CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Itai Koronyo

Project Number

36225

Project Title

Prolonging Shelf Life of Produce: A New Potassium Permanganate Product to Oxidize Ethylene

Abstract

Objectives/Goals

The objective was to develop a product that extends the shelf life of healthy produce at home and reduces excessive waste. Ethylene is a gaseous natural plant hormone that triggers ripening and senescence of fruits and vegetables, shortening their shelf life. Potassium permanganate (PP) is an ethylene oxidizer that neutralizes ethylene effects on produce. A product that increases PP surface area and effectively controls ethylene outcomes, could achieve the objective.

Methods/Materials

Same PP concentrations were used to create products with reduced or increased PP surface areas, Pouches and Sheets, respectively. Zeolite rocks were coated with PP solution, hood dried, and shaped in plastic/paper pockets. Bananas, tomatoes, and broccoli heads were each placed in two containers with six produce per experimental group (Pouch, Sheet, no PP control: n= 54 produce total). They were examined daily for up to 34 days.

Results

Refrigerated Broccoli without PP became brown and non-edible in 15 days, while no signs of senescence were detected in PP-containing refrigerators. Tomatoes with no PP or PP pouches in room-temperature containers started softening or having black-rotten spots after 3-6 days, while tomatoes with PP sheets only after 9-13 days; indicating 6-7-days prolongation. Quantification of bananas# ripening/senescence, showed delayed color change and reduced % area of brown-black spots, PP sheets (11%) versus PP pouches (30%) or no PP (47%), after 34 days.

Conclusions/Discussion

A new effective product to extend the shelf life of fruits and vegetables was successfully created and tested. This potassium permanganate-based product with enlarged surface area (PP sheet) substantially halted ripening and delayed senescence processes, thus prolonging their shelf life. Results from this project provide the rational to commercialize this product for household use.

Summary Statement

This was undertaken to design and build a new, feasible, household product that extends the shelf life of fruits and vegetables by increasing the surface area of potassium permanganate, which neutralizes ethylene's aging effects on produce.

Help Received

Dad assisted in heating and hood drying the potassium permanganate to create the sheet and pouch products. Mom showed me how to use the image processing software (ImageJ), and helped conduct the statistical analysis. Teacher edited my report.