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UNDERUTILIZED FRUITS AND VEGETABLES: CONTRIBUTION IN ACHIEVING FOOD AND NUTRITIONAL SECURITY

Home Science

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ABSTRACT

Eradication of global malnutrition demands progress towards achieving food and nutritional security. Production of wide range of fruits and vegetables can reduce and enhance food security. Fruits and vegetables are excellent source of micronutrients i.e. minerals and vitamins. Incorporation of variety of fruits and vegetables in daily diet is essential for nutritional security. Increasing fruits and vegetables consumption can help alleviate malnutrition by proving balanced diet. Many indigenous fruits and vegetables are rich in micronutrients and could significantly contribute to nutritional security if eaten as a part of daily diet. These indigenous fruits and vegetables are amaranth, Asian eggplant, drumstick, jack fruit, jujube, bael, jamun, carambola, karonda and phalsa. Present status of these fruits and vegetables in India, constraints, their nutritional composition and ways of utilization as a food will be discussed.

KEYWORDS:

Global malnutrition, underutilized, micro-nutrient, nutritional composition.

INTRODUCTION

According to global nutrition report 159 million children under the age of five suffer from stunting, whereas 50 million from wasting. Meanwhile 41 million people are classified as overweight or obese (UNICEF, WHO, and World Bank, 2015). About two million people suffering from micronutrient malnutrition (WHO, 2009). About 800 million people suffer from calorie deficiency (FAO, 2015). The costs of failing to address malnutrition are tragically high: Nearly half of all deaths in children under 5 are attributable to undernutrition. This translates into the unnecessary loss of about 3 million young lives a year. Undernutrition puts children at greater risk of dying from common infections, increases the frequency and severity of such infections, and contributes to delayed recovery. Inadequate nutrition in the first 1,000 days of a child's life can also lead to stunted growth, which is irreversible and associated with impaired cognitive ability and reduced school and work performance. In addition, the interaction between undernutrition and infection can create a potentially lethal cycle of worsening illness and deteriorating nutritional status, premature death, stressed health systems, and a severe drag on economic progress (UNICEF, 2017).

Increased production of indigenous and underutilized fruits and vegetables can be a better way towards eradicating global malnutrition. Because of in-efficient use of locally available underutilized fruits and vegetables, a gap is formed between nutritional status and optimal use of natural source of nutrients *i.e.* underutilized fruits and vegetables. These indigenous fruits and vegetables are amaranth, Asian eggplant, drumstick, jack fruit, jujube, bael, jamun, carambola, karonda and phalsa. These are rich source of many of vitamins and minerals which helps in proper functioning of human body. Lack of proper supply of these components in human body results in specific nutritional deficiencies *i.e.* zinc deficiency, iron deficiency anaemia, vitamin-A deficiency, calcium deficiency etc. A dietary approach, rather than the medicinal (supplementing pills) approach, is the most economical and sustainable way to correct micronutrient deficiencies (Ali and Tsou, 2000). Exploitation of underutilized fruits and vegetables can become a solution to problem of food and nutritional insecurity. To alleviate this condition, efforts should be made to genetically improve and produce the underexploited and lesser known indigenous vegetables as sources of nutrients (Hussain *et al*., 2011). Thus an effort was made to discuss about some of the nutritious underutilized fruits and vegetables.

Jamun (***Syzygium cumini***) is a popular indigenous fruit of India. It is also found in Thailand, Philippines, Madagascar and some other countries. The jamun has successfully been introduced into many other subtropical regions including Florida, California, Algeria, Israel, etc. It is believed to be a boon for diabetic patients. But in India, its organized orcharding is still lacking mainly because of lack of proper information on cultivation practices and non-availability of dwarf and high yielding varieties**.** Jamun grows throughout India's tropical and subtropical regions. Its distribution isn't limited to any specific region—it grows from the North's lower Himalayas to the southernmost point of Tamil Nadu (Anonymous, 2012). Jamun fruit possesses considerable amount of minerals, sugars, and proteins. It helps curing anaemia as it is a good source of iron. It is reported that hundred grams of jamun fruits contain 83 Kcal, 0.9 g of fibre, 1.5mg of iron, 0.4 g of mineral etc. (Anonymous, 2015)

Jamun is tasty and pleasantly flavoured fruit which is mostly used for dessert purposes. The fruit is usually eaten with salt. The jamun fruit has sub-acid spicy flavour. Apart from eating fresh, it can be used for making delicious beverages, jellies, jam, squash, wine, leather, vinegar and pickles. Jamun squash is a very refreshing drink in summer season. A little quantity of fruit syrup is very useful for curing diarrhoea. A mixture of jamun juice and mango juice in equal quantity is very useful for quenching thirst for diabetic patient. Jamun is also used for preparation of jamun wine (Koley, 2011).

