OREGON AGRICULTURAL COLLEGE
EXPERIMENT STATION

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Circular of Information 13. May, 1927

THE DETERMINATION OF MATURITY IN SWEET CHERRIES

by

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Even though considerable improvement has been made in harvesting methods, sweet cherries are still being picked at widely varying stages of ripeness. This results in lack of standardization in the product, and in many cases, is responsible for decreased tonnage, or impaired keeping quality.

When left to their own discretion, growers have generally determined time of picking in sweet cherries by the aid of such factors as size, color, and sweetness. It is generally admitted, however, that these are not reliable guides of maturity. No definite valuation can be placed upon them, and they are capable of various interpretations, with the result that the human element enters in, and that controversies arise. There is need, therefore, for a test of maturity for sweet cherries that will indicate rather definitely the degree of ripeness attained, and that can be easily and quickly applied.

- Scope of Work -

Studies relating to the harvesting and handling of sweet cherries were undertaken by the Oregon Experiment Station in 1924, and have now been carried through three seasons. At the end of the first season a preliminary report was issued as Oregon Station Circular No. 61. The present paper deals only with such phases of the work as relate to maturity and the determination of time of picking.

- Pressure Test Not Adapted -

Softening during the ripening period is a characteristic of many fruits. In the case of plums and pears, for example, a decrease in firmness varying between one and three percent occurs every 24 hours, over a period of several weeks before picking time. Experimental work and practical experience show that firmness is closely associated with the ripening process, and that maturity can usually be ascertained by means of pressure testers which record the degree of softness attained. The present studies have shown, however, that the changes of firmness in sweet cherries are less striking than those manifested by other fruits, and are probably not sufficiently indicative to form the basis of a test of maturity.

- Acid Test Ineffective -

The reason given for the failure of the pressure test, in the case of sweet cherries, applies with equal force to the acid test. While a considerable decrease in acidity occurs during the ripening season as a whole, the reduction that takes place from day to day is probably too small to be of value in determining time of picking.

- The Sugar Test -

Of the many probable tests of maturity considered, none have proved to be equal to the sugar or specific gravity test. This test, while not ideal in all respects, appears to be fairly reliable, and affords a basis for a higher degree of standardization than now obtains in the harvesting and handling of sweet cherries.

The sugar test is simple in principle, and is not difficult to apply under field conditions. The test is based upon the fact that during the growth and ripening of sweet cherries, there is an increase in sugar and other soluble solids. This increase is rather definitely related to maturity and quality, and can be measured fairly accurately by floating a Balling or Brix hydrometer (saccharimeter) in a small quantity of raw juice extracted from a representative sample of fruit.

Increase in Sugar. - The increase in sugar and other soluble solids is pronounced, and consistent throughout the ripening period. In 1925, for example, Royal Ann cherries from a certain orchard in the Willamette Valley, showed an increase in soluble solids from 12.2 percent on June 16, to 24.1 percent on July 9. Lambert, during the same season, showed an increase from 11.3 percent to 22.2 percent between June 24 and July 22. In 1926, Royal Ann showed an increase from 14.5 percent on June 7 to 25.9 percent on June 25. The results obtained in the course of these experiments show quite clearly that the increase in sugar occurs not only at the beginning of the ripening period, but continues at a fairly uniform rate, even to the time when the fruit is past prime condition. Comparison of the figures of one season against another shows that the sugars go through about the same range of increase each year.

Selection of Samples. - Obviously, the selection of samples for the sugar test depends somewhat upon the object in view. When it is desired to ascertain merely the average maturity, the sample chosen should be a cross-section of the whole, including specimens in as many stages of maturity as the lot contains. When it is desired to ascertain the range of maturity presented by a given lot, two samples should be selected, one representing the greenest fruit - the other the ripest fruit. The amount of fruit required for a test depends largely upon the size of the hydrometer and cylinder used. For the smaller hydrometers, about one-half pound of fruit is sufficient for each determination; average-sized hydrometers require about one pound of fruit.

should be disregarded. Raw cherry juice soon becomes thick and coagulated, and for that reason the test should be made as soon after extraction as possible.

Temperature Correction. - With increases of temperature, sugar solutions expand in volume, and the specific gravity becomes correspondingly less. This being true, the temperature of the solution affects somewhat the hydrometer readings. Hydrometers are usually standardized at a given temperature, and unless the solution to be tested be of this temperature, a correction must be made. Table I gives the temperature corrections for hydrometers standardized at 60 degrees Fahrenheit. It will be noted from this table that when the temperature of the solution is below 60° F., the correction must be subtracted from the observed hydrometer reading, but that when the temperature of the solution is above 60° F. the correction must be added to the hydrometer reading. Suppose, for example, that the hydrometer reading is 18.4 percent, and that the temperature of the solution is 50°F. The correction, according to the table, is .26, and must be subtracted from 18.4 percent. The corrected reading, then, is 18.4 - .26, or 18.14 percent. On the other hand, suppose that the hydrometer reading is 18.4 percent, and that the temperature of the solution is 70°F. According to the table the correction is .32, and must be added to 18.4 percent. The correct reading, then, is 18.4 plus .32 or 18.72 percent.

Although hydrometers are standardized at various temperatures, it is suggested that for work with cherries, a hydrometer standardized at 60°F. be secured. With this instrument, a common Fahrenheit thermometer can be used to ascertain the temperature of the juice.

It is not advisable to attempt temperature correction by changing the temperature of the juice itself. Slight changes in the temperature of extracted cherry juice often cause it to thicken or become coagulated.

