DEVELOPMENT OF VALUE ADDED BISCUITS BY INCORPORATION OF FRUIT POMACE AND OTHER INGREDIENTS: A SURVEY

Manoj Panwar[1], Prof. (Dr.) Arif. A. Broadway [2]

[1] *Ph.D. Food Science And Technology Student, Warner School of Food and Dairy Technology, Sam Higginbottom Institute of Agriculture, Technology and Sciences, (Deemed-to-be University), Allahabad, (India)*

[2] *Director, Directorate of Research, Sam Higginbottom Institute of Agriculture, Technology and Science, (Deemed-to-be-University), Allahabad, (India)*

ABSTRACT

Many agricultural and agro-industrial by-products that could profitably be used are available locally but are no fully exploited for the feeding of livestock. Such feedstuffs include fibrous by-products such as wheat bran, maize bran, rice bran, tomato pomace, grape pomace, sugar beet pulp, pomegranate pulp and fruit pomace. This agro-industrial by products, although containing potentially toxic components, can be improved by various treatments such as chemical, mechanical, pelleting, grinding and other processing techniques. Many by-products have a substantial potential value as animal feedstuffs and also for human foods. The utilization of agro-industrial by products may be economically worthwhile, since conventional feedstuffs are often expensive. Several factors have lead to increase interest in by-product feedstuffs, such as pollution abatement and regulations, increasing costs of waste disposal and changes in perception of the value of by-product feedstuffs as economical feed alternatives. In this paper we are surveyed that how different food by products can be utilized for making of human and animal foods.

Keywords: Author Guide, Article, Camera-Ready Format, Paper Specifications, Paper Submission.

I. INTRODUCTION

Fruits have been grown for thousands of years in Asia and Europe, and were brought to North America by European colonists. Fruits have been present in the mythology and religions of many cultures, including Norse, Greek and Christian traditions. Fruit is the climacteric fruit and it continues its metabolic activities even after harvest. The physiological processes which continue after harvest are respiration, water loss (transpiration), ripening, and senescence changes which are altered by environmental conditions (**ADA, 2002).** Most of the production of the fruit is used for table purpose but apportion is being processed into various products of which fruit juice is processed to a greater extent .The world production of fruit is about 58 million tons from an area of about 5.26

million/ hectare. Presently, India is the largest producer of fruits in the world contributing about one third of total fruit production of the world with an annual production of 1.42 million tons from an area of 0.25 million/ hectare (**FAI, 2001).**

Nowadays, there is great political and social pressure to reduce the pollution arising from industrial activities. Almost all developed and underdeveloped countries are trying to adapt to this reality by modifying their processes so that their residues can be recycled. Consequently, most large companies no longer consider residues as waste, but as a raw material for other processes. Most by-product feedstuffs (BPF) result from the processing of commercial crops, the food processing industry and the fiber industry **(Adhikari et al., 2001; ADA, 2002).**

In the past, fruit pomace was dried and used as animal feed **(Singh and Narang 1992).** Pectin manufacture from fruit pomace is the only utilization currently carried out at an industrial level. Fruit pomace needs to be first dried and stored for a period of time; otherwise it is hard to extract the pectin from it **(Pirmohammadi et al. 2006).** Fruit pomace is a rich source of carbohydrates, dietary fibbers, minerals, vitamin C and also has high moisture content Extruded snack products are predominantly made from cereal flour or starches and tend to be low in protein with low biological value. The incorporation of enriched fiber flours with significant values of antioxidants is a way to improve the nutritional value of these snacks.

The composition of fruit pomace with respect to its fiber content viz sugar, cellulose, hemicelluloses, pectin and roughage appears to have the best proposition for incorporation in the bakery industry for production of high fiber baked foods. The crude fiber content of fruit pomace is approximately 14-30% of the dry weights. Fruit fiber is higher in TDF (Total Dietary Fibers) than wheat and oat bran. It has good water holding capacity and act as humectants in certain food products **(Bhushan et al. 2008)**.

