

# Experiment on developing new bamboo shoots crisps

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## **Abstract**

This research developed a new crisp using fresh bamboo shoots, cornstarch and seasonings. The newly developed crisps have special flavor and taste. Compared with conventional snacks, they contain less fat and higher fibre.

Key words: bamboo shoots, snacks, flavor, low fat content, high fibre content

## 1. Introduction

Harvest seasons of both winter shoots and spring shoots are limited in a few certain months and relatively short, moreover, fresh bamboo shoots contain high water content (see table 1), which make shoots difficult to preserve, therefore, bamboo shoots are usually either eaten as fresh vegetable or processed to canned or dried shoots. This project explored the feasibility of producing bamboo shoots snacks using bamboo shoots as main raw material and different processing techniques were also employed. The fat and fiber contents of snacks developed from different processing techniques were compared.

## 2. Materials and methodology

2.1 Materials: winter shoots, spring shoots, corn starch, potato starch, potato grain powder, soybean oil, seasonings (sugar power, fine salt, MSG, etc. ) sold on the markets.

2.2 Equipment: slicing machine, (Germany BORNER), electric frying machine (GLOKLER. Erin. Pa ), centrifuge (Guangzhou Medical Machine Factory), pulsator

(self prepared), extruding machine (self prepared), molding machine (self-prepared), slicing machine (self-prepared), drying machine (self-prepared).

## 2.3 Processing procedures

### 2.3.1 Frying slices of fresh bamboo shoots:

Fresh shoots    removing the outer sheaths    remove part C (bottom part)    washing  
slicing    cooking in hot water    dehydrating    frying    reducing the oil content  
seasoning    packing    final products

### 2.3.2 Pulping fresh shoots and complex shaping technique:

Fresh shoots    removing the hard outer sheaths    washing    cutting into small cubes  
pulping    mixing with corn starch    extruding the mixture (    )    extruding into  
sticks    cool and keep for 8-12 hours    slicing    drying    frying    reducing the oil  
content    seasoning    packing    final product

## 2.4 Operational highlights (key procedures):

### 2.4.1 Frying slices of fresh shoots

#### 2.4.1.1 Selecting materials

Select fresh shoots without damage by diseases and pests and remove the hard outer sheaths of the shoots and then cut down the tip (part A) and bottom part (part C) of the shoots and keep the middle part (part B). As part A is too tender and contains a lot of edible sheaths, a number of tiny debris will be produced during slicing and frying, which will affect the production and appearance of the products. Part C is removed because it contains excessive fibre, which will influence the taste of the final products.

#### 2.4.1.2 Slicing

Slice the part B into even slices about 2 – 2.5mm thick. Thicker slices will require longer time to fry and decrease the productivity and thinner slices will cause many tiny particles and a high oil content of final products.

#### 2.4.1.3 Frying

Fry bamboo shoot slices in hot oil at a suitable temperature of 180-165°C for 2-5 minutes. It is hard to operate if the oil temperature is too high and higher temperature will also speed up the oxidization of oil. Meanwhile, lower temperature will reduce the productivity.

### 2.4.2 Key procedures of making bamboo chips from fresh shoot pulp

#### 2.4.2.1 Pulping fresh shoots

Select fine fresh shoots and remove the outer hard sheaths. Then cut the whole body into small cubes and pulp them evenly using tissue triturator. Shoot pulp should be made as needed and should not be kept for long time.

#### 2.4.2.2 Mixing with corn starch

Mix shoot pulp with corn starch at the ratio of 1:2 in a stirring equipment for 30-60 minutes. The suitable rotation speed of stirring wing is 150 – 350rpm. Keep the mixture for 10-20 minutes after it is mixed evenly.

#### 2.4.2.3 Extruding and molding

Extruding and molding needs two extruding machines. The first one is of high compression ratio, and is heated by electricity, there are three segment of temperature control, 90 °C, 110 °C and 150 °C, the rotate speed of principle axis is 45rpm. The second one is of low compression ratio and use cooling water, the rotate speed of the principle axis is 35rpm. After heated in the Extruding machine, the material is cooled in the molding machine, and is extruded by the mould in the machine, finally become bars (sticks) that are two meters long, the diameter is 15mm.

#### 2.4.2.4 Aging

The formed bars after cooling, should be put away for 8-12 hours before further processing, note should be taken to keep the moisture.

#### 2.4.2.5 Slicing

The thickness of the slices is usually 1-1.5mm, if the slices are too thick, they may not dilate completely when fried in oil.

#### 2.4.2.6 Drying

The quality of those final products that are dried in low temperature for long time are better than those that are dried fast. The proper moisture content of the product after drying should be 8% - 12%.

#### 2.4.2.7 Deep frying

The best temperature of the oil for deep frying is 150 -160 , the time should be 20-30 seconds. If the lower or higher oil temperature may affect the dilating rate of the product.

#### 2.4.2.8 De-oiling

Immediate de-oiling using centrifuge can largely reduce the oil content of the product.

### 3. Conclusion and Further Argumentation

#### 3.1 Utility rate of the bamboo shoot

Because of the natural shape and structure of the bamboo shoot, no matter it is cut vertical way or horizontal way, it is hard to get slices of the same size and shape. Therefore, if fresh bamboo shoots are used for slicing and deep frying, the rate of utility could be rather low, usually only 40%, While the water content of the fresh bamboo shoots is usually 90%, thus, every 100kg fresh shoots, after deep-frying, can only produce 15-16kg final products, both the processing efficiency and productivity are rather low.

For the processing stage of pulping and complex shaping, the rate of utility can be above 90%, that is because: except the brown-colored coating of the shoots, all parts of the shoots can be used for pulping.

