59.1	6.59	27.3
228	Nov. 16		64.2	6.62	25.3
277	Nov. 16		54.8	6.60	30.6
262	Nov. 16		59.6	6.69	30.6
230	Nov. 16		66.0	6.68	22.7
218	Nov. 16		60.4	6.50	26.5
217	Nov. 17	Yes	60.9	6.62	26.0
257	Nov. 17	Yes	61.9	6.70	28.2
224	Nov. 17		54.9	6.51	36.7
230	Nov. 17		65.2	6.72	27.4
290	Nov. 17		61.5	6.52	25.6
251	Nov. 18		56.7	6.68	28.5
204	Nov. 18		60.5	6.68	27.6
202	Nov. 18		56.2	6.61	27.7
229	Nov. 18		63.6	6.71	29.0
247	Nov. 18	Yes	56.8	6.64	34.4
243	Nov. 18	Yes	61.2	6.66	32.6
196	Nov. 19		63.4	6.67	27.9
242	Nov. 19		60.3	6.51	29.7
209	Nov. 19		63.5	6.63	27.2
237	Nov. 19		59.4	6.57	29.4
227	Nov. 19		60.0	6.45	34.1