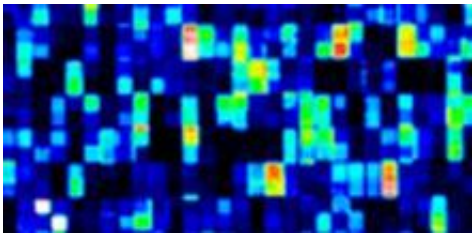


Genome sequencing project sheds light on origin of the date palm

November 9 2015



They are as ubiquitous in the Arab world as camels and shifting sands, and its fruit is required eating at special occasions and during Muslim holidays. Yet as inseparable as the date palm might seem from today's Middle East, one question remains: how did they become what they are today?

Now, researchers at NYU Abu Dhabi have developed a map of genetic changes across the genome of date palms. They have also established genetic differences between Middle Eastern and North African date palms, an important discovery that sheds light on that long elusive question.

In a new paper published in *Nature Communications*, researchers at the Center for Genomics and Systems Biology at NYUAD have identified more than 7 million mutations or nucleotide polymorphisms that are

found between date palm varieties. They have also identified genes that may be important in fruit ripening, fruit color and disease resistance in dates.

The study also offers two possible explanations for the crop's origin. One suggests that contemporary date palms descend from two distinct domestication events—an early event in the Middle East, and a later one in North Africa. A second hypothesis proposes that date palms were first cultivated in the Middle East and later spread to North Africa, but somewhere along the way North African dates were crossed with a wild predecessor.

The research is part of the 100 Dates! genome sequencing project led by Dorothy Schiff Professor of Genomics Michael Purugganan. The project's goal is to learn more about the traits and evolution of the date palm through analysis of the plant's genome. "The data on diversity in the genomes helps us to identify genes that may help develop better date palms," said Purugganan, who is also a professor of biology. "It also tells us how date palms evolve, and provides clues as to where date palms came from."

Evidence from archeological digs suggest that the origin of domesticated dates is in the Gulf. Seeds have been found on Dalma Island, Abu Dhabi that are more than 7,000 years old. Cultivated dates seem to appear about 3,000 years later in North Africa, according to excavation of ancient sites.

The team analyzed the genome of 62 varieties of date palm from 12 countries. Seventeen samples came from North Africa; 36 inhabit the Middle East; nine are native to South Asia. The work was a collaboration between NYUAD and UAE University, as well as other researchers in Dubai, Iraq, US, Syria, Tunisia, Pakistan and Qatar.

The wild ancestor of the date palm is elusive, but identifying one would provide scientists with valuable information. Khaled Hazzouri, senior research scientist at NYUAD and lead author on the paper, entitled Whole genome re-sequencing of date palms yield insights into diversification of a fruit tree crop, says: "It is important to know the identity and geographic origin of the wild progenitor of a domesticated species because it will help us understand the evolutionary process underlying domestication and the nature of the [genetic changes](#) underlying domestication."

Purugganan, Hazzouri, and the team also discovered a genetic mutation that causes the trees to produce either yellow or red fruit. Interestingly, the date palm shares this genetic mutation with its very distant cousin, the oil palm. These two plants are separated by approximately 60 million years of evolution, so it's surprising that genes in both species would code for the same trait. "This similarity tells us that evolution uses the same genes in different species to get the same result," Purugganan said.

It's possible that information like this could be used by plant breeders to engineer date varieties that have particular traits. For example, since some varieties of date palms can live on water with high salinity, farmers who grow crops in arid terrain could plant [date palm](#) varieties suitable for that type of climate.

The 100 Dates! project is still in its first phase, and there is considerable research yet to be done. The next phase will include obtaining more samples and mapping important genes, and future research will include collaborations with researchers at UAE University in Al Ain and the University of Baghdad.

Provided by New York University

Citation: Genome sequencing project sheds light on origin of the date palm (2015, November 9)
retrieved 2 May 2024 from <https://phys.org/news/2015-11-genome-sequencing-date-palm.html>

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