### 3.2 Oil content of the final product

While deep frying, the 90% water in the shoot slices has exchanges heat with the high-temperature oil drastically, the holes left by the escaped water are filled in by oil, therefore, the oil content of the fried shoot slices is high (please refer to table 2).

Whereas complex slices has comparatively lower content of oil, because the slices dilate and form fine and intensive alveolate structure, there is no connections between the “beehives” of the structure, the oil and fat are prevented from leaking into the complex slices. Therefore, the fat content of the complex bamboo shoot slices is comparatively low.

### 3.3 Fiber content of the final product

The dried material of the fresh bamboo shoot, has 40%-50% fiber, after slicing and deep frying the fiber content in the final product is still rather high – 11.45% - 13.47%, thus, it tasted rather rough, which is not acceptable to consumer’s habit nowadays (please refer to table 3). However, after pulping and complex forming processing, the final product does not only have good flavor, and will not taste or look rough because of high fiber content.

## 4. Conclusion

The result of this research shows that, because of some practical problems, such as low utility rate, processing efficiency and productivity, as well as high energy consumption and oil content, the method of using fresh bamboo shoot to produce fried crisps may be difficult to extend to large scale production. However, if the fresh bamboo shoots or the left-over of shoot can production are mixed with starch and flavorings, they may produce new type of leisure food products. This type of food products, in comparison to those without bamboo shoot material, has better, full-bodied flavor. This type of food products tastes loose and crispy, and can be added with various flavors, it has low oil content and

higher edible fiber. The method of pulping and complex forming has higher utility rate, processing efficiency and productivity, the energy consumption and cost are also low. Therefore, the bamboo crisp product that are processed by this method has better commercial prospects.

### Comparison of Nutrient values among fresh bamboo shoots, processed shoots products, and other vegetables

100kg	Energy(KJ)	Water(g)	Protein(g)	Fat(g)	Dietary Fiber(g)	Carbohydrate(g)	Ash(g)	Mineral (mg)					VA (ug)	B1 (mg)	B2 (mg)	Niacin(mg)	VC (mg)
								Calcium	Phosphorus	Iron	Sodium	Potassium					
Fresh shoots	84	91.0	2.0	0.1	3.3	2.8	0.8	17	49	2.5	6.0	379	-	0.06	0.03	0.4	6
Canned shoots	84	93.4	2.6	0.1	0.5	3.2	0.2	24	31	0.2	3	85	-	0.01	0.04	0.1	0
Dried shoots	820	10.0	26.0	4.0	43.2	13.9	2.9	62	222	4.2		1754	2	...	0.32	0.2	...
1#Sample	1960	4.52	1.6	17.71	0.83	73.69	1.65										
Potato	356	77.4	1.9	...	0.5	19.4	0.8	15	43	0.3	3.3	113	-	0.1	0.03	1.3	8
Fried potato chips	2322	2.5	4.7	35.0	1.8	52.6	3.4	17	100	1.7	400	1200	0	0.26	0.06	4.3	15
Carrot	159	89.3	0.9	0.3	1.0	8.0	0.5	20	31	1.1	108.3	104	197	0.03	0.05	0.7	9
Dried Carrot	1338	10.9	4.2	1.0	6.4	71.5	5.1	458	118	8.5	300	1117	2875	0.12	0.15	2.6	32
Sweet potato	469	70 4	1.0	0.1	1.2	26.7	0.6	18	44	0.7	72.6	122	2	0.05	0.05	0.6	35
Mung bean	1372	10.0	21.2	0.3	5.3	60.2	3.0	132	357	4.6	2.2	791	7	0.13	0.14	1.9	-
Mung bean sprout	109	92.7	1.9	0.1	0.7	4.4	0.2	17	33	0.7	5.9	69	2	0.04	0.07	0.5	6
Asparagus	75	93.6	1.1	0.2	1.5	3.0	0.6	8		...	1.4		-	0.04	0.06	-	-
Pumpkin	54	95.2	0.8	...	1.0	2.5	0.5	21	22	...		166	157	0.02	0.01	0.4	

Note: 1# Sample refers to the bamboo shoot crisps made by complex shaping and de-oiled by centrifuge.

Table 2 Fat content of the final products of bamboo shoot crisps

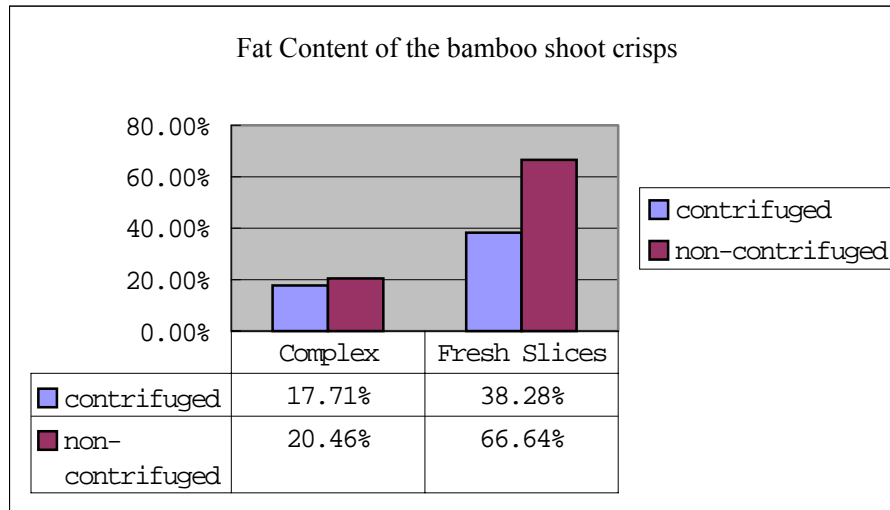


Table 3

