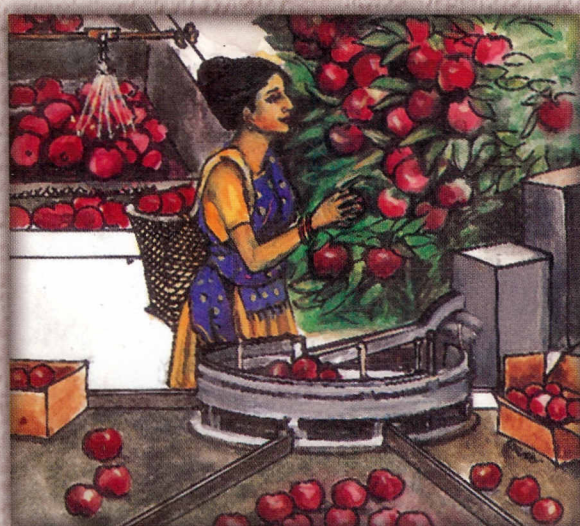




SAARC

Postharvest Management in Agriculture

SAARC Bibliographical Database



SAARC Agricultural Information Centre

Postharvest Management in Agriculture **SAARC Bibliographical Database**

A S Chandel and R M Kamal



SAARC Agricultural Information Centre (SAIC)

SAARC Agricultural Information Centre (SAIC)
BARC Complex, Farmgate, Dhaka 1215, Bangladesh

Published : 1995

Cover design : Mafruha Begum

Price : US\$ 5.00 for SAARC countries
US\$ 8.00 for other countries

Chandel, A S and Kamal, R M

Postharvest Management in Agriculture: SAARC bibliographical database.

Dhaka: SAARC Agricultural Information Centre, 1995.

ii, 231, xxxv p.

1. Postharvest technology, bibliography. 2. SAARC Agricultural Information Centre. i. Jt. Author.
ii. Title.

Published by : Director, SAARC Agricultural Information Centre (SAIC)

Printed at : Panir Printers, 9 Nilkhet, Dhaka 1205

CONTENTS

<i>Preface</i>	i
<i>Introduction</i>	ii
POSTHARVEST EQUIPMENTS	1
PACKING MATERIALS	14
AGRICULTURAL PRODUCE	25
CEREAL GRAINS	27
WHEAT	31
SORGHUM	35
MAIZE	36
BARLEY	38
MILLETS	38
RICE	39
SOYBEANS	60
VIGNA	62
LENTILS	66
STARCH CROPS	66
CASSAVAS	68
TOBACCO	70
COFFEE AND TEA	71
GARLICS	72
GINGERS	73
TURMERICS	75
SPICES	76
OILS	77
FRUITS	78
APPLES	83
PEARS	89
APRICOTS	90
PEACHES	91
PLUMS	92
PRUNUS DOMESTICA	94
CHERRIES	94
LITCHI CHINENSIS	94
CITRUS	95
ORANGES	97
KINNOWS	98
LEMONS	101

GUAVAS	102
SAPOTA	105
MANGOES	107
NUTS	115
COCONUTS	116
DATES	117
POMEGRANATES	118
PAPAYAS	118
JACKFRUITS	119
AEGLE MARMELOS	120
AMLA	121
BERRIES	121
BANANAS	122
PINEAPPLES	126
ZIZIPHUS MAURITIANA	126
GRAPES	128
VEGETABLES	133
CARROTS	136
POTATOES	138
ONIONS	144
CAULIFLOWERS	151
TOMATOES	151
BRINJALS	156
PEAS	157
GROUNDNUTS	159
MUSHROOMS	162
OTHER VEGETABLES	163
FLORICULTURE	164
DAIRY SCIENCE	166
FOOD TECHNOLOGY	191
JUICES	205
WINE AND BEVERAGES	211
SEED TECHNOLOGY	213

Term Index

i

Author Index

xvi

1513 SURESH, ER; ETHIRAJ, S. 1991. Utilization of overripe bananas for vinegar production. *Tropical Science (UK)*, 31: 3, 317-320.

1514 VERMA, JK; SRIKAR, LN. 1994. Protein and lipid changes in pink perch (*Nemipterus japonicus*) mince during frozen storage. *Journal of Food Science and Technology - Mysore*, 31: 3, 238-240.

Frozen storage of pink perch mince resulted in non-significant decrease in crude protein, total lipid and water soluble protein during initial storage, whereas salt soluble protein decreased significantly ($P < 0.05$) throughout the storage. Free fatty acids, peroxide value, trimethylamine nitrogen, and total volatile base nitrogen were found to increase significantly throughout the storage period of 180 days. A significant ($P < 0.05$) inverse correlation has been observed between salt soluble protein and peroxide value, free fatty acids, trimethylamine nitrogen as well as total volatile base nitrogen.

