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The Best Research Publication

ARTICLE: Impact of Seed Size on Residual Hypoglycin Levels in Ackee
Historically there have been periodic outbreaks of a “mysterious illness”, designated the Jamaican Vomiting Sickness, which would result in numerous deaths in rural Jamaica, typically among children and the elderly. Symptoms vary in severity and include vomiting, lowering of blood sugar levels and, in extreme cases, death. Almost one hundred years ago ackee was implicated as the cause of Jamaican Vomiting Sickness following a report many years earlier by the Island Chemist of extraction of a toxin from distilled ackee. In the 1950s this link was confirmed by researchers at the University of the West Indies who isolated and identified the toxin and determined that these outbreaks could be attributed to the consumption of unripe ackees.

Although the populace knows that ackee which is not fully ripened should be avoided there are still reported cases today of ackee poisoning, the latest occurring over the period December 2010 to February 2011, with several confirmed fatalities. Ackee consumption in Jamaica dates back centuries. Despite this, much remains unknown about the poison which it contains. While the identity of the toxin in ackee (hypoglycin) is known, the various factors which periodically contribute to elevation of the levels of this toxin are yet to be delineated.

Role of the ackee seed in hypoglycin conversion
Hypoglycin, the poison in ackee, occurs in two forms. Hypoglycin A is found in the edible part of the ackee (the aril) and in the seed, while its derivative, hypoglycin B, is found only in the seed which is typically not consumed. Minott’s research group previously demonstrated that as the fruit matures and the ackee pod opens the level of hypoglycin A in the aril is exponentially reduced and drops to a concentration which is negligible or safe for consumption. Simultaneously, the amount of hypoglycin B in the seed increases. Evidently, hypoglycin A in the aril is being translocated to the seed and converted to hypoglycin B; the seed thus plays an important role in detoxification of the fruit as the poison moves into the seed where it is stored as hypoglycin B. Following on this finding, the characteristics of the ackee seed were investigated to determine the influence of the seed on the levels of hypoglycin A in the fruit.

Relationship of ackee seed size to hypoglycin content
Mature, open ackees collected from several trees were shown, not unusually, to have seeds of different sizes including very small seeds embedded in the aril. These immature or aborted seeds varied in frequency from 5 to 18% per tree of the ackee fruit population sampled. Ackee seeds, categorized according to size (large, regular, medium, very small), were analyzed using the technique high pressure liquid chromatography, wherein, an extract of the seed was separated into its components and the hypoglycin concentration measured. Levels of the stored toxin, hypoglycin B, in the very small or aborted seeds were less than half that
found in the regular seeds and in some cases hypoglycin B was not detected. This indicated that fruits with aborted seeds had a lower capacity to assist in natural detoxification through the translocation route.

When the associated edible part of the fruits were similarly analyzed, the amount of the toxin hypoglycin A in arils from which aborted seeds had been removed were found to be significantly higher than in arils which had borne regular seeds. Fruits from one tree had much higher hypoglycin A concentration than other trees sampled, demonstrating the existence of natural low and high hypoglycin ackee varieties. Arising from this work, efforts should be directed towards identification of suitable low hypoglycin ackee varieties for propagation.

**Implications**

While it is known that only naturally opened mature ackees should be eaten, the findings adduced by Dundee and Minott suggest that ackee consumers could be well recommended to limit their consumption of arils from which embedded, very small or aborted seeds have been removed. It is advisable therefore, that food processors avoid including significant amounts of ackee aril from very small seeds in order to reduce the residual hypoglycin concentration in the product. Processed ackee is an important foreign exchange earner, ranked in the top five for the agricultural sector. Hypoglycin content in processed ackee is strictly regulated and measures that may be instituted to reduce the residual levels are actively being explored. It is recognised that several factors contribute to an increase in the levels of hypoglycin in ackee, seed size being only one. The possibility exists that these factors might vary at different times and seasons, according to environmental influences, and could act synergistically. This study by Dundee and Minott contributes to the limited information available on factors that are responsible for elevated levels of toxins in the ackee fruit.

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**Ms Safiyyah Dundee** (MPhil) is a graduate of the Department of Chemistry and is currently an entrepreneur pursuing research leading to potential commercial products of local origin.