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Package of Practices of Winged Bean

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Introduction

Globally, there were 809.9 million undernourished people, of which 194.4 million people (24 %) were in India in 2016-18. Nutrition security is achieved "when all people at all times consume food of sufficient quantity and quality in terms of variety, diversity, nutrient content and safety to meet their dietary needs and food preferences for an active and healthy life, coupled with a sanitary environment, adequate health, education and care" (FAO, 2012). The lack of ability to access a minimum nutrition requirement, expressed in terms of daily energy intake in calories terms, has serious implications for human development. Malnutrition as a term is used by nutritionists to describe all kinds of nutritional deficiencies. It arises due to food insecurity caused by deficiency, excess or imbalance in the intake of micro/macro-nutrients in one's diet. In India, food security has always been associated with food grain security. However, while adequacy of grain can ensure that dietary energy requirements are met, diet diversity is important to meet nutrient requirements.

Crop Diversification

The world population depends for its basic diet of carbohydrates, fats, and proteins on a very limited cereal crops. However, the increasing demand of food with better nutrition cannot fulfill by only major grain and pulse crops. The availability of long-term food and nutritional security can be achieved with an enhanced local productivity and yield stability strategy that fully embraces the benefits of both between and within-crop diversification. As well as the greater use of fruit crops, potential for agricultural diversification which are often richer in micronutrients and fiber than staple crops. Better utilization of fruit crops and some underutilized fruit species like pilu, paniyal, cactus pear etc. in diversified cropping systems can be an important first step toward secure food provision in times of uncertainty. Such local crops can provide valuable nutrients as part of a healthier diet and can be processed into other products. Avocado contains not more than 1% sugar and it recommended as high energy food for diabetes patient. The increased consumption of fruits can positively influence

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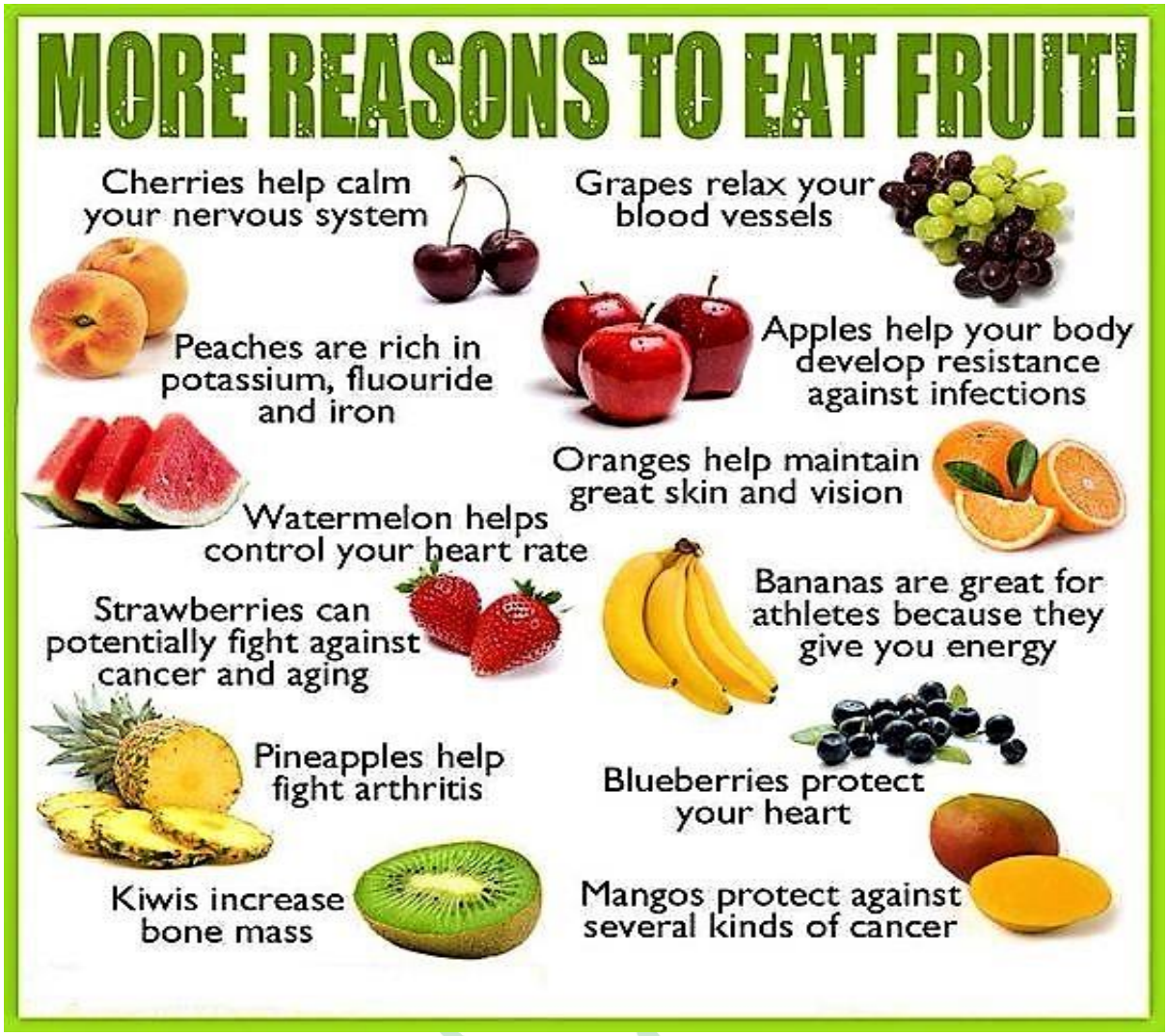
nutrition status as well human productivity. So the adoption of fruit crops, for agricultural diversification can be part of the solution to providing food, health and nutritional security. The changing consumption pattern towards a nutrient rich diet is likely to have positive effect on health and nutritional outcomes.