The vinegar prepared from juice extracted from slightly ripe jamun fruits is stomachic, carminative and diuretic, apart from having cooling and digestive properties. Almost every part of the tree is used for one purpose or other. A tree made of tender leaves and alcoholic extracts of leaves and a fruit is used in South America for curing the stomach disorder. Powdered seeds are also very useful for the cure of diabetes. The seed powder of jamun reduces the quantity of sugar in the urine very quickly and permanently (Anonymous, 2015).

Jujube

The jujube, also known as ziziphus, is grown and cultivated in India, Russia southern Europe, China and the Middle East. In India, the jujube is grown for just a few niche markets. Jujube provides 79Kcal per 100 g of fruits to human body. Jujube contains potassium, phosphorus; manganese and calcium as the major minerals. There are also high amounts of sodium, zinc, iron and copper. Jujube also contains vitamin C, riboflavin and thiamine. Jujube fruits may also be packed with many essential amino acids. Jujube fruit is extremely lower in sodium and it's also an excellent source of vitamin C. The vitamin and mineral content of the fruit helps to support cardiovascular health and enhance metabolism (Sharma *et al*., 2011).

Ber is richer than apple in protein, phosphorus, calcium, carotene and Vitamin C (Bakhshi and Singh, 1974) and oranges in phosphorus, iron, vitamin C and carbohydrates and exceeds them in calorific value. Ripe fruits provide 20.9 Kcal per 100 g of pulp (Singh *et al*., 1973). Jujube can be used in many preparations such as Jam, jelly, pickle (Uddin and Hussain, 2012).

Amaranth

Amaranth leaves have a good content of essential micronutrients *i.e.* vitamin A, vitamin K, vitamin B6, vitamin C, riboflavin, and folate, and dietary minerals including calcium, iron, magnesium, phosphorus, potassium, zinc, copper, and specially manganese. One cup of amaranth leaves, that are cooked, boiled, and drained contain 73% of vitamin-A daily requirement, 90% vitamin C, 28% calcium and 17% iron. The leaves are not as rich in protein, as they only contain 2.8 g of protein. The seeds are also nutritious. One cup of boiled amaranth seeds provides 5.2 g of fiber. It is somewhat rich in zinc (2 mg/ cup). A cup of boiled amaranth contains 5 mg of iron. The only notable vitamin present in boiled amaranth is folate. Amaranth carries 9.3 g of protein however, it is an incomplete protein. The crop is drought-tolerant, provided there is sufficient moisture during the early growing period. Amaranth can be used in many preparations such as parathas, curry, raita etc. (Venskutonis and Kraujalis, 2013).

Bael fruit

Bael (Aegle Marmelos) is growing wild throughout the deciduous forests of India. This is generally considered as sacred tree by the Hindus, as its leaves are offered to Lord Shiva during worship. The different parts of Bael are used for various therapeutic purposes, such as for treatment of asthma, anaemia, fractures, healing of wounds, swollen joints, high blood pressure, jaundice, diarrhoea healthy mind and brain typhoid troubles during pregnancy (Sharma et al.,2011). The unripe dried fruit is astringent, digestive, stomachic and used to cure diarrhea and dysentery. Sweet drink prepared from the pulp of fruits produce a soothing effect on the patients who have just recovered from bacillary dysentery. The ripe fruit is a good and simple cure for dyspepsia (Parichha, 2004; Chowdhury *et al.,* 2008).

Fruit pulp can be stored for 6 months, when stored in heat-sealed containers. Fruit powder can be stored for a year when packed in 400 gauge polypropelene pouches and stored under dark, cool place, while fruit jam, squash and preserve can be stored for several months (ITDC, 2000). The bael fruit pulp contains many functional and bioactive compounds such as carotenoids, phenolics, alkaloids, coumarins, flavonoids, and terpenoids and has innumerable traditional medicinal uses (Karunanayake *et al*., 1984; Singh 1986; Nagaraju and Rao, 1990). Thus value added products can be produced by using above process technology to reduce post- harvest losses, increase shelf life, value addition and increase the income.

