

## Comparative Study on Ripening Of Banana Using Different Ripening Agents

Bhurtel Srijana and Adhikari Anjan

### Abstract

*Ripening is the process by which fruits attain their desirable flavour, quality, colour, palatable nature and other textural properties. Due to short shelf-life of ripen banana and climatic nature as the market demand and the based on the transportation facility artificial ripening is common in banana. Among different ripening agent calcium carbide is common in semi-conscious community like Nepal which is carcinogenic in nature and has been banned by Food Law. So in this circumstances, present study is based on different ripening agent effect on ripening time, shelf-life, physio-chemical attributes of banana. For this study, physiologically matured green banana (*Musa Sapientum*) was collected from Vijaypur of Dharan sub-metropolitan city and was placed in lab based condition following latin-square method and subjected to ripening by different ripening agents like calcium carbide, apple, smoke and control under the similar conditions. All the data collected from this study was analyzed only by descriptive statistics like frequency, mean, median etc. Among these ripening agent apple was found to be most efficient in case of ripening time, shelf-life as well as physio-chemical properties, uniformity in peel colour, taste and flavour followed by smoke. Calcium carbide has very poor performance in all of the comparative attributes.*

### Background

Ripening is the process by which fruits attain their desirable flavour, quality, colour, palatable nature and other textural properties. Ripening is associated with change in composition *i.e.* conversion of starch to sugar. Lack of easier and rapid methods for uniform ripening poses a major problem in the fruit industry. Banana is the second most produced fruit in Nepal after citrus fruits. In Nepal, banana has been grown throughout the Terai and some parts of the mid hills valleys and pockets in the country (under diverse agro-climate conditions) with lesser inputs and possess unique nutrients and bioactive components that may promote health of consumers, particularly those from the less privileged groups. Commercial ripening is an essential part of fruit business as ripe fruits are not suitable to carry and distribute due to their fast rotting. Therefore, fruit traders pick unripe fruits and utilize different methodologies to fasten the ripening process of the fruits. In case of Nepal for the artificial ripening calcium carbide, ethylene, smoke and in some cases ripened fruits are

in practices. Among these calcium carbide is common practiced despite of legal banned by Food Law (2057) of Nepal which has carcinogenic effect. So, it is necessary to use an alternative method for ripening of banana. Use of smoke and apple can also hasten the ripening process of banana similar to the synthetic chemicals and can be exploited as a natural and safer mode for fruit ripening.

## Materials and Methods

### Selection and sampling of banana:

The physiologically matured green bananas (*Musa Sapienta*) locally available at Vijaypur 14, Dharan were selected for experiment. The sample of green banana from each comb of one bunch prepared and the bases were covered with the plastic tape. Each triplicate samples were possessed three fingers and weight of each sample was measured. From triplicate sample, out of three samples, one was used for ripening by apple, another was used for ripening by smoke in smoking chamber and calcium carbide. The rest was used as control.

### Ripening method:

For the study three ripening agents were used i.e. calcium carbide, smoke and well ripen apple in different recommended condition in different container.

### Analysis of physicochemical properties:

After completion of ripening the sample from each methods were extracted and analyzed. Colour Chart of stage -6 was used for matching colour of ripened banana. In the same way acidity was analysed by using titratable acidity (Rangana,2000); TSS by hand refractometer and  $p^H$  by  $p^H$  meter.

### Sensory evaluation of ripe banana:

By using Hedonic Rating test as per Rangana (2000) peel colour and taste of ripe banana was done and the banana, which had not attained uniform colour were discarded.

### Study for shelf life

The ripened banana having uniform colour which match the commercial colour chart of stage- 6 from three methods were enclosed in a plastic pack of 40 microns at 25<sup>0</sup>C.

The changes in acidity, total soluble solids, total sugar were measured at interval of 24 hours.

## Results and Discussions

### Comparative ripening of banana by calcium carbide, apple and smoke

The comparative results are tabulated below.

**Table 1: Comparative ripening of banana by calcium carbide, apple and smoke**

Ripening of banana by				
	Apple	Smoke	CaC <sub>2</sub>	Control
Ripening time (h)	68	84	96	192
Temp.( <sup>0</sup> C)	15-25	15-25	15-25	15-25
% RH	85	85	85	85

The sample ripened by using apple was ripen faster than that in calcium carbide than that of control under similar ripening conditions. The sample ripening by using smoke in smoking chamber also ripen faster but didn't posses uniform colour. The sample in CaC<sub>2</sub> was ripened by the action of acetylene gas from carbide whereas control was ripened by ethylene gas from fruits under favourable conditions of temperature and relative humidity .The sample in apple were ripened as already ripen apple produces ethylene which helps to trigger the ripening of banana. The sample in smoking chamber using smoke was ripened as smoke

emanates acetylene gas which helps in ripening of sample.

The control was ripened within 192 hours but sample in apple, smoke and CaC<sub>2</sub> were ripened within 68,84 and 96 hours respectively. So, there were some factors which were responsible for ripening with treatments of apple, smoke and CaC<sub>2</sub>. The long time for ripening of control was due to the inadequate amount of ethylene gas produced from fruits short time for ripening of sample in apple was might due to the adequate amount of ethylene gas produced from ripe apple and fruits itself (Hook, 1978).

