International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(3): 3461-3463

Received: 28-03-2018
Accepted: 30-04-2018

Effect of pre-treatments on production of banana powder

Laxmi BW, Jagadeesh SL and Suresha GJ

Laxmi BW
Department of Post-Harvest Technology, Kittur Rani Channamma College of Horticulture (University of Horticultural Sciences, Bagalkot, Arabhavi, Gokak, Belgaum, Karnataka, India

Jagadeesh SL
Department of Post-Harvest Technology, Kittur Rani Channamma College of Horticulture (University of Horticultural Sciences, Bagalkot, Arabhavi, Gokak, Belgaum, Karnataka, India

Suresha GJ
Department of Post-Harvest Technology, Kittur Rani Channamma College of Horticulture (University of Horticultural Sciences, Bagalkot, Arabhavi, Gokak, Belgaum, Karnataka, India

Correspondence
Laxmi BW
Department of Post-Harvest Technology, Kittur Rani Channamma College of Horticulture (University of Horticultural Sciences, Bagalkot, Arabhavi, Gokak, Belgaum, Karnataka, India

Abstract
The banana powder was preprared from mature mature green banana fruits of grand nine (AAA) varieties. The fruit pulp slices of 0.5cm thickness (in lots of 1kg/treatment/replication) were subjected to various pre-treatments as sulphur fumigation, dipping in KMS solution and $NaHSO_3$solution with control. Pre-treated banana slices were dried under electric cabinet tray drier for 60^{o} C for 18 hours and made into fine powder by grinding in electric mixture grinder and sieved and analyzed. The highest sugar content of 9.28% observed in the powder prepared from Control**.** The highest moisture content of the powder of 5.70% and the maximum powder recovery of 29 per cent was recorded in the treatment Dipping in 0.25% $NaHSO_3$ for 5min, the visual sensory evaluation revealed that banana powder the maximum visual sensory score obtained by the treatment Sulfuring 2g/Kg for 30 min. are 9.18 out of 10.

Keywords: Banana fruit, Banana powder, pre-drying treatments, moisture

1. Introduction

Banana (*Musa spp.*) is a fruit common in the tropics and is non-seasonal. It is readily available in India. Banana ranks first in total production and area among the fruit crops grown in India accounting to the production of 29780(000) MT annually, from an area of 830.0(000) ha, with productivity of 35.9 MT/ha. It shares 13% of total area under fruits and 39.8% of total fruit production. In Karnataka crop occupies an area of 118(000) ha, with production of 2281.6 (000) MT and productivity 20.4MT/ha (Anon., 2011). Shorter harvest times and enhanced yields have popularized the cultivation of this fruit crop with respect to the area of cultivation and production by tissue culture methods

Drying being a major food processing operation helps to increase the shelf life. The purpose of drying of fruit and vegetable is to produce stable and easily handled form of products. Different pre-treatment methods have been developed for fruit drying, among which are for long-term storage of dried fruits, sulfuring or using a sulfite dip are the best pre-treatments. If no pre-treatment is done, the fruits will continue to darken after they are dried.

Banana fruit is prone to injury during transport. Further, release of ethylene during bulk storage makes the fruit ripen faster and the fruits generally rot before reaching its destination. Hence, it has always been considered a ‘problem fruit’ with respect to transportation. These reasons contribute to a local market glut, resultant price crash and subsequent disinterest among the farming community to cultivate it on a large scale. It is hence important to overcome this problem by exploring possibilities of converting banana into a cash crop by developing shelf stable products of commercial interest.

Dried fruits are a good source of energy because they contain concentrated fruit sugars. Dried foods are high in fiber and carbohydrates and low in fat, making them healthy food choices. Completely dried fruit powders are often used for making food products. Fruit powders less than 4% (w b) moisture content can be used to make candy, toffee, fudge and hard candy (Saeed *et al.*, 2010). The dry powder can be used as an additive in confectioneries, milkshakes and baby foods.

2. Materials and Methods

2.1 Methodology of production of banana powder

Mature green banana fruits of Grand naine (AAA) varieties were selected for this experiment due to good quality bunches. Fruits develops attractive, uniform size with better shelf life than other varieties fruits were brought from local market.

Washed in tap water, peeled and cut into slices of 0.5cm thickness. The slices (in lots of 1kg/ replication) were subjected to various pre-treatments as given in treatment details.
Pre-treated banana slices were dried under electric cabinate tray drier for 60° C for 18 hours. Dehydrated banana slices were made into fine powder by grinding in electric mixture grinder and sieved. The powder was weighed and packed in 200 gauge polyethylene bags, sealed and stored in a dry, cool place for further study.
Raw material: Banana cv. Grand Naine (Mature unripe fruits),
Design: Completely Randomized Block Design.
Sample size: 1Kg slices/replication.

2.2 Treatment details

T_1 – Control
T_2 - Sulfur fumigation 1g/Kg for 30 minutes
T_3– Sulfur fumigation 2g/Kg for 30 minutes
T_4 – Dipping in KMS solution 0.10% for 5 minutes
T_5 – Dipping in KMS solution 0.20% for 5 minutes
T_6 – Dipping in $NaHSO_3$solution 0.25% for 5 minutes
T_7 – Dipping in $NaHSO_3$solution 0.50% for 5 minutes

The total sugar in the sample was estimated by the principle of reducing sugar after inversion (Anon., 1984). Then Dinitro-salicylic acid (DNSA) method for estimation of reducing sugar was followed. The results obtained were expressed in terms of percentage. The percentage of reducing sugar in the juice was determined by Dinitro-salicylic acid (DNSA) method (Miller, 1972) [5]. The percentage of non–reducing sugar was determined by subtracting the per cent reducing sugar from the per cent total sugar as Non – reducing sugar (%) = (per cent total sugar - per cent reducing sugar) 0.95. Moisture was determined by using moisture balance (Model: P1019319, A & D Company Limited, Made in Japan). Interpretation of the data was carried out in the level of significance used in 'F' test was p=0.01.

