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Development of Tropical Fruit Juices by Enzymatic Maceration for Developing Countries (Third 6 months report. May-October, 1988). Project C5-208 AID-CDR.

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Objective: To design and start the experiments on a Pilot Plant (PP) scale in Costa Rica, applying the process steps as to the available equipment and the results of the lab scale experiments.

1. During the first year of our research, we (in Israel) worked mainly on a lab scale with Mango (var. Maya) and Guava (var. Bendov), starting also experiments with Papaya (var. Sunrise) in Costa Rica . A process for preparation of the pulp and its maceration was developed and preliminary reported. Different maceration conditions (enzymes and enzyme concentration, pH, temperature, time, etc.) were assesed as to their influence on the yields and quality characteristics of the final product (pasteurized juice). From the several enzymes assessed, the best results were obtained with Pectinex 3x, Ultrazyme (Novo) and Rohapect (Rohm). Combinations of one of this enzymes with Celluclast (celluloitic enzyme) resulted in an increase of the yields by about 10% (on juice yield basis). We designed the PP experiments in Costa Rica on the optimum conditions found on a lab scale.

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2. Aharon Levi visited with CITA during May-June, 1988 and started the P.P. experiments, with the equipment available there. During this visit experiments with quantities of up to 100 kg, and more - Mango (var. Haden), Papaya (var. Sunrise) and Guava were designed and started and the results partially assessed in situ.

The following was observed:

a. Papaya

There is a necersity to peel the papaya fruits before further treatments, in order to avoid undesirable off-flavors, observed in the juice of unpeeled fruits. Steam treatment of about 2 min. followed by immediate cooling (tap water) - facilitated the peel removal with minimum peeling losses. After enzymatic maceration with Pectinase 3x (150-200 ppm) + 1000 ppm Celluclast - better yield and quality characteristics were obtained with non pasteurised then pasteurised pulp (before maceration). The experiments will be rechecked before a conclusion will be reached.

b. Mango

No peeling pretreatment was needed, the peel was removed directly by a pulper. After maceration with only Pectinex 3x (150 ppm) and Celluclast (+ Pectinex) no clear difference was observed between the yields; but combination of Ultrazyme (150 ppm) with Celluclast (1000 ppm) showed a clear addvantage of the combined enzymes treatment. The quality characteristics (cloud, color, etc.) were also better for the combined treatment. Further experiments are needed before a final conclusion will be reached.

c. Guava

Pilot plant experiments with pink varieties designed on the preliminary experiments (on the lab scale) - were started during A. Levi's visit. The results were not yet clear and summarised and will be reported latter. On the other hand an astringant flavor of the pasteurized clarified guava juice was observed occasionally. An

addition of gellatin before clarification - was suggested (by A. Levi') and will be tried, in order to remove the astringency.

3. Fruit juices producing plants in Costa Rica were visited and some macerated juice samples presented to the management. A considerable interest to apply the process at the proper time was shown. It seems that the industrial application is highly probable, after the PP experiments could be assessed and the best process steps and conditions concluded.

4. "Know-how" promotion firms were contacted directly during A. Levi's visit in Washington (AIS-CDR offices), as suggested by Dr. I Asher there. A possibility to offer the so developed "Know-how" to other developing countries was suggested as possible. Further contacts will be made in a latter stage.

5. A "new" fruit maceration enzyme - Pectinex SP- was offered by NOVO, during a short visit of A. Levi in Switzerland, as an enzyme possessing higher hemicelluloitic and celluloitic activity. The experiments with this enzyme started already on lab scale - in Israel. The results will be assessed and reported in the next report for all 3 fruits.

A. Levi

Aharon Levi

P.S. The international devaluation of the US $, affected by all means the possibility to extend our work (needed additional manpower and equipment - for example a desludger) in both countries. Therefore we shall continue to work to the best of our abilities, with the existing (or already purchased) equipment and manpower.