Several experimental studies on the drying characteristics of fruit products have been conducted such as fruit slices fruit cubes. Fruit puree, cylindrical shaped fruit lump, and rectangular shaped fruit lump. Fruit pomace was, however, only used as a test material to compare two moisture determination methods, i.e., infrared drying technique and conventional oven technique. So far, there is little information available about drying characteristics of fruit pomace. Therefore, study on drying of fruit pomace is of great significance for environment protection and resource utilization. The most promising method for complete utilization of fruit pomace may be through solid state fermentation with yeasts, separating out ethanol and using the left over protein rich material after drying as an animal feed. The increasing demand for ethanol for various industrial solvents, cleansing agent, and preservatives has necessitated increased production of this alcohol **(Almosnino et al. 1996; Thakur et al. 1997; Lin and Demain, 1991; Attri and Joshi 2005; Roberts et al. 2004).**

In this paper we are surveying the methods of different drying characteristics of fruits pomace, making of biscuits form them and also different types of physio-chemical analysis with the different types of microbiological analysis. In this paper frst section defined the historical aspects of the fruits pomace and fruits pomace made biscuits, then next section explained that the methodology used in the developing of the fruits pomace and biscuits.

II. HISTORICAL BACKGROUND OF FRUITS POMACE AND POMACE BASED BISCUITS

Drying of the fruits pomace seems to be a promising utilization way for animal feed or for further processing such as nutrient recovery. Drying of moist materials is a process involving heat and mass transfers simultaneously**.** Drying techniques have been used for centuries, undergoing important evolutions**.** Studies on the drying processes are numerous because it is one of the most common industrial operations and involves high energy consumption, 10-25% of the total energy used in manufacturing processes worldwide.

Several experimental studies on the drying characteristics of fruits products have been conducted such as fruits slices **[Sharma and joshi, 2001, Bhushan *et al.* 2008],** fruits cubes fruits puree cylindrical shaped fruits lump and rectangular shaped fruits lump. Fruits pomace was, however, only used as a test material to compare two moisture determination methods, i.e., infrared drying technique and conventional oven technique (Fenton and Kennedy, 1998). So far, there is little information available about drying characteristics of fruits pomace. Therefore, study on drying of fruits pomace is of great significance for environment protection and resource utilization.

Walter *et al.* (1976) explained that pineapple pomace is the by product of pineapple cider and juice processing industries and it account for about 35% of the original fruit mass at 87.8% (wet) moisture content pineapple pomace contains 26.41% dry matter (DM), 3.95% proteins,0.4% sugars, 6.82% cellulose, 0.30% ash,0.45% acid and 20mg calcium per 100 g of wet pineapple pomace; when it dried it contains 97.75% DM, 25.90% proteins, 0.3% sugars, 27.85% cellulose, 1.90% ash, 1.80% pectin, 6.5% protopectin and 55.2 mg calcium per 100 g of dried pineapple pomace. **Wang and Thomas (1989)** reported that conducted experiment on the direct use of pineapple pomace in bakery product. **Shah *et al.* (1994)** studied on the utilization of wastes from fruit processing plants. **Mckee and Latner (2000)** reviewed the source of dietary fibres in underutilized food products. **Bates *et al.* (2001)** studied that fruit pomace, through traditionally utilized as cattle feed, only a fraction of pomace is used. Due to rapid spoilage of the wet pomace . **Sharma and joshi, (2001)** studied that efforts have been made to utilize fruit pomace in the preparation of edible product like fruit pomace jam and sauce or to make citric acid.

Stoll et al. (2003) reported the utilization of a carotene-rich functional food ingredient recovered through mechanical and enzymatic breakdown of the tissue of fruit pomace. **Bhushan *et al.* (2008)** author discussed about 25-30% of the total production was processed into juice, cider, as well as frozen and dried processed products. **Bates *et al.* 2001** studied that pineapple pomace ,through traditionally utilized as cattle feed, only a fraction of apple pomace is used due to rapid spoilage of the wet pomace.

