



The Yam Conundrum





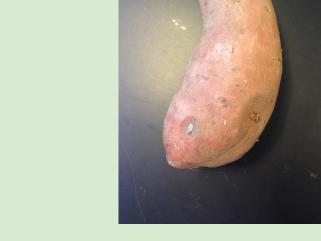
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Abstract

Yams (genus: Dioscorea) and sweet potatoes (Ipomoea Batatas) are two completely different plants, but most people think they are the same thing. Sweet potatoes are dicots commonly found in the US, but true yams are monocots that originate in Africa and Asia and are rarely seen in this country. The purpose of this experiment was to discover what mainstream grocery stores have been labeling as yams. Our hypothesis was that all stores are actually selling sweet potatoes and labeling them as yams. We isolated the DNA of an authentic Ghana yam and the DNA of multiple varieties of yam' and sweet potato purchased from various grocery stores. We amplified the DNA and sent it in to be sequenced. By comparing the Blast results, we found that all the sweet potatoes and "yams" sold in grocery stores were actually all sweet potatoes. We also observed that the authentic Ghana yam was very distant from the sweet potatoes.





Yam

Sweet Potato **Introduction**

The orange vegetable that most people call 'yam' is actually a sweet potato. Sweet potatoes are dicots, and are from the family *Convolvulaceae*, often referred to as "morning glory" plants. Yams are from the *Dioscoreaceae* family. They are monocots, so they are more closely related to onions and grass then they are to sweet potatoes.

Sweet potatoes come in a variety of colors and can be soft or hard, referring to the texture of the flesh after they have been cooked. Yams are bigger than sweet potatoes, are often asymmetric, and have rough, bark-like skin. A true yam does not have very much beta carotene, while varieties of orange sweet potatoes have a lot.

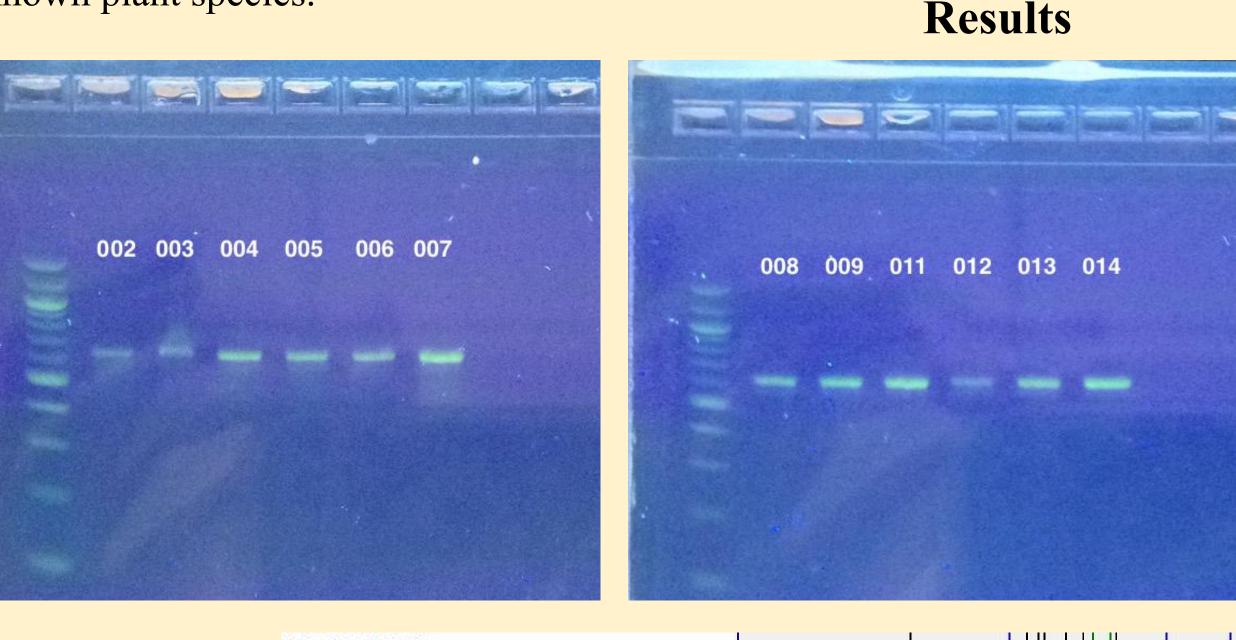
West African slaves working in areas where orange sweet potatoes were grown started referring to them as "nyami", which is the West African word for yam. This is where the name confusion began.