Jackfruit

Jackfruit grows abundantly in India, Bangladesh, and in many parts of Southeast Asia (Rahaman and others, 1999). Jackfruit has been reported to contain high levels of protein, starch, calcium, and thiamine (Burkill, 1997). Jackfruit contains vitamin A, vitamin C, thiamin, riboflavin, calcium, potassium, iron, sodium, zinc, and niacin among many other nutrients. Jackfruit has a low caloric content: 100 g of jackfruit only contains 94 calories (Mukprasirt and Sajjaanantakul, 2004). Jackfruit is a rich source of potassium with 303 mg found in 100 g of jackfruit. Studies show that food rich in potassium helps to lower blood pressure. Mature jackfruits are cooked as vegetables, and used in curries or salads (Narasimham, 1990). Ripe fruits can be eaten raw, or cooked in creamy coconut milk as dessert, made into candied jackfruit or edible jackfruit leather. In India, the seeds are boiled in sugar and eaten as dessert (Roy and Joshi, 1995).

The seeds may be boiled, or roasted and eaten or boiled and preserved in syrup like chestnuts. Roasted, dried seeds are ground to make flour that is blended with wheat flour for baking (Morton, 1987). In addition to its ripe fruit, which has a unique flavor, the jackfruit seed is widely consumed as a dessert. The jackfruit seeds are used in cooked dishes and its flour is used for baking. Jackfruit seeds are fairly rich in starch (Singh et al., 1991). Jackfruit is also used for further processing. For instance, jackfruit chips can be made from dried jackfruit pulp (Nakasone and Paull, 1998). Pureed jackfruit is also manufactured into baby food, juice, jam, jelly, and base for cordials (Roy and Joshi, 1995). Jackfruits are made into candies, fruit-rolls, marmalades, and ice cream. Other than canning, advances in processing technologies too, have pushed toward more new products (Narasimham, 1990). Freeze-dried, vacuum-fried, and cryogenic processing are new preservation methods for modern jackfruit-based products.

Another benefit of eating jackfruit is that it is a good source of vitamin C. The human body does not make vitamin C so one must eat food that contains vitamin C to reap its health benefits. The health benefits of vitamin C are that it is an antioxidant that protects the body against free radicals, strengthens the immune system, and keeps our gums healthy (Umesh *et al*., 2010).

Jackfruit contains phytonutrients: lignans, isoflavones, and saponins that have health benefits that are wide ranging. These phytonutrients have anticancer, antihypertensive, antiulcer and antiaging properties. The phytonutrients found in jackfruit, therefore, can prevent forming of cancer cells in the body, can lower blood pressure, can fight against stomach ulcers, and can slow down the degeneration of cells that make the skin look young and vitae. Jackfruit also contains niacin that is known as vitamin B_3 and necessary for energy metabolism, nerve function, and the synthesis of certain hormones. A portion of 100 g of jackfruit pulp provides 4 mg niacin (Soobrattee et al., 2005).

Carambola

The Carambola (*Averrhoa carambola*) is also known as Golden Star. The word Carambola is derived from the Sanskrit word karmaranga meaning "food appetizer". It is a good source of potassium, copper, as well as folate and pantothenic acid. The Ascorbic acid level of the star fruit is believed to be responsible for its sweet or sour taste. For a sweet fruit, the ascorbic acid level is around 10.40 mg per 100 ml of juice (Chang *et al.*, 2002). It is often consumed fresh and also processed into jam, jelly, sweets, fresh juice and cordial concentrate. Star fruit is rich in nutritive value - 100g of Star fruit pulp contain 0.38 g Protein, 9.38 g Carbohydrates, 35.7 Calories, 0.08 g Fat, 89-91 g Moisture, 0.80-0.90 g Fiber, 0.26-0.40g Ash, 26-53.1mg Ascorbic Acid, 4.4-6 mg Calcium, 0.32-1.65 mg Iron, 15.5-21 mg Phosphorus, 0.003-0.552 mg Carotene, 0.03-0.038 mg Thiamine, 0.019-0.03 mg Riboflavin and 0.294-0.38 mg Niacin (USDA, 2005).

Drumstick Leaves

Most parts of the moringa tree are edible. The leaves and flowers are eaten as salad, as cooked vegetables, or added to soups and sauces or used to make tea (Bosch, 2004). The young, tender pods—known as drumsticks—are highly valued as a vegetable in Asia and also are pickled (Ramachandran *et al.*, 1980). Fried seeds taste like groundnuts. The root bark has a pungent taste and used as a condiment. Dried leaf powder is a good option to supplementary diets of children and pregnant and lactating women (Duke, 2013). For example, moringa leaf powder is added to a soybean and groundnut/peanut paste to form an energy-dense supplemental food known as ready-to-use food for treatment of severe acute malnutrition (Jilcott *et al.*, 2010). Moringa has a high nutrient density and is rich in many essential micronutrients and vitamins as well as antioxidants and bioavailable iron. It excelled among 120 species of Asian traditional vegetables tested for their content of micronutrients and phytochemicals, antioxidant activity. Moreover, it is easy to grow, has excellent processing properties, and good palatability (Yang *et al.*, 2006).

