

Generation of fruit waste among selected juice outlets and local venders

DEEPA M. MADALAGERI AND PUSHPA BHARATI

Fruit waste like peel, pith, rind are recognized as essential components of our diets as it contains many vital nutrients and non nutrient compounds, which play an important in well being. The main objective was to conduct the survey among fruit juice outlets and venders to calculate the waste generated. Twelve fruit juice outlets of Dharwad city were selected for the study. Mosambi, pine apple, watermelon and mango were most popular fruits consumed in te form of juice and were available at all the outlets surveyed. The total waste generated per day from each shop was in the range of 8 to 35 kg and on an average 20 kg from each outlet which goes waste as animal feed and contributing to environmental pollution. The part of fruits which is thrown as waste also comprises of edible part which contains natural antioxidants, phytochemicals, fiber, polyphenols flavonoids and also possesses antimicrobial activity. Hence it can be used in the development of value added products to increase the therapeutic value of the product and to facilitate improvement in the health of the consumers. In turn, these value added products help to reduce the risk of diabetes mellitus, cardiovascular diseases and metabolic syndrome. Development of value added products can act as the employment opportunity for the self-help groups or the interested entrepreneur which enhances the utilization of fruit waste and contribute to food security as a whole.

Key Words : Fruit waste, Local venders, Juice outlet

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INTRODUCTION

India is the second largest producer of fruits after China with 81.284 million tonnes of fruits from an area of 6.982 million hectares. A large variety of fruits are grown in India, of which mango, banana, citrus, guava, grape, pineapple and apple are the major ones. Apart from

these, fruits like papaya, sapota, jackfruit, ber, pomegranate in tropical and subtropical groups and peach, pear, almond, walnut, apricot and strawberry in the temperate groups are also grown in a sizeable area. Although fruits are grown throughout the country, the major fruit growing states are Maharashtra, Tamil Nadu, Karnataka, Andhra Pradesh, Bihar, Uttar Pradesh and Gujarat.

Fruit juice outlets and venders are believed to be part of the fruit processing industries. These fruit processing centres produces significant amounts of by-products, which present disposal issue since fruit waste is usually prone to microbial spoilage. Usually these by-products are used as animal feed; however, their higher

MEMBERS OF RESEARCH FORUM

Author for correspondence :

DEEPA M. MADALAGERI, Department of Food Science and Nutrition, College of Rural Home Science, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA
Email : madalagerideepa2@gmail.com

Associate Authors' :

PUSHPA BHARATI, Department of Food Science and Nutrition, College of Rural Home Science, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA

dietary fibre contents and bioactive compounds could permit their use as new natural ingredients for the food industries (Stabnikova *et al.*, 2005). Fruit peels are the novel, easily available, efficient, affordable, eco-friendly, natural and economic source of antioxidants and antimicrobial agents (Prakash *et al.*, 2013).

Processing wastes for biological compounds such as natural antioxidants or bioactive compounds to add to food products could represent a solution to the environmental problem. (Wolfe *et al.*, 2003) suggested the use of apple peel as a value-added food ingredient. Some researchers have used by-products from pears, oranges, peaches (Grigelmo-Miguel and Martin-Belloso, 1999) as sources of dietary fiber supplements or polyphenols in refined food. (Larrosa *et al.*, 2002) obtained a 'functionalised' tomato juice using phenolic enriched extracts from vegetables by-products

In fact, an interesting approach to utilize by-products is their potential use as sources of natural compounds (mainly phenolic compounds) with high antioxidant activity. For example, it has been reported that mango peel contains a number of valuable compounds such as polyphenols, β - caroteneoids, enzymes and dietary fibre (Ajila *et al.*, 2007) and watermelon peel is a rich source of biological amino acids such as citrulline (Tarazona-Díaz *et al.*, 2011), which possess potential antioxidant and vasodilators roles (Ikeda *et al.*, 2000). However, little information is available about the useful compounds that are present in the by-products obtained during fresh-cut operations.

The present case study was conducted among fruit juice outlets and local venders, to find out type of fruit processing, the most preferred fruit juice, quantity and type of waste generated, mode of disposal of the fruit waste generated after the juice preparation in the selected outlets.