The United States Department of Agriculture requires that it be indicated somewhere that the vegetables labeled "yams" are actually sweet potatoes. However, most companies indicate that they are actually sweet potatoes in such small text that nobody ever sees it, or they place the words "sweet potato" on a hidden part of the box. This poses a possible danger to people who are allergic to sweet potatoes and eat the food labeled as yams because they see no indication that they are actually sweet potatoes.

To investigate the mislabeling of sweet potatoes as yams, we bought one Ghana yam from an African food market, and compared its DNA to the DNA of multiple "yams" and sweet potatoes purchased from regular grocery stores around the NYC area.

Materials & Methods

- We obtained one real Ghana yam, 7 samples of vegetables labeled as yams and 4 samples of vegetables labeled as sweet potatoes.
- 2. We extracted DNA from our samples and amplified the DNA using PCR with an rbcL primer cocktail. The rbcL primer attaches to the sequence for ribulose bisphosphate in the plants' chloroplast DNA and allows the DNA polymerase to replicate this portion of the DNA.
- 3. We confirmed the success of PCR in amplifying the DNA by doing gel electrophoresis with all of our samples.
- 4. We put the results of PCR into test tubes and sent them into Cold Spring Harbor DNA Learning Center to be sequenced.
- 5. We analyzed the sequencing results on DNA subway and compared the sequences of all of our samples to each other and to multiple known plant species.



