

# Utilization of banana pseudo-stem in food applications

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■ **Abstract** : The banana is one of the highly consumed fruits in the world, with a global annual production of 114 million metric ton in 2014. The annual production of banana in india is 26.2 million tons. The banana fruit, peel, and banana pseudo-stem from various species of banana have been reported to be rich in total carbohydrates, fibre and minerals specially potassium. Banana pseudo-stem is waste from banana plants after harvesting of the trees. It is used for preparing handicrafts, ropes, fabrics, Papers etc. In order to utilize this bio-waste in bioactive perspective, the pseudo-stem can vary well be utilized in the powder form in the number of value added food products. It has been reported by number of researchers that banana pseudo-stem powder is well known remedy for urinary disorders, stomach troubles like diarrhoea, dysentery and flatulence. It also helps for removal of stone in kidney, gall bladder and also to control obesity. Banana pseudo-stem powder is prepared by cutting into dices and then drying into powder as varying temperatures from 40°C to 70°C. Banana pseudo-stem powder is utilized into the different food products such as bakery products viz., bread, biscuits, cookies and also in dairy products such as shrikhand, paneer, cheese etc. to fortify these products with fibre, total carbohydrates and minerals. The food products which are fortified by banana pseudo-stem powder served as nutraceutical food and these show nutritional improvement as well as prove as medicine.

■ **Key words** : Banana pseudo-stem powder, Fibre, Potassium, Fortification, Nutraceutical

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India is the largest producer of banana next to mango and major banana producing states are Maharashtra, Kerala, Tamil Nadu, Gujarat, Bihar, West Bengal, Assam, Andhra Pradesh and Karnataka. Banana is cultivated primarily for their fruit and to a lesser extent to make fibre and as ornamental plants (Desai *et al.*, 2016).

Banana is most important fruit crop that grows all over the tropical regions of the world and has an major commercial importance in many of these countries. The annual production of banana in india is 26.2 million tons, contributing about 23% of world banana production.

Pseudo-stem (BPS) constitute a major part of plant biomass, which are usually left in the plantation or incinerated and wasted. BPS appears to be a rich in source of fibre, total carbohydrate and cellulose (Saravanan *et al.*, 2011).

The banana is an important global commodity. The stem of the each plant is of concentric sheaths with tender core at the centre. Banana plantations face the problem of disposing the pseudo-stem which goes as a waste after harvesting of the trees. In hectare, on an average about 60 to 80 tonnes is of pseudo-stem alone. The stem of banana, commonly known as pseudo-stem

is an aggregation of leaf stalk bases in cylindrical form. Pseudo-stem of Banana normally goes as waste though it could be used in pulp and paper industries due to its cellulosic content. It is also consumed as juice in fresh form. The banana central core finds use in south indian cuisine. Banana stem is a rich source of fibre and helps to control obesity. It also aids to detoxify the body. In southern india, it is consumed as fresh juice to prevent kidney stones (Dawn *et al.*, 2016b).

Inside the central part of the pseudo-stem is the core which edible. In many parts of India, the pith or the tender core of the banana pseudo-stem has been used as food after boiling and the addition of spices. Banana central core is rich in fibre and aids in weight loss. It helps to relieve constipation. It is also found to be rich in potassium and vitamin B6. It helps to detoxify the body being a diuretic. It is used in the treatment of kidney stones (Lakshman *et al.*, 2015).

Banana pseudo-stem is a by product of plant and has potential for providing profitable products such as food source for human consumption. Banana pseudo-stem flour (BPF) has good amount of several important macro minerals potassium (K), sodium (Na), calcium (Ca), magnesium (Mg) and phosphorus (P) which is important to maintain body health. BPF exhibits high fibre content (Ho *et al.*, 2015).

Minerals play an important role in maintaining proper function and good health in the human body (Bhat *et al.*, 2010). According to Hendricks (1998), approximately 98% of the calcium (C) and 80% of the phosphorus (P) in the human body are found in the skeleton. Inadequate intake of minerals in the diet is often associated with an increased susceptibility to infectious diseases due to the weakening of the immune system. Plants, animal foods and drinking water are an important source of essential elements (Ho *et al.*, 2012).

The surface of the banana pseudo-stem is easily subjected to browning after harvest, which will affect the sensory evaluation and economic value of the banana pseudo-stem made products. In order to utilize banana pseudo-stem it has to be processed to be incorporated into food products to increase its value, including both nutritional and sensory characteristics. The effects of various treatments (microwave drying, ultrasonication and irradiation) on physical and chemical properties of banana (Jun *et al.*, 2016).

Banana pseudo-stem has been known as potential

cellulose source. Presently, this biomass is discarded as waste in many countries (Khan *et al.*, 2013). In past, some researchers have successfully demonstrated use of banana pseudo-stem and leaves for extraction of fibres on a small scale. In india, the fibres are being used for preparing handicrafts, ropes etc., which otherwise can be used for making fabrics, home furnishings and good quality papers. At present, the banana pseudo-stem are dumped on road side or burnt which causes environmental pollution. The centre core of banana is edible and used to prepare dish in the southern states of india. It is also used to prepare candies and pickles (Dawn *et al.*, 2016c).

