

Seminar report

**CONVENIENT FOODS – REVOLUTIONARY TRENDS IN THE
PRESENT ERA**

By

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(2018-16-003)

Presented on 03/01/2019

Submitted in partial fulfilment of the requirement for course

FN 591: Master's Seminar (0+1)



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DECLARATION

I, Riya. K. Zacharia (2018-16-003) hereby declare that the seminar entitled ‘Convenient foods – Revolutionary trends in the present era’ has been prepared by me, after going through various references cited at the end and has not copied from any of my fellow students.

Vellanikkara

25/01/2019

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CERTIFICATE

This is to certify that the seminar report entitled 'Convenient foods – Revolutionary trends in the present era' has been solely prepared by Riya. K. Zacharia (2018-16-003) under my guidance and has not been copied from fellow students.

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Convenient foods – Revolutionary trends in the present era

1. Introduction

Convenient foods are commercially prepared food, designed for ease of preparation and consumption. Busy life style, time constraints and efforts needed makes them to go for better convenient choices. Nowadays, Indian households, welcome foods with convenience. It is gaining acceptance in their day to day life. Convenient foods are those that help consumers to reduce time as well as physical and mental efforts required for food preparation, consumption and clean-up (Brunner *et al.*, 2010).

At present in India, convenient food products covers a main portion of shelf space in stores and super markets. This has been done through media, particularly electronic and print media, as it creates understanding of the goods contrived and sold out in the markets. Emergence of convenient food products changed people's lifestyle as well as provide a high and new quality of convenient food products to them which saves their time as well as energy. It can also be analyzed by the entry of Indian companies in markets with varieties of convenient food products.

Currently, convenient foods is the largest segment in the overall conventional and non-conventional food industry. This segment is growing at a fast pace as a result of the high consumer acceptance for such food globally. Innovative products in functional ingredients, convenience, and organic foods and advancement in areas of packaging technology are expected provide a future growth opportunity in the sector.

2. Convenient foods - Global scenario

Global ready to eat food market is projected to grow at a CAGR of 4.3% during the forecast period 2016 - 2024. The young consumers spend most of their income on convenient food products. Young consumers are the easiest targets for convenient food manufacturing giants. The convenience level of such products helps to increase the total demand in the market, across the world. North America holds the largest market share of convenient foods. The United States is the largest market in North America due to technological innovations, busy lifestyles, and high disposable incomes.



Figure 1. Convenient food- Global scenario (Mordor Intelligence, 2018)

3. Need of convenient foods

The improving consumer lifestyle, rapid urbanization, high disposable income, are increasing demand for on the go convenient foods, thereby fuelling the convenient food market growth. Changing food consumption behaviour among consumers, increased willingness to spend on such food and the lack of time to cook at home are a result of the rapid urbanization. Urbanization also helps in increasing the disposable income, which increases the food expenditure of the final consumer. The unexpected rise of working women due to urbanization and nuclear family, increased dual income from increased working couple and impact of western culture and media, easiness of convenient foods makes change in consumer preference towards convenient foods.

In a study conducted by Sreenivasan and Shande, (2015) they found that benefits of convenient foods for working women among 100 working women in Pune. Majority of respondents said that, convenient foods helped to prepare off seasonal foods and another 81% of working women reported that it helped in emergency situations. Easiness in preparation was found to be the most important reason for their choices (Fig.2). It is also observed that most of preferred convenient foods were bottled products RTE snacks (Fig.3).

