Pak. J. Biochem. Mol. Biol. 2010; 43(2): 58-60

Preparation and evaluation of physical and chemical characteristics of instant mango juice powder

Saeed Akhter, Hamida Abid, Azra Yasmin and Shahid Masood*
Food Technology Center, PCSIR Laboratories Complex, Peshawar, Pakistan

Abstract: Mangoes pulp of 20.5-degree brix was extracted and preserved by adding double the usual quantity of preservative. Pulp was concentrated by a climbing film evaporator up to 40-degree brix. Powdered sugar, flavor and other food additives helpful in dehydration like dextrose, maltodextrin and color were added in the concentrated pulp. The prepared pulp was dehydrated in cabinet shelf-dryer under controlled drying conditions. Tricalcium phosphate and citric acid were mixed through grinder to obtain powder of uniform and desired mesh size. Powdered samples were assessed for moisture contents, total soluble solids, titratable acidity, ash %, ascorbic acid, protein, ether extract, reducing and total sugars. The prepared product was organoleptically acceptable and nutritionally sound.

Keywords: dehydration, mango powder, tricalcium phosphate, citric acid.
Received: February 17, 2010 **Accepted:** March 27, 2010
***Author of Correspondence:** saeedpcsir1@yahoo.com

INTRODUCTION

The word mango is the British pronunciation of the mankay, the Tamil word for the fruit, because it is found in most abundance in Southern India, around Madras. The mango is held in high esteem all over the world and is considered to be native of Indo-Pakistan sub-continent and eastern Asia. It is found in nearly all over the tropical regions of the World, therefore known as "the king" of all fruits. There are more than 1300 varieties of the mango, which are cultivated in the Indo-Pak sub-continent. In Sindh, there are more than 125 varieties of mango. Mangoes are also cultivated in Balochistan and NWFP, but the main source are Sindh and Punjab. In Pakistan we get more than 10 lacs tons production, out of which Sindh provides 50% i.e. more than 5 lacs tons. Multan and Mirpurkhas are the main regions, where we get mangoes in large quantity. The maximum production is from Rahim Yar Khan, where mangoes are cultivated on more than 26 thousand acres[1].

Fruits and fruit products are the enigma of food in modern society. Fresh fruits are perishable and have limited shelf life. To prolong shelf life,various processing and preservation methods such as drying, chemical treatments and various packaging methods are used. Drying is the major food processing operation to increase the shelf life. The purpose of drying of fruit and vegetable juices is to produce a stable and easily handled form of the juice, which reconstitutes rapidly to a quality product resembling the original juice as closely as possible. Dried juice products today are used mainly as convenience foods and have long storage life at ordinary temperatures[2]. Completely dried fruit powders are often used for making food products. Fruit powders less than 4% (wb) moisture content can be used to make candy, toffee, fudge and hard candy.

Mango is a popular fruit with excellent flavor, attractive color, and delicious taste with high nutritional value. Due to higher moisture content (85 %); it has very poor keeping quality and cannot with stand any adverse climatic conditions during storage. This results in the loss of 30% of fruits every year[3]. To overcome this post-harvest loss and to increase the shelf life, the surplus mango has to be processed into shelf stable products like sterilized pulp or dried flakes and powders[4,5] for consumption. Mango powder is generally required for certain food products like ice cream, yoghurt, mango fruit bar, mango cereal flakes, mango cake. Therefore, there is a great need to develop a non-caking and soluble/readily mixing mango flakes/powder[6].

MATERIALS AND METHODS

Different varieties of the fruit that are commonly available in the market were investigated and the one found better suited for the purpose was selected. This research work describes the preparation of mango juice powder from Chaunsa variety. Only mature but not over-ripe sound and unblemished fruits were used. The fruits, after preliminary screening, were placed in suitable tanks equipped with running water and washed manually to detach the sticking material like, dirt, fungus, fruit exudates etc. The fruit was then passed through the sorting and trimming procedures. This step removes not only the waste material but also gets rid off the stalk end of the fruit, which normally carries undesirable flavoring compounds. A cut is usually made at one or more places in each fruit.