Walter *et al.* (1976) stated that pomegranate pomace accounts for about 25% of the original fruit mass at 85% wet basis moisture content.

Schieber *et al.* (2003) studied that pomegranate pomace produced from pomegranate contains significant quantities of polyphenols. Polyohenol subclasses of pomegranate pomace are: flavanols (catechin, epicatechin, procynidins), flavonols , hydroxycinnnamates and dihydrochalcones.

Schweiggert (2004) reported the orange fruit pomace as a source of functional ingredients. Utilization of fruit pomace as a source of valuable bioactive and functional compounds was discussed.

III. METHODOLOGY

In this section we are discussed about the making of fruit pomace and the methodology of development of fruit pomace biscuits. We also discussed about the method of different analysis test for the quality standard of biscuits such as physiochemichal and microbiological analysis.

For the making of fruits pomace from fruits, we purchase fruits from the market then extract their juice. After the extraction of juice only fruit pomaces left which is initially a waste but it have all the nutrition values which are present in the fruits. So first we dry it by different methods of drying which is explained bellow.

3.1 Drying Techniques and Dryers

Several types of dryers and drying methods, each better suited for a particular situation, are commercially used to remove moisture from a wide variety of fruits and vegetables. Conventional drying process ranges from natural sun drying to industrial drying (Leon et al. 2002). Some of the most common types of drying processes and dryers are introduced in the following sections.

a. Sun Drying
b. Hot Air Drying
c. Cabinet Dryer
d. Tunnel Dryer
e. Belt-Trough Dryers
f. Pneumatic Conveyor Dryers
g. Fluidized Bed Dryer
h. Microwave Drying
i. Spray Drying
j. Freeze-Drying
k. Osmotic Dehydration

3.1.1 Drying Characteristics

3.1.1.1Drying Rate

Drying rate measures the rate of existence of moisture content from the Apple. The measurements for the moisture are mathematically calculated by different formulas .

$$\text{Present moisture content} = \frac{\text{Loss in weight}}{\text{Initial Weight of the sample}} \times 100 \quad (1)$$

$$\text{Present moisture content} = \frac{\text{Loss in weight}}{\text{Initial Weight of the sample}} \times 100 \quad (2)$$

$$\text{Moisture content(M.C.)(wet basis)} = (M_1 - M_2)/(M_1) \times 100 \quad (3)$$

$$\text{Moisture content(Dry basis)} = \frac{\text{M.C.(wet basis)}}{100 - \text{M.C.(wet basis)}} \times 100 \quad (4)$$

$$\text{MC(lost)} = (\text{M.C.(current)} - \text{M.C.(previous)} \quad (5)$$

$$\text{Rate of drying} = (\text{MC(lost)})/(\text{time difference}) \times 100 \quad (6)$$

M.C. = moisture content of the sample (% w.b. and d. b.)

M_1 = wt. of the sample before solar dryer (g).

M_2 = wt. of the sample after solar dryer (g).

Moisture content of sample during drying

Moisture content of the sample during dying was computed through mass balance. For this purpose, weight of the sample during was recorded every 30 balance mint.

The following formula was used to calculate the moisture content:

M.C. =

$$\frac{(\text{Wt. of the sample at desired time}) - (\text{wt. of bone dry material})}{(\text{Wt. of sample at any time})} \times 100$$

(7)

Where,

$$\text{Wt. of born dried} = \frac{(\text{Initial wt.of the sample} \times 100) - (\text{Initial M.C.})}{(100)} \quad (8)$$

