



Contribution ID: 272 Contribution code: S1 Physics Innovation

Type: Oral Presentation

Utilization of DBD plasma in shelf-life extension for climacteric fruits

Friday, June 24, 2022 3:30 PM (15 minutes)

Tomato, mango, banana and durian are climacteric fruits characterized as having high respiration rate during the ripening. Generation of ethylene is actively involved in metabolic activities leading to the ripening. Inhibition of the ethylene generation is therefore able to delay the ripening. Typically, the ethylene generation is dependent on temperature, oxygen level and fruit injury which includes mechanical damage, diseases, and insect infestation. These factors stimulate the generation of ethylene. To overcome this issue, low CO₂, low temperature and the use of ethylene absorbent are conventionally required. However, in the current work, a technique using dielectric barrier discharge (DBD) plasma was proposed. DBD plasma could not only eliminate ethylene but also moisture in the package in a short period. In this work, a comparative study was done on storing cultivated banana, papaya and mango in different ways of storage: non packed, packed in a paper box, packed in a paper box treated with 5-minute plasma, packed in a paper box sealed with plastic wrap, packed in a paper box sealed with plastic wrap and treated with 5-minute plasma and packed in a paper box sealed with plastic wrap and treated with 10-minute plasma. It was found that the cultivated banana samples ripened in sequence, when packed in (1) the paper box sealed with plastic wrap, (2) the paper box, (3) non-packed, (4) the 5-minute plasma box, (5) the paper box sealed with plastic wrap and treated with 5-minute plasma (6) the paper box sealed with plastic wrap and treated with 10-minute plasma. This suggests that C₂H₄ was successfully removed by a DBD plasma reactor.

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Session Classification: S1 Physics Innovation

Track Classification: Physics Innovation