

## Assessment of Utilization of Fruit Pomace and Nutritional Analysis of Pineapple Pomace

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### ABSTRACT:

The pomace is solid remains of any fruit covers a large part of fibers, throw out as waste after the fruit juice extraction. Pineapple pomace contains various nutrients and functional substances which have crucial role in improving human health. The main objective of the research study is to conduct a pre-survey amidst fruit juice shops to know the utilization of fruit pomace and to know the nutritional importance of pineapple pomace. The survey was conducted on thirty participants (shopkeeper n=30 and consumer n=30) to assess the utilization of fruit pomace. Such survey may help in designing further use of pomace as a valuable product. Fruit pomace is incredibly nutrient-dense and contains polyphenols, fiber, and natural antioxidants as well as antimicrobial action. Pineapple pomace was taken for further study because its pomace have more potential compare to other fruit pomace and generate a significant amount of pomace than other fruits. The nutritional analysis of pineapple pomace contains good amount of fiber  $42.55 \pm 1.03$ , protein  $3.94 \pm 1.03$ , negligible amount of fat  $0.71 \pm 0.21$ , carbohydrate  $43.81 \pm 0.63$  and minerals like calcium and iron. Furthermore, it can be added to various food items to enhance the product's therapeutic potential and make it easier for consumers to improve their quality of life.

**Keywords:** functional substances, pineapple pomace, nutrient-dense, polyphenol and antioxidant.

### INTRODUCTION:

Although fruits are grown throughout the country, like Maharashtra (MH), Tamil Nadu (TN), Karnataka, Andhra Pradesh, Bihar, Uttar Pradesh, and Gujarat are the major fruit-growing states. Fruit juice vending machines and outlets are said to work for the food processing sector. Pomace, leaves, stems are waste is frequently prone to microbial deterioration; these fruit processing units produce substantial volumes of byproducts, which provide a disposal problem mentioned (Stabnikova *et al.*, 2005). Fruit peels are a new, convenient, effective, economical, ecofriendly, naturalistic, and cost-effective source of antioxidants and antibacterial agents (Prakash *et al.*, 2013). These Processing wastes contains natural fruit flavor compounds, natural antioxidants or bioactive compounds which can solve environmental problem as well as enhance the quality of food products (Wolfe *et al.*, 2003).

Most of the fruit peels of common fruits discarded as waste even when it is safe for human consumption. The pineapple fruit pomace is recognized as one of the major components of human diet as it contains many vital nutrients and non-nutrient compounds. (Rai and Ranganathan, 2012). Fruit waste is an issue for processing industries and environmental monitoring agencies because it is highly perishable in nature. It can be turn into value-added products, by using appropriate processes and techniques. Pomaces fibers and are byproducts while processing the fruits into puree or juice. Fruit juice and fiber can be dried, further processed and ground to a fine particle size (Walter *et al.*, 1985). There is very short information available regarding the useful compounds by fruit products (pomace).

## METHODOLOGY:

Local juice shops were contacted for the present research study juice shops in Udaipur city, Rajasthan. This study was planned to utilize the pineapple pomace after their juice extraction and their nutritional analysis for further use in food products. Thus a pre-survey was conducted to assess the consumer preference for juice and knowledge about the pomace qualities. The survey was conducted by using questionnaire. The survey was conducted on thirty participants (shopkeeper n=30 and consumers n=30) to assess the utilization of fruit pomace. Some questions were asked by consumers who were consuming the juices at those shops.

### Selection of area:

A total number of 30 fruit juice shops is situated in Udaipur city in Rajasthan were selected. A well formulated questionnaire was used to collect the basic basis data on type of fruits purchased, source of fruits purchased, type of processing operation, type of fruit juices available, type and quantity of waste generated and type and preference of consumers for juice etc. The data gathered were tabulated and percentages calculated. Mean and SD for sensory analysis of the products were calculated.

### Proximate composition

A quantitative analysis of nutrient composition provides numerical information about the amount of components in a measured quantity of matter. The methods followed in assessing the nutrient constituents of developed pineapple pomace, flour and selected products are given below:

#### Moisture:

Moisture, carbohydrate, protein, fat, fibre, energy, ash content was estimated using the method of NIN (2003).