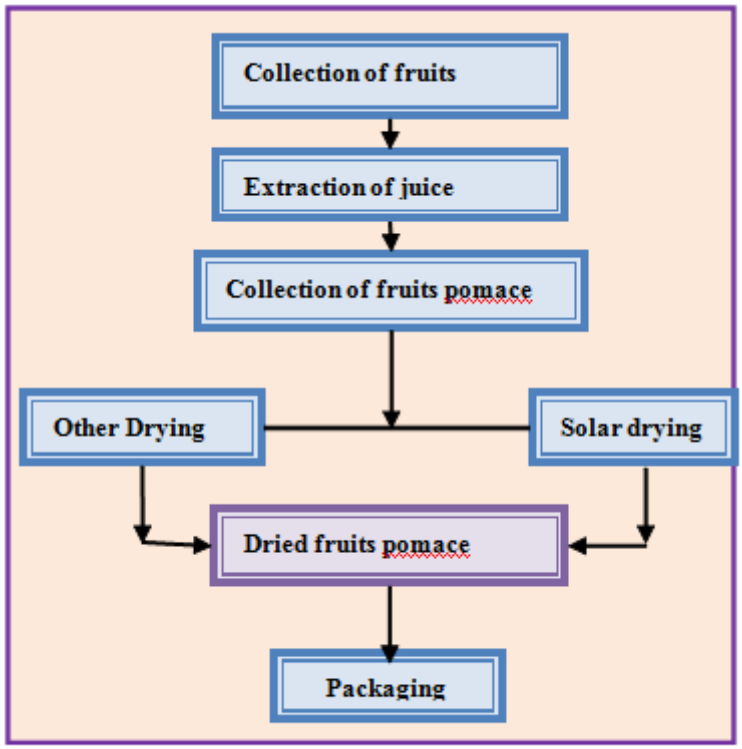

Fig. 1 Process Flow Chart of Fruits Pomace Drying

3.1.1.2 Dehydration Ratio

Dehydration ratio is an important factor, which shown bulk reduced in weight of the sample. Moist the dehydration ratio better the process of drying. Formula used for calculating dehydration ratio is:

$$\text{Dehydration ratio} = \frac{(\text{Initial weight of the product})}{(\text{Weight of dehydration product})} \quad (9)$$

3.1.1.3 Rehydration Ratio

Rehydration ratio is one of the important bases to form a base material for further utilization. Rehydration is the replace of water in development food. Fruits are rehydration to study the reconstitute of dried sample. Rehydration ratio show the originality grained and acceptability attribute of a product.

$$\text{Rehydration ratio} = \frac{(\text{Weight of the socked product } (W_r))}{(\text{Weight of dehydration product } (W_d))} \quad (10)$$

Where,

W r = weight of the soaked product.

W d = weight of the dehydration product.

3.2 Development of Fruits Pomace Biscuits

For the development of the fruits pomace biscuits we use following steps which are given in the flow-chart (fig. 2)

3.2.1 Pre Mixing Of the Ingredients

The sweetener with edible oil was mixed and paste was made. Simultaneously the fruits pomace with wheat flour mixed well together. The uniform mixture was done for good quality.

3.2.2 Baking Powder

The baking powder will be taken approximately 2 g for the good baking of the biscuits. Baking powder is the combination of sodium bicarbonate and an acid salt when moisture heating. Baking powder lightens the product and make easy digest. It act as buffer between soda and acid prevent reaction when expose to air by absorbing moisture.

3.2.3 Addition of Flavors and Preservatives

The essence for the flavour and preservatives such as sodium bicarbonate ($NaHCO_3$) were also added for enhancing the shelf life of the biscuits.

3.2.4 Mixing

All the ingredients were well mixed and kneading process is carried out for the uniformity.

3.2.5 Molding

The different molding sizes were employed for desired shapes the biscuits.

3.2.6 Baking

The baking of the biscuits was done at 160^0C to 180^0C for 30 minutes.

3.2.7 Cooling

The cooling of the baked biscuits was done at room temperature after baking.

3.2.8 Packaging

The L.D.P.E. packaging materials was used for the packing of biscuits and was stored under the ambient temperature and standard storage conditions.

3.3 Analytical Methods:

3.3.1 Determination Of Dietary Fibre Contents

Total dietary fibre (TDF), soluble dietary fibre (SDF) and insoluble dietary fibre (IDF) contents of samples were determined with an enzymatic–gravimetric procedure according to AOAC Method 991.43,[3,38].