In this article we will discuss about the nutritional importance of fruits. The mean chemical compositions of fresh fruits are presented in (Table 1).

Table 1. Mean chemical composition of fresh fruit (content per 100 g).

Nutrient	Composition	Nutrient	composition
Water	80-85 g	Potassium	110-450 mg
Protein	0.5-1.5 g	β-Carotene	0.2 mg
Carbohydrate	1.5-16.0 g	Vitamin C	10-90 mg
Dietary fiber	0.2-6.4 g	Vitamin B_6	0.03-0.035 mg

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Calcium	6-50 mg	Energy	6-66 Kcal
Iron	0.3-1.0 mg		

Source: Lintas C. (1992).

Table 2. Rich fruit Sources of Different Nutrients

Nutrient	Fruits
Protein	Almond, filbert, pecan, pistachio, and walnut
Fructose	Apple and pear
Sucrose	Apricot and peach
Vitamin C	Strawberry, citrus fruit, kiwifruit, citrus fruits guava, papaya, gooseberry.
Vitamin E	Nuts
vitamin A	Mango, papaya, apricots, peaches, cantaloupes and bananas, apricot
Thiamine	Plum and dried fruit
Calcium	Strawberry and dried fig
Fibre	Guava, Fig

How Can Increase Availability and Consumption of Fruits

Processing

Processed fruits available as canned, frozen, and dried and juices are beneficial, are available all year round and have a longer shelf life.

Nutrition education

(Mcaleese *et al.*, 2007) illustrate the efficacy of using garden-based nutrition education when attempting to increase adolescents' consumption of fruits. The education may influence the nutritional knowledge of fruits and consequently also influence their intake.

Crop yield improvement

Despite the conduciveness to produce fruits is constantly challenged by natural phenomenon such as soil salinity, drought, pests, pathogens and climate change.

