

BiOWiSH™ Fruit & Vegetable Wash

Institute of Post Harvest Technology, Sri Lanka

Background

Sri Lanka produces more than 800,000 metric tons of fruits and vegetables annually. About 40% of the product is lost during harvesting and post-harvest operations due to spoilage and disease. To reduce this high spoilage rate, banana producers are looking to implement better hygienic conditions in their harvest and packing operations.

BiOWiSH™ Fruit & Vegetable Wash

- Increase storage life
- Cleaner fruits & vegetables
- Resolve latex issues
- Reduce wash process chemicals
- Improve wash & discharge water quality
- Reduce odor from wash water
- Reduce water & energy usage
- Reduce cleaning and labor cost

Available sizes:

- 3.5oz/100g
- 2.2lbs./1kg
- 11lbs./5kg



Objectives

The Institute of Post Harvest Technology R & D Center in Anuradhapura, Sri Lanka, tested the efficacy of BiOWiSH™ in extending the shelf life of bananas and reducing post-harvest defects.

Solution

BiOWiSH™ Fruit & Vegetable Wash was selected for the trial. Manufactured in the United States, BiOWiSH™ Fruit & Vegetable Wash is a powerful organic composite biocatalyst product that breaks down complex organic molecules allowing the reduction of chemicals used in the banana wash pools and improving production issues. Previous research has shown BiOWiSH™ Fruit & Vegetable Wash is effective at increasing storage life, maintaining freshness, reducing water and electricity usage, and saving man-hours used for cleaning.

Implementation Plan

Bananas were washed using a solution prepared by dissolving the recommended rate of BiOWiSH™ powder in water and stored in the laboratory for evaluation. A control group (without BiOWiSH™) was also stored in the laboratory for comparison. The same bananas were used to measure differences from harvesting to the end of the experiment.

Testing was conducted until over-ripening (deteriorating) of the bananas was realized. Bananas were evaluated by measuring the physiological and biological parameters.

Visual Quality Rating (VQR) was determined by visual observations of fruits and using ratings given below.

Score	Degree of severity	Description
9	Excellent	Essentially no symptoms of deterioration
7	Good	Minor symptoms of deterioration, not objectionable
5	Fair	Deterioration evident, but not serious, limit of salability
3	Poor	Serious deterioration, limit of usability
1	Extremely Poor	Not usable

The firmness of banana fruits were measured, at the initial stage, immediately after the test, and during the storage period, using a digital fruit firmness tester with a 4 mm cylindrical shape (flat end or spherical end) probe (TR Model 53205). Three readings were taken from each fruit at short, middle and long points.

The physiological weight loss of fruits were determined from the difference in weight of produce at regular intervals weight loss percentage was measured using following equation.

$$\text{Weight loss \%} = \frac{\text{Final weight of the sample}}{\text{Initial weight of the sample}} \times 100$$

The total soluble solids (TSS) content in fruit juice was recorded using a hand held refractometer (ATAGO, model: HR-5) and reading was reported as % Brix. To extract the juice for this test, a piece of 10g was cut from the whole banana fruit and blended in 50 ml of distilled water in a blender for one minute as explained by Sultani et al, (2010).

pH of value of fruits treated with BiOWiSH™ and the control were measured daily using a digital pH meter.

Peel color (L, a, b values) of the banana for the experiment were measured by using Mini-scan XE plus Hunter Lab Colorimeter.

To analyze the BiOWiSH™ treatment effect, the above data was analyzed using a SAS® computer statistical package. Each treatment was replicated three times. Analysis of Variance (ANOVA) on Complete Randomized Design (CRD) by General Liner Model (GLM) procedure was performed.

Results

The visual quality rating, firmness change, weight loss percent, total soluble solids (TSS), pH and color change of the bananas were determined as described in the implementation section.

Visual Quality

The visual quality rating of fresh fruits and vegetables is one of the best quality determinants made by the buyer, wholesaler, retailer and the consumer. Often, the appearance of a banana is one of the most critical factors in the purchase decision.

Researchers found bananas treated with BiOWiSH™ Fruit & Vegetable Wash maintained their freshness for five days and after seven days were still classified as being in good condition. The untreated bananas were classified as being in poor condition in that same timeframe.

