Macadamia post-harvest care
Shelf-life and rancidity

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The shelf life of macadamias is becoming an important issue with processors who are not able to sell their production by the end of their season and (especially) to bulk consumers who store the nuts for longer periods to hedge prices or for other reasons.

Until recently macadamias were consumed almost as rapidly as they were produced and shelf life was seldom an issue. However, the increased production on farms and deliveries to processors has resulted in farmers and their processors becoming more hard pressed to manage their new dynamics without long-term damage to their product. In an ideal world a batch of macadamias that is opened for consumption and found to be rancid can be traced via a tracking system to the processor and even to the farmer, resulting in permanent reputation damage. However, for the most part, macadamias go into a common sales pot resulting in permanent reputation damage. However, for the owner of the macadamia nuts is to manage his shelf-life standards and protocols when the industry is willing to apply them.

The reduction of the shelf life of macadamias is largely the result of poor handling and storage procedures, both on the farm and at the processor, that promote rancidity. An acceptable shelf-life term can be achieved by the conscious effort and loyal collaboration of both the farmer and the processor. This will require a shared common sense understanding of the causes of rancidity and the handling and storage procedures that will minimise the risk of long-term storage deterioration.

RANCIDITY

Rancidity is a well-known phenomenon that results from the oxidation of exposed oils and their subsequent breakdown to free fatty acids. These free fatty acids take various forms, but all add to a bad smell and taste and are often toxic. The early stages of rancidity may be imperceptible to the unwary palate and can be – and are – easily sold to an unsuspecting market.

As a safeguard, the macadamia industry applies a peroxide test to random samples of nuts to provide an indicator of the level of exposed oil to oxygen. The SAMAC indicator maximum is 3 meq/k, but it is important to note that any value above zero is an indication that the irreversible process of rancidity has begun. The problem now for the owner of the macadamia nuts is to manage his product in such a way as to have them sold and consumed before the market perceives a change in odour and taste. Until recently, this strategy has been successful because the demand exceeded the supply for many years, but now there are many producers supplying a more sophisticated, quality conscientious customer who is also living in new and restricted financial times.

Internationally the quality macadamia nut is lauded for its many positive nutritional features, but it has now become commonplace for many market researchers to report on both rancid macadamia nuts on supermarket shelves and bad taste experiences by first-time consumers. The macadamia industry may be a good business, but it will never be great or reach its full potential unless the concerns relating to rancidity and shelf life are effectively dealt with.

CONSUMER STORAGE PROTOCOL, SELL-BY DATE

Macadamias are a perishable product that is presently sold without storage instructions or a sell/consume-by date. Technologically, we live in scientific times that allow us to establish all the necessary parameters to ensure buyer confidence and also limit – and even prevent – the rancidity that retards the prosperity that the macadamia industry should enjoy. The macadamia industry also has a research budget that could easily be focussed on establishing shelf-life improvement, consumer storage protocols and sell-by dates.

The problem, however, is neither a lack of science or research budget. The difficulty lies with the political and financial will of the macadamia industry to focus beyond “acceptable quality” and apply the established knowledge that will ensure uncompromised quality before profit. It will only be possible to empower researchers to develop shelf-life standards and protocols when the industry is willing to apply them.

The cause of rancidity in macadamias is the exposure of the oil to the atmosphere (oxygen) and the main cause of this due to bruising that takes place on farm, in transit, during processing as well as pre- and post-processing handling. Bruising is simply cell damage anywhere in the macadamia kernel that results in a damaged cell wall that allows oil to leak either intra-cellular or onto the surface of the kernel. Bruising (cell damage) follows mechanical handling that causes damage mostly by dropping and squeezing. The exposed oil guarantees the start of rancidity, but the process is insidious and not apparent on the sorting table. Bruised nuts also results in “after roast darkening” (ARD).

The severity of bruising, the length of time exposed to the atmosphere (and moisture) thereafter – especially in elevated temperatures – will determine the rapidity with which the rancidity will develop. Generally, the macadamia industry arrests the rapid degradation progress with cold storage and inert atmosphere packaging after processing, and this has been mostly successful in the past providing consumption follows soon afterwards.

It is now apparent that bulk buyers cannot ensure rapid consumption and that the “dormant during cold storage”
rancidity process continues in wholesaler storage and supermarket shelves. Since it is not possible to identify rancidity until a chemical test positively identifies its presence (usually several months after it began), then the only way to reduce the incidence is to eliminate the known causes of kernel cellular damage. There are many handling systems on farms – and especially at processors – that allow high impact drops and squeezing (through the shell) that cause cellular damage. All the other handling and processing methods that exacerbate the speed at which rancidity occurs must be identified and corrected, e.g.: long periods of storage before processing, uniformed, carelessly designed drying methods (instead of curing), lengthy exposure to temperatures above 30ºC, harsh processing techniques and aggressive bulk marketing that does not allow cold shipping and storage protocols at buyer storage sites.

It will be a relatively simple, but lengthy and costly process for researchers to identify the methods, equipment and processes that cause rancidity and promote short shelf-life periods. It will even be possible for empowered researchers to rate and certify each handling step, both on-farms, at the processor, all transit stages and at the storage places of buyers to determine the risks. Until now, the macadamia industry has been mostly concerned with managing its rapid growth and has buried its head when appropriate research points in the right direction. The costs and other implications of making the necessary changes to eliminate the causes of bruising to large volumes of nuts seem to paralyse both the farmer and – especially the larger – processors. Yet there is no other way. The problem will not go away without appropriate measures to reduce bruising – the fact is that it will appear to get worse as more and more producers enter the market with ever larger volumes.

The market eventually discovers who supplies consistent quality and long-term shelf life. Those processors – and their associated farmers – who consistently apply high standards with soft handling and processing methods will be suppliers of choice and receive the highest prices and the biggest market share. In the final analysis macadamias will continue to be sold and consumed even if the problems resulting from rancidity and short shelf life are not dealt with. But the nut will not achieve its true status and the financial reward for all concerned will always be less than it should be.