TABLE III—*Concluded*

	Agriculture	Anatomy	Anthropology	Archeology	Astronomy	Bacteriology	Botany	Chemistry	Engineering	Geography	Geology	Mathematics	Medicine and Surg.	Metallurgy	Paleontology	Pathology	Physics	Physiology	Psychology	Public Health	Seismology	Zoology	Total
St. Louis	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	2	.....	.....	1	.....	5
Stanford	.....	.....	.....	.....	.....	.....	1	7	1	.....	1	1	.....	.....	.....	1	1	1	6	.....	.....	1	21
State College Wash.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1
Syracuse	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	3
Texas	.....	.....	.....	.....	.....	.....	3	1	.....	.....	.....	2	.....	.....	.....	.....	2	.....	1	.....	.....	1	10
Tulane	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Vanderbilt	.....	1	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
Virginia	.....	.....	.....	.....	.....	.....	1	2	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1	5
Washington	.....	.....	.....	.....	.....	1	2	7	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	13
Wash. Univ. St. Louis	.....	1	.....	.....	.....	.....	3	2	.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....	8
Western Reserve	.....	1	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	.....	.....	1	8
Wisconsin	6	1	.....	.....	.....	8	4	29	.....	.....	2	2	.....	2	.....	13	6	3	5	.....	.....	7	88
Yale	4	2	2	.....	.....	4	1	16	1	.....	2	.....	.....	2	.....	1	7	.....	4	1	.....	10	57
Totals	31	16	6	3	8	46	79	420	47	5	45	75	8	7	2	43	113	46	104	8	2	127	1241

titles of the theses, will be found in Reprint and Circular Series No. 104. Earlier numbers of this series, containing such data for earlier years, are 26, 42, 75, 80, 86, 91, 95, 101. Copies of these may be obtained from the Publication Office, National Research Council, Washington, D. C.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

RELATION OF ANATOMY AND METHOD OF EXTRACTION TO QUALITY OF SATSUMA ORANGE JUICE[1]

RECENT research carried out jointly by the Division of Horticultural Crops and Diseases, Bureau of Plant Industry, U. S. Department of Agriculture and the Florida Agricultural Experiment Station, has yielded some preliminary results of immediate value to those interested in the subject of the quality of expressed citrus juices, as affected principally by the physiological anatomy, type, variety and maturity of citrus fruits.

A definite correlation was first established, while working with ripe Kawano Wase Satsuma oranges, between certain methods of preparation and the development of a bitter taste in the prepared juice on aging.

In Method No. 1 the juice was pressed from juice sacs only between porcelain plates. Result: Pleasantly tart taste, no bitter taste developed after 24 hours at room temperature; retained good quality in refrigerator for several days; deep chrome color, no change.

In Method No. 2 the juice was pressed from the halved unpeeled fruits between an inverted cup and a form fitting over it. Result: Pleasantly tart taste with added flavor of citrus oil, no bitter taste developed after 24 hours; color changed from deep chrome to light yellow within an hour.

In Method No. 3 the juice was pressed from the whole peeled fruit by means of a conical worm in a fluted housing. Result: Developed bitter taste in 2 hours and became exceedingly bitter after 4 hours; deep chrome color, no change.

In Method No. 4 the pulp was reamed out by means of a revolving cone. Result: Developed bitter taste in 2 hours and became exceedingly bitter after 4 hours; deep chrome color, no change.

Supplementing the technique indicated, specific methods were employed to separate the fruit into eight complex tissue fractions: (1) Outer peel; (2) inner peel and veins; (3) locular walls; (4) central axis; (5) seed coat; (6) cotyledons and germ; (7) empty juice sacs and (8) juice pressed from juice sacs only. The process was in some cases carried one step further—oil was pressed from outer peel, glucosides and pectins were extracted from the inner peel and veins, etc. The possible effect of the various com-

[1] Cooperative research between Bureau of Plant Industry, U. S. Department of Agriculture, and Florida Agricultural Experiment Station.

plex tissue fractions when present in the prepared citrus juice mixture was determined by testing out the effect of infusions of the tissues when mixed with juice pressed from juice sacs only. The causal agent responsible for the bitter taste was identified as of glucosidal origin with a regional distribution mainly in the inner peel and veins and locular walls. The degree of development of the bitter taste in prepared citrus juices on aging is apparently dependent upon fruit maturity, citrus type and variety, method of extraction and possibly after-treatment.

