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ORIGINAL ARTICLE **OPEN ACCESS**

Scope of Functional Food- Chikki Prepared By Adding Pomegranate Peel

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ABSTRACT
The whole, fortified, enriched or enhanced foods which give health benefits beyond the provision of essential nutrients (vitamins, minerals and antioxidants), when they are consumed at effectual levels as part of a varied diet on a regular basis are known as functional foods. Pomegranate fruit many chambered and multi seeded. The use of pomegranate as anti viral, anti microbial and as anti cancer agent. The using up of pomegranate juice is effectual against coronary heart disease and chronic obstructive pulmonary disease. Antioxidants present in pomegranate peel, pulp, seed fractions and juice. This review focuses on the Antifungal Activity, Health Benefits, Antioxidant Property, Anti Diarrheal Activity of pomegranate peel and development of functional food by fortifying Chikki with it.
Keywords: Chikki, health effects, Pomegranate Peel

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INTRODUCTION

Functional foods may be defined as the whole, fortified, enriched or enhanced foods which give health benefits beyond the provision of essential nutrients (vitamins, minerals and antioxidants), when they are consumed at effectual levels as part of a varied diet on a regular basis.

Functional food cannot be a single well-defined/well characterisable entity. Undeniably, a wide variety of food products is or will, in the future, be characterized as functional food with a variety of components. Some of those functional foods will be classified as nutrients, affecting a variety of body functions relevant to either a state of good health and or to the reduction in risk of diseases. Thus definition of functional food exists.

From a practical point of view, a functional food can be-

· a natural food.
· a food in which component has been added
· a food from which a component has been removed.
· a food where the nature of one more components has be modified.
· A food in which the bioavailability of one or more components has been modified or any combination of these possibilities.

POMEGRANATE-

Archeobotanical investigations show that pomegranate is probably originated in Iran and Afghanistan, and has been cultivated since ancient times throughout the Mediterranean basin to India. It was considered as a holy fruit since the distant past by many religions. The plant was used in many ways, including juice, dyes, inks, tannins for leather (bark) and a variety of remedies for various ailments. The fruit has a quite long shelf life at room temperature, and thus was carried on long journeys through desert climates as a basis of water and nourishment.

Taxonomy of pomegranate:-

Phylum: **Angiospermae**
Subphylum: **Dicotyledonae**
Division**: Lignosae**
Order: **Myrtales**
Family: **Punicacae**
Species: *P. Granatum*(Linn)

Pomegranate Fruit- Botany

Pomegranate fruit is botanically a sole type of fruit classified as balausta. The fruit is many chambered and multi seeded, developed from an inferior ovary and synchronous pistil with two whorls of basal carpels lying within the receptacle. During the development of ovary, the outer carpels become covered and superimposed, results in the formation of two layers of chambers, with the outer or upper ones occupying a partial position. The pericarp (peel) of fruit is tough and leathery, and chambers made of thin walls of carpals (capillary membrane). The seeds are anchored on a soft and fleshy placental (pith) tissue. The testa of the seed (aril) is filled with an acid juice while the tegmen (seed) is horny.

Browning in Pomegranate arils:-

The ripening changes in pomegranate arils associated with disintegration of membrane permeability, which may leads to the loss of water and acid content, and increase in the calcium content resulting in increase in the pH of arils. The exposure of oxidative enzymes viz. PPO & POD enzymes and associated substrates due to degenerated membrane integrity, leads to the enzymatic browning reactions in the arils.

The decreased anthocyanin content and ascorbic acid content and increased pH favors the oxidative enzyme activity. Further amassing of calcium crystals in the arils leads to the hardening of the arils. The research findings towards browning of arils in pomegranate were consolidated and interlinked to elucidate the possible mechanism of internal browning.

Antifungal Activity:-

Punica granatum, (pomegranate) have been extensively accepted for their antimicrobial properties. The antimicrobial property of any material not only refers to its antibacterial properties but also includes its antifungal, antiprotozoal and antiviral properties, converse to which all the research is concerted only towards finding the antibacterial property of the material. As oral microbiota not only consist of bacteria but also contain other microorganisms that cause mixed infections in the oral cavity. Therefore a broader range of activity of oral care products is required. The founding and protection of oral microbiota is related not only to antibacterial co aggregations but also to interactions of these bacteria with yeasts such as Candida albicans. Fungi are commonly inaccessible in several oral sites, including the tongue, buccal mucosa, palate, dental biofilm, sub gingival microbiota, carious lesions and prosthetic appliances. Studies have suggested a likely relation between Candida albicans and periodontal disease, dentin and/or root caries. These studies showed that Candida albicans has a similar capacity of colonizing hydroxylapatite as Streptococcus mutans; however, using diverse mechanisms.