Fruit tree domestication

Increasing yield and value when bringing indigenous food trees into cultivation is essential as if indigenous trees are not productive they have little chance of becoming properly established in farming systems, which will otherwise be dominated by a few staple crops, reducing agro-biodiversity and limiting resilience. **Introduction**

Psophocarpustetragonolobus (L.) DC., generally referred to as winged bean, Asparagus pea or Goa bean. This is a selfpollinated leguminous crop grown in tropical regions tropical legume being catagorised within the phaseoloid clade of Leguminosae (Fabaceae). It is also referred to as Princess pea,Super market, Goa bean, Four-angled bean, Asparagus pea, Vegetable of 20th century, Manila bean on a stalk. Twining habit, tuberous roots, longitudinally winged pods, and annual and perennial growth types all are features of the

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winged bean. The winged bean is believed to have originated in Madagascar, in Africa's eastern region. It contains a diploid genome with 9 pairs of chromosomes (2n = 2 = 18) and a 1.22 Gigabase pair genomic size. In hot, humid equatorial countries like Indonesia, Malaysia, Thailand, Philippines, India, Bangladesh, Myanmar, and Sri Lanka, the plant thrives. The winged bean has enormous economic and ecological potential in tropical areas of the world, where soybean farming appears to be challenging. The fact that the plant's most parts are edible at all stages of its life cycle, combined with its exceptional nutritional quality, makes it a promising candidate for increased, wide - spread use in protein-deficient areas of the world, earning it nicknames like "one species supermarket" and "supermarket on a stalk." Ruminants, poultry, fish, and other livestock may eat winged bean as a source of food. It can also be used as a cover crop, green manure, and soil reclamation. Winged bean outperforms several tropical crop legumes when seed and tuber yields are combined. It also nodulates more than most other legumes, which helps to improve soil quality.

Nutrient/minerals/ physico-chemical properties of winged bean seeds (Lepcha*et al.*, 2017)

Nutrients/minerals/ physico-chemical properties	**Winged bean (concentration/ amount)**	**Nutrients/minerals/ physico-chemical properties**	**Winged bean (concentration/ amount)**
Moisture (%)	9.22 ± 0.18	Calcium (mg/kg)	889.86 ± 0.63
Total ash (%)	4.91 ± 0.01	Sodium (mg/kg)	1,972.34 ± 0.69
Fat (%)	17.51 ± 0.35	Potassium (mg/kg)	4,219.30 ± 0.81
Crude fiber (%)	12.23 ± 0.13	Peroxide value (meg/kg)	11.41 ± 0.30
Crude protein (%)	33.83 ± 0.61	Saponification value (mgKOH/g)	190.34 ± 0.64
Carbohydrate (%)	22.30 ± 0.82	Unsaponification matter (g/kg)	16.36 ± 0.64
Magnesium (mg/kg)	2,238.18 ± 0.04	Acid value (mg KOH/g)	0.71 ± 0.01
Zinc (mg/kg)	36,476 ± 0.64	Iodine value	144.57 ± 0.53

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Copper (mg/kg)	90.79 ± 0.72	Refractive index at 25 °C	1.47 ± 0.01

Yield data and food use of winged bean (Lepcha*et al*., 2017)

Plant part	Greatest yield reported (kg/ha)	Composition per 100 g fresh weight	Food preparation
Pods	34,000–35,500	1.9–4.3 g protein	Steamed, fried, soups, salads
Tubers	5,500–11,700	3.0–15.0 g protein	Steamed, roasted, boiled
Seeds	2,000–5,000	29.8–39.0 g protein 15.0–20.4 g oil	Parched, in tempeh, flour added to traditional dishes
Leaves	-	5.0–7.6 g protein	Steamed, salad
Flowers	-	2.8–5.6 g protein	Steamed, salad

Botany:

Winged bean is a herbaceous perennial planted as an annual climber with a green or purple stem, trifoliate leaves, and vine heights ranging from 3 to 4 meters. The pods are 6 to 9 inches long and have four sides with wings extending from angles, hence the name. Hermaphrodite flowers, blue in colour. When the seeds are ripe, they turn brown; the beans are spherical in shape and have an asparagus-like aroma. It is photosensitive, and normal flower induction takes only a few days. Winged bean is a diploid with chromosome numbers 2n=18 and 22 and belongs to the Fabaceae family.