In past, some researchers have successfully demonstrated use of banana pseudo-stem and leaves for extraction of fibres on a small scale. A part from this, the high value products *viz.*, mordant from sap, microcrystalline cellulose powder from fibre and edible products like candy from central core can also obtained (Desai *et al.*, 2016).

Drying is one of the most cost-effective ways of preserving foods of all varieties which involve removal of water by application of heat. A variety of food sub types are preserved using drying which includes marine products, meat products as well as all fruits and vegetables. Fruits, vegetables and their products are dried to enhance storage stability, minimise packaging requirements and reduce transport weight (Sagar and Kumar, 2010). To analyze the drying behaviour of a food product it is quite essential to study the drying kinetics of the food (Kadam *et al.*, 2011). Banana centre core mainly comprises of 90 per cent moisture and hence cannot be kept for a long period of time. It can be converted into flour which is used to prepare bakery products, soup etc. (Dawn *et al.*, 2016c).

The Banana pseudo-stem powder will be prepared by using different drying method such as sun drying, tray drying at different temperature for specific time periods. This powder is fortified into the any food product. In order to utilize banana pseudo-stem it has to be processed to be incorporated into food products to increase its value, including both nutritional and sensory characteristics.

Now-a-days consumers demand convenience, quality, and innovative food products. Consumers expect the food producers to deliver high quality products for a reasonable price. In addition, consumer's tastes and preferences are also changing. Health is considered

important, but not at the expense of quality. Consumers want to experience novel and interesting foods, which are fresh, convenient and tasty. Banana pseudo-stem it has to be processed to be incorporated into food products to increase its value, including both nutritional and sensory characteristics. Hence, this study aimed at developing a process to convert this waste into a value added product.

Nutritional components	Mg/100g dry sample
Sodium	444.12±4.08
Potassium	944.12 ± 1.41
Calcium	1,335.33 ± 14.11
Magnesium	255.00 ± 2.83
Phosphorus	137.82 ± 1.89
Iron	3.31 ± 0.05
Zinc	8.05 ± 0.05
Manganese	1.27 ± 0.11
Ash (%)	6.75 ± 0.11

Ho *et al.* (2012)

### Health benefits of banana pseudo-stem :

Banana stem is a rich source of fibre and helps in weight loss (Chandrasekaran, 2012).

Pseudo-stem have low glycemic index and have a high content of dietary fibre and antioxidant which is good for diabetes (Bhaskar *et al.*, 2011).

Banana stem is rich in potassium and vitamin B6.

Vitamin B6 helps in production of haemoglobin and insulin.

It improves the ability of the body to fight infection.

Potassium helps in the proper functioning of muscles, including the cardiac muscles.

It also helps prevent high blood pressure, and maintain fluid balance within the body.

Banana stem is said to be a diuretic and helps detoxify the body.

It is used prevent and treat kidney stones.

It has been reported that a high dietary fibre intake has beneficial effects on human health (Dawn *et al.*, 2016a).

### Process of banana pseudo-stem powder :

Freshly collected mature banana pseudo-stem was washed with potable quality water, followed by rinsing with deionised water. Further, all the layers of banana pseudo-stem epidermis were peeled off and the white

colored pseudo-stem obtained were collected. This was further cut into small pieces and was boiled for 15 min. before being proceed to slicing (electric slicer-Robot coupe, France) followed by air-drying (ventilated dryer Afos, Model Mini, No. CK 80520, England) at 60°C for 24 h. The samples were then ground to powder and sieved by passing the material through a 355-  $\mu$ m mesh sieve (Ho *et al.*, 2015).

### Conclusion :

The Produce powder from banana pseudo-stem which normally considered a waste material in banana plantations. The influence of its physical, chemical and functional properties revealed that the powder prepared from banana pseudo-stem sample dried in different drying methods such as a sun and tray dryer at different temperature in and select better quality product. Drying of dried banana pseudo-stem could increase the shelf life of the quickly perishable banana waste material. It suitable to be incorporated in various recipes and could be expected to give health benefits. In order to utilize this bio-waste in bioactive perspective and it can utilized in the powder form in the number of value added food products such as bakery products *viz.*, bread, biscuits, cookies as well as in dairy products such as shrikhand, paneer, cheese etc. to fortify these products with fibre, total carbohydrates and minerals. The banana pseudo-stem powder fortified with many food products and high fibre content *i.e.* nutritional value of that product are higher.

### Future scope :

Till date all the research has done in medicinal field yet the research in food processing field have notdone. So use banana pseudo-stem powder in this field will be a great opportunity for researchers in future. Banana pseudo-stem powder will be fortification in Dairy product and also in nutraceutical food product.

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