3.3.2 Proximate Chemical Composition*:*

Moisture, crude protein, crude lipid, ash and carbohydrate contents were determined using the appropriate AOAC (2000)[3]. Carbohydrates were determined by difference from the total dietary fibre, lipids, protein and ash contents
[10].

3.3.3Functional Properties

Water holding capacity (WHC) and oil holding capacity (OHC) were measured according the methods reported by Femenia *et al.* (1997) and Robertson *et al.* (2000)[18,43].

Swelling capacity (SWC): was measured using the bed volume technique described by Kuniak and Marchessault (1972) [33]. Approximately 0.2 g of the sample material was weighed into a 50 mL graduated glass cylinder. After making up the volume to 50 mL with de-ionized water and the mixtures were then vigorously stirred, the material was left overnight at room temperature for equilibration. The volume of the

swollen sample was noted. Results of SWC were expressed as the ratio of volume (mL) of swollen sample to the weight (g) of dry initial sample. Triplicate measurements were taken for all WHC, OHC and SWC.

3.3.4 Rheological Characteristics

Fruits and vegetables waste blends at 0, 5, 10, 15 and 20% levels were prepared by replacing wheat flour. The effect of fruits and vegetables fibre on the mixing profile of the dough was studied using farinograph (Brabender, Duisburg, Germany) according to the standard AACC methods (2000) [1]. Farinograph test was carried out to determine the water absorption, arrival time, dough development time, dough stability and degree of weakening. The elastic properties of the dough were studied using extensograph (Brabender, Duisburg, Germany) according to the standard AACC methods (2000) [1]. Extensograph test was carried out to determine resistance to extension (B.U.), extensibility (mm), proportional number and energy (cm^2).

