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ACKEE POISONING AND THE EVOLUTIONARY BIOLOGY OF JAMAICA'S ACKEE MOTIF

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ABSTRACT. There is a Jamaican riddle that asks: "Me fader send me to pick out a wife; tell me to tek only those that smile, fe those that do not smile wi' kill me" (Beckwith 1969). The answer to this riddle is the ackee (*Blighia sapida* Konig) -- the fruit of one of Jamaica's best loved food trees which is generally considered poisonous if improperly harvested, processed or prepared. According to Jamaican tradition, the fruit must open on the tree naturally -- it must "smile" or "laugh" -- before harvesting. This clear association between open ackees, smiling and well being is the most important recurring ackee theme in Jamaican culture, and its expression in oral traditions (such as riddles and folk beliefs) reveal in an essential way what Jamaicans need to know in order to eat ackees safely. The purpose of this paper is to explain within the framework of evolutionary biology why Jamaica's ackee motif has developed, and to show from this perspective that the most important of the early accounts of ackee poisoning must be reconsidered.

SCOTT AND "VOMITING SICKNESS"

The ackee is a beautiful tropical West African evergreen tree in the Sapindaceae family that was introduced to Jamaica in the eighteenth century and is now found island-wide from sea level to about 900 m (Adams 1972). Its fruit is one of the two main ingredients in "ackee and saltfish," popularly regarded as the national dish, and it is probably this fact that accounts for its selection as Jamaica's official national fruit. As a national icon, the image of the fruit, tree or dish appears on a wide variety of objects such as postcards, key rings and place mats which are often seen in homes, hotel giftshops, craft markets and stores.

The island chemist, J. Bowrey, published the earliest account of ackee poisoning in the Jamaica Gazette in 1887 and 1892, and in 1904, Turnton offered the first medical report in the Journal of Tropical Medicine. In 1913 Seidelin published the results of his investigation and Grabham did the same in 1917. It was Harold Scott, however, then government bacteriologist and pathologist, who argued most persuasively

that ackee poisoning was the cause of what had come to be known as "vomiting sickness". In his address to the Society of Tropical Medicine in December, 1916, Scott said "the Vomiting Sickness of Jamaica must be looked upon as a new disease" (1917), one he described as being prevalent in rural areas in the winter, particularly among malnourished African Jamaican children and their families. The illness began suddenly with vomiting, followed by weakness, prostration and a period of apparent improvement; then came another bout of vomiting followed by convulsions, coma and death. In the discussion that followed Scott's presentation, a Dr. G. C. Low said there were several points which he thought Dr. Scott should "follow out" further including the following:

> It certainly seems very strange why the fruit from a bruised branch, or fruit which has been opened prematurely or unnaturally, should be poisonous, while the ripe fruit which has burst open of itself is not poisonous. It seems difficult to say exactly why this should be so, though, of course, it might be that the poison is a volatile substance -- a substance which has escaped in the open ripe fruit, but not in the case of the immature fruit (cited in Scott 1917).

Scott (1917) made the following comment in response to the points raised by Dr. Low:

> I cannot answer Dr. Low's question as to why the unopened fruit is toxic: that is the direction the further investigation will take. The natives know the fact themselves [my emphasis]. I shewed them several fruits, and asked, "Would you eat this?" [answer] "No." "Why?" [answer] "I don't know." I think it may sometimes be due to it not being quite ripe. It is usually those with a small seed, the fruit itself not having properly developed.

The question raised by Dr. Low and the "native" knowledge that Scott mentions can be explained within the framework of evolutionary biology.

PLANT DISPERSAL AND ANIMALS

In an effort to increase the likelihood of reproductive success, and as a consequence, ensure the continuation of the species, plants have evolved a wide variety of extraordinary techniques to facilitate the dispersal of their offspring in the form of seeds or vegetative structures. These techniques includes mechanical means of self-dispersal like spring mechanisms or explosive fruits, as well as adaptations for dispersal by gravity, wind, water, and animals (Ridley, 1930; Pijl, 1969).

Many seeds that are incidentally dispersed by animals are associated with "food offerings" from plants in the form of fleshy fruits, or fruits with fleshy appendages i.e., arils.[1] The seeds from such fruits are either rejected when the fruit is being eaten (especially when they are large), or they are regurgitated intact as occurs with some birds, or they are consumed with the fruit and spread by defecation. Usually camouflaged in green, these fleshy fruits, are often distasteful, even harmful, when their seeds are developing, but they become attractive to animals (i.e., conspicuously colored, scented, soft, juicy, sweet, and without harmful or distasteful properties) when their seeds mature and are ready for dispersal. With arilate fruits (such as many legumes), the attractive fleshy food offering is exposed when the seeds are mature.

The ackee is an arilate fruit that fits this profile. The tree produces small, fragrant, white flowers on pendulous racemes two or more times a year on which develop clusters of large, leathery, pear-shaped capsules about 8 cm long. They are green at first, but then they become a bright red or yellow, or red with flushes of yellow, or yellow with flushes of red. What sets the ackee apart from many other fruiting plants is that its fruit becomes brightly colored long before it ripens, and is traditionally considered deadly poisonous if eaten at this immature stage. But why should the fruit manifest display colors before the seeds are ready for dispersal?

A possible explanation is that this occurs to encourage dispersers to begin visiting the tree and to keep visiting the tree since the fruits open over several weeks rather than all at once. If all the fruits ripened at once the chances for dispersal would be minimal. The short-lived seeds would fall to the ground, germinate, and attempt to grow under adverse conditions -- competition with parent and siblings for space, light, water, and nutriments and exposure to the concentration of predators and diseases associated with the parent. The pre-ripened display colors and staggered ripening (i.e., the ripening of the fruits over several weeks) means that each fruit stands a better chance of being dispersed away from the parent.