METHODOLOGY

Selection of area :

A total of twelve fruit juice outlets situated in Dharwad city in Karnataka were selected. A well formulated questionnaire was used to collect the basic information on type of processing operation, type of fruit juices available, type and quantity of waste generated and type and preference of consumers etc. The data gathered were tabulated and percentages calculated.

OBSERVATIONS AND ASSESSMENT

The survey was conducted in the fruit juice outlets and venders at Dharwad city Karnataka using the personal interview questionnaire. Table 1 depicts the Demographic information of fruit processing outlets and venders. When we look in to the type of venders, 50 per cent of the venders were mobile venders and remaining 50 per cent were fixed fruit juice outlets. Mobile venders are those who will be selling the juice in mobile carts. Most of the mobile venders were selling the juices for 6 to 8 months. About 58.33 per cent of the fruit juice outlets were open throughout the year. About 58.33 per cent of the venders were between 1-5 year of establishment whereas, 25 per cent of them were between 5-10 years of establishment and remaining 16.66 per cent of them were well established and had the background of more than 10 years of experience in this field of fruit juice selling. Among all the shop keepers only 8.33 per cent of them were graduated and most of them were only had a primary education (50%) whereas, 25 per cent of them had only SSLC and remaining 16.66 per cent learnt up to PUC. Most of the shops (75 %) had the working hours of 10 to 12 h per day whereas only 16.66 per cent of the shops worked for more than 12 h per day which were located near bus stand. Fifty per cent of the fruit juice outlets used 10-20 kg of fruits per day for the processing followed by 20-30 kg (33.33 %) used and only 16.66 per cent of the outlets used more than 30 kg of fruits per day. Most of the mobile venders were situated near the colleges and institutes whereas the fixed fruit juice outlets are situated around the bus stand and in market areas of Dharwad. The most common consumers of the mobile fruit juice venders were students and families.

Purchasing pattern of fruits :

Most of the shop keepers (58.33%) purchased the fruits from Hubli Wholesale market followed by both Hubli and Belgaum (25 %) and least at Belgaum (16.66) as the Hubli is the nearest commercial fruit market centre to Dharwad which will reduce the transportation cost, increases the frequency of purchase and reduces the storage cost and damage to fruits as the fruits are highly perishable commodity. All shop keepers purchased the fruits from wholesale and none of them were purchasing the fruits from retail or farmers or from markets. When we look in to the purchasing frequency of fruits, 50 per cent of the shop keepers purchased fruits weekly followed

by fortnightly (41.66%) and daily (8.33 %) similar results were also found by Vasanthi and Saradha Ramadas (2012).

Table 2 shows that mosambi and pineapple juices were prepared by all the selected fruit juice outlets and venders followed by watermelon (83.33%), papaya (66.66%), apple, sapota and orange (50 %) and mango (41.66 %). Beside this 33.33 per cent of the fruit juice outlets were preparing muskmelon and banana juice and 25 per cent of the juice outlets were preparing custard apple, grape and lemon. Whereas only 16.66 per cent of fruit juice outlets were preparing pomegranate and strawberry juice similar results were also found by Vasanthi and Saradha Ramadas (2012).

The commonly consumed juices by the consumer in Dharwad are shown in Table 3. It is clear that 91.66

per cent of the consumers preferred mosambi juice and 83.33 per cent preferred pineapple, watermelon and mango juice. Apple was 75 per cent followed by lemon and sapota of 66.66 per cent and strawberry was preferred by 58.33 per cent and mainly strawberry juice was in demand by young students. These preferences are varied by the seasons and availability of the fruits similar results were also found by Vasanthi and Saradha Ramadas (2012).

