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Development and quality evaluation of apple and beetroot chutney

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Abstract
Chutney is may be lunch time staple for many but; overall chutney are failing to capture attention of many, so the focus is on making innovative chutney made out of beetroot and apple. The preparation of chutneys is a well-known method of preserving fruit and vegetables. The basic principles of the preservation method are the addition of sugar and acid combined with concentration of the mixture by heating to reduce the water content. This product can be preserved meaning its nutritious content remains intact and they are also low on saturated fats and high in unsaturated fats. It is made especially for the people who reluctant to consume beetroot and lack the nutrition obtained from it. It can be eaten with any kind of bread, salads, khakra, chapatti, etc. The basic ingredients used are beetroot and apple. Additionally, lemon juice, vinegar and onion were added along with spices, salt and sugar. The product is contains appreciable amounts of iron and vitamin C. The product was evaluated for tasting the product with about 3 different formulations followed by its sensory analysis. From the sensory and organoleptic evaluation it was found that the average scores obtained by the pickles and chutney products for colour & texture, taste & flavour, absence of defects and total scores were satisfactory. The colour and taste of the product was found to be very appealing to the people. The long shelf life of the product is a benefit as people tend to eat such products little and often.

Keywords: chutney, preservation, nutrition, shelf life

Introduction
Chutneys are thick, jam-like mixtures that are made from a variety of fruit and vegetables, with added vinegar, sugar and spices. They tend to be sweeter than pickles. The mixture is heated to reduce the moisture content. Any edible sour fruit or vegetable can be used to make chutney. Vinegar and sugar are often quite expensive ingredients, which make the chutney expensive to make. Sometimes it can be more cost effective to make lactic acid fermented pickles that are made by adding salt to vegetables and allowing them to ferment (see the technical brief on lactic fermented pickles).

An offshoot that took root in Anglo-Indian cuisine is usually a tart fruit such as sharp apples, rhubarb or damson Chutney made milder by an equal weight of sugar (usually demerara or brown sugar to replace jaggery in some Indian sweet chutneys). Vinegar was added to the recipe for English-style chutney that traditionally aims to give a long shelf life so that autumn fruit can be preserved for use throughout the year (as are jams, jellies and pickles) or else to be sold as a commercial product. Indian pickles use mustard oil as a pickling agent, but Anglo-Indian style chutney uses malt or cider vinegar which produces a milder product that in western cuisine is usually eaten with a Cheddar-type cheese or with cold meats and fowl, typically in cold pub lunches.

Nowadays, the making of some pickles and chutneys in India has been passed over to commercial production, whereas at one time it was done entirely in people's homes. The disadvantage of commercial chutneys and those produced in western style with vinegar and large amounts of sugar is that the main aim of sugar and vinegar as preservatives is to make the product safe for long-term consumption.

Materials and Methods
Beetroot
Beetroot is the root of the beet plant, (Scientifically known as *Beta vulgaris*). Beet plant belongs to a family of plants wherein both the leaves and the roots can be eaten. Beetroot was first discovered by the Romans and later travelled across the world. The commercial value of

the plant was established in the 19th century when its potential to be converted into sugar was discovered.

The taproot of the beet plant, known as the beetroot, is rich in other nutrients like phenols and ascorbic acid, apart from sugar. Due to this property of beetroots, they are often considered as a source of dietary nitrogen; mostly in the form of inorganic nitrate (NO_3^-). Beetroot, as per the beet plant, is often deep purple to deep red in colour.