**Determination of calcium:** It was estimated by titrimetric method (Cheng And Bray, 1951),

**Iron:** Iron was analyzed using atomic absorption spectrophotometer.

## OBSERVATION AND ASSESSMENT:

### Background information of the subjects

The survey was conducted in the fruit juice shop at Udaipur city, Rajasthan using the questionnaire Table (1) depict the background information of shopkeepers.

Age: Forty percent of the shopkeepers were aged between 20 to 30 years followed by 30-40 years (36.67%) and more than 40 years (23.33%).

Education: Most of the shopkeepers were having education up to secondary level (46.67%) and by primary level (36.67%), only 10% of the shopkeepers were graduate followed by (6.67%) who were illiterate.

Table 1 Background information of the subjects

S. No.	Information	Frequency	Percentage
1	Age		
	20-30	12	40.00
	30-40	11	36.67
	>40	7	23.33
2	Education		
	Illiterate	2	6.67
	Primary	11	36.67
	Secondary	14	46.67
	Graduation	3	10.00

### Processing of fruit by the shopkeeper

#### Shopkeeper's preference related purchasing of fruit

Table (2) shows that the preferred fruit to purchase by shopkeepers was (36 %) either from retail/ Mandy or fruit garden followed by wholesale market (24%). The second preference of the shopkeepers regarding fruit purchase was wholesale market (34%) followed by retailer or fruit gardens (22%). The reason for this (preference) may be due to high cost and the unavailability of quality products in the retail or fruit garden was observed. Only few share of shopkeepers (2%) equally preferred wholesale market, retail market or fruit garden as their last preference to purchase fruits.

Table 2 Shopkeeper's preference related to market

Preferred market for purchasing fruits-								
Market	Preference							
	1st		2nd		3rd		4th	
	F	%	F	%	F	%	F	%
Supermarket	00	0.00	00	00.00	0	00.00	0	0.00
Wholesale market	12	24.00	17	34.00	1	02.00	0	0.00
Retailer / Mandy	18	36.00	11	22.00	1	02.00	0	0.00
Fruits garden	18	36.00	11	22.00	1	02.00	0	0.00

### Quantity of fruit purchased by shopkeepers

Table (3) shows that four type of fruits, namely pineapple, pomegranate, *musambi*, and orange, were purchased in bulk for juice extraction. In the case of pineapple, the majority (66.67%) of the shopkeepers purchased 50- 100 kg of fruits followed by less than 50 kg (33.33 %). In the case of pomegranate, the majority (96.67 %) of the shopkeepers purchased less than 50 kg of fruits followed by 51-100 kg (3.33%). In the case of *musambi*, the majority (70%) of the shopkeepers purchased 51-100 kg of fruits followed by <50 kg (30%). In the case of oranges, the majority (76.67 %) of the shopkeepers purchased 51-100 kg of fruits followed by <50 kg (23.33 %).

Table (3) quantity of fruit purchased by shopkeepers (per day)

Quantity of particular fruit purchased (kg)-			
Fruit	Quantity (Kg)	Frequency	Percentage
Pineapple	<50	10	33.33
	51-100	20	66.67
	>100	00	00.00
Pomegranate	<50	29	96.67
	51-100	01	03.33
	>100	00	00.00
Musambi	<50	09	30.00
	51-100	21	70.00
	>100	00	00.00

Orange	<50	07	23.33
	51-100	23	76.67
	>100	00	00.00

### Fruit availability at shops and juice preference

Majority (70 %) of the shopkeepers recorded that they had both, seasonal and off season fruit available for juice extraction at their shop. Only 30 percent of the shopkeepers sold the fruit juice that was available in season. This may be because fruits available in season are cheaper and give more profit. The information gathered by asking the shopkeeper which juice the consumer preferred. Shopkeepers revealed that most preferred fruit juice by the consumer was the pineapple (36.67 %) followed by *musambi* (33.33%), orange (13.33 %), mixed fruit (10 %).