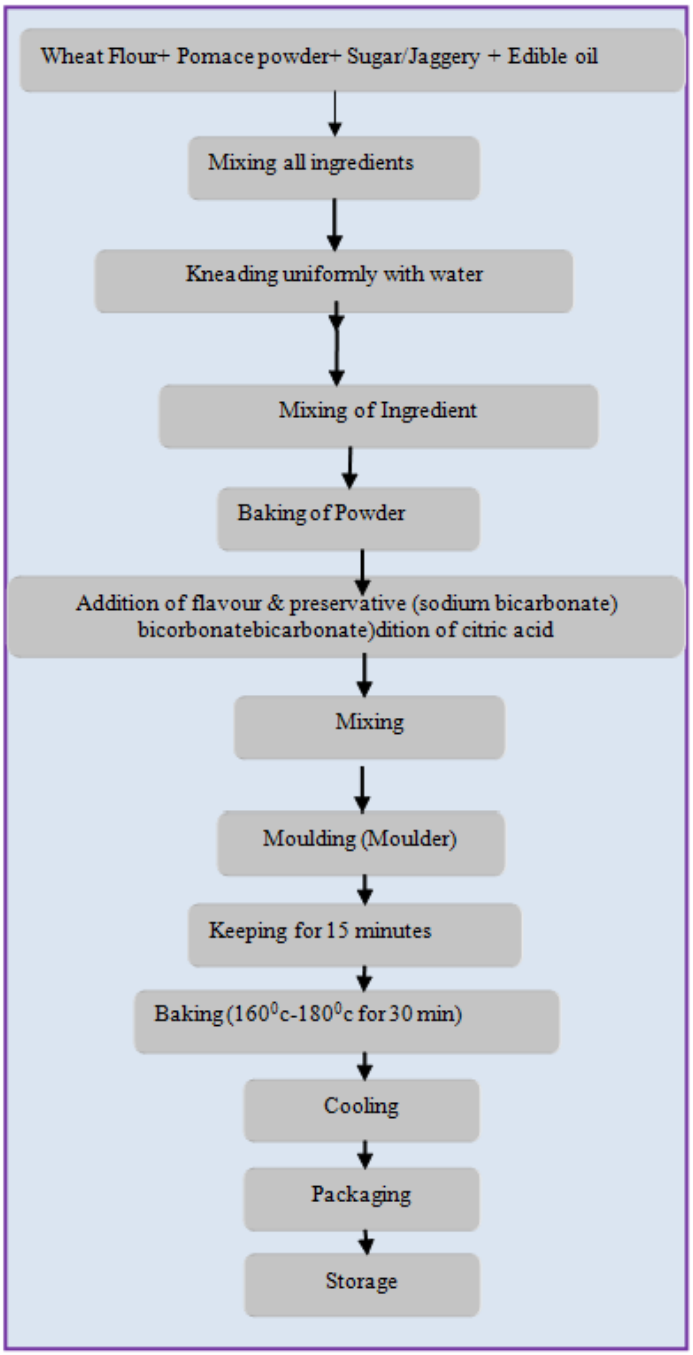

Fig. 2 Process flow chart for biscuits

3.3.5 Physical Characteristics for Biscuits

- The weight (g) for biscuits was determined individually within one hour after baking the average was recorded.
- The volume (cm3) of different types of produced biscuits was determined by rape seeds displacement method according to (AACC, 2000) [1].
- Specific volume was calculated according to the method of (AACC, 2000) [1], using the following equation

$$Specific\ Volume = \frac{\text{Volume (cm3)}}{\text{Weight (g)}} \quad (11)$$

3.3.6 Texture Characteristics

The texture of the cakes was measured objectively using food texturometer (TAHDi, Stable Micro System, UK) as per the standard AACC methods (2000) [1]. A test speed of 2.0 mm s-1 were used. A 35 mm diameter cylinder aluminum probe (P-35), was used to measure the required compression force. Force required to compress 25% of the cake slice (2.54 cm) was recorded. All measurements were performed at ambient temperature 25±2°C according to Gomez *et al.* (2007) [23].

3.3.7 Statistical Analysis

Data obtained from the chemical analysis and physicochemical properties was subjected to analysis of variance technology two way classification, and critical different will be used to determine best treatment. Completely randomized design (CRD) will be used to know the significant different between treatment of product regarding the attributes. Calculated a value will be compound with a table value of F at 5% level of signification. If calculated value will be the table effect will be considered to be significance of study will be tested at 5% level.

t $= \sqrt{(n-2)} / \sqrt{(1-1/2^2)}$

S.Ed. $= \sqrt{2}$ MESS / r × t ×s

C. D = S.Ed × t 5 % at e. d. f.

Where,

t = distribution of observation

r = co-efficient of correlation

n = no. of observation

S.Ed. = standard error of difference

e.d.f. = error of degree of freedom

C.D. = critical difference

MESS = error mean sum of square.

3.3.8 Chemical Analysis

3.3.8.1 Moisture Content

Samples were heated at a specified temperature for a specified period of time and the loss in weight were recorded as moisture content of the sample.

a. Requirement

Moisture Dish- made of porcelain, silica, glass or aluminum oven – maintained at 110^0C and desiccators.

b. Procedure

The instrument used for moisture determination**.** Weighed about 3 g of the prepared sample in the moisture dish, previously air dried in the oven and weighed. Placed the dish in the oven maintained at the 110±5^{0}C for 4 hours.

Cooled in the desiccators and weighed. Repeated the process of drying, cooling and weighing at 30 minute intervals until the difference between the two consecutive weighing is less than 1 mg. record the lowest weight.

c. Calculation

It will be analysed in Hot air oven at 103C and will be calculated by formula.

$$M.C. = \frac{(\text{Wt.of the sample at desired time}) - (\text{wt.of bone dry material})}{(\text{Wt.of sample at any time})} \times 100 \quad (12)$$

3.3.8.2 Determination Of Ash Content By Muffle Furnace (By Ranganna, 1986)

The ash of the food stuff is the organic residue remaining after the organic matter has been burnt away. When a high ash figure found it suggests the presence of an adulterant, it is often advisable to determine the acid insoluble ash also.