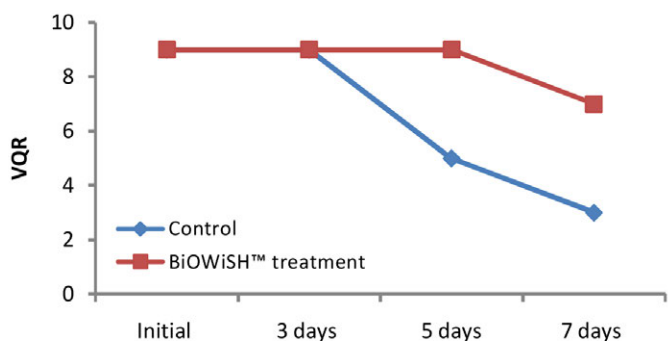


Figure 1: Change of VQR of banana in experimental sample



BiOWiSH™

Control

Firmness

Firmness of fruits and vegetables refers to almost all the textural properties associated with the commodity. It was clear the BiOWiSH™ treatment reduced firmness changes of the banana significantly as compared to the control bananas. Bananas treated with BiOWiSH™ remained firmer longer than the untreated bananas, delaying ripening and extending the shelf life better than other conventional methods.

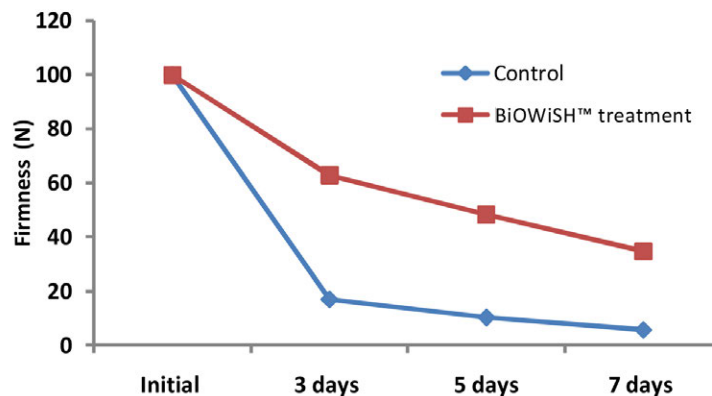


Figure 2: Change of firmness of experimental samples with time

Weight Loss Percentage

Weight loss of fruits occurs mainly due to continuous evapotranspiration of moisture from fruits and due to the respiration process. Figure 3 shows the change of weight loss percentage of BiOWiSH™ treated bananas and control samples over time. The results confirm no significant difference in weight loss percentage for BiOWiSH™ treated banana in comparison to the control treatment.

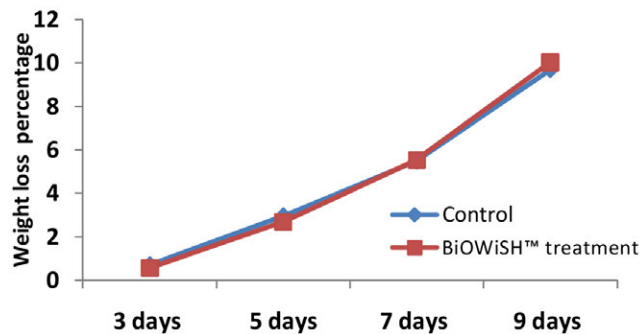


Figure 3: Change of weight loss percentage of banana

Total Soluble Solids (TSS)

Measuring TSS is one way to test for ripeness. TSS levels increase as the fruit ripens. If the ripening process is slow, changes in the TSS are also slow. Using BiOWiSH™ slowed down the TSS change, increasing the shelf life of the bananas.

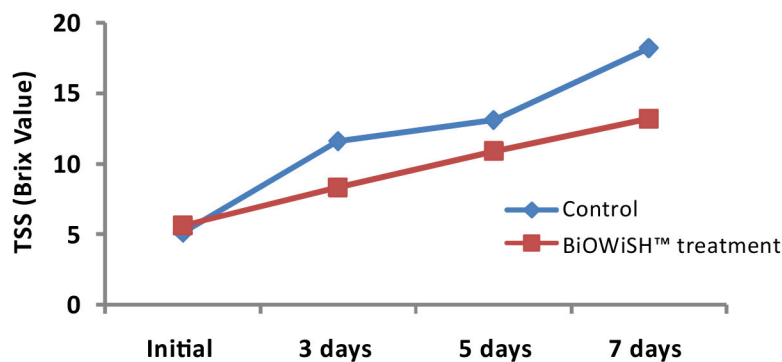


Figure 4

pH Value

Figure 5 illustrates the change of acidity (pH) of the banana for a 7 day time period. The experiment revealed the BiOWiSH™ treatment did not have an impact regarding the pH level in the banana.