Table 4 fruit availability and juice preferred by consumers

Fruit mostly available for juice extraction at shop-		
Types of fruits	Frequency	Percentage
Seasonal fruits only	09	30.00
Off season fruits only	00	00.00
Both the fruits were available	21	70.00
Type of fruit juice preferred by consumers-		
Fruit juice	Frequency	Percentage
Pineapple	11	36.67
Pomegranate	02	06.67
Musambi	10	33.33
Orange	04	13.33
Mixed	03	10.00

### Profit and left over juices

Shopkeepers responded that pineapple as the most profitable fruit juice (30%) followed by orange (26%), mixed juices (20%), pomegranate (13.33%), *musambi* (10%). Majority (56.67%) of the shopkeepers revealed that they mixed the left over juices of the container with the fresh juice and sale it while 43.33 percent of the respondents mixed with the left over

juice of the container with sugar and sale it.No single shopkeeper reported that they used left over fruit juices for fruit vinegar preparation. Equal majority (50%) of the shopkeepers used either electric juicer or hand juicer for juice extraction. It was observed that the shopkeeper used hand operated juicer for seasonal fruits juice extraction.

Table 5 profit and left over juices

<b>Most profitable fruit juice-</b>		
Fruit juice	Frequency	Percentage
Orange	8	26.67
Musambi	3	10.00
Pineapple	9	30.00
Pomegranate	4	13.33
Mixed	6	20.00
<b>Preferred usage of left-over juices of container-</b>		
Usages	Frequency	Percentage
Mixed with other fresh juices	17	56.67
Mixed with sugar	13	43.33
Use for fruit vinegar	00	00.00
<b>Equipment used for juice extraction-</b>		
Equipment	Frequency	Percentage
Electronic juicer	15	50.00
Hand juicer	15	50.00
Both of the above	00	00.00

### Pomace production, fruit waste and handling

Table (6) shows that the shopkeepers responded the pineapple fruit produced highest amount of pomace (43.33 %) followed by orange (23.33 %), *musambi* (20%), and pomegranate (13.33%). Shopkeepers categorized the waste produced from juice shop in wet waste that was 30 percent and biodegradable waste (30%), followed by green waste (23.33%). While only 16.67 percent of shopkeepers agreed to the production of a mixture of wet, green and biodegradable waste.

Table 6 pomace production, fruit waste and handling

<b>Highest amount of pomace from particular fruits-</b>
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Fruit	Frequency	Percentage
Orange	07	23.33
<i>Musambi</i>	06	20.00
Pineapple	13	43.33
Pomegranate	04	13.33
<b>Wastes produced-</b>		
Type	Frequency	Percentage
Wet waste	9	30.00
Green waste	7	23.33
Biodegradable waste	9	30.00
All of the above	5	16.67

### Methods for utilization of pomace

All the shopkeepers (n=30) reported that they considered pomace as waste. The method adopted to dispose the pomace were dumping (46%) followed by composting (20%), while equal shares of shopkeepers (16.67 %) disposed off the pomace by means of animal feeding and landfills.

Majority (73%) of the shopkeepers indicated the problem of bad smell followed by fermentation (26%). Cent percent of the shopkeepers did not separated particular fruit pomace after juice extraction. Not even the single shopkeeper had knowledge about pomace handling. Cent percent of the shopkeepers did not know about fruit pomace. Forty percent of the shopkeepers have knowledge about use of fruit waste whereas 60 percent shopkeepers had no knowledge about fruit waste. Equal majority (50%) of the respondents used either electric juicer or hand juicer.

Table 7 methods for utilization of pomace

Separation of particular fruit pomace after juice extraction-	Frequency	Percentage
Yes	00	0.00
No	30	100.00
<b>Knowledge about fruit pomace-</b>		
Yes	00	00.00
No	30	100.00
<b>Knowledge about pomace handling-</b>		
Yes	00	0.00
No	30	100.00

<b>Knowledge about use of fruit waste-</b>		
Yes	12	40.00
No	18	60.00
<b>Utilization of pomace as</b>		
<b>Method</b>	<b>Frequency</b>	<b>Percentage</b>
Consumable	00.00	00.00
Waste	30.00	100
<b>Problem faced during handling pomace-</b>		
<b>Problem</b>	<b>Frequency</b>	<b>Percentage</b>
Fermentation	08	26.67
Bad smell	22	73.33
<b>If it is used as well utilized as the pomace</b>		
Dumping	14	46.67
Animal feeding	05	16.67
Landfills	05	16.67
Composting	06	20.00

### Consumer knowledge

#### Consumer response at those shops

In the response recorded below, consumers drinking juice at the same juice store were asked whether they were aware of fruit waste or the health benefits of pomace. Table (8) indicates knowledge of consumer about pineapple pomace and their utilization at consumer level and their knowledge about fiber and their health benefits.