3. Results and Discussion

The maximum powder recovery of 29 per cent was recorded in the treatment T_6 (Dipping in 0.25% $NaHSO_3$ for 5min), Whereas the minimum powder yield (26.5%) was documented in the treatment T_1 (Control). The moisture content in banana powder was found to differ significantly due to the influence of various pre-treatments employed. The significantly maximum moisture per cent content (5.70%) over all other treatments was recorded in the treatment T_5 (Dipping in KMS 0.2% for 5 min). However, the minimum moisture content (2.07%) recorded in the treatment T_3 (Sulfuring 2g/Kg for 30 min) was statistically different over rest of the treatments. Water activity is an intrinsic product characteristic and it is free moisture content in the product (Phisut *et al.*, 2013) [3].
Total sugar content was found maximum in the treatment T_1 (Control) of 9.28 per cent and was differing statically over rest of the treatments. On the other hand, the minimum value (6.08) recorded in the treatment T_5 **(**Dipping in KMS 0.2% for 5) was statistically on par with treatments T_3 (6.84%), T_5 (6.08%), T_6 (6.60%) and T_7 (6.24%). The variation in sugar content due to treatment effect has also been reported by Phisut *et al.* (2013) [3] in cantaloupe and Marco et *al.* (2005) [5] in apricot.
The significantly maximum reducing sugar content (2.08%) was recorded in the treatment T_1 (Control; without any pre-treatment**)** and it was found to be statistically on par with treatments T_4 (1.58) and T_5 (1.65). But, the minimum value (0.94) recorded in the treatment T_7 (Dipping in $NaHSO_3$ 0.50% for 5min) was statistically on par with the treatments T_3 (1.24%) and T_6 (1.03%). Table 12. Effect of pre-treatments on reducing sugar, non-reducing sugar, total sugar, powder recovery and moisture.

Table 1

Treatments	Reducing sugar (%)	Non-reducing sugar (%)	Total sugar (%)	Powder recovery (%)	Moisture (%)
T_1	2.08	6.84	9.28	26.50	3.00
T_2	1.49	5.42	7.19	27.40	3.77
T_3	1.24	5.32	6.84	28.23	2.07
T_4	1.58	6.27	8.18	28.37	4.23
T_5	1.65	4.21	6.08	27.83	5.70
T_6	1.03	5.29	6.60	29.00	4.80
T_7	0.94	5.04	6.24	28.53	3.23
Mean	1.43	5.48	7.20	27.98	3.82
S E m ±	0.13	0.26	0.25	0.63	0.20
C D at 1%	0.53	1.07	1.04	NS	0.85

The significantly maximum non-reducing sugar content was recorded in the treatment T_1 **(**Control**)** of 6.84 per cent and the treatment found statistically on par with the treatment T_4 (6.27%). The minimum value recorded in the treatment T_5 **(**Dipping in KMS 0.2% for 5 min) of 4.21% was significantly differing with all other treatments except T_7 (5.04%).

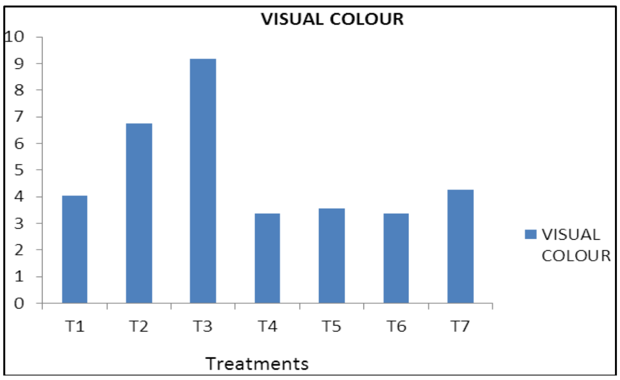

Fig1: Effect of pre-treatments on banana powder colour and appearance.

The sensory score (visual evaluation) for colour and appearance as influenced by different treatments showed significant differences. The treatment T_3 (Sulfuring 2g/Kg for 30 min) with maximum score (9.18 out of 10) was found statistically on par only with the treatment T_2 (6.75). But, the significantly minimum score was recorded in the treatment T_4 (Dipping in KMS 0.1% for 5 min) of (3.37 out of 10) and it performed statistically on par with all other treatments except T_3 (9.18).

4. Conclusion

Banana powder prepared by different pre-treatments was evaluated for the various physic-chemical and nutritional constituents results indicated significant differences observed among the treatments. The highest sugar content of 9.28% observed in the powder prepared from Control**,** whereas, least sugar content of 6.08% observed in the Dipping in KMS 0.2% for 5. The highest moisture content of the powder of 5.70% and minimum moisture content of 2.07% content were recorded in the powder of Dipping in KMS 0.2% for 5 min and Sulfuring 2g/Kg for 30 min respectively. The Dipping in KMS solution 0.20% for 5 minutes with high moisture content was also Sulfuring 2g/Kg for 30 min with minimum moisture content also exhibited minimum water activity (0.20%). And the maximum powder recovery of 29 per cent was recorded in the Dipping in 0.25% $NaHSO_3$ for 5min. Visual sensory evaluation revealed that banana powder the maximum visual sensory score (9.18 out of 10) obtained Sulfuring 2g/Kg for 30 min.

5. References

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