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Mohit Kumar
Centre of Food Science and Technology, CCS Haryana Agricultural University, Hisar, Haryana, India

Rekha
Centre of Food Science and Technology, CCS Haryana Agricultural University, Hisar, Haryana, India

Rakesh Gehlot
Centre of Food Science and Technology, CCS Haryana Agricultural University, Hisar, Haryana, India

Rattan Singh
Centre of Food Science and Technology, CCS Haryana Agricultural University, Hisar, Haryana, India

Ritu Sindhu
Centre of Food Science and Technology, CCS Haryana Agricultural University, Hisar, Haryana, India

Sandeep Kumar
Centre of Food Science and Technology, CCS Haryana Agricultural University, Hisar, Haryana, India

Correspondence
Rattan Singh
Centre of Food Science and Technology, CCS Haryana Agricultural University, Hisar, Haryana, India

Physico-chemical composition of ripe and overripe banana powder

Mohit Kumar, Rekha, Rakesh Gehlot, Rattan Singh, Ritu Sindhu and Sandeep Kumar

Abstract
Banana powder prepared from ripe and overripe bananas samples were evaluated for various physico-chemical characteristics. Data show that ripe banana powder prepared by hot water blanching had significantly lower protein, fat, crude fibre, ash and total phenol but higher moisture content as compared to ripe banana powder prepared by microwave blanching. These banana powders had moisture (2.95, 2.18%), protein (8.24, 9.71%), fat (0.29, 0.47%), crude fibre (2.31, 2.81%), ash (2.18, 2.60%), carbohydrates (86.98, 84.41%), energy (383.67, 380.36 Kcal) and total phenols (9.25, 11.86 mg/100 g). Powder of overripe banana fruits prepared by microwave blanching had significantly higher moisture (3.80%), crude fibre (3.82%) and total phenols (14.22 mg/100 g), and lower protein (5.92%) and fat (0.25%) than that of powder prepared from ripe banana powder. There was significant difference in ash content in powder prepared from overripe banana (2.12%) and ripe banana (2.60%) prepared by microwave blanching but difference was non-significant in powder prepared from ripe banana by hot water blanching (2.18). Total phenols were highest in overripe banana (14.22 mg/100 g) and lowest in ripe banana powder (9.25 mg/100 g) prepared by hot water blanching.

Keywords: Banana, physico-chemical, composition, powder

Introduction
Rapid urbanization and changes in eating habit of people have led to development of instant mixes and ready to eat convenient foods. Consumers these days are looking for commercially available, culturally acceptable, convenient, nutritive and minimally processed foods with longer shelf life. Instant food products that are available in the market have a liquid or paste like consistency and are easily rehydrated. Instant products prepared using fruits and SMP is highly nutritious and convenient to use without much processing.

Banana (*Musa sapientum*, genus Musa) is a delicious and most nourishing of all fruits. It is preferred by people of all ages and consumed all over the World. It has also several medicinal properties. Many *in vitro* studies, animal model studies and clinical studies showed that various parts of banana act as food medicines for treatment of diseases like diabetes, hypertension, cancer, ulcers, diarrhoea, urolithiasis, Alzheimer's and infections. It helps in treating some emotional and bodily sicknesses, and it contains high amount of iron, which helps in stimulating the production of haemoglobin in the blood, reduces the risk of blood pressure and stroke due to its high potassium and low salt content (Jyothirmayi and Rao, 2015) [4]. Banana has low sodium and fat content, and used for treating diarrhoea and provides resistance to chronic disease like cardiovascular dysfunction, muscular degeneration and muscle cramps (Wall, 2006; Oguntibeju, 2008) [9, 6].

Conventional hot air drying is an old and commonly used drying technique and the temperature of drying is maintained between 50 and 70 °C. Due to longer drying time and overheating of the product, the problems of darkening, flavour loss and substantial decrease in rehydration arise. Sugar containing foods in conventional drying requires high temperature and long drying time to remove the water. Compared to conventional hot air drying, microwave drying is rapid, more uniform and energy efficient (Decareau, 1985) [3]. In conventional hot air drying, the heat is directly transferred in the product by means of conduction mechanism throughout the entire mass of the food material. The microwave energy is equally dissipated throughout the product that inactivates enzyme complexes. This phenomenon greatly reduces the time required for complete drying by more than 30% compared to conventional methods. There is a substantial improvement of the final product quality prepared by microwave drying. Further vitamins, flavours, pigments, carbohydrates and other water soluble components are also preserved.