Phalsa

Phalsa shrubs grow in the Himalayan regions of India. The major areas in India cultivating the fruit commercially are Punjab, Uttar Pradesh, Madhya Pradesh, Haryana, and Rajasthan. On a local level, the fruits also grow in Maharashtra, Gujarat, Bihar, Karnataka, Andhra Pradesh and West Bengal. When it comes to fruiting, however, phalsas are awfully fickle plants: unless the region experiences distinct seasonal changes between summers and winters, the shrub flowers sporadically and yields poor fruits. Most farmers grow the trees on the outskirts of the city wherever the land has loamy soils. Phalsa is a summer fruit, ready for picking in the south from March through April**,** and in the north, from May to June**.** The harvesting season itself is short, lasting only three weeks. There are other factors limiting phalsa's availability: The plant ripens unevenly, and each small fruit must be hand-picked—a laborious task. The yield per plant is also quite low, offering roughly 11Kg per tree (Anonymous, 2013).

Phalsa contains 90.5 Kcal, 1.57g protein, 5.53 g fiber, 136 mg calcium, 372 mg potassium, 1.08 mg of iron, 24.2 mg phosphorus, 16.11 µg vitamin-A, 0.02 mg thiamin,0.26 mg riboflavin, 0.82 mg niacin, 4.38 mg ascorbic acid per 100 g of fruits. Phalsa fruit has several traditional health benefits. According to the "Encyclopedia of World Medicinal Plants," phalsa is an astringent, coolant, and stomachic. The fruit treats dehydration and acts as a coolant. Phalsa is a low glycemic index fruit, thereby having positive effects on blood glucose metabolism. Simply put, the fruit is a good choice for those with blood sugar problems such as diabetes. Phalsa has strong irradiation protection qualities due to its amazing free radical scavenging activities. Phalsa can also be used in the form of sherbet (Sinha *et al*., 2015).

Eggplant

Eggplant is a rich source of vitamins and minerals; it also contains important phytonutrients which have antioxidant activity. Phytonutrients contained in eggplant include phenolic compounds, such as caffeic and chlorogenic acid, and flavonoids, such as *nasunin*. Research on eggplant has focused on an anthocyanin phytonutrient found in eggplant skin called *nasunin*. Nasunin is a potent antioxidant and free radical scavenger that has been shown to protect cell membranes from damage (Umesh *et al*., 2015).

Karonda

Karonda fruit believed to be originated near the Himalayas. The plant is found to be distributed in the Himalayas at elevations of 300-1800 m, in the Siwalik Hills, the Western Ghats, in Nepal, Afghanistan, India, Sri Lanka, Java, Malaysia, Myanmar, Pakistan, Australia, and South Africa In India it is cultivated in the states of Maharashtra, Bihar, West Bengal, Chhattisgarh, Orissa, Gujarat, Madhya Pradesh, Rajasthan, and in the Western Ghats. In Maharashtra, the major area under this crop is scattered in submountain area like Kolhapur, Ratnagiri, and Pune district (Sawant *et al*., 2002). Karonda is a fair source of calcium, phosphorus, vitamin-A and ascorbic acid (Singh and Uppal, 2015). Karonda can be canned, preserved and pickled. In Rajasthan karonda fruits are commonly cooked with green chillies to make a tasty dish to be taken with chapatis. Common food products of karonda are karonda jam, jelly, candy, frozen puree, sauce, wine, pickle, chutney (Singh *et al*., 2008; Wani *et al*., 2013).

CONCLUSION

Most of the minor fruits are enriched with nutritional and medicinal value. Therefore, it is valuable to look into the organized cultivation and improvement of minor group of fruits and vegetables like jamun, carambola, amaranth, asian eggplant, phalsa, karonda, jujube, jack fruit, bael etc. So that underutilized fruits and vegetables can be utilized maximally. Consumers demand for new, delicious, nutritious and attractive food products. To satisfy this demand, we can make an effort to develop products from diverse sources. The potentiality of processed products from some minor fruits in the country is still untapped. Entrepreneurship with these processed products may uplift the nutritional and socio-economic status of the vulnerable communities of country. Incorporation of indigenous fruits and vegetables in the daily diet can help eradicating food and nutritional insecurity.

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