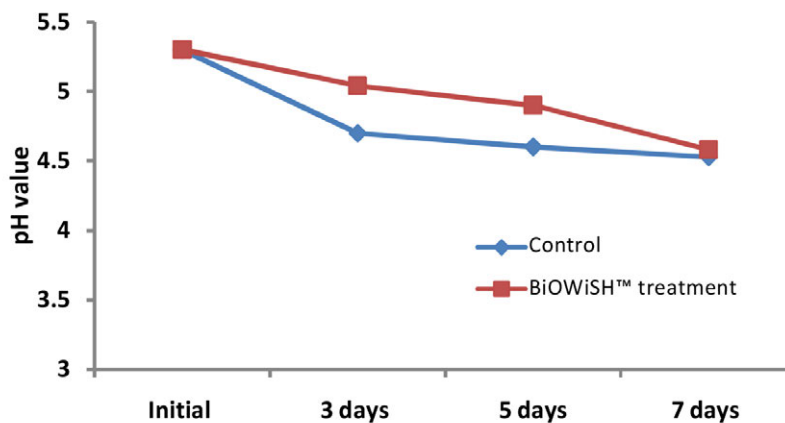


Figure 5: Change of pH of experimental samples with time

Color Change

Figures 6, 7 and 8 show color change of the banana for a 7 day period. It can be concluded the BiOWiSH™ treatment does not accelerate the color change of the banana.

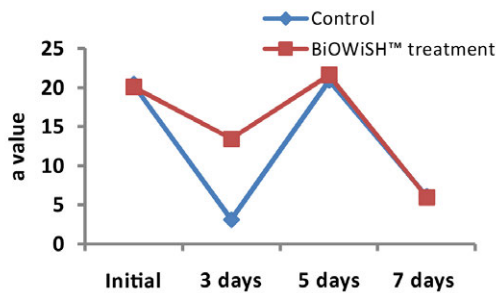


Figure 6: Change of "a" color value

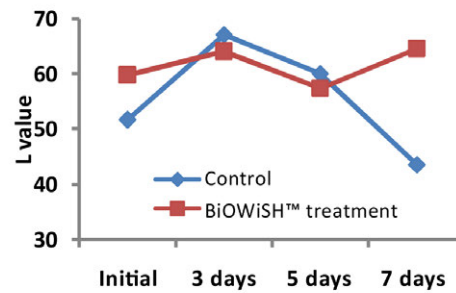


Figure 7: Change of L color value

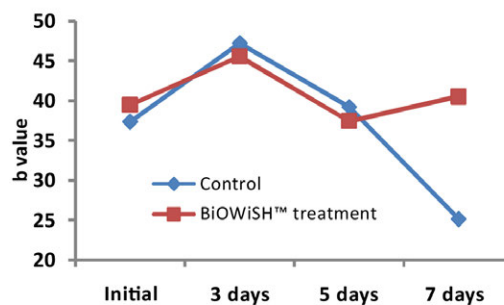


Figure 8: Change of "b" color value

Conclusions

Through a series of tests, The Institute of Post Harvest Technology R & D Center determined using BiOWiSH™ Fruit & Vegetable Wash significantly extended the shelf life of bananas in terms of firmness and Total Soluble Solids (TSS). In addition, visual quality ratings confirm BiOWiSH™ was effective for controlling microbiological contamination and spreading.

It was observed that adding BiOWiSH™ to the banana wash process improves biological activity of the water. Therefore, organic matter present in the banana wash water and odor caused by these organic compounds may be reduced by the organic matter degradation.

Based on the results obtained from this study, it is the recommendation of the Sri Lanka Institute of Post Harvest Technology R & D Center that commercial scale banana wash processes should implement BiOWiSH™ Fruit & Vegetable Wash into their current practice to extend the banana shelf life and quality.

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