1515 VIJAY, S. 1991. Preservation of raw mango slices for use in pickle and chutney. *J. Fd. Sci. Tech.*, 28: 1, 54-56.

1516 VIJAY, S; ANAND, JC; CHADHA, KL; PAR-EEK, OP. 1993. Fruit preserves and pickles. *Advances in Horticulture*/edited by KL Chadha. New Delhi: Malhotra Publishing, p. 1913-1930.

JUICES

1517 ALI, IMTIAZ; HUSSAIN, KHALIQ. 1988. Dextran - a yardstick for cane staleness. *Proceedings of the Annual Convention - Pakistan Society of Sugar Technologists, Mandi Bahuddin, Pakistan*. No. 23, 434-442; 4 ref.

If cane is not processed within 24 h of harvesting, the dextran content increases to a level which causes serious problems in processing. To aid in the control of dextran formation, a method for its routine determination in cane juice is described. It is based on measurement of absorbance after treatment of the sample with trichloroacetic acid and ethanol.

1518 AMINUDDIN, M; ASMA, RN; SIDDIQ, M. 1985. A method for the estimation of ascorbic acid from preserved fruit juices and squashes. *Pakistan Journal of Scientific and Industrial Research*, 28: 5, 364-366; 9 ref.

Ascorbic acid in fruit juices and squashes containing

metabisulphite or sodium benzoate as preservatives was oxidized by ferricyanide and estimated by titration with $K_2Cr_2O_7$ using diphenylamine as indicator.

1519 ASHOK KUMAR; PANDE, HP. 1989. Effect of growth regulators on foliar enzymes and sugars: relationships with the juice quality of sugarcane. *Bharatiya Sugar*, 15: 2, 47-54.

Five sugarcane cultivars (Co. 997, CoJ. 64, B. 37172, Co. 1148 and Co. 1158) were sprayed with glyphosate, Miraculan [triacentanol], Cycocel [chlormequat] or Ethrel [ethephon] on 15 Oct. Plant samples were harvested 4 and 12 weeks after spraying and the leaves were analysed for enzymes and sugars; Stalk juice was analysed every 2 weeks from spraying until 12 weeks later. Reddish patches on the young foliage were observed in the high-sugar cultivars CoJ. 64 and B. 37172 8-10 days after glyphosate application and lamina desiccation was evident after 2 weeks. Glyphosate significantly increased the leaf sucrose content in all cultivars at 12 weeks and the juice sucrose in the plant crop of 4 cultivars after 4 weeks. Foliar amylase and invertase activities were depressed at 4 weeks by most growth regulators, but enhanced at 12 weeks (except with Ethrel which did not affect amylase activity and generally reduced invertase activity at both dates). Protein content was enhanced by all treatments, particularly Miraculan, at 4 weeks; however, at 12 weeks the leaves of untreated controls had the highest protein content. The relationships between amylase, invertase and sugars in the leaves and their significance with regard to juice sugars are discussed.

1520 BATTA, SK; SINGH, R. 1991. Post-harvest deterioration in quality of sugarcane. *Bharatiya Sugar*, 16: 4, 49-51; 17 ref.

Juice composition was studied during field storage of topped sugarcane (cv. Co.J.64) in piles exposed to the sun during hot ($35-40^\circ C$) dry weather. During 12 days' storage: total soluble solids content (hydrometer Brix) increased from 21.4 to 24.0%; polarimetric sucrose content decreased from 19.5 to 14.6%, while reducing sugars content increased from 0.1 to 3.5%; starch content decreased from 169 to 28 mg/ml; total activity (in nmol sucrose/min per ml juice) of acid invertase increased from 10.2 to 68.4, and its specific activity (nmol sucrose/min per mg protein) increased from 34.7 to 123.2; total activity of neutral invertase increased from 20.5 to 80.2, and its specific activity from 69.7 to 144.4. Estimated sucrose recovery % cane (formula given) decreased from 13.7 to 7.9.

1521 BHATT, S; RANA, RS; NAIN, LR. 1987. Ethanol production from mixed fruit juice of damaged guava and banana. *Journal of Food Science and Tech. - Mysore*, 24: 4, 192-193.

Candida krusei isolated from damaged guava and banana was compared with *Saccharomyces cerevisiae* CDRI and *S. cerevisiae* NCIM 3095 at different pH, nitrogen and phosphate levels for ethanol production from mixed damaged guava and banana fruit juice. *C. krusei* gave the same ethanol yield as *S. cerevisiae* CDRI NTG but required 20 h more fermentation time. Maximum biomass production in *C. krusei* was 2.1 g/litre in 50 h and in *S. cerevisiae* 2.8 g/litre in 35 h.