Soil: The crop can be cultivated in a variety of soil types, but the best is well-drained sandy loam soil rich in organic matter with a pH range of 5.8-6.0. Germination and tuber production are aided by good soil texture. It's prone to water buildup and moisture stress.

Climate: It is a tropical plant and grows up to an elevation of 2000 m from sea level. Vegetative grow this best at day temperature 30 ^{0} C and night temperature 22 ^{0} C. Optimum temperature for flowering and pod development is 25-35 ^{0} C. Optimum rainfall requirement is 1500-2000 mm.

Varieties: In India, there are a few options, including No.21, 60, and 71 at the IIHR in Bangalore, WBC-2 in Meghalaya, and JCV44 in West Bengal. SLS-44 is a DOA-

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recommended and officially released variety, while UPS-122 and SLS-40 are suggested but not yet legally produced.

Land preparation:

Soil should be ploughed thoroughly to a depth of 30-40 cm and worked to a very fine tilth.

Season: It can be sown in June-July in northern plains and end of July to October in southern plains.

Sowing: Winged bean is a direct seeded crop. Seeds are soaked in water for 1-2 days before sowing for better germination. The pre-soaked seeds germinate in 5-6 days at 250 C otherwise normally after 10 days. Seeds are sown on flat bed or ridges at a depth of 2 cm.

Spacing: The spacing varies and is determined by the variety and location of the plants. Tall types are planted with 75-100 cm between rows and 25-50 cm between plants, whereas dwarf kinds are planted with 60 cm X 25 cm spacing. Tuber-producing varieties are planted at a closer spacing.

Nutrient management: About 10-15 tons of FYM/ha applied to the soil at the time of field preparation. 40 kg N, 100 kg P and 25 kg K/ha applied before sowing. Half quantity of N is top dressed at the time of flowering.

Irrigation: For the crop, one irrigation every 7-10 days is sufficient. If the rains are consistent during the rainy season, the crop may not require irrigation. Water logging, on the other hand, should be avoided.

Staking: After seed germination, the vegetative development is rapid. The vines can reach a length of 3-4 meters. As a result, the plants must be staked from the beginning of their growth. After around 30 days of seeding, the plants are supported on bamboo poles, subabool, Leucaenaleucocephala. Tuber crops typically do not require staking, and vines are permitted to trail freely on the ground.

Interculture: Once a month, light hoeing and weeding is done to keep weeds at bay. Tuber output is increased by mulching with dried leaves or straw. When the main vine has developed 10-12 leaves, pinch out the top to stimulate side shoots.

Harvesting: After 70-90 days of seeding, green delicate pods for vegetable use are ready to harvest, depending on the variety. After 20-35 days of flowering, the pods are ready to

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harvest, and the harvesting period can last up to 2-3 years. After 5-6 months, the seeds mature, and after 8 months, the tubers are collected. The green pod harvest lasts approximately 5-6 months.

Yield: Yield of green pods is 10-15 t/ha, dry seed yield is 1-1.5 t/ha and tuber yield is 5-10 t/ha.

Storage: To keep the beans fresh, place them in a plastic bag with the neck tightly closed. For optimal results, place them in the refrigerator. It can be stored for four weeks at a temperature of 100°C and a relative humidity of 90%.

Pests and Diseases

Diseases	False rust (*Synchytriumpsophocarpi*), dark leaf spot (*Pseudocercosapsophocarpi*), powdery mildew (*Oidium* sp.; *Erysiphecichoracearum*), collar rot (*Macrophominaphaseolina*, *Fusariumsemitectum*, *F. equiseti*, *F. moniliforme*, *Rhizoctoniasolani*) and choanephora blight (*Choanephoracucurbitarum*).
Pests	*Marucatestulalis* (bean pod borer) and *Helicoverpaarmigera* (cotton bollworm),*Leucopterapsophocarpella* (winged-bean blotch miner)
Nematodes	*Meloidogynejavanica*, *M. incognita* and *M. arenaria*

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