Keeping in view the medicinal and nutritional importance of banana fruits, the work was conducted to develop powder from ripe and overripe banana fruit pulp and study its physico-chemical composition for its further utilization and processing into different value added products.

Materials and Methods

The present study was carried out in Centre of Food Science and Technology, CCS HAU, Hisar during 2017-18. The ripe and overripe banana fruits were collected from local market, Hisar for developing powder and analyzing its physico-chemical characteristics. Moisture content and ash content in samples were estimated using AOAC method (2005) [1]. Crude protein was estimated using micro-Kjeldhal method (AOAC, 2005) [1] with KELPLUS nitrogen estimation system. Crude fat was analysed using Soxhlet apparatus (AOAC, 2005) [1]. Crude fibre estimation was done by the standard method as described by Thimmaiah (2009) [8]. Carbohydrates were calculated by difference method AOAC (2005) [1] on dry basis using following formula: Total carbohydrates (%) = 100-(fat + protein + ash + crude fibre). Energy was calculated by factorial method by multiplying the protein, carbohydrate and fat present in the sample by 4, 4 and 9, respectively using following formula: Energy (Kcal/100 g) = 4.0 x protein (%) + 4.0 x carbohydrate (%) + 9.0 x fat (%). Total phenols were estimated by the method of Amorium (1997) [2].

Results and Discussion

Physico-chemical composition of banana powder prepared from ripe and overripe bananas has been depicted (Table 1). Ripe banana powder prepared by hot water blanching had significantly lower protein, fat, crude fibre, ash and total phenols but higher moisture content as compared to ripe banana powder prepared by microwave blanching. Hot water blanched and microwave blanched ripe banana powder had moisture (2.95 and 2.18%), protein (8.24 and 9.71%), fat (0.29 and 0.47%), crude fibre (2.31 and 2.81%), ash (2.18 and 2.60%), carbohydrates (86.98 and 84.41%), energy (383.67 and 380.36 Kcal) and total phenols (9.25 and 11.86 mg/100 g).

Overripe banana powder prepared by microwave blanching had significantly higher moisture (3.80%), crude fibre (3.82%) and total phenols (14.22 mg/100 g), and lower protein (5.92%) and fat (0.25%) than ripe banana powder. There was significant difference between ash content of powder prepared from overripe banana (2.12%) and powder prepared from ripe banana (2.60%) by microwave blanching but the difference was non-significant with powder prepared from ripe banana using hot water blanching (2.18). Total phenols were highest in overripe banana powder (14.22 mg/100 g) prepared by microwave blanching and lowest in ripe banana powder (9.25 mg/100 g) prepared by hot water blanching. The proximate composition of ripe and overripe banana powder was in accordance as results given by Thakur *et al*., (2016) [7] and Maina *et al*., (2012) [5].

Table 1: Physico-chemical composition of ripe and overripe banana powder*

Parameters	Ripe banana powder		Overripe banana powder	CD at 5%
	Hot water blanching	Microwave blanching	Microwave blanching	
Moisture (%)	2.95±0.18	2.18±0.04	3.80±0.09	0.29
Protein (%)	8.24±0.10	9.71±0.17	5.92±0.03	0.22
Fat (%)	0.29±0.03	0.47±0.05	0.25±0.01	0.02
Crude fibre (%)	2.31±0.46	2.81±0.29	3.82±0.17	0.18
Ash (%)	2.18±0.03	2.60±0.08	2.12±0.13	0.25
Carbohydrates (%)	86.98±1.21	84.41±1.27	87.89±1.13	NS
Energy (Kcal)	383.67±0.67	380.36±1.66	377.53±2.98	NS
Total phenols (mg/100 g)	9.25±0.01	11.86±0.03	14.22±0.12	0.14

*The values are mean ± S.D. of three replicates; NS= Non-significant

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