The consumer (40.00%) indicated easy availability of the bakery products as the main reason to consume bakery products followed by energy dense (33.33%), good in taste and flavor (20.00%), less expensive (06.67%). Their reason for not consuming bakery products majority (53.33%) of the respondents did not consume bakery products because of health issue followed by the cost (30%), dislike taste and flavor (10%), not available in nearby shops (06.67%). Not even a single consumer knows the health benefit of fruit pomace and considering it totally as a quit waste. Majority (60.00%) of the consumer did not know the fiber rich bakery products available in the market followed by (40%). Majority (63.33%) of the consumer know about fiber rich bakery products available in the market whereas 36.67 percent consumer did not know the fiber rich bakery products available in the market. Majority (63.67%) of the consumer agreed that if the products available in future by adding pineapple pomace they would like to consume.

Table 8 consumer response at those shops



<b>Reason(s) for consuming bakery products-</b>	<b>Frequency</b>	<b>Percentage</b>
Easily available	12	40.00
Energy dense	10	33.33
Good in taste and flavor	06	20.00
Less expensive	02	06.67
<b>Reason for not consuming bakery products-</b>		
Dislike taste and flavor	03	10.00
Health issue	16	53.33
Expensive	09	30.00
Not available in near by	02	06.67
<b>Knowledge about health benefit of pomace-</b>		
Yes	00	00.00
No	30	100.00
<b>Frequent preference to pineapple juice-</b>		
Yes	23	76.67
No	07	23.33
<b>Knowledge about nutrient present in fruit pomace-</b>		
Yes	00	00.00
No	30	100.00
<b>Knowledge about Fiber rich bakery product-</b>		
Yes	11	36.67
No	19	63.33
<b>Knowledge about fiber rich bakery products available in the market-</b>		
Yes	12	40.00
No	18	60.00
<b>If the products available in future by adding pineapple pomace would they like to consume-</b>		
Yes	11	36.67
No	19	63.33

### Pineapple pomace powder (PPP)

The nutrient content of pineapple pomace powder (PPP) is given viz. moisture, carbohydrate, protein, fat, energy, fiber and ash mentioned in Table (9). The moisture content of PPP was found to be 5.61 percent which was found higher to the result reported (Kumar *et al.*, 2018) moisture content in pineapple pomace was 3.41 percent.

The protein content of PPP was found to be 3.94 which lower 4.65 to the value reported by Kumar *et al.*, (2018). Mohammad *et al.*, (2021) showed the physicochemical and nutritional composition of the pineapple pomace in prepared nut bar on the day of storage and after 2 months of storage. All the treated samples significantly differed. The protein content of the treated samples ranged from 8.53- 13.06 percent whereas the collected market sample was 3.18 percent.

The fat content of PPP was observed to be 0.71 g/100. The ash content of PPP was observed to be 2.25 percent. The fiber content of PPP was observed to be 42.55 g/100g. The carbohydrate content of PPP was observed to be 43.81 g/100g. The energy content of PPP was observed to be 187.37 kcal/100 g. Result reported by Kumar *et al.*, (2018) fat content in pineapple 0.62 g/100. Ash content in pineapple pomace powder 2.21 percent. Total dietary fiber content in pineapple pomace powder to be 44.38g/100g and carbohydrates content in pineapple pomace has been 42.85 g/100g.

Pineapple pomace was rich in dietary fibre, while low in fat content. The moisture, ash, carbohydrate and fat content of pineapple pomace were 6.19 g/100g, 3.36g/100g, 75.96g/100g and 0.26g/100g respectively. Moisture, ash and carbohydrate content were higher, whilst fat content was slightly lower as compared to the findings of Selaniet *et al.*, (2014).

Calcium and iron content were recorded to be 9.00mg/100g and 3.60mg/100g respectively which were in value as reported by Devi *et al.*, (2016). The calcium content of PPP was observed to be  $8.91 \pm 1.37$  and iron content was found to be  $0.42 \pm 0.28$  which was lower than the reported by Devi *et al.*, (2016).