1522 BLIESENER, KM; MIEHE, D; BUCHHOLZ, K. 1990. Chemical pretreatment and pressing of exhausted cossettes. *Pakistan Sugar Journal*, 4: 3, 25-27.

Tests are briefly described, in which sugarbeet cossettes were pretreated with calcium saccharate, and juice was extracted by pressing in various types of press. Results showed that the process is attractive as a potential replacement for extraction by diffusion.

1523 BORAWAKE, SD; KUMAR, A; JADHAV, SJ. 1989. A simple method to measure colloids in sugarcane juice. *Bharatiya Sugar*, 15: 2, 17-18.

The colloids in raw and clarified sugarcane juice were determined by precipitation with ethanol-ether (20:1), filtering-off and drying at 70°C to constant weight. Results are tabulated; they were reproducible to 0.2%. The average colloid contents of raw and clarified juice were 5.6% and 4.3% respectively, showing that removal during clarification averaged 23%

1524 CHINNASWAMY, AP; THEERTHAMALAI, K; VENUGOPAL, R; ASAITHAMBI, V. 1990. Improved increased imbibition application in consequent improvement in milling technique and evaporation technique. *SISSTA Sugar Journal*, 16: 3, 44-56.

Increasing imbibition from 130% on fibre (as in the 1970s and at some old factories) to 200, 250 and 300% can be expected to give progressive increases in sugar recovery of 1.0, 0.3 and 0.2% on cane. Various imbibition systems are shown and their performances are compared, and advice is given for getting the most benefit from higher imbibition. This includes fine preparation of cane, differential grooving for rapid drainage of juice, arc welding of rollers for better gripping of the bagasse blanket, applying all the water to the last mill, hot water imbibition (80°C) to force-fed mills, and applying pressure of >50 t/ft of roller.

Modified vapour bleeding schemes are recommended to cope with 300% imbibition in 5-effect and 'double-effect vapour cell + quad' systems, maintaining steam demand at \approx 50% on cane.

1525 CHOUDHARI, SD. 1990. Effects of date of harvest on juice yield and brix of high energy sorghum. *Journal of Maharashtra Agricultural Universities*, 15: 2, 232-233; 3 ref.

In 1986, rainfed sorghum grown for energy production was harvested on several dates after attaining physiological maturity, when panicles were removed from the plants. In 1986-87, irrigated sorghum was harvested at flowering and on several dates thereafter. The effects of harvesting dates on stem juice yields and juice brix readings were studied. The stem juice yields depended on soil moisture conditions. The brix readings increased up to 20 d after physiological maturity. The brix readings increased up to 30 d after flowering and decreased between 30 and 40 d after flowering which coincided with the period of maximum DM accumulation in grain.

1526 CHOUDHARY, R; GUPTA, S; PANT, M; BAIKAKATI, D; MASOOD, K; SARKAR, S. 1987. Horticulture processing industry: trends and prospects of world imports and exports. *Agricultural exports strategy: problems and prospects*. London: Sangam Books, p. 183-261; 28 tab.

Trends in the volume and value of imports of fruit and vegetable juices into 25 major importing countries are analysed by product and by origin during 1977-81. It is noted that: (1) the USA's import of fruit juices increased by over 300% in value; (2) citrus juices formed the largest group of imports of fruit juices into France, with the bulk of imports coming from developing countries; (3) the total value of imports of fruit and vegetable juices into the UK increased by 72%, (4) imports into Japan rose by 194%, (5) imports into Saudi Arabia increased significantly both in volume and value, and (6) imports into the Netherlands increased by nearly 87%, by about 64% into the GFR, and by nearly 123% in the case of Canada.

1527 CHOUDHARY, SD. 1991. Effect of time lag after harvesting for cane crushing on juice and Brix in genotypes of high energy sorghum. *Bharatiya Sugar*, 16: 4, 39-40; 7 ref.

High-energy sorghums are types of *Sorghum bicolor* that produce high grain yields and whose sweet stalks yield enough biomass and carbohydrates for processing into alcohol or sugar. An advantage is their short

maturity period (100-120 days), which can be planned to provide sugar when cane sugar factories are idle; a particular disadvantage is the rapid loss of sucrose between harvesting and juice extraction. Five high-energy sorghum genotypes (HES 2, HES 3, HES 4, HES 6 AND HES 13) were grown in medium black soil during *kharif* 1988-89; panicles were gathered one week after physiological maturity and the stems were harvested, to be crushed after delays of up to 4 days. Juice yield, Brix and weight loss of stems are compared. Brix at harvest was highest (17.0) in HES 13, and lowest (9.7) in HES 3; weight loss [average of all storage periods?] was lowest (5.12%) for HES 13 and highest (8.98%) for HES 3. Over the 4-day period, weight loss averaged 15.73%, average juice yield decreased from 41.7 to 37.6%, and average Brix increased from 14.4 to 18.0.