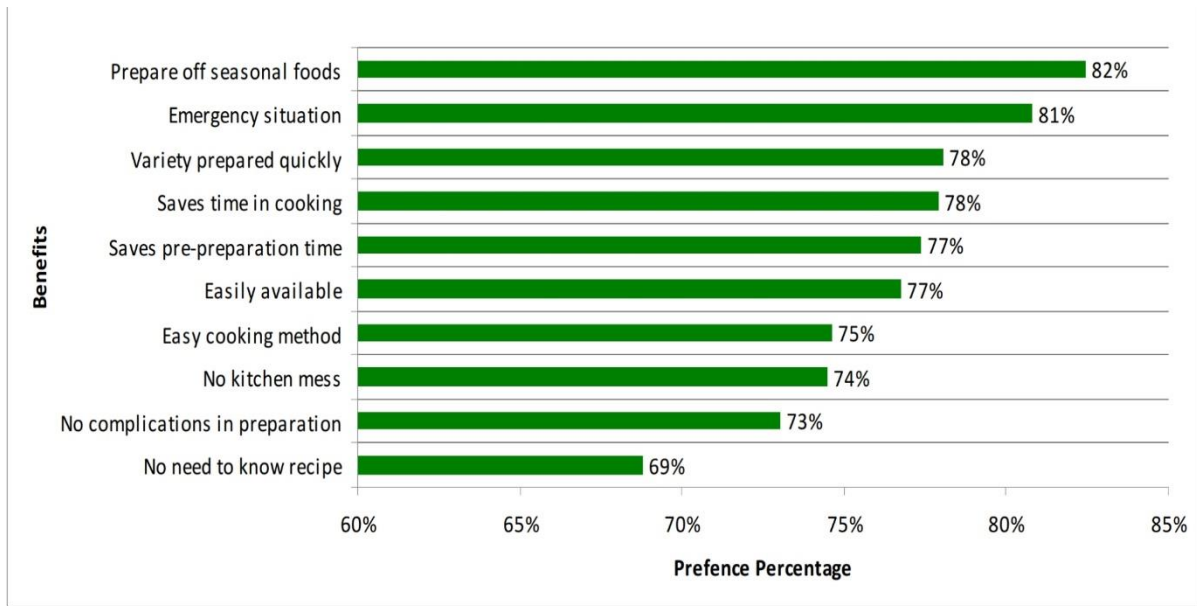


Figure 2. Benefits of convenient foods for working women

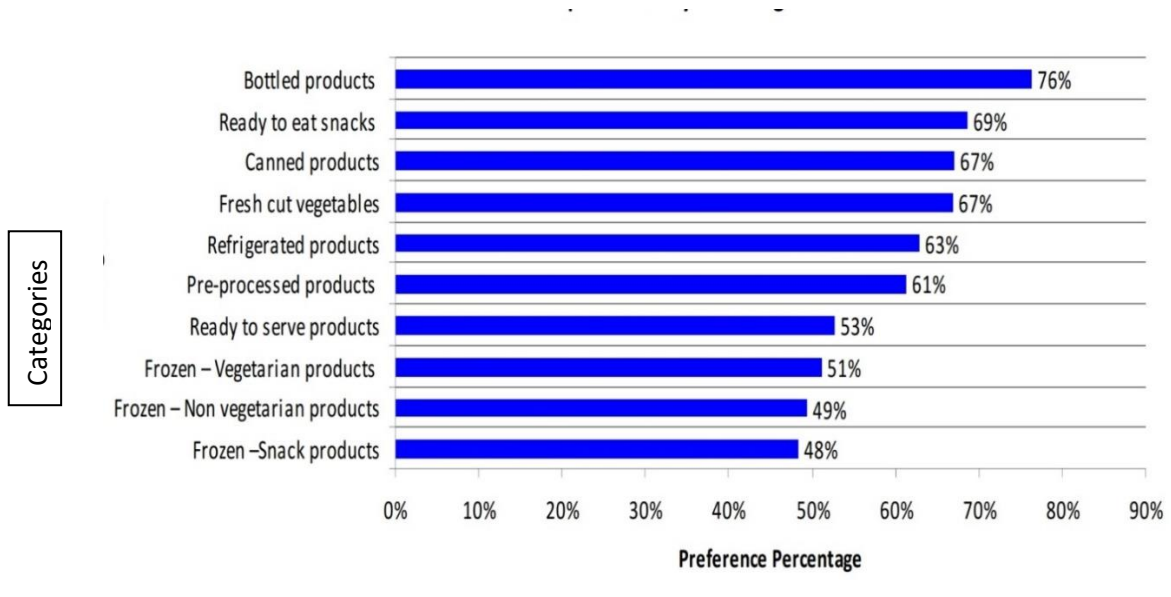


Figure 3. Convenient foods preferred by working women

A survey done in major metropolitan cities in India showed that nearly 72.6 per cent of bachelors preferred convenient foods because of less cost, time and energy saving, convenience in preparation and consumption in the busy and hectic life. About 76 per cent of working women in nuclear family also preferred convenient foods (Fig.4). The share of urban residents is about 80 per cent while semi urban and rural residents consumed over 40 per cent and 22 per cent of convenient foods respectively (ASSOCHAM, 2011).

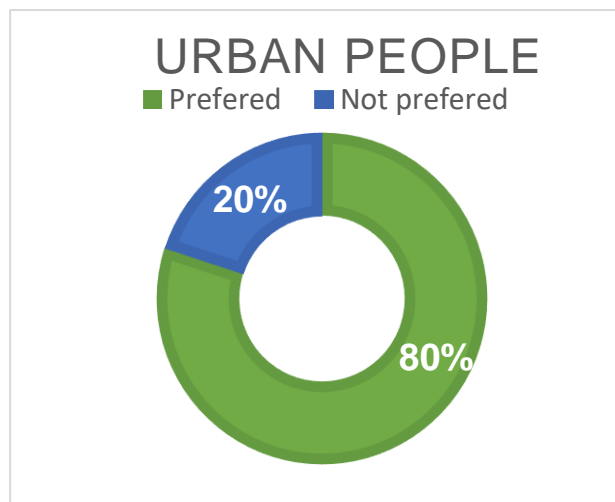
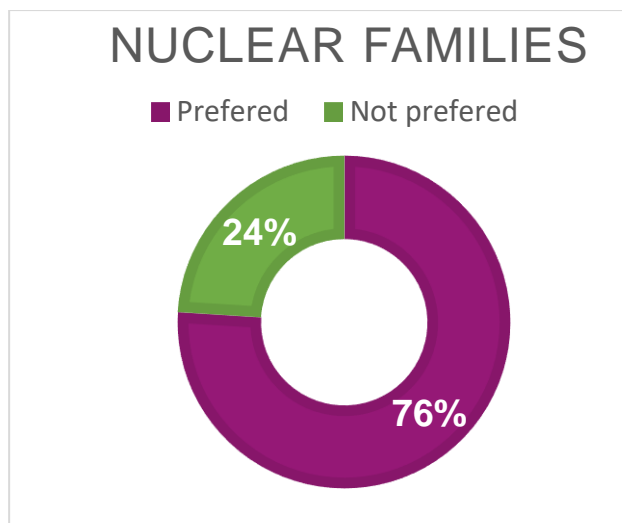
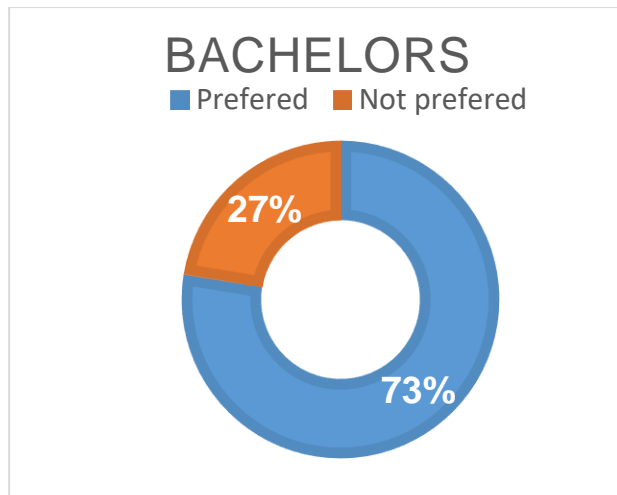


Figure 4. Consumption pattern of convenient foods among different groups

4. Convenient food market in India

A comparison of some of the countries in terms of market volume of the convenient foods shows that India's market in terms of volume is less than that of China, Australia, Brazil and Mexico. With the increase in population of India in the urban areas, demographic advantage and awareness, convenient food market is ready to boom in India.

Convenient foods market in India in terms of market value, grew at a double digit CAGR of 14.80 % during the period 2011-16. The market value of this high-growth segment was at INR 880.57 million in 2011 and increased to INR 1, 755.89 million by 2016. It is expected that the ready meals market in India would continue to grow at a CAGR of approximately 12.36 % during the period 2016-21 and reach INR 2, 901.53 million by 2020 (MOFPI, 2017).

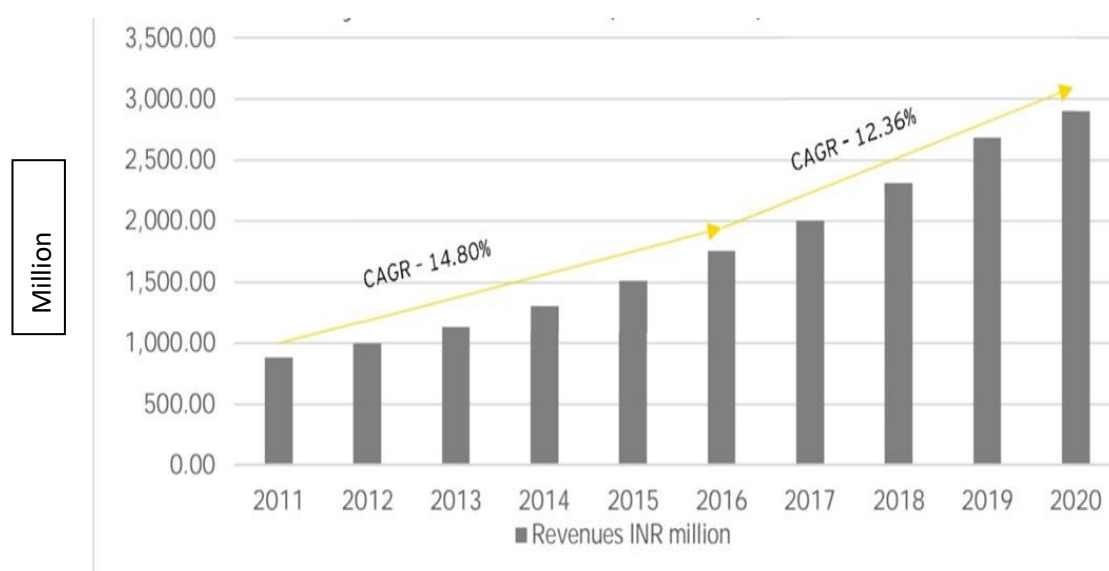


Fig 5. Convenient food market in India

5. Classification of convenient foods

According to Monterio *et al.* (2010) convenient foods can be classified as Nova classification on the basis of extent and purpose of industrial processing. The NOVA classification system defines industrial processing, as distinct from domestic processing and preparation, and thus is completely specific. NOVA is completely coherent, there is a continuum in the nature, extent, and purpose of processing from 'unprocessed' to 'ultra-processed'. Each group is also conceptually different in various ways that are specified.

