

## MICROBIAL EXAMINATION OF SPOILED BANANAS PACKED IN POLYTHENE BAGS

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**Key words :** *Fruit spoilage, Microorganisms, Spoilage, Spoiled bananas, Gram negative.*

**Abstract** – Banana (*Musa spp*) is a significant staple crop and has its importance in the developing world. Microscopic organisms are the major and significant factor for fruit spoilage. The colour of banana could suggest the level of deterioration or infection. This type of food infection or contamination are usually observed, that causes health hazards. These organisms invade banana by riddling through natural opening or damaged sites. The damaged fruit because of microbial action reduces its market value and nutritional importance. This study was done to examine the presence of various microorganisms in spoiled banana. For current research rotten banana samples were collected and observed under different conditions. Suspension of each was streaked on different media. From the study it was found that various Gram negative microorganisms were present in spoiled bananas. Microbial spoilage of banana may occur due to Gram negative microbes or fungi causing fruits to undergo undesirable changes. It was found that spoiled banana when stored in polythene bag becomes more susceptible to spoilage. Techniques based on preservation can be evolved to increase the shelf life of bananas.

### INTRODUCTION

Banana is a comestible fruit botanically referred as berry. They are obtained from herbaceous flowering plants of genus *Musa*. Banana cooking is often referred as 'plantain'. Colour, plantain, cooking and odour of banana largely affects the evaluation of quality by consumers compared to any other factor. The colour of banana could suggest the level of deterioration or infection. Microscopic organisms are significant and major factor for fruit spoilage. This microbial deterioration may occur due to some bacteria, fungi and yeast that decreases its monetary value and may cause health problems like gastroenteritis. Post-harvest malady leads to loss of quality and quantity of banana (Oyewole, 2012).

Loss of plant materials such as explant in tissue or organ culturing are badly affected by fungi, bacteria and yeast. Contamination in growth media appears due to ineffectiveness in process of explant disinfection or because of aseptic handling of culture. The biggest source of contamination in the amplification stage of culturing are endophytic organism as they anchor inside the vegetal tissues

and remain fortify from action of surface disinfectants (Thomas, P. 2007; Scherwinski-Pereira and Costa, 2010). In case of bananas the explant or raw material is obtain from apical buds and are protected from contact with soil by multiple layers of tissue which are removed during sterilization.

It is estimated that, due to spoilage, about 20% of local fruits produced are lost each year. Annually 18.9 billion pounds of fresh fruits were lost due to spoilage according to a statistical department data (DOS, 2017). Fruits provide the absolute conditions for many types of microorganisms to survive and grow. The intramural tissues of fruits contain high concentration of different types of sugars, minerals, vitamins and amino acid (Bhale, 2011). The majority of microorganisms initially found on whole fruit or vegetable surfaces are residents of the soil (Andrews and Harris, 2000). Spoilage refers to any alteration in the state of the food in which it is unwanted or inappropriate for human consumption (Akinmusire, 2011). Some spoilage microbes can colonize and cause lesions on healthy, uninjured plant injured (Tournas and Katsoudas, 2005). Bacterial spoilage initially causes tissue softening as pectin degrade

and the entire fruit can gradually degenerate into a slimy mass and produce unpleasant odours and flavours (Rawat, 2015).

## MATERIALS AND METHODS

**Sample collection:** Spoiled bananas were collected from the local market of Bhiwandi and were brought to laboratory for further analysis.

**Isolation of organisms :** As per standard protocol various media were prepared after sterilizing plates. Serial dilution method was carried out to isolate microorganisms. The samples were tested under different conditions. An amount of diluted suspensions of spoiled stored banana, spoiled un-stored banana and spoiled banana were incubated with nutrient broth. Spoiled banana of different conditions were streaked on different media. The inoculated plates were incubated at 37 °C for 24 hours for observing bacterial growth.

**Identification of Isolated Bacterial Organisms :** Bacterial colonies were identified by observing morphological, cultural and biochemical characteristics of organisms.

**Maintenance of the culture:** Organisms have property to change their characteristics with the period of time, so to avoid the mutation and to keep the organisms in log phase they were provided with continuous supply of nutrients. From that, the cultures were sub-cultured time to time.