1528 DOSS, KSG. 1990. Invasive extraction, a revolutionary milling technology. *Proceedings of the 52nd Annual Convention of the Sugar Technologists' Association of India*. STAI, Kanpur, India. p. E71-E73.

In a preliminary experiment to demonstrate the feasibility of a new technique for extraction of juice from sugarcane ('invasive extraction'), water was forced by means of compressed air through compressed bagasse from the 1st mill. This decreased the residual pol to that of 3rd mill bagasse. Proposed designs of factory equipment to achieve the same effect are shown; water or steam could be forced-in through holes in the trash plate, or while the bagasse is passing through a specially designed rectangular chamber. Only 2 mills would be required, one before the 'invasive extractor', the other for final dewatering.

1529 ETHIRAJ, S; SURESH, ER. 1985. A note on the occurrence of *Leuconostoc oenos* as a spoilage organism in canned mango juice. *Journal of Applied Bacteriology*, 59: 3, 239-242.

The occurrence of this organism in a blown can of mango juice comprises the first report of it as a spoilage organism in fruit products other than wine.

1530 FAROOQI, WA; MALIK, MA; SHAUKAT, GA; AHMAD, MS. 1986. Influence of Ph on the growth of *Alternaria citri* on citrus fruit juice. *Proceedings of the Florida State Horticultural Society*, 98, 214-215; 9 ref.

A. citri, which causes black rot in stored citrus fruits, showed significantly more growth on juice from Kinnow and Feutrell's Early mandarins (pH c. 4) than on juice of Valencia oranges, Marsh grapefruit and Eureka

lemon (pH ≤ 3.7). In confirmatory experiments when the pH of juice of all test cultivars was adjusted to 4.5 and then growth of *A. citri* was measured for 12 d at $29 \pm 1^\circ\text{C}$, the growth increased substantially and thus showed pH dependence.

1531 GAUR, SL; DESAI, BB. 1988. Influence of storage time on post-harvest deterioration of juice quality in some promising Co varieties of sugarcane. *Journal of Maharashtra Agricultural Universities*, 13: 2, 129-131; 11 ref.

Length of storage significantly influenced post-harvest deterioration of 5 cultivars of *Saccharum officinarum*. Cane weight decreased progressively accompanied by an increase in juice brix up to 120 h. The cultivar Co6407 had the highest cane weight (6.01 g) and lowest juice brix values (0.02%). Sucrose and commercial cane sugar (CCS) content increased slightly up to 24 h then decreased. Co740 showed the highest percentage decrease in sucrose (7.64%) and increase in reducing sugars (6.42%) at 120 h storage. Co6407 suffered minimum losses of these components. The percentage decrease in CCS content was lowest in Co419 (10.08%) which also had a minimum decrease in juice purity (8.75%). Co740 and Co775 suffered greatest losses in these 2 characters.

1532 GHATODE, KS; KALMEGH, VB; SAGARE, BN; PAVITRAKAR, NR. 1991. Effect of environment on quality of sorgho and its juice in relation to phenological stages. *Annals of Plant Physiology*, 5: 1, 52-57; 8 ref.

In 1987, sweet sorghum was sown on 29 June, 6, 13 or 20 July and harvested at 8 phenological stages between early flowering and the ripe stage and also at 1 week after the ripe stage (post-ripe). Delay in sowing decreased the stalk diam. at different phenological stages. The total soluble solids, reducing sugar and non-reducing sugar contents in juice decreased with delay in harvesting up to the ripe stage, while juice acidity increased.

1533 GHATODE, KS; KALMEGH, VB; KADU, AB; NIMKAR, PM; GORE, NB. 1991. Effect of post harvest conditioning of sorgho stalks on juice quality and syrup recovery at various phenological stages. *Annals of Plant Physiology*, 5: 2, 238-241; 7 ref.