- Group 1: Minimally processed foods
- Group 2: Processed culinary ingredients
- Group 3: Processed ingredients
- Group 4: Ultra- processed foods

Thus minimal processing of foods are used to preserve the foods and to make them suitable for storage, facilitate their culinary preparation, enhance their nutritional quality. Processed culinary ingredients are highly durable but usually not consumed by themselves. They are combined with foods in the preparation and cooking of dishes and meals. Processed food products are ready-to-consume by themselves or in combinations, and ultra-processed products are typically formulated to be convenient, and intensely palatable.

Ultra-processed products are conceptually and actually different from processed foods. They are formulations of industrial ingredients and substances derived from foods and typically contain little or even no whole foods, which are processed by sophisticated methods like extrusion, pasteurization, retorting, hybrid drying technologies and high temperature short time treatments. Convenient foods in the market can be generally categorised according to its degree of easiness as ready to eat, ready to use and beverages are classified as ready to drink and ready to serve beverages.

Ready to eat	Ready to use	Ready to drink	Ready to serve
Breakfast cereals Intermediated moisture foods Retorted products Fried snacks	Extruded foods Instant mixes Battered and breaded products Frozen Foods Canned foods	Fruit and vegetable beverages Milk based beverages Carbonated beverages Sports drinks	Instant juice powders Fruit concentrates Instant beverage mixes

Table 1. Classification of convenient foods

6. Minimally processed foods

Over the past decades, consumers want fresh like foods with their natural nutritive values and sensory attributes, such as flavour, odour, texture and taste (Huxley *et al.*, 2004). Fresh fruits and vegetables are the good examples of convenient foods. This growing consumer's demand of minimally processed foods with no or lesser synthetic additives pose challenges to food technologists (Siddiqui *et al.*, 2011). In addition, demand of functional foods to prevent or control of diseases are growing. All these demands force to develop safe foods with minimal processing techniques.

Minimally processed foods are those fully usable product, which is packed to offer high nutrition, convenience and flavour while maintaining freshness (IFPA, 2001). General protocol for minimal processing include pre-cooling, washing, disinfection, peeling, trimming, deseeding, dipping, draining followed by packaging. Examples of minimally processed foods are fresh cut fruits and vegetables, cubed meat and dried fish.

6.1 Ozonisation

It is the latest trend in minimal processing. It is 'Generally Recognized as Safe'. Ozone is one of the most powerful antimicrobial substances (natural sanitizing and disinfecting agents) in the world destroying up to 99.9% of pesticides and microorganisms commonly found on food due to its potential oxidizing capacity. Any pathogen or contaminant that can be disinfected, altered or removed through an oxidation process which can be affected by ozone. It is the strongest of all molecules available for disinfection in water treatment and is second only to elemental fluorine in oxidizing power.



Figure 6. Ozonator

Ozonisation is done by a non-thermal processing by ozonator (Fig.6) by dissolving O₃ in water in which vegetables are soaked is called ozone molecular bubble process (OMB). Initially it used as a disinfectant in potable water. It is predominantly effective against *E coli*, which can improve shelf life. It is an alternative for chlorine, oxidation potential of ozone is 1.5 times greater than chlorine. Residual pesticide can also be removed by OMB process. Ikeura *et al.* (2011) reported that, potatoes' shelf-life can be extended up to six months at 6 – 14°C and 93 - 97% relative humidity, by the application of ozone @ 3 ppm without lowering the potato quality.

6.2 Pre-treatments for fresh cut fruits and vegetables

Pretreatments can reduce the initial water content, or modify the properties of tissue in some extent, thereby increasing the drying rate, improving the quality of material and inhibit the bio-enzymes, then minimize possible deterioration reactions during drying and subsequent storage. Pretreatments involve several chemical treatments also, such as alkaline dipping in sodium hydroxide, potassium carbonate which helps in colour preservation, lower water activity and to prevent browning in berries. Acid dipping in citric acid and ascorbic acid helps to inactivating of enzymes, enhancing pigment stability and modifying texture Zhu *et al.* (2007) reported that, apple treated in combination of 0.4% citric acid and 0.1% of ascorbic acid, helped in retention of firmness, colour and juice yield.

Sulphite dipping in sodium hydrogen sulphite, sodium meta bisulphite and potassium meta bisulphite is commonly practiced in fruits. Bisulphate ion prevent enzymatic and non-enzymatic browning and microbial activity. Natural sanitisers those include plant extracts which are capable of removing maximum pesticide residue. Typical example for natural sanitisers is KAU veggie wash. Muralikrishna *et al.* (2016) studied that amaranth leaves treated in KAU veggie wash (1%) resulted in 86 per cent removal of pesticide residue with cooking compared to other household pre-treatments.

There are certain other pretreatments also other than chemical dipping, like application of edible coating and use of natural preservatives in fresh cut fruits. Edible coatings are a thin layer of edible material formed on a food as a coating polysaccharides such as starch, proteins (whey proteins, soy proteins) lipids have been used, individually or in mix. Natural preservatives which include antioxidants, anti microbials and anti-browning agents which helps to reduce respiration rate and microbial activity and against browning reaction.

Edible coating	Anti-microbial	Food	Effect	Reference
Sodium alginate+ glycerol	Grapefruit essential oil	Grapes	Reduce weight loss & fungal decay	Aloui <i>et al.</i> , 2014)
Glycerol+ emulsifier	Aloe vera	Blueberries	Reduce weight loss Extending shelf life	(Vieira <i>et al.</i> , 2016)
Cassava starch + glycerol	Cinnamon bark essential oil	Apple slices	Reduce respiration rates, against enzymatic browning	(Boesso Oriani <i>et al.</i> , 2014)

Table 2. Pre-treatments in fresh cut fruits

7. Ready to eat foods (RTE)

Foods which are directly edible and does not require additional treatments to make it safe to eat such as, breakfast cereals, inter mediated moisture foods, retorted foods *etc.* belongs to the category of ready to eat foods (RTE).