## RESULTS

Spoiled bananas were purchased from the local market in Bhiwandi and were observed under different conditions. Spoiled banana stored in polythene bag was considered as sample1 and the other diluted in sterile saline was considered as sample 2. The one inoculated with sterile Nutrient broth for 24 hours was considered as sample 3. The results are as given in Table 1.

**Table 1.** Isolation of organisms on different media

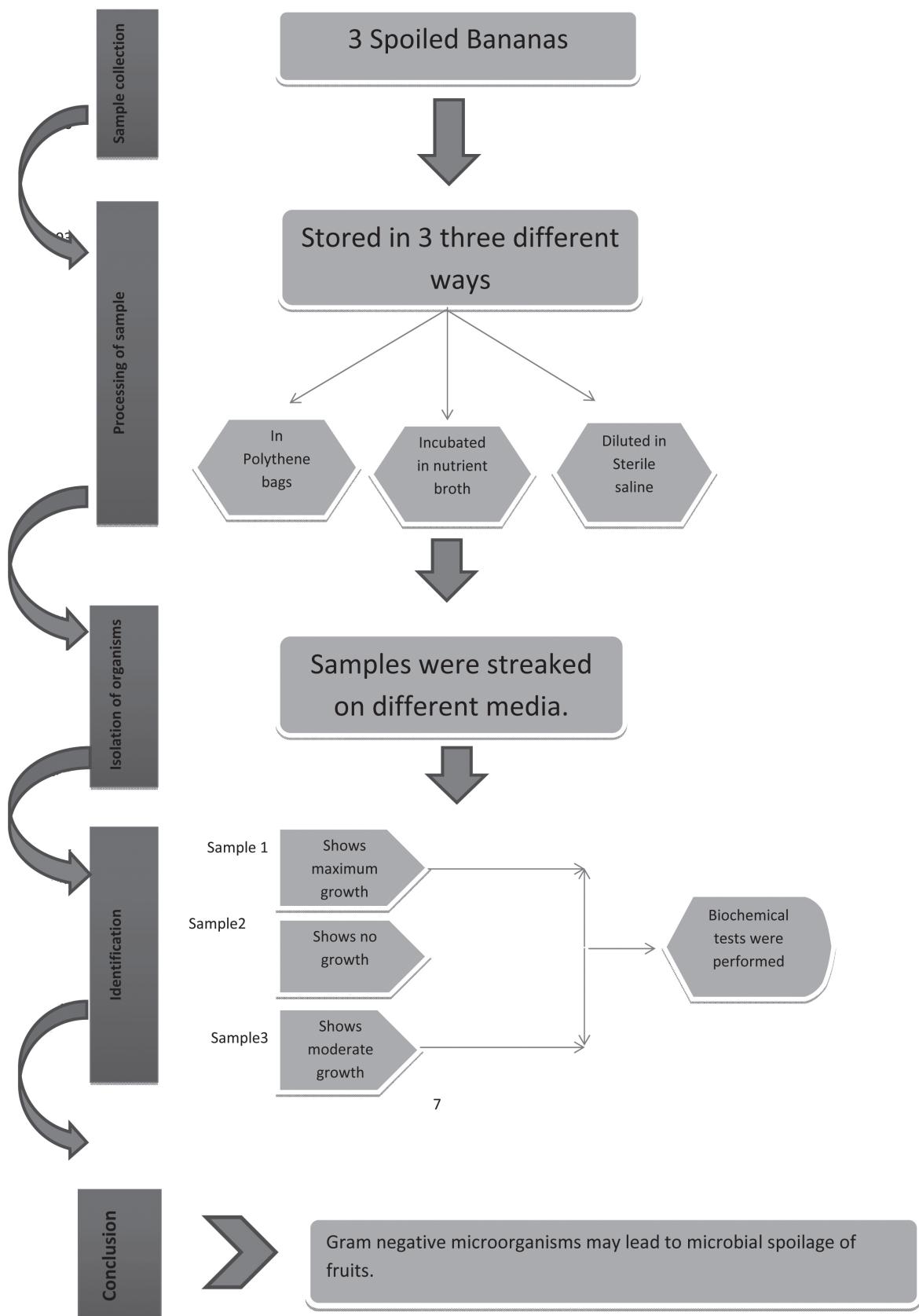
Banana↓ Media→	Nutrient agar	Mac Conkey'sagar	Salmonella and Shigella agar	Thiosulphate citrate bile salts agar
Sample 1	+	+	+	+
Sample 2	-	-	-	-
Sample 3	+	-	+	-