In field trials in the *kharif* [monsoon] season of 1987 the effects of harvesting sweet sorghum cv. SSV-108 stems at the dough, hard dough, ripe or 1 week post-ripe growth stages, stripping leaves and storing the stems at a maximum/min. temp. of $34.1/20.6^\circ\text{C}$ and 77%

(morning) and 42% (evening) RH for 24, 48, 72, 96, 120 or 144 h on juice quality and syrup recovery were studied. The highest juice extractability (31.1%) was obtained from fresh stems at the ripe stage, and the lowest (0%) from 120 h storage of post-ripe sorghum. Juice extractability decreased with storage time. The highest total soluble solids and reducing sugars were recorded at the ripe stage after storage for 144 h. The highest syrup recovery was recorded at the ripe stage after 48 or 72h storage.

1534 GNANAVADIVELU, A; MOHANAVELU, R; OYYARAM, G. 1990. Imbibition vs. whole reduced extraction vs. recovery - a theoretical approach. Proceedings of the 52nd Annual Convention of the Sugar Technologists' Association of India. Kanpur: Sugar Technologists' Association of India, p. C1-C23.

Increasing the amount of imbibition water during milling of sugarcane increases the juice extraction and the sugar recovery, but also increases the steam consumption in subsequent processing. Data from Ambur Co-op. cane sugar factory were used to calculate the effects of the amount of imbibition (200, 225....300% on fibre in cane) on mixed juice % cane, mixed juice Brix, pol in mixed juice % cane, sugar recovery % cane, pol % bagasse, moisture % bagasse, mill extraction, whole reduced extraction, steam consumption % cane and fuel consumption. Increasing the imbibition from 200 to 300% on fibre would increase mill extraction by about 4%, sugar recovery by about 0.5%, moisture % bagasse by about 2.5% and steam consumption by about 3%

1535 HASNAIN, A; ALI, R. 1988. Protein and amino acids of *Grewia asiatica*. Pakistan Jrl. of Scient. and Industrial Res., 31: 11, 777-779.

The chemical composition of falsa [phalsa] fruits including the seeds was determined. Crude protein percentage and amino acid composition were evaluated. Electrophoresis revealed the presence of 2 major proteins. The quantity of phosphoserine, compared with other free amino acids was found to be higher in the pulp, while the hydrolysate contained excessive amounts of aspartic acid, glycine and tyrosine. It is suggested that the specific amino acid profile may be used as an index for determining adulteration in pure phalsa juice. The significant content of Na, K and Ca makes the juice palatable and nutritious.

1536 JADHAV, SY; LONDHE, MB. 1989. Effect of stale cane on clarification. Bharatiya Sugar, 14: 10, 25, 27-30; 16 ref.

Chemical changes in cane after harvesting are reviewed.

Laboratory tests are reported, in which juice from cane stored for 24, 48....120 h was analysed, and its sedimentation properties after sulphitation were studied. Results showed that, with increasing storage time, juice quality deteriorated (as indicated by an increase in reducing sugars content and changes in other properties), mud settling rate decreased, and mud volume after 40 min increased.

1537 KAZMI, SM. 1991. Effect of different stabilizers on pasteurized apple juice drink. Agriculture Univ., Faisalabad (Pakistan). Dept. of Food Technology. 70 p.

1538 KHURDIYA, DS; ROY, SK. 1982. Making apples nectar is easier than juice. Delhi Garden Magazine, Flower show number (Special issue).

1539 LEE, CY; SMITH, NL; UNDERWOOD, BA; MORSE, RA. 1990. Honey protein from different bee species in relation to apple juice clarification activity. American Bee Journal, 130: 7, 478-479.

The 3 honeys tested were from *Apis mellifera* (USA), *A. cerana* (Nepal) and *A. laboriosa* (Nepal). Contents of soluble solids were 80.8%, 81.2% and 75.4%, and pH values were 4.04, 5.57 and 4.59, respectively. Total protein contents were 192, 206 and 233 mg/100 g, respectively. *A. mellifera* honey showed rapid apple juice clarification activity; *A. cerana* honey solution had to be boiled before it showed some activity. *A. laboriosa* honey showed no activity and when its protein pattern was examined there was no major protein band in fraction A at an Rf value near 0.25-0.30. This band, which is already known to be responsible for apple juice clarification activity, was present in the other two honeys.

1540 LISIK, K; SZWAJCOWSKA, K; ZAORSKA, H. 1990. Extraction of sucrose and non-sugars under laboratory conditions. Pakistan Sugar Journal, 4: 3, 25.

Laboratory tests on the effect of extraction time on the diffusion of sucrose and non-sucrose from sugarbeet cossettes into raw juice are outlined.

1541 MANE, JD; PHADNIS, SP; JADHAV, SJ. 1992. Effects of hydrogen peroxide on cane juice constituents. International Sugar Journal, 94: 1128, 322-324.

