

Sensory Parameters of Bamboo Dietary Fiber Enriched Cookies

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ABSTRACT

In view of the nutritive value and presence of health beneficial bioactive compounds, bamboo shoot can be used as an ingredient in powder or paste form to make functional foods. Bamboo is a fast-growing plant in different agro-climatic conditions and can meet the ever-increasing demand of edible fiber by the food industry. There exists a great opportunity especially, for utilization in food products as the prebiotic agent. The bamboo dietary fiber extracted from *Dendrocalamus hamiltonii* was used for incorporation in cookies. The bamboo dietary fibre was added at 0% (Cookies with 100% refined wheat flour), 2, 4, 6, 8 and 10% level by substituting wheat flour. The cookies prepared with different treatments were evaluated for sensory parameters. Cookies with 8% bamboo dietary fiber was found to be the best among the treatments with appearance, texture, aroma, taste and overall acceptability scores of 8.36, 8.28, 8.15, 8.14 and 8.21, respectively. Results showed that up to 8% level of supplementation with bamboo dietary

fiber, the cookies were acceptable with improved functional and nutraceutical properties compared to be control cookies.

Keywords : Bamboo dietary fiber, Cookies, Fortification, Sensory characteristics.

INTRODUCTION

Bamboo is one of the fastest growing plants with the ability to survive in a wide range of climatic and soil conditions. The most commonly grown edible bamboo species in India are *Bambus pallida*, *B. tulda*, *B. polymorpha*, *B. balcooa*, *Dendrocalamus hamiltonii*, *D. giganteus* and *Melocanna bambusoides* (Choudhury et al. 2012, Some species with special highlight for the industrial processing are *Bambusa*, *Dendrocalamus*, *Phyllostachys*, *Pseudosasa*, *Sasa* and *Sino arundinar* (Manâhes 2008, Pereira and Beraldo 2016). Bamboo is recognized as nutraceutical (Xuhe 2003, Lo et al. 200-8, Chongtham et al. 2011) because of its rich composition in phytosterols and high fiber content. The bamboo shoots have functional properties such as weight reduction, prevention of constipation and bowel cancer and reduction of cholesterol level. Consumer interest in wholesome/nutritious foods and beverages continues continues and one category with potential for fast growth is foods stuff fortified with fiber. Previously referred to as roughage, bulk, or ballast, fibre is now termed dietary fiber. They are a potential ingredient in a healthy diet and have positive connection with human health.

Food fortification is a mean of overcoming

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micro nutrient deficiency of some foods. It is also used to enrich some kind of foods by incorporation of nutritionally rich entities. Foods to be fortified are chosen in a way that it is commonly and regularly used by the target consumers. But during fortification, it should also strictly be kept in mind that the sensorial characteristics of the food are not hampered much, or it may not be acceptable to the consumers (Akhtar et al. 2008).

Cookies are small, flat, baked treat, usually containing fat, flour, eggs and sugar. In most English-speaking countries except for the United States and Canada, crisp cookies are called biscuits. The chewer biscuits are also called cookies in the United Kingdom. The term cookie is sometime used for plain bun (Anonymous 2013). Due to taste, crispness and eating convenience, cookies hold an important place in snacks and popular among all age groups especially in children. There is a growing demand for different types of health-oriented food products in the food industry. Therefore, fiber enriched cookies can help fulfil this need, considering cookies are one of the most popular snacks around the world due to their ready to eat and easy to store nature, availability in different varieties and low cost (Baumgartner et al. 2018).

Extraction of dietary fibre from bamboo shoot

The dietary fiber from bamboo powder of *D. hamiltonii* was extracted by following the enzymatic method given by Yi et al. (2014).

Preparation of cookies

The ingredients such as refined wheat flour, vegetable ghee, powdered sugar, skim milk powder, salt and sodium bicarbonate were used to prepare the cookies. A total of six treatments of cookies were prepared, each of a batch of 100 g wheat flour. While one sample was kept as control having only 100 g wheat flour and in the other five samples, the refined wheat flour was replaced with bamboo shoot powder at a level of 2, 4, 6, 8 and 10%. The powdered sugar was mixed with vegetable ghee and the mixture was beaten until light and fluffy. The sieved refined wheat flour and sodium bicarbonate along with salt and skimmed

milk powder were added to the fluffy mass and mixed thoroughly to form soft dough. The mixture was kneaded properly for about 10 minutes and wrapped in an aluminium foil. The dough was allowed to stand at room temperature for about 30 minutes and after that it was converted into small balls. The balls were flattened into sheet and cut into circular shapes with the help of cookie cutter. The cut shapes were placed a baking tray lined with butter paper and baked in an oven at 200°C for 20 minutes.