Key: (+) Growth (-) No growth

**Table 2.** Biochemical results of different isolates

Sr. No	Biochemical Test	<i>E. coli</i>	<i>S. aureus</i>	<i>Sh. flexneri</i>	<i>S. typhi</i>	SPA	SPB	<i>V. cholera</i>
1.	Sugars							
	Glucose	A/G	A		A	-	-	+
	Sucrose	A/G	-	-	-	-	A/G	-
	Xylose	A/G	A	-	V	A/G	A/G	+
	Mannitol	A/G	A	+	A	A/G	A/G	+
	Lactose	A/G	A	V	A	-	-	V
2.	MR Test	+	+	-	-	+	+	-
3.	VP Test	-	+	+	+	-	-	V
4.	Citrate	-	+	-	-	-	+	+
5.	Indole	-	-	-	V	-	-	+
6.	LDC	+	+	V	-	+	+	+
7.	Urease	-	+	-	+	-	-	-
8.	PPA	-			-	-	-	-
9.	Oxidase	+	-	-	-	+	+	-
10.	TSI							
	Slant	A		Alk	Alk	Alk	Alk	
	Butt	A		A	A	A	A	
	Gas	+	-	-	-	+	+	-
	H <sub>2</sub> S	-	-	-	V	+	+	-
11.	Catalase	+	+	+				+

Key: (+) Growth, (-) No growth, Alk: Alkaline, A: Acidic, V: Variable, A/G: Acid and gas production.



Sample 1 and Sample 3 gave positive results on Nutrients agar, Mac Conkey's agar, Salmonella and Shigella agar, and Thiosulphate citrate bile salt agar. Sample 2 did not give any growth on the media used for isolation.

**Identification of organisms :** The biochemical tests were performed for the isolates and the required incubation was done at 37 °C for 24 hours. Results are displayed in Table 2.

Akhtar *et al.*, (2016) observed that presence of *Escherichia coli* and *Salmonella* spp. All the Biochemicals in the present study showed the presence of *Escherichia coli*, *Salmonella typhi*, *Shigella flexneri*, *Staphylococcus aureus*, *Salmonella paratyphi B*, and *Vibrio cholera*.

## DISCUSSION

Banana (*Musa* species) yield an environment which suitable for the growth of organisms, this leads to its microbial spoilage. Deterioration of bananas occur due to some bacterial species causing it to undergo undesirable changes. The results showed us that sample 1 had a major microbial load when stored in polythene bags. While sample 2 did not show any growth and sample 3 also gave positive results. IMViC test was employed in identification and differentiation of microorganisms. From the biochemical results it was seen that usually gram negative organisms caused the spoilage of bananas. It was also seen that spoiled banana doesn't show presence of organisms when plated immediately without incubation.

## CONCLUSION

Banana (*Musa* species) is a significant staple crop has its importance in the developing world. Microbial spoilage of fruits may occur due to bacteria or fungi causing the fruits to undergo undesirable changes. From the study it is concluded that spoiled banana when stored in polythene bag becomes more susceptible to spoilage causing organisms. Inoculation of spoiled banana in nutrient broth also gives presence of organisms causing spoilage. It was also seen that spoiled banana doesn't show presence of organisms when plated immediately without incubation. Organisms like *Escherichia coli*, *Salmonella typhi*, *Shigella Flexneri*, *Staphylococcus aureus*, *Salmonella paratyphi A*, *Salmonella paratyphi B* and *Vibrio cholera* are present in banana which leads to its spoilage. Techniques based on preservation

methods can be evolved which can increase the shelf life of banana. This study suggested supporting the need for protection and hygienic fruit handling as well as good efficient method of processing to minimize the growth or survival of spoilage and pathogenic microorganisms.

## Abbreviation

IMViC: Indole test, Methyl-Red test, Voges-Proskauer and Citrate test.

TSI: Triple Sugar Ion slant.

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