Hydrogen peroxide can be used as a versatile processing aid in the manufacture of sugar. It not only brings about the removal of colour from juice but also reduces its

non-sucrose contents such as amino-acids, starch, reducing sugars and polyphenols, thus improving the overall quality of the sugar, including its ICUMSA colour. The reagent is no-toxic and processing with it is very clean. However, it is more useful in its corrective role when used as a complement to sulphur dioxide rather than as a substitute for it.

1542 MARWAHA, SS; PURI, M; BHULLAR, MK; KOTHARI, RM. 1994. **Optimization of parameters for hydrolysis of limonin for debittering of kinnow mandarin juice by *Rhodococcus fascians*.** *Enzyme and Microbial Technology*, 16: 8, 723-725.

The use of *Rhodococcus fascians* for debittering kinnow juice was explored. Its growth and application conditions were optimized. Incubation of kinnow juice with 5% (v/v) *R. fascians* mass cultivated for 48 h afforded optimal (60%) degradation of limonin at 25° degrees C, pH 4.0 and 150 rev min⁻¹ for 48 h. Coupling of this step with alkaline degradation led to 78% degradation of limonin.

1543 MOHAMMAD RAFIQ; AHMAD, MAQBOOL; CHAUDRY, MA; HUSSAIN, BAKHTIAR; KHAN, ISMAIL. 1987. **Ascorbic acid and quality retention in orange squash as related to exposure to light and container type.** *Pakistan Journal of Scientific and Industrial Research*, 30: 6, 480-483; 20 ref.

The effect of fluorescent light (20 Ft-C) and packaging material on the physicochemical and organoleptic characteristics of orange squash stored at room temperature (22.5° to 35°C) was studied. More ascorbic acid was retained and better colour and flavour were maintained in the samples stored in darkness than in those kept under fluorescent light. Amber and green glass bottles were better for the retention of ascorbic acid and organoleptic characteristics of orange squash than clear glass, white polyethylene and polyvinyl chloride bottles.

1544 MUKHERJEE, S. 1990. **Six roller mill for higher crushing with better extraction.** *Bharatiya Sugar*, 16: 2, 13, 15-16.

The juice extraction achieved by a mill depends on the efficiencies of cane preparation, mill feeding, juice drainage and imbibition. Capabilities and limitations are indicated for the Donnelly chute (and 4-roller mill incorporating it), the toothed roll pressure feeder (TRPF) and the grooved roll pressure feeder (GRPF). A 6-roller mill effectively integrates a normal mill with a very-heavy-duty GRPF and a heavy-duty under-feed roller, giving all the advantages of the GRPF plus better

feeding and extraction. Notes are made about its components.

1545 PRIMI, BR; LAL, BB; JOSHI, VK. 1994. **Comparative efficacy of various debittering techniques in kinnow juice.** *J. Fd. Sci. Technol.*

1546 QURESHI, SZ; AHSAN SAEED; SEEMA HAQUE; KHAN, MA. 1991. **Extraction spectrophotometric method for the determination of ascorbic acid in pharmaceutical preparations, urine and fruit juices with potassium iodate.** *Talanta Oxford*, 38: 6, 637-639; 18 ref.

An indirect determination of ascorbic acid based on extraction of iodine produced by the reduction of potassium iodate is described. Beer's law was obeyed over the range 0.02-0.36 mg/ml ascorbic acid.

1547 RAMAKRISHNA, J; SATYANARAYANA, J; RAO, RV. 1990. **Self-setting mills and continuous vacuum pans for sugar factory.** *Modernisation of Indian sugar industry*. New Delhi: Arnold Publishers, p. 135-138.

Recent developments in cane milling and continuous pan boiling are discussed in relation to their potential for energy savings and improvement of process efficiency and product quality. The self-setting or constant-ratio mill has undergone a series of modifications since its introduction by FCB in 1963. Its characteristics and advantages (notably ease of maintenance) are listed; it is now available in a 4-roller design which gives higher production capacity and more efficient juice extraction.

1548 RAMTEKE, RS; SINGH, NI; REKHA, MN; EIPESON, WE. 1993. **Methods for concentration of fruit juices - a critical evaluation.** *Journal of Food Science and Technology - Mysore*, 30: 6, 391-402.

Concentration of fruit juices, a major unit operation in fruit processing industry, is of critical importance as it determines the quality of the final product. Few commercially feasible methods include vacuum evaporation, freeze-concentration and membrane processes such as osmosis, reverse osmosis and ultrafiltration. Even though considerable developments have taken place in all these concentration methods, evaporation is still the most developed and widely followed method; With the numerous types of evaporators available today, the selection of suitable evaporator for individual fruit juice concentration is an important step. Different criteria such as heat sensitivity, fouling and viscosity, which aid in selection of evaporator, have been discussed. Aroma

recovery has become an integral part of fruit juice concentration process. Various commercial aroma recovery equipments are described and the comparative evaluation of different concentration processes is delineated.