a. Procedure

3 g of the sample was weighed. It was tare, cleaned, dried and pre-weighed porcelain dish or silica dish or platinum dish was taken. The sample was ignited in the dish with the flame of a suitable burner (oxidizing agent) for about one minute. Ignition was completed by keeping it in a muffle furnace at 550-600^{0}C until the grey ash results. It was cool in a desiccator and weigh. The process was repeated till constant weight was obtained. The final weight was noted.

b. Calculation

$$\text{Ash } \% = \frac{W_2 - W_1}{W} \text{ X } 100 \quad (13)$$

Where,

W_2 = Final weight of dish + Ash

W_1 = Weight of dish

W = Weight of sample

3.3.8.3 Determination of fat content by Soxhlet method (By Ranganna, 1986)

a. Procedure

Firstly weight of empty round flask. Weight 05 g of pineapple pomace, wheat bran biscuits in a dry cellulose thimble and covered with cotton and kept into the Soxhlet assembly. The fat extraction was carried out with petroleum ether (60°C-80°C) for four hours. After evaporating the solvent, flask were kept into the hot air oven for one hour and cool into desiccator and weight again.

b.Calculation

$$\% \text{ Fat content } = \frac{W_1 - W_2}{W} X100 \quad (13)$$

Where,

W_1 = Initial weight of round flask

W_2 = Final weight of flask + fat

W = Weight of sample

3.3.8.4 Determination Of Protein Content By Micro-Kjeldhal Method (By Ranganna, 1986)

Kjeldahl method for determining total nitrogen involves first heating with concentrated sulphuric acid. The reaction rate was accelerated by adding Sodium Sulphate to raise the boiling point. The catalyst used was copper sulphate. The oxidation causes the nitrogen to be converted to ammonium sulphate. After making

alkaline with concentrated NaOH, the liberated ammonia was distilled into HCl. The protein content was obtained by multiplying total nitrogen by an empirical factor.

a. Procedure

About 2g of sample were weighted accurately and transferred to a kjeldahl flask. Then 4 g of $CuSO_4$ and 10 g of Na_2SO_4 were added to the flask. 25 ml of concentrated H_2SO_4 were added. The flask was heated gently in an inclined position till the light blue colour solution was obtained. Then the flask was heated on a high flame for three hours. Then the digestion mixture was cooled at the room temperature. The digest were wash into the distillation flask with distilled water. The distillation assembly was arranged to the receiving flask and 50 ml of 0.01N HCl with 2-4 drops of methyl red indicator were added. The distillation apparatus were connected with a delivery tube dipping in an HCl solution. Zn metal pieces were added to the distillation flask which was carefully added to the digestion mixture. It was rinse with water. Around 50-60 ml of 50% NaOH was added to it. Sufficient water was added to the flask. The H_2O were started through the condenser. The solution was heated and it liberates NH_3. The liberated NH_3 were distilled into HCl solution. The heating was continuing thrice, the initial volume of HCl in the receiving flask. The tap was open and washes down the condenser and the delivery tube into the receiver. The burner was put off. The distillate with 0.1N NaOH were titrated and slight pink colour were obtained. Conduct with blank determination.

b. Calculation

$$\% N = \frac{\text{Sample} - \text{blank X N of HCl X vol.of digest X0.014}}{\text{Aliquot taken X Wt.of sample}} \times 100 \quad (14)$$

Aliquot taken X Wt. of sample

Protein =negortiN % X 6.25.

Where,

S = Sample Titrate Reading

B = Blank Titrate Reading

3.3.8.5 Determination of Fiber (By Ranganna, 1986)

When a fat free sample of weighed 2g taken in the triplicate and digest with 200 ml of 1.25% sulphuric acid by gentle boiling for half an hour. Now the contents of the sample filtered and policed by a muslin cloth under suction. Then it washed the residue free of acid using hot distilled sodium hydroxide. Digest the content again for half an hour, filtered and wash free of alkali using hot distilled water. Dry the residue in an oven overnight at 105ºC. Now weighed it and place in the muffle furnace at 600ºC for four hrs. The loss in weight after ignition represents the crude fiber in the sample.

$$\% \text{ of Fiber} = \frac{(W_2 - W_1) - (W_3 - W_1)}{W} \quad (15)$$

Where,

W =Weight of sample

W1 = Weight of crucible

W2 = Weight of empty crucible + sample before ignition

W3 = Weight of empty crucible + sample after ignition

3.4 Microbiological Analysis

3.4.1 Standard Plate Count (SPC) (Govt. Of India, 2012)

The following media and reagents (1-4) are commercially available and are to be prepared and sterilized according to the manufacturer's instructions.