33. KQF-005

34. KQF-011

35. KQF-003

36. KQF-009

002- Ghana Yam

003- Korean Yam

004- Yam

005- Red Sweet Potato

006- White Sweet Potato

007- Organic Yam

008- Sweet Fresh Yam

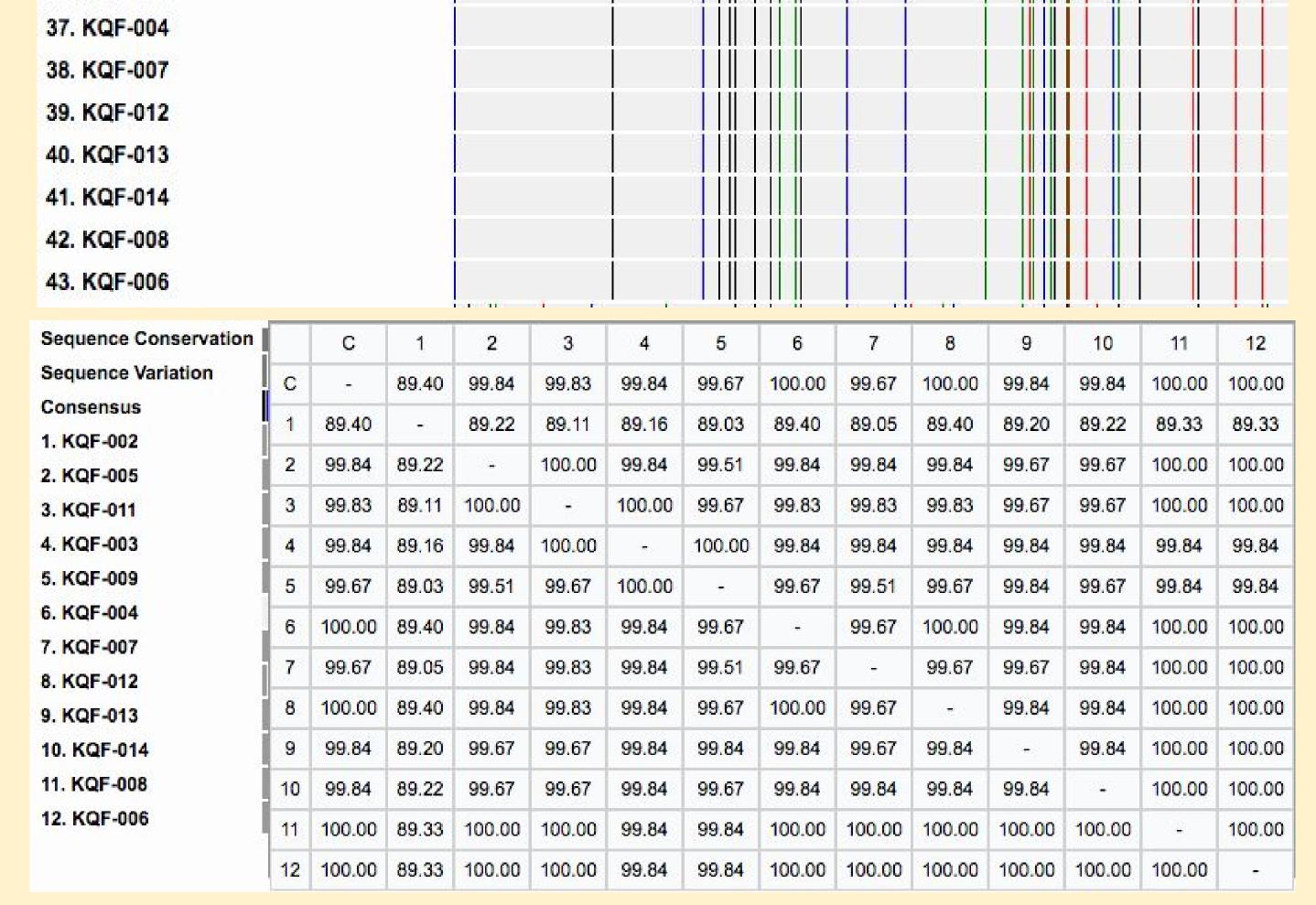
009- Red Batata Korean Yam

011- Japanese Yam

012- Orange Blossom Sweet Potato

013- Sweet Potato

014- Sweet Yam



- The blast results showed that the gene sequence for sample 002 was very different from the sequences of all the other samples. The sequence of sample 002 had 89% similarity to all the other sequences.
- The gene sequences of all the other specimens showed to be almost exactly the same. They all had either exactly 100% similarity or very close to it. When comparing these sequences to known sequences, they showed 100% similarity to the species *Ipomoea Lacunosa*, a flowering plant native to the united states that is in the same genus as *Ipomoea Batatas*, the sweet potato. This means that all of these samples are sweet potatoes, not yams.
- Sample 2, the real Ghana yam, was most closely related to the plants *Dioscorea Japonica, Dioscorea Cirrhosa*, and *Dioscorea Persimilis* (99.67% similarity).

Discussion

Our hypothesis proved to be correct: everything we bought from mainstream grocery stores and farmers markets were sweet potatoes, even if they were labeled as yams. All these samples were most closely related to *Ipomoea Lacunosa*, a plant in the same genus as the sweet potato. The authentic yam had a completely different sequence compared to all the other samples. This makes sense because sweet potatoes and yams are in different families. The Ghana yam was most closely related to three known species of yam in the genus *Dioscorea*.

Stores really don't know that there is a difference between a sweet potato and a yam. People should be made more aware what is being marketed and what they are actually buying. It is the role of the consumer to make sure that what they are buying is truly what is being marketed. People are misinformed and just don't understand where their food comes from and what it actually is. The general population is not going to the farm and seeing the difference between the actual plants- yams and sweet potatoes. Thus, we hope that with the findings of this project, the consumers can become more aware of whether they are actually buying the sweet potato or yam that is being marketed.

Some further questions that can be researched are: Do these results span beyond NYC and the tri-state area? What are the health benefits of sweet potatoes vs. yams? Are people in NYC lacking in the nutrients that they could be getting from real yams?

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