1549 RANOTE, PS; SAINI, SPS; BAWA, AS. 1993. **Evaluation of thermal process and shelf-life of kinnow juice.** *Journal of Food Science and Technology - Mysore*, 30: 2, 88-91.

The slowest heating point was found to be at the geometric centre and at 1/10th of the height from the bottom along vertical axis for pouched and bottled Kinnow juice. The thermal processing time on the basis of pectinmethyl esterase inactivation was 28.3 and 17.0 min for bottled and pouched juice, respectively. Invert sugars increased, while total sugars declined with storage under ambient conditions. Cans, being opaque to light, retained higher amounts of ascorbic acid during storage. Various sensory attributes were significantly affected by types of packaging containers and storage.

1550 ROY, SK; KHURDIYA, DS; KRISHNA, MK; VASISTHA, BB; CHOUDHURY, B. 1973. **Studies on the canning of watermelon (*Citrulus lantus*) juice proc. 60th Session Ind. Sci. Congr. Part III.**

1551 SANDHU, DK; JOSHI, VK. 1994. **Comparative fermentation behaviour of saccharomyces and zymomonas, physico-chemical characteristics of fermented, apple juice from culled fruits.** *Ind. Jrl. Exp. Biol. (Details not known).*

1552 SATO, GS; CHABARIBERY, D; BESSA JUNIOR, AA. 1992. **Overview of production and of the market for passion fruit.** *Informacoes Economicas - Instituto de Economia Agricola*, 22: 6, 17-31; 15 ref., 7 tab.

An analysis is presented of the production of and market for passion fruit in the world and in Brazil, with special reference to the recent production expansion in Sao Paulo. The market prospects for fresh fruit and for concentrated juice are discussed. The main world producers in order of importance are: Brazil, Peru, Sri Lanka, Ecuador, Australia, Kenya, Hawaii and South Africa. Brazil produced 172 290 t of passion fruit in 1989. It was observed that production in Brazil and in other countries showed a periodic fluctuation in relation to variations in the international price of concentrated juice. On the other hand, juice production for export in Brazil depended on production stability and reduction in

costs of raw material, which were high owing to low productivity. Production and marketing in Brazil as well as in the world indicated an increase in consumption of fresh fruit and of concentrate.

1553 SOLOMON, S; SRIVASTAVA, KK; BHATNAGAR, S; MADAN, VK. 1990. **Post harvest changes in invertase activity and juice quality in sugarcane.** *Indian Sugar*, 39: 12, 895-899.

Sugarcane cv. Co. 1158 was harvested, detashed and stored under the trash cover. Samples were taken every 72 h up to 360 h, and the juice was analysed. Graphs show that activities of acid and neutral invertases were low at 72 h, but from then onwards increased rapidly. Contents of reducing sugars and total soluble solids increased progressively; sugarcane weight, extraction, juice purity and commercial cane sugar decreased progressively. Preharvest foliar application of mercuric chloride or cobalt chloride [amounts not stated] eliminated invertase activity up to 20 days after harvesting, and led to less deterioration; juice pol and purity, initially 19.09 and 91.34, respectively, decreased to about 18.1 and 74.5 in 20 days after either of these treatments, compared with 16.6 and 68.7 in untreated controls.

1554 THAKUR, BR; ARYA, SS. 1993. **Effect of sorbic acid on irradiation-induced sensory and chemical changes in sweetened orange juice and mango pulp.** *International Journal of Food Science and Technology*, 28: 4, 371-376.

Gamma-irradiation (10 KGy) of pasteurized orange juice and both blanched and unblanched mango pulp produced off-flavours rendering them unacceptable, and enhanced browning during storage. Sorbic acid (0.1%) completely inhibited the off-flavours and reduced the rate of browning; it also reduced losses in ascorbic acid during irradiation and storage of sweetened orange juice. In mango pulp, sorbic acid did not prevent ascorbic acid loss on irradiation, but did reduce storage losses. Irradiation and storage losses in carotenoids were slight and not influenced by sorbic acid. The pH and acidity of sweetened orange juice and blanched mango pulp did not change on irradiation or storage, but in unblanched pulp acidity increased and pH decreased on storage. Radiolytic degradation of sorbic acid was higher in blanched than unblanched mango pulp, both were more than in orange juice.

1555 UDDIN, MB. 1992. **Development of shelf-stable pineapple juices.** *Bangladesh Journal of Training and Development*, 5: 2, 67-74.