**Comparison of physicochemical properties of ripened banana of three treatments**

**Table 2:** Comparison of physicochemical properties of ripened banana

Parameters analysed	Samples treated with		
	Apple	Smoke	CaC <sub>2</sub>
% Acidity as Citric Acid	0.389	0.299	0.259
p <sup>H</sup>	4.4	4.8	5.21
TSS (%)	18.12	15.30	12.01
Total Sugar (%)	16.60	12.11	10.45

The physicochemical properties of banana ripened by three treatments such as by using apple, smoke in smoking chamber and calcium carbide were determined and tabulated above and significant difference among them is shown by ANOVA at  $p < 0.05$  on appendix-D.

**Sensory evaluation**

From ANOVA table, it was found that there was significant differences between sample

treatment in Apple, Smoke and CaC<sub>2</sub> at  $p < 0.05$ . It showed that the panelist preferred the banana ripened by Apple for consumption in comparison with banana ripened by Smoke and CaC<sub>2</sub> on the basis of peel colour. It showed that the panelist preferred the banana ripened by Apple for consumption in comparison with banana ripened by Smoke and CaC<sub>2</sub> on the basis of taste.

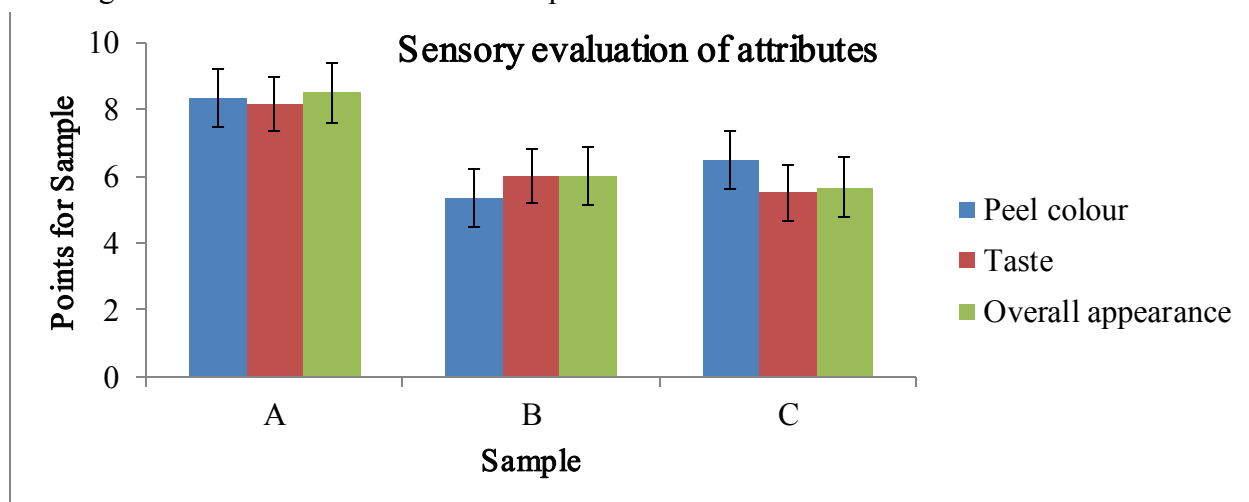


Fig.4.1 Sensory evaluation of attributes

### Comparative study of self- life

The Titratable acid of ripen sample treatment in Apple and Smoke slightly decreased within 24 hours but treatment in  $\text{CaC}_2$  slightly increased within 24 hours. But in the meanwhile TSS of ripen sample treated with Apple and  $\text{CaC}_2$  increased within 24 hours whereas TSS of ripen sample treated with Smoke decreased within 24 hours. After this, the titratable acidity and TSS of ripen sample treated with  $\text{CaC}_2$  was rapidly decreased within 72 hours and deteriorated, whereas sample treated with Apple and Smoke were decreased slowly within 192 hours and deteriorated. The  $\text{pH}$  and Total sugar of ripen sample treated with Apple, Smoke and  $\text{CaC}_2$  increased within 24 hours. After this, Total sugar of ripen sample treated with  $\text{CaC}_2$  was rapidly decreased within 72 hours and deteriorated, whereas sample treated with Apple and Smoke were decreased slowly within 192 hours and deteriorated

### Conclusions and recommendations

The ripening time with use of apple was shorter than that of banana with use of smoke and calcium carbide. Banana treated with smoke ripened earlier than that of calcium carbide but didn't attain uniform colour and flavor. The values of physico-chemical properties of banana ripened by apple was nearly exist with that of naturally ripened banana and the values were slightly

higher than that of banana ripened by smoke and higher than that of banana ripened by calcium carbide. In case of ripening of banana using apple in brown paper bag, ripe apple produces ethylene and this helps to ripen unripe banana. Smoke produced from smoking chamber produces acetylene and helps to trigger the ripening of banana. The self life banana ripened by apple and smoke was longer than that of calcium carbide.

### References

- Dutta, S.C. (1978) .Plant Physiology (M.J. Thomas ed), pp. 529-537.
- John P, Marchal J (1995) Ripening and biochemistry of the fruit. In: Gowen S (ed) Banana and plantains.
- Nepal Rajpatra (2057). Ministry of Agriculture.
- Poudyal Amit (2003). *In*. "Comparative study of ripening phenomenon of banana (*Musa cavindishii*) by using calcium carbide, gulmohar (*Delonix regia*) and golden shower (*Cassia fistula*) leaves.
- Ranganna, S. (2000) Handbook of analysis and quality control for fruits and vegetables product. Tata MC Graw-Hill

Publishing Co. Ltd., pp.623-224, 1011-1020.

Sandip Das, Banana Ripening Agent is Safe:

ICAR.

<http://www.financialexpress.com/news/banana-ripening-agent-is-safe-icar/648847/>,

Accessed 15<sup>th</sup> Jan, 2010.