The Pollination of *Manihot esculenta* (yuca) and It’s Importance to Archeology: A Beginning Study

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Introduction

• Yuca belongs to the family Euphorbiaceae and the genus *Manihot*
• Yuca is one of the world’s most productive crop plants in terms of calories
• There are two types of manioc: the bitter and the sweet

http://www.nationaalherbarium.nl/euphorbs/specM/Manihot.htm
Introduction continued

• Yuca is planted by use of stem cuttings
• Most Amerindian cultivators plant several different varieties of yuca
• Why are there so many different varieties of yuca, if the only method of planting is by use of stem cuttings?
Review of Pollination

http://dbs.umt.edu/courses/sci226/lab4_plantsanimals.htm
• Pollen from the stamen lands on the stigma
• The pollen grain conveys the genetic material down the style to the ovary
• After fertilization the ovule develops into a seed and the ovary develops into the surrounding fruit
Creating new varieties

• Amerindians have many different varieties of yuca
• Cloning is important for maintaining the stock of one variety
Creating new varieties continued

- New varieties of yuca are created through sexual reproduction
- Thus, when different varieties reproduce together, new varieties are created
- Some varieties will be superior and may continue to be cultivated through stem cuttings
- Other varieties will be inferior and will be lost
Seed dispersal

• Most varieties produce flowers which, after pollination, produce a fruit and three viable seeds (Elias et al 2000)

• The fruit dries in the sun and dehisces, sending the seeds flying to the ground
Seed dispersal continued

- Ants disperse the seeds which have been propelled to the ground
- The ants feed their larvae nutrients from the seed appendage \cite{elias_mckey_2000}
- After used, the seed is discarded in a waste pile where it waits until the appropriate germination requirements are met
Spontaneous seedlings

• The spontaneous seedlings are not weeded by Amerindians
• If the spontaneous seedling produces tubers that are deemed desirable, the new variety will be propagated by stem cuttings
Archeology and Paleobotany

- Paleobotanists work to recover, identify and classify plant remains
- Paleobotanists and archeologists could work together to uncover more information about ancient yuca
Why is pollination important to archeology?

- Pollen can be found at archeological sites
- This can help determine where ancient manioc was located
Archeology and Pollen

• *Manihot* fossil pollen has been found at a number of sites
• A grain of pollen was found in the costal region of Tabasco, Mexico (Bartlett et al 1969)
• Pollen also was found in Panama (Dickau et al 2007)
What other methods could be employed to clarify the relationships and unknown data on Manihot esculenta?

- Systematics
- Microfossils
- Macrofossils
Systematics

• Systematics is the study of relationships between species of plants
• Systematics could help end some confusion relating to relationships in the *Manihot* genus
Microfossils

- Microfossils are fossils that are microscopic
- Examples of microfossils include pollen, phytoliths and starch grains
Macrofossils

- Preserved remains of yuca and artifacts pointing to the domestication of yuca can be considered macrofossils
Remaining Questions

• What is the type of pollinator? Bird? Insect? Wind?
• What is the species of pollinator?
• What are the systematic relationships of the varieties?
• What are the exact germination requirements?
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Bibliography


• Elias, M., D. McKey, O. Panaud, M-C. Anstett and T. Robert. 2000 “Traditional management of cassava morphological and genetic diversity by the Makushi Amerindians (Guyana, South America): perspectives for on-farm conservation of crop genetic resources.” Euphytica, Sous presse.