Enamel and dentin demineralization produced by fungal organic acids as well as the presence of cells with *Candida albicans* hyphe invading dentinal tubules confirm this capability of the fungi to invade and destroy organic and inorganic dental tissues. This microorganism adheres to hydroxyapatite, particularly through electrostatic relations, and, at smaller numbers, *Candida albicans* also has the ability to dissolve hydroxyapatite at a larger rate in comparison to Streptococcus mutans tentiating it as a pioneer microbe in the causation of caries, which is a general oral disease. Hence, it is enviable for all antibacterial products to have antifungal properties to prevent infections caused by both bacteria and fungi.

The use of pomegranate as anti viral (1), anti microbial (2) and as anti cancer (3) agent. The using up of pomegranate juice is effectual against coronary heart disease (4) and chronic obstructive pulmonary disease. Antioxidants present in pomegranate peel, pulp, seed fractions and juice.

Pomegranate is used for the prevention and cure of cancer and soreness. It also showed it's antiproliferative effect against human's oral, colon, prostate and breast cancer cell lines, effective against gastric ulcer and check oxidative damage in diabetic rats. Pomegranate inhibits the growth of various microorganisms (*Staphylococcus aureus, Listeria monocitogens, E coli, Candida albicans)*.The main ellagitanin pumicalagin in pomegranate has low cytotoxicity, but report showed that pomegranate ellagitanin ia an enriched dietary supplement, safe for humans, no changes have been reported in hematological, biochemical or urinary analysis. Using either Alginate may be used as encapsulating agents. Spray dried microparticles containing pomegranate extracts are easily prepared.

Health Benefits of Pomegranate tea:-

Pomegranate has been a food known for its antioxidant and health properties since prehistoric times. The pomegranate in pure form is a fruit with seeds or arils, which are the actual fit to be eaten portion of the plant. Through the centuries this fruit has been consumed either as a raw seed, made into a sauce, or the seeds are crushed and blended to make a tea drink. Pomegranate tea is a healthy substitute beverage with

benefits of improving heart health, increasing immune system performance and preserving mental-health stability.

Benefits to the Immune System:-
Pomegranate are known for having essential vitamins such as riboflavin, thiamin, niacin ,vitamin C, calcium and phosphorous. The high content of vitamins in adding up to the antioxidants offer a daily boost to the immune system. Daily use of pomegranate tea can offer decreased chance for virus and infection during prime cold catching season. It also can further improve the chances of preventing a cold once symptoms are present.
Benefits to Mental Health:-
Pomegranate is gaining credibility for being helpful to improve depression.

POMEGRANATE PEEL:-
Pomegranate peels are being unnecessary after juice production and ready to eat arils. Pomegranate peel is nutritionally rich by product which is plentiful due to no more use. Pomegranate peel extract has got consideration due to its noticeable wound healing properties, immune modultory activity, antimicrobial activity, anti atherosclerotic and anti oxidative capacities.
Benefits of the Pomegranate Peel:-
· Probably efficient against prostate cancer, diabetes and lymphoma disease.
· Sustain accurate blood pressure.
· Useful in dealing with fertility problems.
· Helps maintain a smooth vigorous skin.
· Possibly prevents premature aging.
· Useful in fevers.
· Can reduce the inflammation of arthritis by slowing down the enzymes that break down cartialage.
· For dealing with coughs.
· Dry peels of pomegranate are used in conjunction with ginger and tulsi leaves to prepare a home remedy for coughing.
· Used for bad breath.

PREPARING THE POMEGRANATE PEEL POWDER:-

Pomegranate peel
↓
Drying (in the dehydrator)
↓
Grind in a seed grinder in powder form
↓
Store in a labelled bottle
↓
Keep it away from light for preserve antioxidants

Grind powder is an outstanding supply of beta-carotene, potassium, phosphorous and calcium. The powder contains 16.5% polyphenol and 5.35% mineral matter (5).
Antioxidant Property of Peel:-
Pomegranate peels yield more of the powerful antioxidants such as flavonoids, phenolics and pro anthocyanidins. Even the tests performed to test antioxidant activity showed that the peels of the pomegranate fruit had higher activity levels than pulp. These results are interesting in that the antioxidant activity in the peels was more successful in protecting LDL cholestrol against oxidation. Oxidative stress can lead to heart disease and other medical conditions, high antioxidant activity can be one way to battle this state which is very dangerous to the body. The peel of pomegranate could be a potent "tool" against heart disease and other limiting medical conditions. The sweet white peel cultivar's peel extract have more health supplement, rich in antioxidants compared to other pomegranate cultivar's peel extract.
Several phenolic compounds, ellagic acids and hydrostable tannins were present in pomegranate. Vitamin C is unstable among the other antioxidants. Ferric reducing power assay (FRAP assay) is used for comparing the antioxidant activity of different pomegranate cultivers. If the FRAP value decrease, that

