Original Research Article

EFFECTS OF VARIOUS INDIGENOUS RIPENING METHODS ON BIOCHEMICAL CHARACTERISTICS OF BANANA CV. CHENICHAMPA

ABSTRACT

The experiment was conducted with an aim to study the effect of indigenous ripening method on quality parameters of banana cv. chenichampa. The ripening methods *viz.* ripening in covered pit with smoke (T_1); ripening with ripe tomato fruit (T_2); ripening with paddy straw(T_3); ripening in covered pit without smoke (T_4); ripening with calcium carbide (T_5) and ripening naturally at room temperature (T_6) *i.e.* control. The result revealed that among the methods used for ripening, fruit ripened with ripe tomato retained maximum TSS (21.50%), reducing sugar (5.43%) and minimum titratable acidity (0.23%). Whereas moisture content (73.04%) and ash content (1.76%) was recorded highest in treatment T_2. Among mineral composition highest calcium (17.71 mg/100g) and potassium (434.67 mg/100g) content was recorded in treatment T_2. In case of fruit ripened with calcium carbide recorded highest phosphorus (67.66 mg/100g) content whereas ascorbic acid content (5.46 mg/100g) was highest in fruit ripened with paddy straw.

Keywords: banana, chenichampa, calcium carbide, quality, ripening

1. INTRODUCTION

Banana is a fruit that can be considered one of the most affordable, delectable, and nutrient-dense fruits. It has a high caloric and nutritional content and is an important part of the human diet. It is a member of the musaceae family and is frequently cultivated in tropical and subtropical regions of the world. There are many varieties of banana having different flavor and appearance and eaten when it get ripe [2]. One of the main crops of Assam is the banana, and among the various varieties, Chenichampa (AAB) is a favorite in the region's North Bank Plain. Assam's environment is ideal for growing bananas, and the state also produces a lot of them. Once more, this cultivar is crucial from a social and economic standpoint, and they are widely accessible on the market. Concerns over artificial ripening have grown in recent years. Different artificial fruit ripening techniques have been noted, usually to satisfy consumer preferences along with additional economic factors. Consuming fruits that have been chemically ripened (with calcium carbide) is dangerous and puts customers'

health at risk [17]. In order to satisfy the high demand and maximize profits from seasonal fruits, fruit vendors, particularly those in Assam, typically artificially ripen green fruits. Fruit may require several days to be transported and distributed from farmers' orchards to consumers' baskets. Those naturally ripened fruits during this period are susceptible to harm from the rough conditions of transportation. Fruit vendors occasionally choose to collect unripe fruit and artificially ripen them before selling them to consumers in order to reduce loss [16]. This causes them to experience a significant economic loss.

Since bananas are a perishable fruit, a large portion of them deteriorate. Huge physiological changes that occur after harvest are thought to be the cause of the fruit's perishability[15]. In Assam, there are several ways to ripen bananas. The appearance and quality the banana fruits are degraded by smoke treatment [8].In the developed world, ripening is started in commerce by utilizing a variety of chemicals. Bananas are collected at acolor green, fully developed stage and chemically ripened when necessary using ripening chemicals with the goal to reduce the substantial post-harvest losses. These include calcium carbide, gaseous ethylene, ethephon, ethylene glycol, and ethrel[20]; While additional substances used as ripening agents such ethephon, ethrel, and ethylene glycol are also regarded dangerous to human health and they have to be used within suggested safe levels, the adverse effect use the use of calcium carbide as a ripening agent is being demonstrated [20]. According to [7], the application of artificial agents may produce fruits with a more palatable hue than naturally ripened fruits, but it also may raise the possibility of food contamination. The goal of the current study is to examine the biochemical features of natural and artificial (calcium carbide) ripening agents in order to identify alternatives.

2. MATERIALS AND METHODS

Sample preparation and treatment details

Banana fruits of cultivar ‘Chenichampa’ (AAB) was collected at green stage and the bunches were dehanded, washed with chlorinated water and air dried. Uniform size fruits were selected for the various biochemical characters under the study. Treatments were arranged in complete randomized block design with three replications. The ripening methods were T_1: Ripening in covered pit with smoke; T_2: Ripening with ripe tomato fruit; T_3: Ripening with paddy straw; T_4: Ripening in covered pit without smoke; T_5: Ripening with chemicals; T_6: Ripening naturally at room temperature

3. PARAMETER UNDER STUDY

Biochemical parameters

The total soluble solids was estimated using an Erma hand refractometer and expressed as °Brix [18].Titratable acidity, Sugars, moisture and ash content were estimated as per method of [1]. Ascorbic acid content was determined by the visual titration method using 2,6dichloro-phenol indophenol dye [4]. Calcium, Magnesium and Phosphorus were estimated from pre digested sample by following wet ashing method [19]. Potassium was analyzed from pre digested sample as per Ward and Johnson [22].