The properly selected and prepared fruits were then passed through a special juice extractor and the pulp collected. To the seeds and skins, were added approximately 1.25^{th} its volume of water and passed again through pulp extracting machine. The pulp obtained in the two extractions were combined and

thoroughly mixed. To the pulp was added double the usual quantity of preservative and stored. Alternatively canning in suitable size cans can safely preserve it. The pulp thus obtained had a brix of 20.5-25 degrees before concentration and was concentrated through a climbing film evaporator till the brix reached 40 degree. After leaving the first few minutes (10- 15 minutes) the condensate from the early concentration stage was collected for cutting back the strength of the concentrates and to incorporate the flavor lost in the condensate during the concentration. To the concentrated pulp was next added powdered sugars, some flavor adsorbent / preservation aids and other food additives those helping in dehydration like dextrose, maltodextrin and color. The mixture was blended together to uniform consistency. The pulp was now ready for dehydration. The prepared pulp was put in suitable stainless steel trays at the load rate of 1.5 Kg per tray, forming about ½ inch thick layer and placed in cabinet shelf dryer at an initial temperature of around 55 ^{o}C for about 2 hours. The temperature was next brought up to 70 ^{o}C and the dehydrator allowed running overnight.

The product, which was in a semi dry state, overturned and allowed in the dehydrator for a further few hours till the desired level of the dehydration, had been attained. The product was scratched from the trays and passed through a suitable grinder .In the grinded product was added a predetermined quantity of tricalcium phosphate and citric acid and passed again through the grinder and mixer to obtain the powder of uniform desirable mesh size. Maltodextrin (DE 38) was used to reduce stickiness of the fruit powders while tricalcium phosphate as an anti-caking agent [7, 8, 09, 10, 11]. The amount of maltodextrin was added based on the total solid content of respective fruit pulps[12, 10, and 13]. The amount required for mango pulps was 0.093 kg maltodextrin per kilogram of pulp[12]. The optimum amount of tri calcium phosphate was found out from the preliminary work as 0.015 kg per kilogram of dry solid content for mango[13]. The product was packed under controlled condition in plastic bags/sachets or may be stored in airtight dark colored bottles.

The product thus obtained was then subjected to various analytical procedures in order to assess the various nutritional constituents. Total and reducing sugars by the method reported by Ranganna (1987) [14]. Three replicate measurements were taken. First, the reducing sugar content was determined by the Lane and Eynon method (Ranganna 1987). Total sugar was measured after inverting all the sugar present in the sample. Non-Reducing sugars (sucrose content) were then calculated from the values of total invert sugar and reducing sugars. Acidity was quantified by titration with 0.1 N NaOH and expressed as amount of anhydrous citric acid. Moisture content of the prepared product was measured using vacuum drying at 70±1°C for 6 h at pressure less than 100 mmHg as described by AOAC (1990) [15].

Ether extract, protein and ash etc. were also determined by the methods of AOAC. Ascorbic acid was estimated by the indophenol dye method[16]. In order to assess the nutritional values of the prepared products, the same parameters were also determined in some brands of bottled mango juice available in the market.

RESULTS AND DISCUSSION

Instant mango juice powder of reasonable good quality has been prepared successfully. The product so prepared is adequately nutritious and the taste testing evaluation conducted in the past; have shown the product to be highly acceptable. The detailed nutritional composition of the dry mango drink powder is given in table. It can be seen from the table that in most attributes the instant juice powder is ranking superior to the commercially available mango juices. From the nutritional point of view the dry mango product is quite rich in energy and other constituents except vitamin C. The ascorbic acid contents per 100 g powder are higher but in the reconstituted drink prepared from the same, these were found to be 3.6 mg per 100 ml, which is almost half of the commercial brand 1 but still equals that of commercial-2. Significant losses in the ascorbic acid content have been reported in the mangoes during storage and ripening[17].