Beetroot: Nutritional Facts

The popularity of beetroot as a food product increased when its vast nutritional potential was discovered. As mentioned earlier, beetroot is a treasure cove of nutrients and is often used as a dietary supplement of inorganic nitrate (NO_3^-). Some of the other nutrients offered by beetroot include:

- Betaxanthins including Vulgaxanthin I, Vulgaxanthin II and Indicaxanthin are present in beetroot which is known for their antioxidant (substances that inhibit oxidation, thus preventing reactive oxygen species and free radicals from hurting the body) properties. Betaxanthins are plant pigments that give the beetroot its reddish appearance
- Beetroot is a rich source of phenols like flavonoids, phenolic acids, phenolic amides, etc. Phenols have antimicrobial properties that help prevent microbial infections and acts as a strong defence against microbes
- Nitrate including inorganic nitrate and by association high levels of nitrogen as well. Nitrates help lower the blood pressure and thus, prevent various cardiovascular disorders
- High levels of ascorbic acid which are extremely helpful against immunodeficiency disorders (disorders caused due to a weak immune system), as well as against cardiovascular disorders (disorders of the heart and blood vessels), pre-natal disorders (developmental disorders), etc;
- High levels of carotenoids (a type of plant pigment) which are often anti-cancer in nature and help prevent the propagation of cancer-causing cells
- High levels of betacyanins like Betanin and Isobetanin; they are antioxidants and help fight cancer and immune system related disorders
- Beetroot is rich in minerals like calcium, iron, potassium, and manganese. These minerals help keep the bones and teeth strong as well as maintain healthy bodily functions Beetroot has high levels of Vitamins like Vitamin A, Vitamin B6 and as well as thiamine (Vitamin B1), riboflavin (Vitamin B2), niacin (Vitamin B3), pantothenic acid (Vitamin B5), folic acid (Vitamin B9), etc. Like minerals, vitamins to are good for the overall functionality of the body. It helps the body maintain regular functions, helps provide energy, helps in fighting an array of diseases and contributes to the overall health
- Beetroot is high in fibres, making it extremely good for digestion
- One of the best aspects of the nutrients in beetroot is the fact that they are bio-available. Bioavailability refers to the nutrients in beetroot being easily available for absorption by the blood on consumption of beetroot and beetroot juice.
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Apple

Apple- king of all fruits have long been associated with the biblical story of Adam and Eve. Between the Caspin and the Black Sea, the fruit was originated in the Middle East just about 4000 years ago! It is one of the most favourite and popular fruits ever known. As with the well-known adage "An apple a day keeps a doctor away" the fruit has been doing much good to people who are health conscious. In addition, even the fitness freaks prefer having this wonderful nutrient packed fruit. By all aspects, the fruit is indispensable. Apart from health care and nutrition, it is also known for medicinal values. While the study of apples health benefits dates back to early stages, research to date suggests that its nutrients may play a role in promoting human health in a number of ways.

Nutrition Facts

- Good source of soluble and insoluble fibre
- Vitamin C enriched
- Contains heart-healthy potassium
- B-complex vitamins (riboflavin, thiamine, and vitamin B-6).
- Contains Polyphenols which includes flavonols (especially Quercetin, but also kaempferol and myricetin), catechins (especially epicatechin), anthocyanins (if the apples are red-skinned), chlorogenic acid, phloridizin, and several dozen more health-supportive polyphenols nutrients.
- Delicious and crunchy apple fruit is notable for its impressive list of phyto-nutrients, and anti-oxidants. Studies suggest that its components are essential for optimal growth, development, and overall wellness.
- The nutrients present in apple are unduly present in the skin, which is the most valuable part of the fruit with respect to its nutrient substance.

Lemon Juice

The Lemon is small evergreen tree native to Asia, and the trees of yellow fruit. The Fruit is used for culinary and non-culinary purposes throughout the world primarily for its juice, though the pulp and rind zest are also used, mainly in cooking and baking. The distinctive sour taste of lemon juice makes it a key ingredient in many dishes across the world. The genus is commercially important as many species are cultivated for their fruit, which is eaten fresh, pressed for juice, or preserved in marmalades and pickles. Citrus fruits are also good sources of vitamin C and flavonoids.

Nutritional Facts

Lemons contain very little fat and protein. They consist mainly of carbohydrates (10%) and water (88-89%).