The causal agent for the indicated color changes was traced to the outer peel, and identified as citrus oil.

The practical application of these preliminary results is readily apparent. With an understanding of the causes responsible, measures may be taken in the preparation of the juice to reduce the bitter taste to a minimum and to mask slight traces of the bitter taste by bringing in a trace of citrus peel oil. Color changes, from the deep orange of Satsuma and tangerine to lighter shades of orange or to yellow, and the change from orange or deep yellow of sweet orange to lighter shades of orange or to yellow may be controlled. The relative stability of the mixture as a whole is also a subject which concerns the producer, since stratification within the juice mixture may not only affect the color but also the taste qualities. The complete data will be published shortly. In connection with the subject, it should be stated that other problems are under investigation, including attempts to determine the cause of undesirable taste qualities other than bitterness. These results will be reported later.

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A KNOCKDOWN "BERLESE FUNNEL"

As several persons have shown interest in a collapsible desiccation trap which I have used with considerable satisfaction for about fifteen years, I am publishing its specifications so that any one may have one made up for his own use.

The Italian acarologist used the cumbersome hot-water jacket as a heating or drying unit. A convenient laboratory substitute is the incandescent bulb. For field and travel I have used the sunshine and altered the frame so as to pack flat. In brief, the trap consists of a framework of zinc or brass strips one inch wide, cut from material one sixteenth of an inch thick. The strips are soldered together so as to make up five T-shaped pieces (uprights), and one asterisk shaped plate, as shown in Fig. 1. The T-pieces (uprights) have the cross-piece seven inches long and the leg ten inches long bent where it joins the cross-piece, as shown. The three notches are slightly wider than the thickness of the material. The asterisk plate (which functions as a leg stabilizer) has

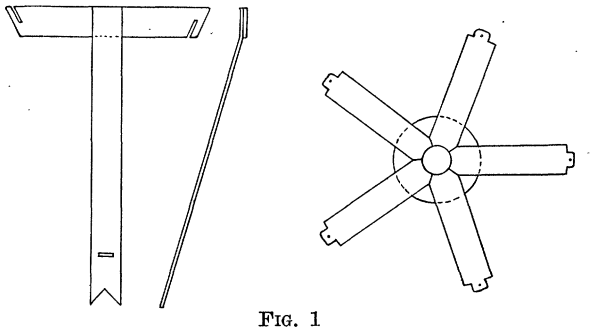

FIG. 1

a central hole (seven eighths inches in diameter for receiving vials to three quarters inches in diameter) cut into the central disc (three inches in diameter). The total length of the arms (measuring from center of the asterisk) is four and five eighths inches. The terminal tongues are a half inch broad, and designed to fit into the slot at the base of the legs. The holes in these tongues should be one sixteenth inch from base of the tongues and of the diameter of a common straight pin.

To assemble this frame, dovetail the notches of the ends of the heads of the five uprights—thus forming a pentagon. Insert the tongues of the stabilizing plate into the slots at the base of the legs, and drop pins into the holes.

The funnel is cut from a piece of stiff paper or pamphlet cover (cardboard) and pinned together along the overlapping edges. I keep two or three such funnel sheets on hand. For the above dimensions a radius of ten and a quarter inches is satisfactory, with a three-quarter inch semicircle cut out of the apex (center of base of funnel sheet). I always use a smaller funnel below the major to take up the space between the vial and the funnel in case there is a gap, as there often is.

The sieve, which is dropped into the mouth of the funnel, fits into the funnel about an inch below the rim, if eight inches in diameter. It may be made of copper mosquito netting soldered to a ring made of three-sixteenth inch wire.

Such a trap may be set up in half a minute. The moss, leaf mould or vegetable débris is spread on the sieve (a pound tin full) and the trap placed on the ledge of a hotel window, steamer deck, balcony, city roof or in the backyard to sun. If the vegetable layer is two inches deep (loose) on the sieve it is best to let it sun through the day.

To kill the catch, drop into the vial, after it has