7.1 Breakfast cereals

Breakfast cereals are food products made from processed cereal grains or with composite flour. Examples are cornflakes, wheat flakes and muesli. It can be consumed with mixing of hot or cold milk and water. Processed breakfast cereals are light and crispy in texture which can improve digestibility and availability of nutrients. Technology involved in breakfast cereal is high temperature short time treatments such as puffing and hot extrusion. Extrusion cooking which reduces microbial contamination and inactivates enzymes with high hot exposure. The main method of preservation of hot-extruded foods is by the low water activity of the product (0.1–0.4).

The principles of operation in extrusion are: raw materials are fed into the extruder barrel and the screw (s) then convey the food along it. Further down the barrel, smaller flights restrict the volume and increase the resistance to movement of the food. As a result, it fills the barrel and the spaces between the screw flights and becomes compressed. As it moves further along the barrel, the screw kneads the material into a semi-solid mass. If the food is heated above 100°C the process is known as extrusion cooking (Fig.7). The food is then passed to the section of the barrel having the smallest flights, where pressure and shearing is further increased.

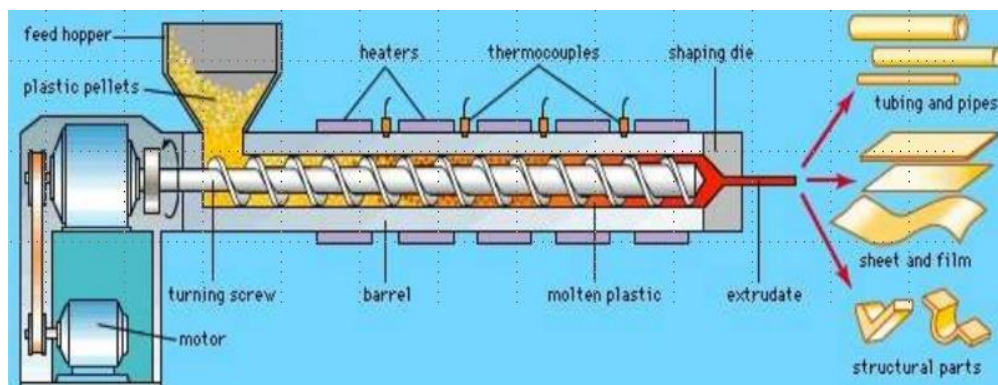


Figure 7. Process of extrusion

Finally, it is forced through one or more restricted openings (dies) at the discharge end of the barrel as the food emerges under pressure from the die, it expands to the final shape and cools rapidly as moisture is flashed off as steam. A variety of shapes, including rods, spheres, tubes, strips or shells can be formed. Typical products include a wide variety of low density, expanded snack foods and ready-to-eat breakfast cereals.

7.1.2 Preparation of nutri flakes

Nutri flakes are one of the breakfast cereals which is light and crispy in texture. Nutri flakes can be prepared by using composite flour. Its nutritive value can be improved through mixing with functional ingredients. Preparation of nutri flakes involves conditioning of composite and it is made into dough. After that, it is extruded followed by steam flaking and drying. Further, cut pieces were puffed into ready to eat crispy nutri flakes (Fig.8).



Figure 8. Flowchart of preparation of nutri flakes

7.1.3 Co-extrusion

A variety of ready to eat products with a liquid or creamy center can be prepared by co-extrusion. It involves the use of an extruder to create the outer envelope and an auxiliary system for injecting a filling to get a cream filled crispy product (Fig.9).

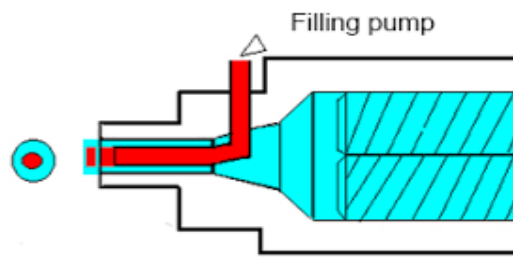


Figure 9. Co-extrusion process

7.1.4 RTE- puffed products

Puffed products are popular worldwide. The textural characteristics of puffed products are critical to their acceptance by consumers. Hot exposure is used to enhance puff formation. The important factor that affects puffed products is the amylose content in starch. Thermo-physical properties of starch gives textural qualities like higher expansion ratio, and hot exposure reduced anti-nutrients such as tannins, phytates, trypsin inhibitors etc. enhances protein and carbohydrate digestibility, increases bio-availability of minerals. Prior to puffing, soaking and

surface drying is being done. Moisture content of grains which will improve the expansion ratio and puffing quality. Rao *et al.* (2016) conducted a study on production of puffed sorghum from whole sorghum grain at 80-100 °C in 2-3 minutes which had 8.89% of expansion ratio, 7.91% protein content, 3.26% fat and 8.8% of total ash.

7.2 Intermediate moisture foods

These are shelf-stable products that have water activities of 0.6-0.84, with a moisture content ranging from 15% - 40% and are edible without rehydration. Intermediate moisture foods can be stored safely without refrigeration. These are done by partial drying, osmotic drying using a humectant, dry infusion. Dried fruits, candies, jellies are the major examples for intermediate moisture food (Fig10).



Figure 10. Intermediate moisture foods

Partial drying is the removal of free water, osmotic drying- soaking of food in highly concentrated solution, water removes from the food to concentrated solution by osmotic pressure. Osmotic dehydration depends on: 1) Temperature of osmotic solution. 2) Concentration of the osmotic solution. 3) Osmotic agent used. 4) Process duration. 5) Geometry of food material.

Dry infusion is the combination of partial dehydration and osmotic dehydration using a humectant. The food product is first dehydrated and then the resultant product is added to a humectant solution to reach the desired water activity. This method is desirable because it results in a higher quality and more appealing product.

7.3 RTE retorted food products

Retorting is the heating of foods prone to microbial spoilage in hermetically sealed containers to extend their shelf life. Temperature and pressure varies with foods generally 121°C, for 15 min is applied. Pressure applied for high acid food is 34 KPa and for low acid food is 73 -104 KPa.

RTE retorted food products consumed straight from the pouch with or without pre-warming. Pre-cooked food products are placed, sealed and sterilized. This is commercial sterilization by application of heat. These foods meet the specific needs of convenience and nutritional adequacy. Retort pouch consist of six layers, (Fig.11) in which outer polyester and paper layers which is printable and provide strength, aluminum foil which protect from light and gas. Adhesion layer and nylon layer which have abrasion resistance. Polypropylene which have physical contact with food and have heat seal surface.

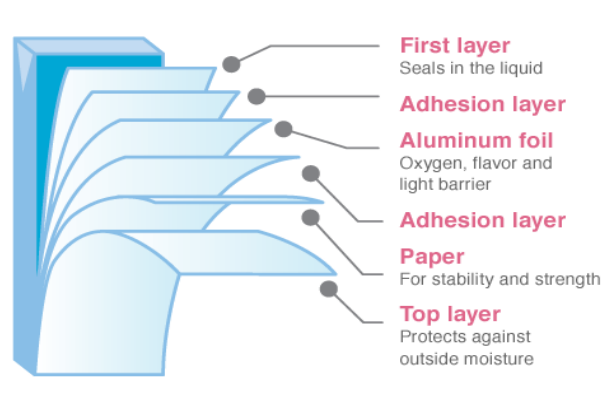


Figure 11. Layers of retorted pouch

8. Ready-to-use (RTU) Foods

Ready to use foods which need some preparations like cooking, frying, reconstitution, dilution before consumption. Which include instant mixes, battered and breaded products and some of the extruded products like pasta products.