4. RESULTS AND DISCUSSIONS

In the present study among the biochemical characters (Table 1) were studied and observed that lowest titratable acidity (0.23%), and highest TSS (21.50˚Brix), reducing sugar (5.43 %) content were recorded in fruits ripened with ripe tomato while the lowest values of these parameters were found in calcium carbide treated fruits. While total sugar content (5.63%) recorded highest in treatment T_1*i.e.* ripening in covered pit with smoke. The increase in TSS, reducing sugar and total sugar during ripening might have resulted from an increase in concentration of organic solutes as consequences of water loss and hydrolysis of starch into soluble sugars as sucrose, glucose and fructose. Another scientist [9] revealed that the conversion of starch into reducing sugar through the process of

glucogenesis caused increase in reducing sugar. Similar results were also revealed by [5] and [14] in banana fruits.

Table 1: Effect of ripening methods on TSS (^{o}Brix), titratable acidity (%), reducing (%) and total sugar (%) content of banana fruits variety chenichampa

Treatment	TSS (^{o}Brix)	Titratable acidity (%)	Reducing sugar (%)	Total sugar (%)
T_1	18.33	0.332	4.15	5.63
T_2	21.50	0.234	5.43	4.76
T_3	20.16	0.344	3.35	4.96
T_4	17.33	0.368	4.19	4.72
T_5	17.67	0.348	3.09	4.14
T_6	20.67	0.310	3.63	4.76
LSD (P=0.05)	1.62	0.063	0.56	0.72

Data from the table 2 it was seen that the ascorbic acid content was recorded maximum (5.19 mg/100g) in banana fruits ripened with paddy straw. As per ripening chemistry, ascorbic acid decreases with increase in temperature. The fruits treated with calcium carbide (T_5) recorded minimum ascorbic acid content which could be due to the effect of increase in temperature and the storage duration. Another scientist [6] ; [10] reported least ascorbic acid in the banana fruits treated with calcium carbide which confirms the findings of the present investigation. The maximum moisture content (73.06%) was recorded in banana fruits ripened with tomato *i.e.* treatment T_2. The increase in moisture in fruits might be due to the carbohydrate breakdown and osmotic transfer from peel to pulp [11]. Similar results were also reported earlier by [6] in banana.The higher ash content (1.76%) was observed in both of banana fruits ripened with tomato (T_2) and banana fruits kept in pits without smoke (T_4) and the lower ash content was recorded in fruits ripened with paddy straw (1.12%). Lower ash contents in fruits might be due to loss of fruit weight through respiration where significant carbon was lost.

Table 2: Effect of ripening methods on ascorbic acid (mg/100 g), moisture (%) and ash content (%) content of banana fruits variety chenichampa

Treatment	Ascorbic acid (mg/100g)	Moisture (%)	Ash content (%)
T_1	4.35	72.68	1.39
T_2	4.20	73.06	1.76
T_3	5.46	71.23	1.12
T_4	4.08	66.97	1.76
T_5	3.00	67.81	1.64
T_6	4.50	69.18	1.60
LSD (P=0.05)	0.88	2.40	0.23

5. Mineral composition

The mineral composition (Table 3) such as calcium, magnesium, phosphorous and potassium) of ripe banana pulp were significantly influenced by different ripening methods. The maximum calcium (17.71mg/100g) and potassium content (434.67mg/100g) were recorded in fruits ripened with ripe tomato while the highest phosphorous content (67.66 mg/100g) was exhibited by calcium carbide treated fruits. Also maximum magnesium content (73.28 mg/100g) was recorded in fruits ripened with

paddy straw. Among the different ripening methods, the most abundant mineral composition of banana fruits was potassium followed by phosphorous. The variation in the mineral compositions might be due to the application of different ripening treatments. The variation in calcium and magnesium was reported by [21]; [3] in banana. Similarly, highest potassium content in fruits ripened with tomato was in close agreement with findings of [12] in banana. The phosphorous content was found to be the highest in the fruits ripened by using calcium carbide. It could be due to the increased rate of production of energy rich phosphate compounds during ripening [13].

Table 3: Effect of ripening methods on mineral composition of banana fruit

Treatment	Calcium (mg/100g)	Magnesium (mg/100g)	Potassium (mg/100g)	Phosphorus (mg/100g
T_1	17.24	74.89	416.88	59.08
T_2	17.71	70.39	434.67	60.35
T_3	11.09	73.28	419.60	61.22
T_4	15.62	71.11	401.04	53.94
T_5	11.43	67.18	393.98	67.66
T_6	12.04	68.44	406.15	58.69
LSD (P=0.05)	1.85	2.31	5.52	2.49

6. CONCLUSION

The result obtained from the study indicated that banana fruits can be ripened effectively either by chemical or indigenous methods. The use of carbide is known to be carcinogenic as reported earlier; thus an alternative method to induce ripening of banana fruits by using ripe tomato or ripening in covered pits with smoke may be considered as effective methods with desirable quality.

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