

emergence herbicide and a systemic insecticide for cotton. Dr. Shaw's opinion is that the surest way to increase use of pesticides is first to keep building the fund of knowledge on crop pests, techniques to control them, and the dollars and cents value of using these techniques. Then, he emphasized, growers must be kept continually informed of the findings.

Mr. Mayfield told the group that so long as there is a reasonable profit to be made in current operations, funds for research can be plowed back. If the members of the industry do not supply the research to carry the whole industry forward, he cautioned, it is certain that someone else will do it for them—and send them the bill.

**Research**

## Tomato Powder Processes Developed in West by USDA

**Vacu-Dry, Inc., announces that it has continuous process near readiness**

**T**WO PROCESSES for preparing tomato powders by vacuum drying have recently been developed in California, where a large share of the nation's tomatoes are grown. In addition, Vacu-Dry, Inc., of Oakland, Calif., first company to produce orange juice powders successfully, has announced that it will begin laboratory scale production "within a matter of days" by a continuous

process and distribute samples to the trade.

The two vacuum-drying processes resulted from a project at the Western Utilization Research Branch of USDA at Albany, Calif., which some time back produced a citrus juice powder process. (Vacu-Dry attained the first commercial orange juice powder by a slight modification of this process.) WURB also has

produced a promising tomato powder with slightly modified spray-dryers.

During the war a "tomato drying" plant operated at Riverbank, Calif., producing drum-dried tomato juice flakes which were used in soups. This plant operated for only a short time.

**Processes and Process Conditions.**

In order to prepare a satisfactory juice powder, it is necessary, when using vacuum drying techniques, that the material "puff" during drying. Otherwise, the product will be a leathery mass completely unsuited to reconstitution. During vacuum drying of orange juice concentrates, this puffing occurs naturally. In tomato juice processing, however, puffing does not occur, and special steps need be taken.

Two vacuum-drying processes have been tried: (1) a one-step process in which the juice is concentrated and dried directly; (2) a split-run process in which pulp and "tomato serum" are separated, dried separately, and recombined.

**One-Step Process.** Juice is concentrated to about 40% solids in commercial concentrating equipment. This concentrate is then whipped in commercial beaters for periods of from 5 to 20 minutes to incorporate air in the concentrate (this air causes the concentrate to puff during drying). The aerated concentrate is spread on pans and placed in a vacuum tray dryer. The dryer is evacuated to 1 mm. Hg, and shelf temperature is rapidly raised to 220° F. As the concentrate temperature rises, tray temperature is gradually reduced to prevent concentrate temperature from exceeding 150° F. (an unsatisfactory product flavor-wise results if higher temperatures are used). When moisture content reaches 3%, the dried product is cooled by the admission of cold water to the shelf and, when cooled, is removed ready for packaging.

While this process works fine for batch production, it is questionable whether it would be suitable for continuous processing. It is possible that the methods used for spreading concentrates in a continuous vacuum dryer would also deaerate it, thus making it unsuited for drying. This has yet to be proved or disproved completely, however.

**Split-Run Process.** Juice is centrifuged to remove the pulp. The juice is concentrated to 62° to 65° Brix in a vacuum pan dryer at 15 mm. Hg and 135° F. This concentrated material, known as serum solids, is placed in pans and is vacuum-tray dried at 3 mm. Hg (220° F. shelf temperature) in a manner similar to orange juice powder drying. It puffs satisfactorily, can be dried to 3% moisture in about 1 hour. The pulp is dried separately—either air or vacuum drying—ground, and added back to the dried serum solids.

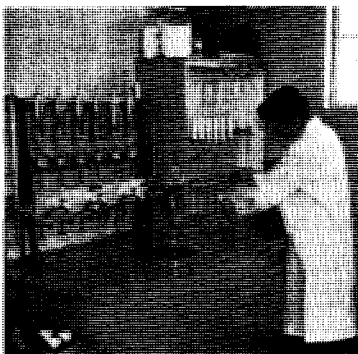
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This process, omitting as it does the necessity for incorporating air in the concentrate, might be suitable for continuous processing. (Orange juice puffs satisfactorily using continuous processing; so do the separated serum solids.)

**Spray Drying.** In addition to the two vacuum-drying processes, WURB has also evolved a spray drying technique. This process would be less costly than vacuum batch. Its biggest disadvantage is that it gives a fine powder (contrasted to a granular product from vacuum drying), and fine powders are hard to reconstitute with cold water. In applications such as soups where hot water is used, this drawback is not important, and it is probable that spray dried products could find a place in the market currently served by pastes.

**Economics.** Tomato juice powders would serve markets currently reached by tomato pastes as well as be suitable as a beverage. Reconstituted juices from powders are quite similar in taste and color to current tomato pastes; however, flavor is slightly different from canned juice. This juice flavor redevelops if reconstituted juices are canned and allowed to stand for several days.

Exact cost figures have not been arrived at, but it appears that such pow-

ders would be close competitors of current tomato products. Advantages in packaging weight (93% saving on "juice" weight alone, not counting savings of container weight) would make the "vacuum batch" powder cheaper in eastern markets than single strength juice. It is likely, however, that powders would be more

expensive than tomato paste. This cost differential could be offset by other savings that are due to the powder form.

Vacu-Dry's process is continuous, but it will not comment as to similarities with either of the WURB vacuum processes, saying that patent matters have not been completely settled yet.

Interior view of the vacuum shelf drier used in tomato powder work WURB. Trays on the lower shelf show freshly loaded paste and upper trays are covered with wire mesh screens to prevent excessive puffing of the paste



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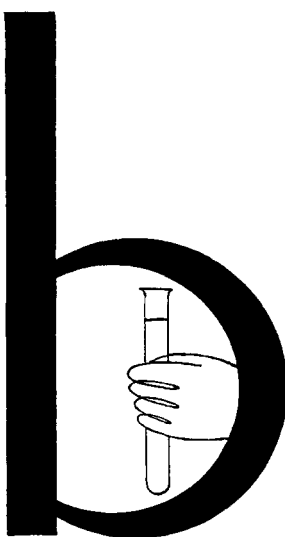
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