1556 VIJAY, S. 1993. Changes in physico-chemical characteristics of litchi squash during storage at different temperatures. *Indian Journal of Horticulture*, 50: 4, 327-322.

1557 VIJAY, S. 1994. Efficacy of various preservatives for preserving whole tomato concentrate. *India Food Packer*, 48: 1, 11-15.

1558 VIJAY, S; ANAND, JC. 1982. Keeping quality of whole tomato concentrates from five varieties of tomatoes. *Indian Food Packer*, 36: 6, 66.

1559 VIJAY, S. 1986. Packaging of fruit juice in packaging of food products. Indian Institute of Packaging, Bombay. pp 135.

1560 VIJAY, S. 1992. Preparation and storage study of lime ginger cocktail at room and low temperatures. *Beverage Food World*, 19: 5, 51-52.

1561 VIJAY, S; ANAND, JC. 1972. Quality of sweet oranges grown in Rajasthan and processing of their juice. *Indian Food Packer*, 26: 2, 17.

1562 VIJAY, S; ANAND, JC. 1977. Whole tomato concentrate. *Indian Horticulture*, 22: 2, 14.

WINE AND BEVERAGES

1563 ATTRI, BL; LAL, BB; JOSHI, VK. 1994. Technology for the preparation of sand pear vermouth. *Indian Food Packer*, 48: 1, 39-47.

1564 CHAU, HTN; PAL, RK; ROY, SK. 1989. Studies on extraction of pulp and development of beverages from green mangoes. *Indian Food Packer*, 43: 3, 27-34.

1565 CHIKKASUBBANNA, V; CHADHA, KL; ETHIRAJ, S. 1990. Influence of maturity of Thompson seedless grape on the wine composition and quality. *Indian Journal of Horticulture*, 47: 1, 12-17; 12 ref.

In 2-year studies, Thompson Seedless grapes were harvested at 5 successive weekly intervals, beginning at a Brix:acid ratio of 15, between mid-Feb. and mid-Mar. The grapes were processed and data are tabulated on must and wine composition. The titratable acidity, and tartaric acid, malic acid and ammonia contents of the must decreased with increasing grape maturity. The results of sensory analysis indicated that for wine

making a Brix:acid ratio of 30-35 was optimum. This ratio could be used as an indicator of grape maturity.

1566 DHAWAN, SS; KAINSA, RL; GUPTA, OP. 1983. Screening of guava cultivars for wine and brandy making. *Haryana Agricultural University Journal of Research*, 13: 3, 420-423.

The cultivars Apple Colour, Allahabad Safeda, Banarsi Surkha, Lucknow-49 and Seedless were assessed for chemical composition of juice, wine and brandy and for recovery of brandy from wine. Highest wine alcohol content (5.81%) was obtained from Allahabad Safeda. The recovery of alcohol in brandy from wine was highest with Lucknow-49 (74.2%).

1567 GARG, SK. 1989. *Kefir* - a cultured carbonated beverage. *Indian Dairyman*, 41: 4, 198-200.

The microflora and preservation of *kefir* grains, methods used for preliminary activation of these grains and production of *kefir* starter, and *kefir* manufacturing methods, are briefly described. *Kefir* can be prepared from milk of cow, ewe, goat, camel etc. which contains lactic acid (0.9-1.1%), alcohol (0.5-1.0%) and CO (0.03-0.07%) with traces of acetaldehyde, propionaldehyde, 2-butanone, iso-amyl alcohol, diacetyl and acetone, and is considered to have a therapeutic value.

1568 JOSHI, VK. 1994. A story about wine. *Beverage Food World*. Vol. 21 (Details not known).

1569 JOSHI, VK; SANDHU, DK. 1993. Effect of different concentration of initial soluble solids on physico-chemical and sensory qualities of apple wine. *Indian Journal of Horticulture* (Details not known).

1570 JOSHI, VK; THAKUR, NS; THAKUR, KS. 1993. Effect of different yeast strains on physico-chemical and sensory qualities of plum wine. *24th Int. Hort. Cong.* (Tokyo, Japan).

1571 JOSHI, VK; THAKUR, NK. 1993. Preparation and evaluation of citrus wine. *24th Int. Hort. Cong.* (Tokyo, Japan).

1572 JOSHI, VK; SHARMA, R. 1993. Screening of plum varieties for its beverages. *24th Int. Hort. Cong.* (Tokyo, Japan).

1573 JOSHI, VK; SHARMA, SK; THAKUR, NS. 1993. Technology and quality of sparkling wine with special reference to plum-an overview. *Indian Food Packer*. Vol. 47?.