8.1 Extruded pasta products

Extruded pasta products are ready to cook foods it can be prepared by using of composite flour followed by mixing, conditioning and extrusion. Technology involved is cold extrusion through single screw extruder, it is low temperature process so cooking of food is not

take place. The principles of operation in extrusion are: raw materials are fed into the extruder barrel and the screw (s). Then the food is conveyed along it. Further down the barrel, smaller flights restrict the volume and increase the resistance to movement of the food. As a result, it fills the barrel and the spaces between the screw flights and becomes compressed. As it moves further along the barrel, the screw kneads the material into a semi-solid, plasticized mass. Generally pasta products available in the market are made up of refined flour. But its nutritional value can be improved by mixing with millets, Rao *et al.* (2016) developed pasta with different millet flour. The nutrient composition is as detailed below.

Food item	Nutrients		
	Protien %	Fat %	Fibre %
Ragi pasta	9.39	1.02	1.2
Bajra pasta	8.39	1.38	1.24
Foxtail pasta	1.2	1.88	1.32

Table 3. Nutrient composition for millet pasta (per 100g)

8.2 Instant food mixes

Instant food mixes are combination of premixed food ingredients, which provide convenience to consumers and assists in reducing the time of preparation whereby no more than five minutes of time is required from the time of food preparation to the food being consumed. Some instant foods include food products that involve the dissolving of a powder in hot water, or the dilution of a concentrated stock solution. For example,

- Instant breakfast mixes - *dosa* mix, *idli* mix, *upma* mix
- Instant baby food mixes – infant formulas, instant millet mix
- Instant soup mixes - mushroom soup mix, spicy tomato soup mix
- Instant curry mixes - *sambar* powder, curry spice masala
- Instant snack mixes -*halwa* mix, *gulab jamun* mix

Rao *et al.* (2016) developed nutritionally improved instant sorghum *idli* mix which have 364 kcal of energy, 71.1 g of carbohydrates, 12.4 g of protein, 45.7 µg of folic acid, 10.2 mg of calcium, 7.2 mg of iron and 102.3 mg of magnesium.

Ajisha, (2017) developed an instant *payasam* mix with 70% of raw jack fruit based vermicelli. Cooking time is estimated around 5 minutes for raw jack fruit based vermicelli *payasam* mix. It was highly acceptable with score of 8.4 for overall acceptability.

Types of instant mixes	Cooking time (minutes)
Wheat flour vermicelli <i>payasam</i> mix	8.00
Jackfruit based vermicelli <i>payasam</i> mix	5.25

Table. 4 Standardisation of cooking time

Types of instant mixes	Overall acceptability
Wheat flour vermicelli <i>payasam</i> mix	8.7
Jackfruit based vermicelli <i>payasam</i> mix	8.4

Table 5. Over all acceptability of instant *payasam* mix

8.2.1 Coconut milk powder

Coconut milk powder is another revolutionary trend in convenient food market. CDB, (2015) developed a standard protocol for the production of coconut milk powder from matured coconut kernel through ,washing, blanching, disintegration, mixing with hot water, extraction of milk filtration and clarification by clarifier, mixing of emulsifiers & stabilizers, thermal processing, concentrating , spray drying and packing. The procedure is detailed in figure 12.

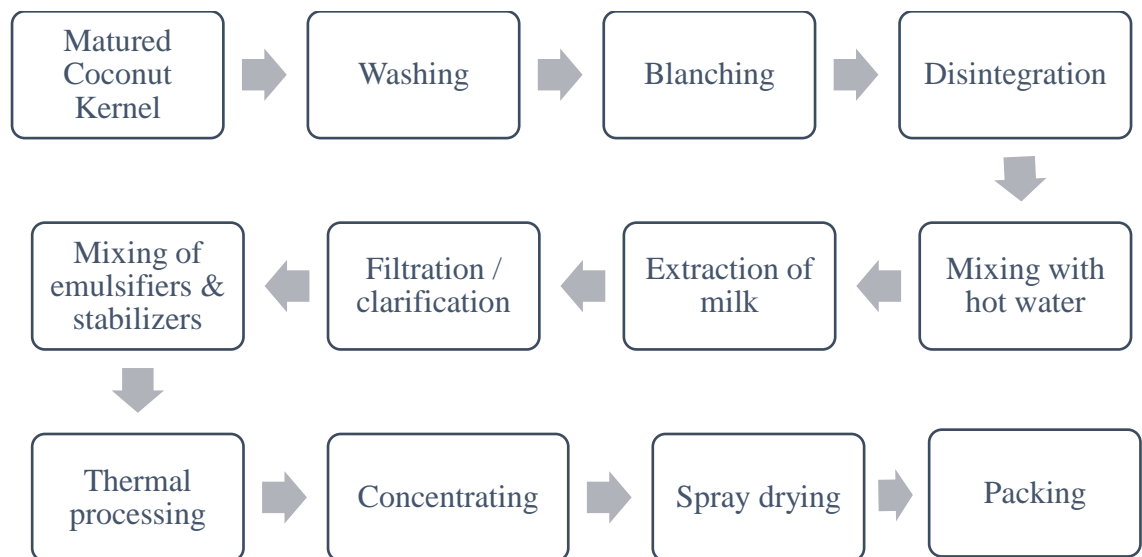


Figure 12. Procedure for development of instant coconut powder

8.3 Battered and breaded products

These are ready to fry products which is precooked and coated. Batter is a flour and water mixture with additional salt, gums and seasonings, there are two main types of batter, adhesion batters or tempura type batters (Varela and Fiszman, 2011). Adhesion batters act as an interface layer between product and breadcrumb coating whereas tempuras are leavened chemically to create a puffed texture (Xue and Ngadi, 2007). Battered and breaded products have grown in popularity and are assessed on appearance, uniformity of coating, colour, crispness, adhesion and flavour. As a textural attribute, crispness perception has been shown to be a combination of tactile and auditory components and depends on macroscopic and microscopic features within the food.

Breading – Is the application of dry mixture of flour starch.

Coating – It act as a moisture barrier also provide juicy inside and crispy outside.

Sreelakshmi and Ninan, (2018) has a protocol for battering and breading. The protocol involved predesting followed by battering and breading. The contents of the battering were 50% of wheat flour corn flour Na_2CO_3 and flavourings. Dry flour starch was used for breading. The coated food products were flash fried (180-200⁰ C for 40- 60 seconds) followed by freezing and packaging.