relates to loss of unstable antioxidants. Pomegranate peel can be recommended as a potent source of antioxidant for the stabilization of food systems, especially unsaturated vegetable oils.
Pomegranate peel extract at concentration of 800-850 ppm has stabilization competence equivalent to conventional synthetic antioxidants, i.e. BHT at its legal limit. It improves resistance of sunflower oil against thermal deteriorative changes.
Pomegranate peel powder, a by-product of the pomegranate juice industry, is prosperous in polyphenols. It was explored for use in bread production, due to its potential health effects. Wheat bread was prepared using different levels for replacement of flour with peel powder (0 to 10 g per 100 g flour) resulting antioxidant levels expressed as Trolox equivalent antioxidant capacity values (TEAC) ranging from 1.8 to 6.8 μ mol TEAC per g bread for fresh bread. TEAC remained constant during 5 days of storage in polyethylene bags at room temperature. The lowest content of peroxide values were found in bread with the highest percentage of peel powder.
An increased death rate of the brine shrimp larvae was found as a function of the alternate of wheat flour with Pomegranate peel in fortified bread providing a general screening method for the toxicological test of polyphenol fortified bread to be recommended for use in product development in addition to subjective evaluation. Based on both toxicological and subjective evaluation an addition of 2.5% peel powder is suggested for the actual product.

Anti Diarrheal Activity of the Aqueous Extract of Pomegranate Peel:-

The anti diarrheal effects of the aqueous extract of Punica granatum peels were evaluated in rats. Studies were carried out on the isolated rat ileum, gastro-intestinal motility in vivo, and on castor oil- induced diarrhoea in rats. The results discovered that the extract exhibit a concentration-dependent inhibition of the impulsive movement of the isolated rat ileum and attenuated acetyl choline induced concentration. The extract also caused a dose –dependent decrease of gastrointestinal transit and noticeably protected rats against castor oil- induced diarrhea enter pooling. A preface phytochemical screening of the aqueous extract of pomegranate peels gave positive tests for tannins, flavonoids, and alkanoids. The outcome obtained showed that the aqueous extract of Punica granatun peels may contain some biologically active principles that may be active against diarrhea, and this may be the basis for its conventional use for gastrointestinal disorders.

Thermal Stability of Liquid Antioxidative Extracts from Pomegranate Peel-

Liquid extracts from pomegranate peel have the prospective to use as natural antioxidant product. The quality of liquid extracts changes before and after thermal treatment during sterilization and storage.
Liquid pomegranate peel extracts were prepared, sterilized under ultra-high temperature (UHT) at 121degree centigrate for 10 seconds and then stored at three temperatures(4,25 and 37 degree centigrate) for up to 180 days. After 180days the extract is stored at 40c retained 67% of the initial total soluble phenolic content and 58% of the original scavenging activity. Results show that liquid pomegranate peel extracts had satisfactory thermal stability after sterilization and storage.

CHIKKI

India with different food habits, having a number of traditional foods, from which chikki is one of the popular Indian traditional sweet snack. Chikki is mainly prepared using jaggery as sweetener and roasted peanuts (*Arachis hypogaea*). Sweets or confections with jaggery are gaining recognition due to the awareness of health benefits. Jaggery is obtained by concentrating sugar cane juice to solid or semisolid state. It is a natural sweetener, having a sweet winey flavor , contains protein, minerals and vitamins and is a effective source of iron and copper. It has been reported that chikki prepared with added sodium bicarbonate were more yellow than other product. Process of making chikki with added soda was patented.

Types of Chikki:-

1. Almond Cashew nut chikki
2. Almond chikki.
3. Badam chikki.
4. Badam kaju chikki.
5. Cashewnut chikki.
6. Cashewnut crushed chikki
7. Cashewnut dryfruit- seasame coconut mix chikki.
8. Coconut chikki.
9. Chocolate crushed
10. Dry fruit mixed (Pista Badam Kaju)

Peanut Chikki Incorporated With Flax Seeds :-

Flaxseed (*Linum usitatissimum*) is one of the richest sources of n-3 fatty acids, mainly consisting of alpha linolenic acid. Flax seed provides one of the non-animal sources of n-3 making it perfect for vegetarians. Flaxseeds contain around 40% Oil, 30% dietary fiber, 20% protein, 6% moisture and 4% ash. Flaxseeds were incorporated in chikki formulation to increase the essential fatty acids, 20% replacement of peanuts in the formulation for preparation of chikki. Addition of flaxseed to chikki increased PUFA content especially n-3 fatty acids, up to 9%, which were not present in chikki prepared only with peanut. TBHQ (Tertiary butyl hydroquinone) at 200ppm level used as an antioxidant. At the end of 60days at 37oc, rancidity developed in samples without antioxidant but not in that with added antioxidant. Thus TBHQ increased the shelf life of the peanut.