Processing operations of fruits :

Among processing operation 41.66 per cent of shop keeper sold the juice only and another 41.66 per cent of shop keeper sold fruit juice, fruit salad, cut fruits and milk shakes. Whereas, only 16.66 per cent of the shop keepers sold juice and cut fruits. Number of fruits used

Table1 : Demographic profile of fruit juice outlets and venders

	Category	No. of outlets	Per cent (%)
Duration of selling	Seasonal	5	41.66
	Throughout year	7	58.33
Education	Primary	6	50
	SSLC	3	25
	PUC	2	16.66
	Degree	1	8.33
Year of establishment	1-5 years	7	58.33
	5 – 10 years	3	25
	>10 years	2	16.66
Type of vender	Mobile	6	50
	Fixed	6	50
Working hours	8-10 h	1	8.33
	10-12 h	9	75
	12-15 h	2	16.66
Source of raw materials purchased	Hubli	7	58.33
	Belgaum	2	16.66
	Hubli and Belgaum	3	25
Purchasing pattern	Wholesale	12	100
	Retail	-	-
	Farmers	-	-
	Market	-	-
Purchasing frequency	Daily	1	8.33
	Weekly	6	50
	Fortnightly	5	41.66
	Monthly	-	-
	As and when fruits over	-	-
Total fruits used /day (Kg)	10-20	6	50
	20-30	4	33.33
	>30	2	16.66

Table 2 : Fruits used for the preparation of juices at the various fruit outlets and local vendors

Name of the fruit	Number of outlets	Percentage (%)
Mosambi	12	100
Pine apple	12	100
Watermelon	10	83.33
Papaya	8	66.66
Apple	6	50
Sapota	6	50
Orange	6	50
Mango	5	41.66
Muskmelon	4	33.33
Banana	4	33.33
Grapes	3	25
Custard apple	3	25
Lemon	3	25
Pomegranate	2	16.66
Strawberry	2	16.66

to prepare one glass of juice varied for different fruits and size of the fruits and shop keepers (Table 4). The mean number of fruits used for some of the most popularly consumed fruit juices was, 2 fruits for apple juice, 3-4 fruits mosambi, 2 for mango and 3-4 for sapota. Whereas for the large fruits like watermelon, pineapple and papaya it was recorded as number of glass prepared from each fruit. From each watermelon 6-8 glasses of juice were prepared whereas from pine apple around 4-5 glasses and 5-6 glass of juices were prepared from each papaya fruit similar results were also found by Vasanthi and Saradha Ramadas (2012).

Price and profit :

The cost of each glass of juice was Rs. 20, milkshake

Table 3: Most popularly sold juices

Name of the fruit juice	Number	Percentage (%)
Mosambi	11	91.66
Pine apple	10	83.33
Watermelon	10	83.33
Mango	10	83.33
Apple	9	75
Sapota	8	66.66
Lemon	8	66.66
Strawberry	7	58.33

Table 4 : Processing operation of fruits

Processing operation	Number	Percentage (%)
Juice only	5	41.66
Juice/ Milkshake/ fruit salad	5	41.66
Juice/ cut fruit	2	16.66

was Rs. 25, fruit salad was Rs. 25-30 and fresh cut fruit was Rs. 15-20. The price of the juice, milkshake, fruit salad and cut fruit did not differ from shop to shop. Fifty per cent of the fruit outlets had the profit of Rs. 1000-2000 per day (33.33 %) followed by Rs. 500-1000 per day and only 16.66 per cent had the profit of more than Rs. 2000 per day. When we look in the number of glass of juice sold per day, 50 per cent of the fruit juice outlets sold 50 -100 glass per day followed by 33.33 per cent sold 30-50 glass of juices per day and remaining 16.66 per cent sold more than 100 glass of juice per day, respectively (Table 5). The shops located near to bus stand were able to sell 300 glasses of juice and hence more profits compared to the others. Most of the juice outlets were open from 9am to 10 pm and work for 12 to 13 hours per day. At all the fruit juice outlets and vendors

Table 5 : Processing and waste generation information of fruit juice outlets and vendors

Parameters	Category	Number	Percentage
No. of glass of juice sold	30-50	4	33.33
	50-100	6	50
	>100	2	16.66
Profit /day (Rs.)	500-1000	4	33.33
	1000-2000	6	50
	>2000	2	16.66
Total waste generated (kg)	5-10	7	58.33
	10-20	4	33.33
	>20	1	8.33
Mode of generated waste disposal	Animal feed	4	33.33
	Sold as animal feed	6	50
	Collected by Municipal corporation	2	16.66

the glass mugs were used to sell the juice and none of them used the disposable glasses similar results were also found by Vasanthi and Saradha Ramadas (2012).