Ingredients	Addition range (%)
Wheat flour	30-50
Corn flour	30-50
Na ₂ CO ₃	Up to 3
Soy flour	0.5
Starches	5
Gums, emulsifiers and colours	<3
Salt	Up to 5
Sugars	0-3
Flavourings	As required

(Sreelakshmi and Ninan, 2018)

Table 6. Standard ingredients for batter

8. Beverages

Fruit beverages and drinks are one of the popular categories of convenient foods that are consumed across the globe. The fruit beverages and drinks are easily digestible, highly refreshing, thirst quenching, appetizing and nutritionally far superior to most of the synthetic and aerated drinks. In recent past the consumption of fruit based beverages and drinks has increased at a fast rate. Fruit juices or pulp used for the preparation of these products are subjected to minimal processing operations like filtration, clarification and pasteurization. The fruit juice or pulp, are mixed with ingredients like sugar, acid, stabilizers, micronutrients and preservative to develop beverages and drinks.

Natural fruit juices, sweetened juices, ready-to-serve beverages, nectar, cordial, squash, crush, syrup, fruit juice concentrate and fruit juice powder *etc.* belong to the category of non-alcoholic and non-carbonated beverages. Ready to drink beverages can be directly consumed from container and ready to serve beverages need some preparation before serving, the beverages have to be diluted or reconstituted before use. There are some fruit and fruit based beverages and its standards,

Preservative	Range
Sulphur dioxide	0.005-0.2%
Sorbic acid	0.05-0.2%
Benzoic acid	0.03-0.2%
Citric acid	0.14-0.5%

(FAO, 2010)

Table 7. Range of preservative in fruit juices

Type	Standards
Juices	100% fruit juice
Nectar	Juice content -20%, Acidity – 0.3%, TSS-15 %
Cordial	Juice content -25%, Acidity – 1.5%, TSS-30%, Preservative -350 ppm of SO ₂
Squash	Juice content -25%, Acidity – 1%, TSS-45 %, Preservative -350 ppm of SO ₂
Syrup	Juice content -25%, Acidity – 1.3- 1.5%, TSS-65 %

(FSSAI, 2011)

Table 8. Standards for fruit beverages

9.1 Instant Juice powders

Another development in beverages is instant juice powders which have bright and attractive colour, flavour and ascorbic acid retention. Spray drying is one of the technique for juice powders. Spray-drying is a unit operation by which a liquid product is atomized in a hot gas current to instantaneously obtain a powder. Atomization, moisture evaporation and separation of dry product are the steps in spray drying. Moisture content below 3% which give stable, hygroscopic and higher shelf life product. Maltodextrin is used to improve textural properties and free flowing nature.

Mahendran (2010) develop guava instant fruit powder from ripe guava, through pulping clarification by clarifier, concentration through reverse osmosis, followed by spray drying and packaging.

Parameters	Quantity
Moisture %	2.24
Acidity %	0.39
TSS %	8.30
Vitamin C (mg)	782

Table 9. Properties of guava juice powder

10. Packaging for convenient foods

Convenient packaging deliver products to consumers in perfect condition. Well-designed packaging meets the requirements of the product while minimizing economic and environmental impacts of both the product and its package. Convenience packaging goes beyond the essential purpose of preserving and protecting the product. Conveniently packaged food products that can be quickly made into meals without sacrificing quality. This includes products displayed in supermarkets. For examples, salad kits, zippered pouches, tea-bags, individual milk portions, sugar sticks and tomato sauce sachet that preserve shelf-life and maintain freshness.

These are sustainable, economical multi-pack, ideal for replacing corrugate, paperboard and plastic rings for PET bottles, aluminium cans and more. Shrink films are great for bundling aluminium cans, glass bottles, PET bottles, tetra pack boxes and more in everything from convenience store to club store pack sizes.

Microwavable tray which can be directly insert to microwave oven, pull tab and open end containers for milk made and beverages. Zip lock pouches which have easiness for open and reclosing. Tetra pack with 6 layers of package which is resistant from light, air abrasion etc. (Fig.13)



Figure 13. Packaging for convenience

Some improved packaging technologies like heater meals, self-heating cans *etc.*, helps to prepare food quickly at emergencies and adverse conditions.

10.1 Heater meals

Heater meals is introduced into US military people for their convenience it is done by flameless ration heater. Flameless ration heater which is water-activated exothermic chemical heater. It contains finely powdered magnesium metal, alloyed with a small amount of iron and table salt. It is made up of bio degradable food grade Iron and magnesium so it is easily disposable. To activate the reaction- water is added, when redox reaction is initiated, it act as a galvanic cell and function as a battery. Boiling point of water increases, when reaction proceeds with flameless heating. It is capable of raising the temperature of 226.8 g by 38 °C in twelve minutes.



Figure 14. Self heating bag

10.2 Self-heating cans

Self-heating cans are triple-walled container which are heated by themselves through exothermic reaction. Inner wall contain beverage, Middle wall contain the heating agent such as calcium oxide, Outer wall contain water which is separated from a container of water by a thin breakable membrane. When the user pushes on the bottom of the can, a rod pierces the membrane, water is mix with heating agent. Resulting reaction increases temperature around 40°C in 3 min. (Fig. 15)

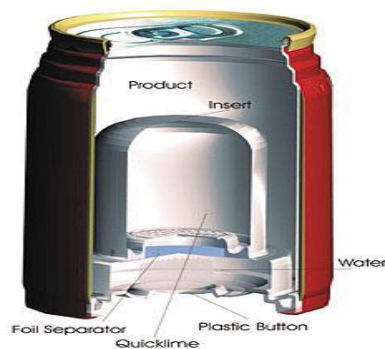


Figure 15. Self heating cans

There are some products with same technologies for example, Nestle's 'Hot when you want' coffee can. 'On the go' - baby bottles, 'Scaldo' pack (Fig.16) in which reaction initiate when we press in the pack. There are cold beverage cans also which are operated by endo thermic reaction.



Figure 16. Scaldo pack

11. Disadvantages of convenient foods

It is a fact that convenient foods are designed to be tasty and comparatively shelf stable, but many of them are of low in protein, fibre, essential vitamins and minerals along with added with high sugars and fat. There are also some disadvantages such as,

- Cannot get natural freshness
- Loss of nutrients during processing
- High in sodium, fat, or added sugars
- More expensive than fresh foods
- Increase usage of plastics

Over dependence of convenient foods with low nutrient profiles prone to non-communicable diseases, Marron-Ponce *et al.* (2019) observed that, Increases in the dietary share of convenient foods were associated with diets higher in energy density, added sugars and saturated fat, and lower in protein and fibre in Mexican population. Chen *et al.* (2018) observed that, Increases in the dietary share of convenient foods were associated with diets higher in saturated fat, lower in protein, vitamins A, C, D, B1, and B6, niacin, potassium, magnesium, calcium, and iron increased risk of poor dietary quality in Taiwanese Adolescents.

Dietary share of convenient foods and the occurrence or incidence of several non-communicable diseases, including obesity and obesity-related outcomes, cardiovascular and metabolic diseases, breast and all cancers, depression, gastrointestinal disorders, frailty in the elderly, and also premature mortality.