INGREDIENTS OF CHIKKI

JAGGERY

Jaggery is essentially unrefined sugar. It is obtained from raw, concentrated sugarcane juice, by boiling it and then making it into a block. Other sources that are used for making gur include gur palm and the sap of coconut. Traditional Indian sweetener jaggery will be launched and served as complete health food for all age groups soon.

IISR Scientists are instrumental fortifying age old traditional sweetener with vitamins, minerals and protein to suit health requirements of all age and sex group, with a focus on malnourished sections of rural masses. 25% to 30% sweetener requirements of the country in the form of traditional jaggery products. Jaggery manufacturing in India started even before 326BC, when Alexander's army noticed sugarcane in India during their conquest.

Indian jaggery is thought to be nourishing and healthy sugars in the world due to its innate prosperity in minerals, vitamins and proteins. However in recent times jaggery using up had curved in due to poor hygiene in manufacturing and storing the produce. Apart from Uttar Pradesh, major sugarcane growing states in India are Bihar, Maharashtra, Tamilnadu, Karnataka and Andhra Pradesh. India exports about 1 million tones of jaggery to Pakistan, Sri Lanka, UAE, Malaysia and Yemen, as in 2010, trade activity fetched India Rs 3500 crores as revenue (sources-The Times of India).

Health Benefits-

- It is a great digestive aid and should be consumed post meals.
- Including jaggery in meals relives constipation by stimulating bowel movements.
- Jaggery is an excellent source of iron and also helps to prevent anemia.
- It helps to treat cough, bloating, water retention and migraine.
- To soothe throat from cough jaggery can be added instead of sugar in tea.
- Jaggery is also good for the liver as it helps in detoxifying it.
- It is often called medicinal sugar
- Jaggery has a high mineral content which ensures that our body gets its intake of micronutrients.

Gur is slightly high on the number of calories –it contains 4 kcal/gram. So people who are on a weight loss diet or are diabetic should monitor their consumption as it can lead to weight gain and fluctuations in the blood sugar levels.(sources-India.com health)

GROUNDNUT

The groundnut belongs to the pea and bean family and is a legume below the earth. The groundnut plant grows up to 50cm in height. It is a variable annual herb. The flowers of the plant develop a stalk which enters into the soil, forms a pod containing generally two seeds. They become mature in about two months. The plant is then allowed to dry after removed from the earth. They are separated from the plant after 3-6 weeks. It is a rich source of energy and vitamins such as vitamin A, E, B Complex. Vitamin C is found abundantly in groundnut.

Groundnut contains more protein than meat, about two and half times more than any other vegetables except soybean and yeast. India is one of the major exporting countries of groundnuts after china.

Varieties-

The main groundnut varieties produced in India are kadiri-2, kadiri-3, BG-1, BG-2, Kuber, GAUG-1, GAUG-10, PG-1, T-28, T-64, Chanda, Chitra, Kaushal, Parkash and Amber.

Area of Cultivation-

Andra Pradesh, Bihar, Gujrat, Haryana, Uttar Pradesh, Maharashtra, Tamilnadu, Madhya Pradesh are the main production area in India (www.apeda.gov.in).

Use of Groundnut in Some Illness:-

- Eating a handful of groundnuts helps to prevent malnutrition and checks arterial and venous occlusion.
- Chewing fresh groundnut helps to restore the strength to the gums and the teeth.
- It is useful in bleeding disorders, in bleeding from nose.
- Nicotinic acid deficiency can cause chronic diarrhea, since groundnut is a rich source of nicotinic acid, it can be consumed with goats milk.
- Groundnut oil is applied daily on the face, keeps the face fresh and free from acne.
- Groundnut is known to trigger an asthmatic episode, so asthmatic person should avoid raw or roasted groundnut. Excessive use of groundnut can produce stomach upset, hyperacidity and indigestion in a few individual.(Sources-www.tandurust.com)

Process

- Preparing the hot jaggery syrup with minimum of water
- Adding arjuna, peel powder and cardamom powder
- Color was changed because of heating
- Adding nuts to the syrup to coat them, with the syrup
- Transferring the nuts to a mould
- Rolling them to a wooden roller
- Place in to a steel plate for cooling
- Cutting into slabs
- Packing

CONCLUSION

Pomegranate peels become attractive as a functional food and as a source for the development of nutraceuticals responsible for their antioxidant, anticancer, antimicrobial, anti diabetic, anti ulcer properties. The therapeutic action of pomegranate peel is attributed to the presence of bioactive compounds such as polyphenols, vitamins, etc. Some of them have antioxidant properties which are referred repeatedly to be the key aspect of their observed beneficial effects.

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