- Plate count agar (PC)/Nutrient Agar (NA)
- Peptone water diluent (0.1%)(PW)
- Sodium 2, 3, 5 triphenyltetrazolium chloride, TTC (0.1%) (optional)
- 1N HCl and 1N NaOH
- pH meter or paper capable of distinguishing to 0.3 to 0.5 pH units within a range of 5.0 to 8.0 Stomacher, blender or equivalent for sample preparation/homogenization.
- Incubator capable of maintaining the growth temperature required for the specific type of aerobic bacteria being enumerated (i.e. for psychrophilic bacteria: 15 – 20°C, for mesophilic bacteria: 30 – 35°C, and for thermophilic bacteria: 55°C) and 45°C waterbath
- Colony counting device (optional)

3.4.2 Coliform Count Analysis (Govt. Of India, 2012)

The following media and reagents are commercially available and are to be prepared and sterilized according to the manufacturer's instructions.

- Violet Red Bile Agar
- Peptone water diluent (0.1%)(PW)/ N-Saline
- pH meter or paper capable of distinguishing to 0.3 to 0.5 pH units within a
- range of 5.0 to 8.0
- Stomacher, blender or equivalent for sample preparation/homogenization.
- Incubator capable of maintaining the growth temperature required for the specific type of aerobic bacteria being enumerated i.e. at 35°C.
- Colony counting device (optional)

3.4.3 Yeast And Mould Count (Govt. Of India, 2012)

The following media and reagents are commercially available and are to be prepared and sterilized according to the manufacturer's instructions.

These agars are suitable for yeast and mould count in food products:

- Chloramphenicol Yeast extract Glucose Agar (CYGA)
- Potato dextrose agar with chloramphenicol (PDA-C)
- 20% sucrose (diluent additive for osmophiles)
- Malt extract agar containing 50% (w/w) sucrose

Other materials:

- Peptone water (0.1%) (PW)
- 1N HCl and 1N NaOH
- Gram stain solutions
- Stomacher, blender or equivalent
- pH meter or paper capable of distinguishing to 0.3 to 0.5 pH units within a range of 5.0 to 8.0
- Light microscope
- Colony counting device (optional)
- Incubator (darkened) capable of maintaining 22 to 25°C,

3.5 Shelf Life of Apple Pomace Powder

Shelf life is the length of time that a commodity may be stored without becoming unfit for use or consumption. It applies to foods, beverages, pharmaceutical drugs, chemicals, and many other perishable items. In some

regions, an advisory best before, mandatory use by, or freshness date is required on packaged perishable foods. Shelf life of apple pomace will be done by incubating the sample and counting the colonies for total plate count, and yeast and mold. Shelf life depends on the degradation mechanism of the specific product. Most can be influenced by several factors: exposure to light, heat, and moisture, transmission of gases, mechanical stresses, and contamination by things such as micro-organisms. Product quality is often mathematically modelled around a parameter (concentration of a chemical compound, a microbiological index, or moisture content).

IV. CONCLUSIONS

This study demonstrated the feasibility of using some by-product from plants of food industry to produce dietary fiber powder which may be used as a food ingredient. The results showed that the sources of dietary fiber had significant effects on the dietary fiber composition and technological properties. Moreover, the high effect on hydration properties which would affect the further. Overall, the results suggested that fruits waste, could be used as a good raw material to produce dietary fiber powders, and this powder can be used for many food items which can be used by human and animals both. These products have all the ingredients presents which are available in the real fruits so they are very usefull.

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