A study conducted by Canhada *et al.* (2019) in Brazil within 3.5 years, high convenient foods consumption induces higher risk of obesity and weight gain (>1.68 kg/year) in adults (≥ 35 year old). High ultra-processed convenient foods induces higher risk of developing depressive symptoms in adults (≥ 18 year old) in France within 5.5 years (Gomez-Donoso *et al.*, 2019). Each percentage point increase in the dietary share of ultra-processed convenient foods results in 1.12 % higher risk of coronary heart diseases, and 1.11 % higher risk of cerebrovascular disease, Adults (≥ 18 year old) , France within 5 years (Srour *et al.*, 2019). Studies which show that, higher ultra-processed convenient foods induces incidence of frailty in adults (≥ 60 y old) in Spain with a median follow-up of 3.5 years (Sandoval - Insausti *et al.*, 2019).

12. Conclusion

Convenience is an important choice for modern life style. As a developing nation, India also contributing in convenient food market size. Consumers can minimize time as well as physical and mental effort required for food preparation. It can be categorised according to its degree of easiness. Various technologies in food processing and packaging, improves the product quality and easiness of convenience. Convenient foods with good nutrient profile is a better choice of the day. It make revolution in consumer market and increase food consumerism. Regarding health issues, there are some disadvantages, over dependence on convenient foods can cause health implications mostly convenient foods are with low nutrient profile. Convenient foods can be manufactured in a healthy way that would be upcoming aspect. Formulation of healthy and nutritious convenient food is better choice for future life. Convenience food is a boon for working women and bachelors and also it is a bane with poor dietary outcome and causes non-communicable diseases.

13. Discussion

1. If ozonisation is only applicable for fruits and vegetables? Is there is any studies for effect of ozonisation in pesticidal removal?
 - ✓ Ozonisation is also applicable in minimal processing of meat, poultry and sea foods. There are some studies which shows shelf life of shrimp can be improved through ozonisation. Ikeura *et al.*, (2011) reported that, residual fennitrothion can be removed in lettuce and also applicable in fruits like tomato.

2. Which are the major companies in convenient food market?
 - ✓ MTR, Parle, Knorr, Halidarms which is based in Delhi, ITC which is based in Kolkata and these have two brand names kitchen of India and Ashirvad, these are the major companies in convenient food market in India.

3. If puffing can improve nutritional quality? And is there is any significance in soaking before puffing?
 - ✓ In puffing, hot exposure of heat can reduce antinutrients which improve digestibility and availability of nutrients. By the standard procedure of puffing whole sorghum soaking in water for 150 minutes and surface drying id done. Studies show that moisture content can improve puffing quality to some extend.

4. What are the advantages of tempura batter?
 - ✓ Tempura batter is puff type with leavening agents in that bread crumps are not used. Coating is light and provide with high textural quality. It is less oily and healthy also.

14. Reference

- Ajisha, K. H. 2017. Process optimisation and quality evaluation of jackfruit (Koozha type) based vermicelli. MSc. (Ag) thesis, Kerala Agricultural University, Thrissur, 126p.
- Aloui, H., Khwaldia, K., Sanchez-Gonzalez, L., Muneret, L., Jeandel, C., Hamdi, M., and Desobry, S. 2014. Alginate coatings containing grapefruit essential oil or grapefruit seed extract for grapes preservation. *Int. J. Food Sci. Tech.* 49 (4): 952-959.
- ASSOCHAM [Associated Chambers of Commerce and Industry of India]. 2011. Packaged food annual spending set to rise 32% by 2017: ASSOCHAM. [on-line]. Available: <http://www.assochem.org> [29 Dec. 2019].
- Boesso Oriani, V., Molina, G., Chiumarelli, M., Pastore, G.M., and Dupas Hubinger, M. 2014. Properties of cassava starch-based edible coating containing Essential Oils. *J. Food Sci.* 79: 189-194.
- Brunner, T. A., Horst, K., and Siegrist, M. 2010. Convenience food products: Drivers for consumption. *Appetite.* 55(3): 498–506.
- Canhada, S. L., Luft, V. C., Giatti, L., Duncan, B. B., Chor, D., Jesus, M., Matos, S. M. A., Molina, M. D. C. B., Barreto, S. M., Levy, R. B. and Schmidt, M. I., 2019. Ultra-processed foods, incident overweight and obesity, and longitudinal changes in weight and waist circumference: The Brazilian longitudinal study of adult health. *Public Health Nutr.* 17:1-11.
- CDB [Coconut Development Board] 2015. Innovative technologies in coconut innovative technologies in coconut processing sector processing sector [on-line]. Available: <http://www.Coconutboard.gov.in>. [29 Dec. 2019].
- Chen, Y. C., Huang, Y. C., Lo, Y. T. C., Wu, H. J., Wahlqvist, M. L., and Lee, M. S. 2018. Secular trend towards ultra-processed food consumption and expenditure compromises dietary quality among Taiwanese adolescents. *J. Food Nutr. Res.* 62: 465- 476.
- FAO [Food and Agriculture Organisation] 2010. Preservatives [on-line]. Available: <http://www.Fao.org>. [29 Dec. 2019].
- FSSAI [Food Safety and Standard Authority of India] 2011. Specification for fruits and vegetable products [on-line]. Available: <http://www.Fssai.gov.in>. [29 Dec. 2019].

- Gomez - Donoso, C., Sanchez - Villegas, A., Martinez - Gonzalez, M. A., Gea, A., de Deus Mendonça, R., Lahortiga-Ramos, F., and Bes - Rastrollo, M. 2019. Ultra-processed food consumption and the incidence of depression in a Mediterranean cohort: the sun project. *Eur. J. Nutr.* 4: 1-11.
- Huxley, R. R., Lean, M., Crozier, A., John, J. H., and Neil, H. A.W. 2004. Effect of dietary advice to increase fruit and vegetable consumption on plasma flavonol concentrations: results from a randomised controlled intervention trial. *J. Epidemiol. Community Health.* 58(4): 288-289.
- IFPA [International Fresh-cut Produce Association]. 2001. Fresh-cut produce: Get the facts. [on-line]. Available: <http://www.freshcuts.org> [29 Dec. 2019].
- Mahendran, T. 2011. Physico-chemical properties and sensory characteristics of dehydrated guava concentrate: effect of drying method and maltodextrin concentration. *Int. J. Trop. Agric.* 13(2): 48-54
- Marron -Ponce, J. A., Flores, M., Cediel, G., Monteiro, C. A., and Batis, C. 2019. Associations between consumption of ultra-processed foods and intake of nutrients related to chronic non-communicable diseases in Mexico. *J. Acad. Nutr. Diet.* 119(11): 1852-1865.
- MOFPI [Ministry of Food Processing Industries]. 2017. High-growth segments of Indian food and beverage industry. [on-line]. Available: <http://www.foodprocessingindia.co.in> [29 Dec. 2019].
- Monteiro, C. A., Levy, R. B., Claro, R. M., Castro, I. R., and Cannon, G. 2010. A new classification of foods based on the extent and purpose of their processing. *Cadernos de saude publica.* 26: 2039-2049.
- Mordor intelligence. [Mordor intelligence]. 2019. Ready To Eat Food Market - Growth, Trends and Forecasts (2020 - 2025) [on line]. Available: <http://www.mordorintelligence.com>. [29 Dec.2019]
- Rao, D. B., Sangappa, Vishala A. D., Christina G. D., and Tonapi V. A. 2016. Technologies of Millet Value Added Products. Centre of Excellence on Sorghum, ICAR-Indian Institute of Millets Research. Rajendranagar, Hyderabad, India, 50p.
- Sandoval -Insausti, H., Blanco - Rojo, R., Graciani, A., Lopez - Garcia, E., Moreno - Franco, B., Laclaustra, M., Donat-Vargas, C., Ordovas, J.M., Rodriguez - Artalejo, F., and

