

Edible Coatings

A potential multifunctional post-harvest treatment for stone fruit

By Anna Mouton

Dr Olaniyi Fawole is a senior researcher in post-harvest technology at Stellenbosch University. He has previously worked on pomegranates and apples and is currently helping to find solutions to the problem of shrivel in stone fruit.

"This year we had a lot of shrivel-related problems," said Fawole. One exporter suffered financial losses of as much as 48% due to claims. Shrivel also impacts the confidence of the export market in South African produce.

Shrivel affects stone fruit once moisture losses reach 5%. Moisture loss is influenced by the properties of the fruit cuticle and the underlying epidermal cells. Fawole pointed out that more research is needed to fully understand what causes shrivel. "We need to keep researching but it could take forever and we can't keep losing money. So we have to find a possible solution."

Current strategies to control shrivel rely on minimal post-harvest handling — to maintain cuticular integrity — and multilayer packaging. Existing multilayer packaging includes several plastic components. Fawole highlighted the global trend to eliminate single-use plastic. "We know what the market requires and if they don't want plastic we cannot ship plastic."

TRIALS WITH EDIBLE COATINGS

"When you coat fruit with a functional edible coating you create a barrier to water, to gas, to mechanical damage, and to light," said Fawole. "You can even reduce decay." Edible coatings present an alternative to both plastic packaging and fungicide treatment.

Fawole and his team started by screening six edible coatings: alginate, chitosan, gellan gum, gum arabic, an imported commercial coating, and a locally-available commercial coating. They compared the performance of these coatings to an untreated control in African Delight plums stored for five weeks at minus 0.5 degrees Celsius followed by a shelf life of 20 days at 20 degrees Celsius.

The results showed that gellan gum, gum arabic and both commercial coatings reduced the occurrence of shrivel to a quarter or less of that of the control group.

Chitosan increased the occurrence of shrivel while alginate had no effect. There was a strong correlation between shrivel and mass loss with the lowest mass loss in those plums that developed the least shrivel.

LEFT Typical signs of shrivel in a nectarine.

RIGHT Plums treated with different edible coatings compared to the uncoated control after 5 weeks cold storage followed by 20 days shelf life.

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"We looked at the effect of edible coatings on respiration because we want to be sure that it doesn't lead to fermentation," said Fawole. The coatings didn't affect respiration rate. However alginate and chitosan delayed ripening and gum arabic extended shelf life by more than ten days. "This is interesting for the prospect of using these coatings to delay ripening," commented Fawole.

The research team also evaluated storage index and measured flesh firmness, fruit compression and skin toughness. The results were in line with their observations on ripening. There was no evidence of internal disorders associated with any of the coatings.

TAKING EDIBLE COATINGS TO THE PACKHOUSE

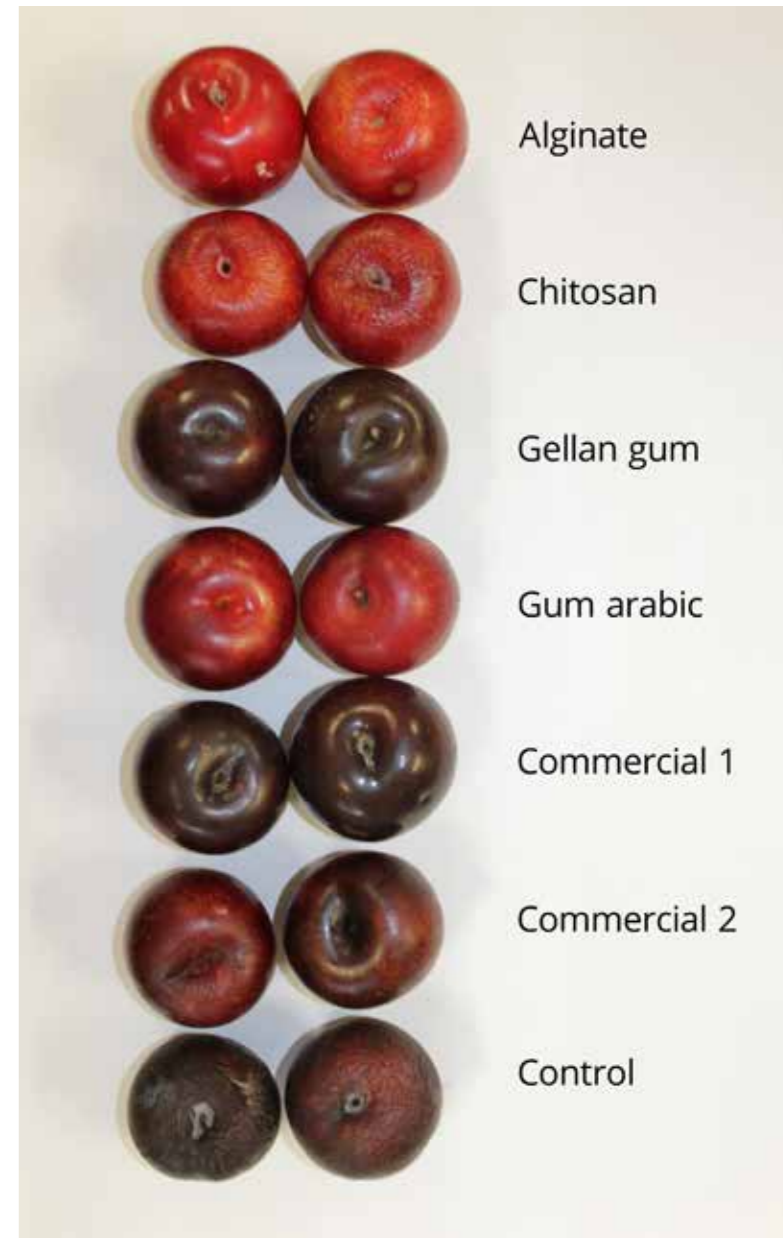
Based on the laboratory results, Fawole went on to conduct commercial trials with gum arabic. "We wanted to test how easy it is to use in the industry and what's the success in real life." His team ran experiments at a packhouse under normal production conditions. They compared the performance of the edible coating in fruit packed with and without shrivel sheets. Sensory analysis and testing for food safety were also performed.

The edible coating reduced the occurrence of shrivel by about half when used alone and to less than a fifth when combined with shrivel sheets. According to Fawole it was very easy to apply the coating on the normal pack line. "We didn't have to change anything. So it's very viable."

However it's unlikely that the edible coating will eliminate the need for shrivel sheets. Fawole also cautioned that interventions at the packhouse alone cannot solve shrivel. Fruit may suffer sufficient moisture loss to cause shrivel before reaching the packhouse. This moisture loss cannot be mitigated by changing packing procedures.

In conclusion, Fawole presented the audience with a novel suggestion. "We should start looking at how we can apply edible coatings just before harvest." In that way, fruit will be protected from the moment it's picked. Fawole is already working on this technology and — after the losses of the past season — producers will be impatient to learn the outcome. **FQ**

PHOTOS: OLA FAWOLE | STELLENBOSCH UNIVERSITY



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