Picking Standards. - During the seasons of 1924, 1925, and 1926, the Oregon Experiment Station made several hundred hydrometer determinations with the idea of correlating the sugar test with quality and maturity. These were made with fruit of the leading commercial varieties grown at The Dalles, Hood River, and in the Willamette Valley. While the results obtained may not settle for all time the matter of picking standards, it is thought that they offer at least a tentative basis for the use of the sugar test.

Bing, Lambert and Royal Ann are usually fairly well sized, and well flavored when the hydrometer reading is 20 per cent. With 20 percent as the minimum for these varieties, the consumer would be assured of a good quality product, whether the fruit was canned or sold in a fresh state. All cherries of these varieties, whether grown in the Willamette Valley, or in the regions east of the Cascade Mountains, will show a reading higher than 20 percent if given time to ripen.

Waterhouse has good quality when a minimum of 18 percent has been attained. Black Tartarian and Governor Wood are well flavored, and well-sized when the test registers 16 percent.

In establishing picking standards, it must be borne in mind that sweet cherries do not improve in quality after harvest. They show no increase in sugar, and practically no decrease in acidity while in storage or in transit. It is highly essential, therefore, that they be well flavored at the time of picking.

TABLE I - Temperature Corrections to Readings of Brix of Balling Hydrometers Standardized at 60° Fahrenheit.

Temperature		Correction - Subtract from observed percent
Degrees Fahrenheit	Degrees Centigrade	
50.	10	.26
52.	11	.22
53.5	12	.17
55.5	13	.12
57.	14	.08
59	15	.02
		Correction - Add to observed percent
61.	16	.02
62.5	17	.08
63.5	17.5	.11
64.5	18	.14
66.	19	.20
68.	20	.26
70.	21	.32
71.5	22	.38
73.5	23	.45
75.1	24	.52
77.	25	.56
79	26	.65
80.5	27	.72

Fig. 1. A common food chopper may be used to crush the fruit.

Fig. 2 The tincture press is satisfactory for extracting the juice.

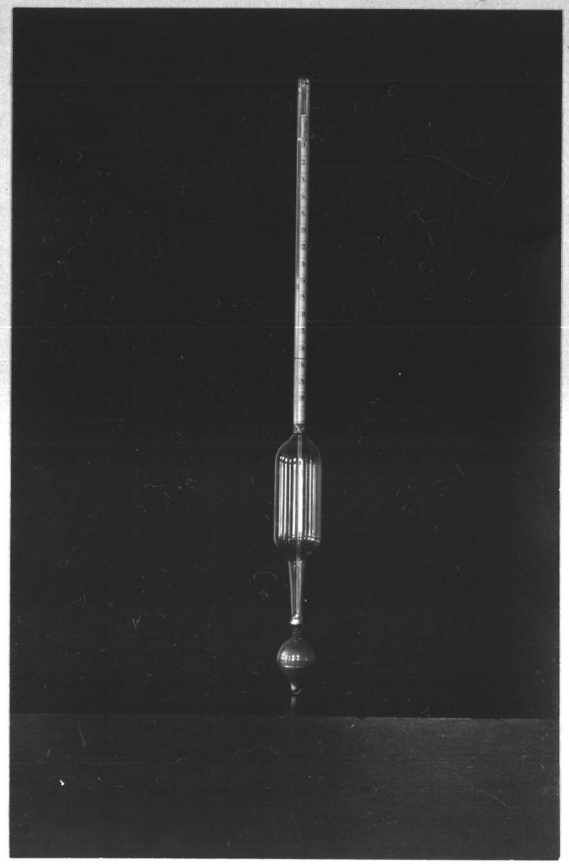

Fig. 3. Common Balling Scale Hydrometer used in the sugar test.

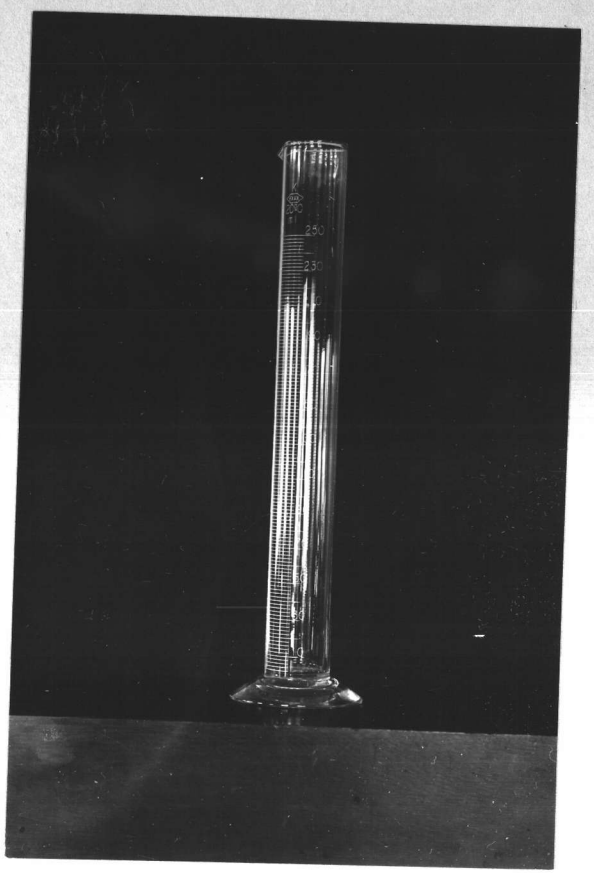

Fig. 4. A graduated glass cylinder may be used as a receptacle for the juice.