- Guallar - Castillon, P. 2019. Ultra-processed food consumption and incident frailty: a prospective cohort study of older adults. *J. Gerontol. A Biol. Sci. Med. Sci.* DOI: 10.1093/gerona/glz140.
- Siddiqui, M. W., Chakraborty, I., Ayala - Zavala, J. F., and Dhua, R.S. 2011. Advances in minimal processing of fruits and vegetables: a review. *J. Sci. Ind. Res.* 70: 823–834
- Srinivasan, S. and Shende, K.M. 2015. A study on the benefits of convenience foods to working women. *Atithya: J. Hosp.* 1 (1): 56-63.
- Sreelekshmi, K. R. and Ninan, G. 2018. Coated products from fish meat. ICAR-Central Institute of Fisheries Technology. Kochi, Kerala, 8p.
- Srour, B., Fezeu, L. K., Kesse - Guyot, E., Alles, B., Mejean, C., Andrianasolo, R. M., Chazelas, E., Deschasaux, M., Hercberg, S., Galan, P., and Monteiro, C.A. 2019. Ultra-processed food intake and risk of cardiovascular disease: prospective cohort study. *Br. Med. J.* 365: 1451p.
- Ikeura, H., Kobayashi, F., and Tamaki, M. 2011. Removal of residual pesticide, fenitrothion, in vegetables by using ozone microbubbles generated by different methods. *J. Food Eng.* 103 (3): 345-349.
- Varela, P. and Fiszman, S. M., 2011. Hydrocolloids in fried foods. A review. *Food Hydrocolloids.* 25(8): 1801-1812.
- Vieira, J. M., Flores-Lopez, M. L., de Rodriguez, D. J., Sousa, M. C., Vicente, A. A., and Martins, J. T. 2016. Effect of chitosan - aloe vera coating on postharvest quality of blueberry (*Vaccinium corymbosum*) fruit. *Postharvest Biol. Technol.* 116: 88-97.
- Xue, J. and Ngadi, M. 2007. Rheological properties of batter systems containing different combinations of flours and hydrocolloids. *J. Sci. Food Agr.* 87(7): 1292-1300.
- Zhu, Y. I., Pan, Z., and Mc Hugh, T. H. 2007. Effect of dipping treatments on color stabilization and texture of apple cubes for infrared dry-blanching process. *J. Food Process. Pres.* 31(5): 632-648.

15. Abstract

**KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF HORTICULTURE, VELLANIKKARA**

Department of Community Science

FN 591: Master's Seminar

Name	: Riya K. Zacharia	Venue	: Seminar hall
Admission No	: 2018-16-003	Date	: 03-01-2020
Major Advisor	: Dr. Aneena E. R.	Time	: 10.45 am

Convenient foods – Revolutionary trends in the present era

Abstract

Convenient foods are commercially prepared food, designed for ease of preparation and consumption. The improving consumer lifestyle, rapid urbanisation and high disposable income are increasing the demand for convenient foods, thereby fuelling its market growth. The market value of convenient foods in India is estimated to reach 2.9 billion by 2020 (MOFPI, 2017). Currently, convenient foods forms the largest segment in the overall food industry.

Convenient foods are those that help consumers to reduce time as well as physical and mental efforts required for food preparation, consumption and clean up (Brunner *et al.*, 2010). Nearly 73 per cent of bachelors living in major metropolitan cities and about 76 per cent of working women in nuclear families in India preferred convenient foods because of time and energy saving, convenience in preparation and consumption in their busy life. The share of urban residents who consume convenient foods is about 80 per cent while semi urban and rural residents consumed more than 40 per cent and 22 per cent respectively (ASSOCHAM, 2011).

Convenient foods in market can be generally classified according to its degree of easiness as ready to eat (RTE) and ready to use foods (RTU) and in the case of beverages, ready to drink (RTD) and ready to serve beverages (RTS). Minimally processed foods are those products which is packed to offer convenience while maintaining its nutritional qualities and freshness to the maximum (IFPA, 2001). Ready to eat foods include breakfast cereals, intermediate moisture foods, retorted foods *etc.* Ready to use foods include extruded products, battered and breaded products and instant mixes. These ultra-processed foods are processed by sophisticated methods like extrusion, pasteurisation, retorting and dehydrating technologies.

Instant juice powders, fruit beverages and milk based beverages are the fast moving beverages in the convenient food market.

Convenient foods can be packed in microwavable tray, tetra pack, retortable pouches *etc.* for the convenience of the consumer and also to maintain the quality and shelf life of the product. Some improved technologies like heater meals, self-heating cans *etc.* helps to prepare food quickly at emergencies and in adverse conditions.

It is a fact that convenient foods are designed to be tasty and comparatively shelf stable, but many of them are of low protein, fibre, essential vitamins and minerals along with added high **sugars** and **fats**. The nutritional qualities can be improved by the addition of nutritious functional ingredients. Rao *et al.*, (2016) developed nutritionally improved instant sorghum *idli* mix which have 364 Kcal of energy, 71.1 g of carbohydrates, 12.4 g of protein, 45.7 µg of folic acid, 10.2 mg of calcium, 7.2 mg of iron and 102.3 mg of magnesium.

Convenient foods with better nutrient profile can make revolution in the consumer food market. Innovative products with functional ingredients, convenience and advancement in packaging technology are expected to create a boom in the convenient food sector.

References

- ASSOCHAM [Associated Chambers of Commerce and Industry of India]. 2011. Packaged food annual spending set to rise 32% by 2017: ASSOCHAM. [on-line]. Available: <http://www.assochem.org> [29 Dec. 2019].
- Brunner, T. A., Horst, K., and Siegrist, M. 2010. Convenience food products: Drivers for consumption. *Appetite*. 55(3): 498–506.
- IFPA [International Fresh-cut Produce Association]. 2001. Fresh-cut produce: Get the facts. [on-line]. Available: <http://www.freshcuts.org> [29 Dec. 2019].
- MOFPI [Ministry of Food Processing Industries]. 2017. High-growth segments of Indian food and beverage industry. [on-line]. Available: <http://www.foodprocessingindia.co.in> [29 Dec. 2019].
- Rao D. B., Sangappa., Vishala A. D., Christina G. D., and Tonapi V. A. 2016. Technologies of Millet Value Added Products. Centre of Excellence on Sorghum, ICAR-Indian Institute of Millets Research. Rajendranagar, Hyderabad, India, 50p.