Jamaica's ackee motif reveals the significance of the relationship between humans and ackees from the cultural side of the interaction. The purpose of the ackee motif -- i.e., the association of open fruits with smiling and safety (as evidenced in the riddle with which this paper began) - - is to make it clear that even though the fruit is bright red or yellow (generally a sign of ripeness for many animal-dispersed fruits and their mimetic counterparts), it is not truly ripe until it opens to reveal its large, round, glossy black seeds attached to a fleshy, oblong, yellow or cream-colored aril that is oily to the touch and like marrow when cooked. The fruit must "smile" or "laugh" on the tree before harvesting.

Jamaica's ackee motif is also evident in a widely known traditional belief that points to the cultural impact of the staggered ripening of the ackee's fruits. The most commonly expressed form of this belief was related by a Jamaican informant who learned as a child that "If you laugh or smile under an ackee tree just when the crop begins to open, they will open faster." Because the ackee's fruits are borne in clusters and the fruits in a cluster do not open simultaneously, the ripe fruits must be harvested individually before they spoil or are eaten.[2] This means people must "search" to find ackees with fresh "smiles". The impatience for these highly prized fruits, coupled with this search requirement (resulting from staggered ripening), is probably the basis for the belief that ackees can be encouraged to open by smiling or laughing with them, or by "clapping" or "counting" as stated in some accounts.[3]

THE NATURE OF ACKEE POISONING

Because ackee consumption is associated with poisoning, an extensive scientific literature has developed over the past one hundred years that has focused largely on the toxicity of the fruit.[4] Jamaica's ackee motif, when accounted for within an evolutionary biology framework, is consistent with the results of these studies showing that ackee is indeed poisonous if eaten before it is fully ripe (Bressler 1976, Chase 1990, Brown 1992). This being so, Scott's influential account of ackee poisoning in Jamaica must be rejected because of its serious inconsistencies.

Scott (1917) summarized his view of "vomiting sickness" with the following profile:

1. The peculiar seasonal prevalence.
2. Limitation to Jamaica.
3. Sudden onset of symptoms.
4. The rapid and complete recovery of non-fatal cases.
5. Affection of several persons practically simultaneously in one house or close neighbors in a settlement.
6. The vastly greater preponderance in children.
7. Attacking the West Indian native in much greater numbers than the East Indian or the white man.

For Scott (1917), there was no doubt that these seven characteristics of "vomiting sickness" all found "explanation in the view that the condition is an acute intoxication by the unwholesome ackees [my emphasis]."

If, as Scott himself reports, Jamaicans know that unopened or forced-open ackees are poisonous, and that "unwholesome ackees" are

unsafe (whether because they are over-ripe, rotting, discolored, or come from broken branches, or because they have soft spots, aborted seeds or other disfigurements), then why would they eat them? And why would they eat them mostly in the countryside rather than in urban areas, and in the winter rather than at other times of the year when the ackee is also in season? These and other inconsistencies, and the questions they raise, have been recognized in the scientific literature (e.g., Williams 1954), but they are yet to be adequately explained by those who continue to accept, often uncritically, the formulation presented by Scott.

CONCLUSION

The ackee is a major food tree only in Jamaica (Adams 1971; 1972), despite claims that in the "Caribbean" it is "commonly used as a prized food" (Kingsbury 1988) or "is a popular dish" (Encyclopedia Britannica 1993); or claims that in the "West Indies" it is "a great delicacy" (Irvine 1930), "in great demand" (Sturrock 1940), or is "much esteemed" (Hedrick 1972). In fact, the ackee could well be regarded in the neotropics as a marker species for Jamaicans, and for those with Jamaican connections, since its spread in the region has been greatly influenced by economic migration and by travel in association with education and tourism (Standley 1968). It is possible that the absence of an ackee motif similar to the one in Jamaica is the reason why the ackee is not widely eaten in other Caribbean territories where the fruit is simply regarded as poisonous without further qualification.

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1. Other important categories of animal-dispersed fruits are seed-predator dispersal associated with temperate nut trees, and fruits bearing prickles, spines, hooks, barbs, hairs, or sticky coverings that adhere to the fur or skin of passing animals (including human clothing and equipment) and are thereby incidentally dispersed.

2. Some Jamaicans do make an effort to protect their ackee crop, especially from birds. My father said when he was a boy some people built bird snares in ackee trees. Williams (1954) reports that some of her informants had

"observed crows and bats attacking the fruit." Jeffrey-Smith (1972) says parrots "enjoy ackees" and that when "ackees are in season [red-bellied] woodpeckers (*Centurus radiolatus*) may be seen devouring the ripe fruit, of which they are very fond and eat appreciable quantities." And in "Countryman's Diary," a well know column in the Daily Gleaner (September 18, 1976), the author describes his wife's effort to protect their ackee crop from birds in an article titled "My Wife and the Birds."

3. There are also different interpretations of this belief as is evident in a conversation between a retired physician and a young woman. The physician interpreted it to mean that during harvesting, "if you keep looking you will see more. The laughing," he said, "was not important." The woman interpreted it to mean -- as did many informants -- that "the more you go and laugh, the more the ackees open. Go everyday, everyday you see more and more." With this traditional view, "smiling" or "laughing" with ackees is an example of what Frazer (1911-1915) identified as "sympathetic magic," which is the principle that like produces like -- a smiling face produces a smiling i.e., open ackee.

4. For a review of this literature see Hill (1952), Chambers (1953), Arnold (1954), Williams (1954), Hassall and Reyle (1955) and Plimmer (1963). Examples of more recent works are Kean (1975), Thomas and Krieger (1976),Tanaka (1979), Chase *et al.*, (1990), and Brown *et al.*, (1992).

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