Table 1: Chemical composition of Instant Mango Juice Powder and Two commercially available brand of bottled mango juice

No.	Parameters	Bottle juice 1	Bottle juice 2	Instant Mango Powder
1	Moisture %	85.7	85.9	3.0
2	Ash %	0.12	0.11	0.80
3	Total Soluble solids	15.8	15.2	-
4	Protein %	-	-	1.42
5	Ether extract %	0.013	0.01	0.89
6	Total Acidity %	0.15	0.16	3.80
7	Ascorbic Acid (mg/100 g)	7.1	3.3	14.3*
8	Total Sugar %	11.85	12.6	61.5
9	Reducing Sugar %	3.25	1.40	9.3

* = 3.6 mg/100 ml of the juice prepared from powder

Although beta-carotene was not the estimated but in literature they are not likely affected. The product has been adjudged well by various taste testing panels and also by the visitors to the

laboratory. The product was also compared with the commercially available mango juices in the market and found to compare with these products. The product is organoleptically acceptable and nutritionally sound energy content is higher than the commercial mango drink.

REFERENCES

1. Alam SM and Khan MA. Mango- An important fruit of Pakistan, http://www.pakistaneconomist.com/issue2001/issue26/i&e3.htm, (2001).
2. Pap L. Production of pure vegetable juice powders of full biological value. *Fruit Proc*., 1995; 3: 55-60.
3. Thind KK, Grewal KS and Bakshi AK. Method of preparation and keeping quality of reconstituted skim milk based mango beverage. *Beverage and Food World.,* 2002; 29: 60-62.
4. Saxena R and Arora VPS. Consumers of processed fruit and vegetables products. An analysis of buying behaviour, *Indian Food Industry*, 1997; 16: 25-36.
5. Srinivasan N, Elangovan S and Chinnaiyan P. Consumer perception towards processed fruit and vegetables products. *Indian Economic Panorama*, 2000; 10: 11-12.
6. Chattopadhyay TK. A textbook on pomalogy (Tropical Fruits – Vol II). Kalyani publishers. New Delhi. India. 1996; pp 41-71.
7. Bhandari BR, Senoussi A, Dumoulin ED and Lebert A. Spray drying of concentrated fruit juices. *Drying Technol*., 1993; 11, 33–41.
8. Peleg M, and Hollenbech AM. Flow conditioners and anti caking agents. *Food Technol*., 1984; 38: 91–100.
9. Patel S. Development of a process technology for production of tomato powder using foam mat drying techniques. Ph.D Thesis. Kharagpur, India: Indian Institute of Technology, 1990; 190.
10. Jaya S and Das H. Effect of maltodextrin, glycerol monostearate and tri calcium phosphate on vacuum dried mango powder properties. *J Food Engineer*., 2004; 63: 125–134.
11. Jaya S and Das H. Accelerated storage, shelf life and color of mango powder. *J Food Proc Preserv.,* 2005; 29: 45–62.
12. Das H and Jaya S. Production technology for fruit juice powders. Indian Patent. No. 192040, (2000).
13. Jaya S, Das H and Sudhagar M. Optimization of maltodextrin and tri calcium phosphate for producing vacuum dried mango powder. *Int. J Food Properties*, 2006; 9: 13–24.
14. Ranganna S. Hand book of analysis and quality control for fruit and vegetable products. New Delhi: Tata McGraw-Hill publications, (1987).
15. AOAC Fruits and fruit products. In K. Helrich (Ed.) Official methods of analysis of the association of official analytical chemists. Vol. II. (pp. 910–928). Arlington, Virginia: Association of Official Analytical Chemists, Inc., (1990).
16. Bessy OA. A method for the determination of samm quantities of ascorbic acid and dehydro-ascorbic acid in turbid and colored solution in the presence of other reducing substances. *J. Biol. Chem*., 1938; 126: 771-784.