MATERIALS AND METHODS

The bamboo shoots of *Dendrocalamus hamiltonii* species was procured from Anu, Giripul, Karganu, Lakothi and Nauni villages of District Solan, in Himachal Pradesh, India. The packaging material such as Low Density Polyethylene (LDPE) pouches was purchased from International Scientific and Surgicals, Solan.

Sensory analysis.

The cookies with different treatments were subjected to sensory evaluation (9-point hedonic scale) following standard procedure described by Rangana (2009). Ten judges comprising of faculty members and post graduate students of the department of Food Science and Technology, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan (HP) were selected to evaluate the products. The parameters considered for the evaluation were appearance, texture, aroma, taste and overall acceptability.

Statistical analysis

Data on sensory characteristics of bamboo dietary fiber supplemented cookies was analyzed by Completely Randomized Design (CRD) suggested by Cochran and Cox (1967). While Randomized Complete Block Design (RBD) as described by Mahony (1985) was used to analyze the data pertaining to sensory evaluation.

Optimization of level of bamboo dietary fiber supplementation in cookies

The procedure followed for preparation of cookies

Table 1. Optimization of level of bamboo dietary fiber supplementation in cookies.

Treatments	Refined wheat flour : Bamboo dietary fiber
T ₁	100.0
T ₂	98.2
T ₃	96.4
T ₄	94.6
T ₅	92.8
T ₆	90.10

supplemented with bamboo shoot powder was similar as described above. Bamboo dietary fiber was added at different levels (Table 1). The bamboo dietary fiber supplemented cookies of different treatments was subjected to sensory evaluation by a panel of ten judges. The best treatment was selected on the basis of highest sensory scored for further studies.

RESULTS AND DISCUSSION

Sensory scores of cookies supplemented with bamboo dietary fiber

The refined when flour was replaced with bamboo fiber at six different levels for preparation of cookies (Table 1). The prepared cookies were subjected to sensory evaluation by a panel of ten judges, The data (Table 2) relating to sensory evaluation of cookies clearly indicate that T₅ (92:8) got the highest mean scored for all the parameters such as appearance (8.36), texture 98.28), aroma (8.15), taste (8.14) and overall acceptability (8.21) and therefore was selected for further studies.

Atuonwu and Akobundu (2010) prepared cookies supplemented with defatted pumpkin seed flour at levels of 0, 10, 20, 30 and 40% and noticed higher sensory scores at 10% incorporation level. Kohajdova et al. (2011) suggested that the addition of apple fibre powder up to 10% in cookies was feasible to produce sensory acceptable product. Choudhury et al. (2015) evaluated bamboo powder fortified biscuits for organoleptic characteristics. They concluded that an overall appearance of biscuits was acceptable only upto 10% fortification. According to Eber et al. (2015), a level of 20% incorporation of cashew apple

Table 2. Sensory scores* of cookies supplemented with bamboo dietary fiber. *Nine point hedonic scale. Treatments (RWF : Refined wheat flour, BDF : Bamboo dietary fiber). T₁ : Control (100EWF : 0BDF), T₂ : (98RWF :2BDF), T₃ : (96RWF : 4BDF), T₄ : (94RWF: 6BDF), T₅ : (92RWF : 8BDF), T₆ : (90RWF:10BDF).

Treatments	Appearance	Texture	Aroma	Taste	Overall seceptability
T ₁ (100.0)	7.79	7.84	7.75	7.78	7.79
T ₂ (98.2)	8.12	7.92	7.82	7.88	7.90
T ₃ (96.4)	8.18	8.07	7.91	7.93	7.97
T ₄ (94.6)	8.27	8.19	8.08	8.05	8.12
T ₅ (92.8)	8.36	8.28	8.15	8.14	8.21
T ₆ (90:10)	8.31	8.21	8.11	8.09	8.17
CD _{0.05}	0.07	0.06	0.09	0.09	0.08

fiber in cookies was acceptable. Mustafa et al. (2016) incorporated bamboo powder in cookies at different levels (2, 4, 6, 8 and 10% and found acceptable limit for sensory characteristics upto 6% supplementation. As per the reports of Dhimar et al. 2018), the cookies supplemented with 20% pumpkin seed flour got the highest sensory scores.

CONCLUSION

Bamboo shoot is rich in minerals, total dietary fiber, total carbohydrates, water holding capacity, oil holding capacity and swelling capacity. Therefore, cookies enriched with bamboo dietary fiber showed higher appearance, texture, aroma, taste and overall acceptability than the control sample. It may be concluded from the study that bamboo dietary fiber could be incorporated up to a level of 8% in the formulation of cookies without affecting the overall quality. Thus, bamboo shoot can be utilized for preparation of fiber rich cookies with improved functional properties.

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