Table 9 Pineapple pomace powder

Nutrient Constituents ( Per 100g)	PPP Mean $\pm$ SD
Moisture	4.42 $\pm$ 0.79
Fiber	42.55 $\pm$ 1.03
Ash	2.25 $\pm$ 0.29
Protein	3.94 $\pm$ 1.03
Fat	0.71 $\pm$ 0.21
Carbohydrate	43.81 $\pm$ 0.63

Energy	187.37±1.37
Minerals	
Calcium	8.91±1.37
Iron	0.42±0.28

PPP (Pineapple Pomace Powder) Value is expressed on 100 gm dry weight basis

## CONCLUSION:

Thus it can be concluded that the first preference of the market to purchase fruits by the shopkeepers was *mandy*, no one were prefers to supermarket to purchase the fruit in bulk it may be due to higher in cost or not available in nearby. shopkeepers purchase fruits, in case of pineapple 50- 100 kg, pomegranate less than 50 kg *musambi* 50-100 kg, orange 50- 100 kg. The pomegranate quantity is less than 50 kg; it may be due to the higher cost of pomegranate juice. Seasonal and off-season both types of fruit juices were available at juice shops, pineapple juice was the most preferable and most profitable juice was recorded. Shopkeepers recorded the highest amount of pineapple fruit pomace produced, all the waste including pomace mostly. It was recorded that there was no proper handling of pomace; they did not know about the health benefit of pineapple pomace, they prefer pineapple juice among all the fruit juices; it may be due to its taste. The nutritional composition in pineapple pomace powder is rich in fiber content which can act as functional ingredients in food. The pineapple pomace has also strong flavour which can also replace the artificial essence.

## REFERENCE:

1. Cheng, K. L & Bray, R.H. (1951). Determination of calcium and magnesium in soil and plant material. *Soil Sci.* 72: 449-458.
2. Raghuramulu, N., Madhavan, N. K & Kalyansundram, S. (2003). NIN (National Institute of Nutrition). A Manual for Laboratory Techniques.. (ed.) NIN, ICMR, Hyderabad.
3. Prakash, A., Mathur, K., Vishwakarma, A., Vuppu, S. & 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.* 19 : 131-135.
4. Raj, A. A. S & Ranganathan, T.V. (2012). Extraction of Pectin from Different Fruit Wastes due to the Quality Upgradation of Jellies Preparation–Review. 1:553.
5. Stabnikova, O., Wang, J.Y & Ding, H.B. (2005). Biotransformation of vegetable and fruit processing wastes into yeast biomass enriched with selenium. *Bioresource Technol.*, 96 : 747-751.

6. Walter,R.H..Rao, M.A. Sherman, R.M & Cooley, H.J. (1985). Edible Fibre from Apple Pomace. *J. Food Sci.* 60: pp. 747–749,
7. Wolfe, K. L & Liu, R. H. (2003). Apple peels as a value-added food ingredient. *J Agric Food Chem* 51:1676–1683.
8. Selani, M.M., Brazaca, S.G.C., Santos, Dias, C.T., Ratnayakem, W.S., Flores, R.A & Bianchini, A. (. 2014). Characterisation and potential application of pineapple pomace in an extruded product for fibre enhancement. *Food Chem.*; 163: 23-30.
9. Kumar, H. Katiyar, S. K., Rakha, R., Soni, A & Kiran Singh. (2018).“Studies on pineapple pomace and its qualities,” *International Research Journal of Advanced Engineering and Science*, 4; 26-27,
10. Devi L.K, Karoulia, S & Chaudhary, N. (2016). Preparation of high dietary fibre cookies from pineapple (*Ananascomosus*) pomace. *Int. J. Sci. Res.*; 5(5): 1368-1372.
11. Mohammad,M.M.Ashfak,A.S. Khan, M.H., Chowdhury, M. G. F.Alam, M. Akhter, S and Ali, M.S.(2021). Effect of Pineapple Pomace on the Development of Peanut Bar and their Physicochemical and Nutritional Properties with Consumer Acceptance. *Journal of Agricultural Science and Food Technology* 7 (3), pp. 46-56.