A medium sized lemon only contains about 20 calories.

Carbs
The carbohydrates in lemons are primarily composed of fibers and simple sugars such as glucose, fructose and sucrose.

Fibre
The main fibre in lemons is pectin.
Soluble fibers like pectin can lower blood sugar levels by slowing down the digestion of sugar and starch.
Dietary fibers are an important part of a healthy diet, and linked with numerous health benefits.

Vitamins and Minerals
Lemons contain several vitamins and minerals.

- **Vitamin C:** An essential vitamin and antioxidant. It is important for immune function and skin health.
- **Potassium:** A diet high in potassium can lower blood pressure levels and have positive effects on cardiovascular health.
- **Vitamin B6:** A group of related vitamins that are involved in converting food into energy.

Other Plant Compounds
Plant compounds are natural bioactive substances found in plants, some of which have powerful health benefits.
The plant compounds in lemons, and other citrus fruit, may have beneficial effects on cancer, cardiovascular disease and inflammation.
These are the main plant compounds found in lemons:

- **Citric acid:** The most abundant organic acid in lemons, and may help prevent the formation of kidney stones.
- **Hesperidin:** An antioxidant that may strengthen our blood vessels and prevent atherosclerosis.
- **Diosmin:** An antioxidant that is used in some drugs that affect the circulatory system. It improves vascular muscle tone and reduces chronic inflammation in blood vessels.
- **Eriocitrin:** An antioxidant that is found in lemon peel and juice.
- **D-Limonene:** Found primarily in lemon peel. It is the main component of lemon essential oils, and responsible for the distinct smell of lemons. In isolation, it can help relieve heartburn and stomach reflux.
- Many of the plant compounds in lemons are not found in high amounts in lemon juice, so it is recommended to eat the whole fruit for maximum benefit.

Procedure recipe per kilogram of product
Selection of raw material: Good quality of beetroots, apples, onions and lemon were purchased from market and used in the preparation of Apple Beetroot Chutney.

Peeling and Extraction: Peel the beetroots with peeler and extract juice from lemons using juice extractor.

Cutting: Cut beetroots, onions and apples into small pieces (5mm thickness) using sharp knife

Heating of Pan: Keep the pan on gas burner and heat it.

Addition of ingredients: Add oil, onion, beetroot and apple one by one into the pan.

Addition of sugar and spices: When beetroot and apple starts to cook add sugar and spices to them which were weighed previously.

Addition of vinegar and Lemon juice: Add measured amount of vinegar and lemon juice to the cooking mixture.

Cooking: Cook the chutney for about 45 minutes till all the ingredients cooks well and acquires proper texture.

Cooling and Packaging: Cool the chutney and fill it into standing plastic pouches and seal the pouches using sealing machine.

Storage: Storage the chutney at room temperature.