Waste generation and disposal :

The information on fruit waste generated from each fruit juice outlet was collected and computed which is given in Table 3. It was documented that about 5- 10 kg of fruit waste was generated each day by 58.33 per cent of juice outlets and vendors followed by 10-20 kg by 33.33 per cent of the fruit juice outlets and vendors and remaining 8.33 per cent of them generated more than 20 kg of fruit waste per day. These fruit outlets and vendors used to mix all the waste together and it consists of peels, rind, pith, seeds, core, kernel etc. which was discarded as waste. Disposal of the fruit waste was studied and results are presented in Table 3. The municipal corporation collected the waste from only 16.66 per cent of the fruit juice outlets. Remaining 83.33 per cent of the fruit juice outlets discarded the fruit waste generated as animal feed, out of which 50 per cent of the fruit juice outlets sold the generated fruit waste as animal feed at the rate of Rs.10-15 per kg and remaining 33.33 per cent of the fruit juice outlet dumped as a waste creating environmental hazard. Among the surveyed fruit juice outlets and vendors none of them had the knowledge on the nutritional content of waste.

Conclusion :

Fruit waste generated from fruit juice centre contain most of it is edible like rind mango peel, mosambi and pine apple pith and peel etc. Which are rich source of polyphenol, flavonoids, tannins, ascorbic acid, natural antioxidants fibre and other bioactive compounds which contribute to the activity of antioxidants. In spite of rich in nutrients the fruit edible parts are being wasted and discarded after the juice preparation. Since it is nutritious it can be utilized for various food preparation in the form of dried or incorporated in to many value added foods, so it will enhance the nutraceutical value of the foods. Development and utilization of such functional and

nutritional products can be used to provide health benefits by preventing degenerative diseases. Development of value added products can act as an employment opportunity for the self-help groups or the interested entrepreneur which will reduce the wastage of fruit edible parts and also contribute to food security as a whole.

LITERATURE CITED

- Ajila, C.M., Naidu, K.A., Bhat, S.G. and Rao, U.J.S.P. (2007).** Bioactive compounds and antioxidant potential of mango peel extract. *Food Chem.*, **105** : 982-988.
- Grigelmo-Miguel, N. and Martín-Belloso, O. (1999).** Comparison of dietary fibre from by-products of processing fruits and greens and from cereals. *LWT-Food Sci. & Technol.*, **32**, 503-508.
- Ikedo, Y. Takami, H., Sasaki, Y., Kan, S. and Niimi, M. (2000).** Endoscopic neck surgery by the axillary approach. *J. American College Surgeons*, **191** : 336-340.
- Larrosa, M., Llorach, R., Espin, J.C. and Tomas-Barberan, F.A. (2002).** Increase of antioxidant activity of tomato juice upon functionalisation with vegetable byproduct extracts. *LWT-Food Sci. & Technol.*, **35** : 532-542.
- Prakash, A., Mathur, K., Vishwakarma, A., Vuppu, S. and Mishra, B. (2013).** Comparative assay of antioxidant and antibacterial properties of Indian culinary seasonal fruit peel extracts obtained from Vellore, Tamil Nadu. *Internat. J. Pharm. Sci. Rev. Res.*, **19** : 131-135.
- Stabnikova, O., Wang, J.Y. and Ding, H.B. (2005).** Biotransformation of vegetable and fruit processing wastes into yeast biomass enriched with selenium. *Bioresource Technol.*, **96** : 747-751.
- Tarazona-Diaz, M.P., Viegas, J., Moldao-Martins, M. and Aguayo, E. (2011).** Bioactive compounds from flesh and by-product of fresh-cut watermelon cultivars. *J. Sci. Food & Agric.*, **91** : 805-812.
- Vasanthi, P. and Saradha Ramadas, V. (2012).** Survey on wastage of fruit pomace among selected fruit juice outlets. *Internat. J. Sci. & Res.*, **3** (10) : 2013-2015.
- Wolfe, K., WU.X and Liu, R.H. (2003).** Antioxidant activity of apple peels. *J. Agric. & Food Chem.*, **51** : 609-614.

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