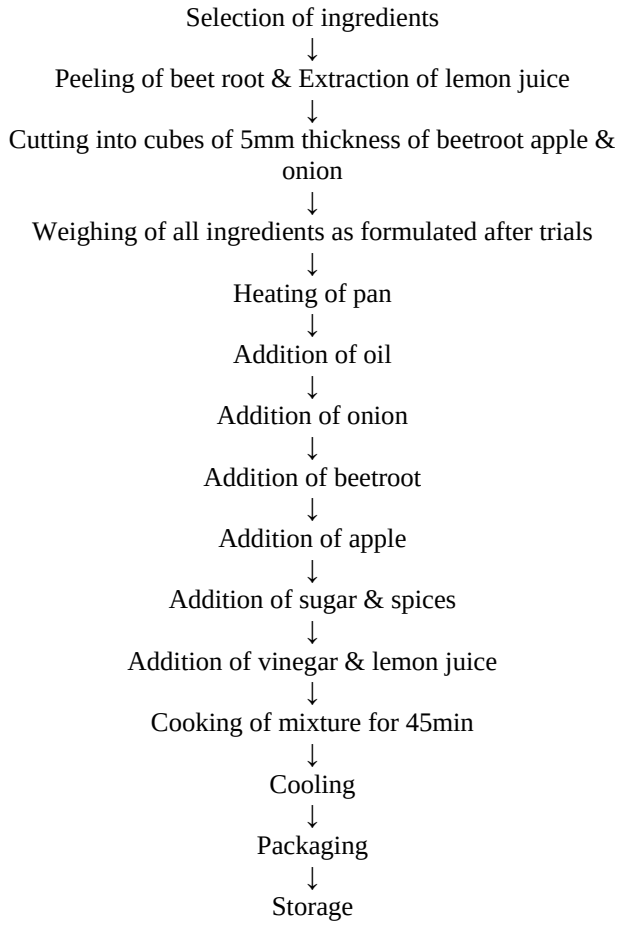

Fig 1: Preparation of apple and beetroot chutney

Formulation for apple and beetroot chutney

Table 1: formulation for apple and beetroot chutney

Raw Material	Sample A(gm)	Sample B(gm)	Sample C(gm)
Beetroot	666	666	666
Apple	167	167	167
Onion	-	167	167
Sugar	100	100	50
Oil	50	50	50
Lemon Juice	10	10	-
Vinegar	50	50	-

Cumin Powder	8	8	8
Chilli Powder	20	20	15
Salt	20	25	25

Result and Discussion

Sensory evaluation of the sample was carried out by trained sensory panel members using nine point's hedonic scale. Attributes like taste, colour, appearance, flavour and overall acceptability was scored based on its intensity scaled. 9-Point Hedonic Scale has been used for the purpose. The sensory score given by the panel have been evaluated for the sensory result. As per the result of sensory analysis Sample B was selected.

Table 2: Average of sensory analysis data

Product	Appearance	Color	Flavour	Taste	Overall Acceptability
Sample A	6.5	7.5	7.5	7.0	7.1
Sample B	8.0	8.0	7.0	8.5	7.8
Sample C	7.0	8.0	7.0	7.0	7.2

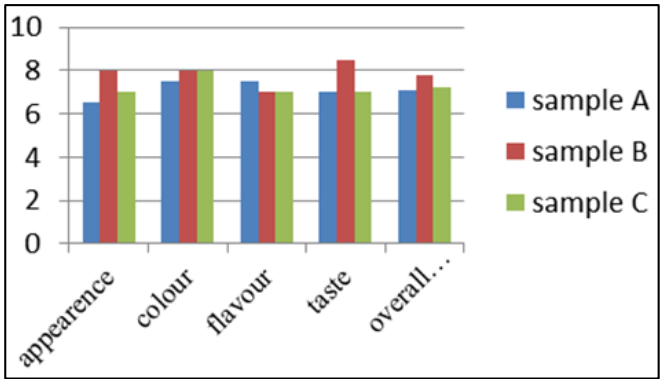

Fig 1: Average sensory analysis data

Chemical Analysis

Table 3: Result of Chemical analysis

Sr. no.	Particulars	Value (g/100gm)
1	Energy value (Kcal)	216Kcal
2	Protein	9.30gm
3	Iron	0.88mg
4	Non-Reducing sugars	0.31gm
5	Ash	1%
6	Moisture	45.6%
7	Acid Value	0.23%

Conclusion

Now a day's wide range of Chutneys are available. To avoid dangerous health diseases, consumption of healthy and nutritious food is necessary. As a source of minerals, vitamins, antioxidants and bioactive compounds in preparation apple beetroot chutney. Healthy eating is not about strict dietary limitations, staying unrealistically thin or depriving yourself of the foods you love. Rather, it's about feeling great, having more energy and stabilizing your mood. In this project we studied various properties of all ingredients and found that many health benefits to our body. After the study we decided to prepare chutney which is combination of apple, beetroot, onion, sugar, vinegar and spices together.

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