

## This Week in Genomics September 18,2023

### First Crop's Genome Sequenced

[https://agupdate.com/agriview/news/crop/first-crops-genome-sequenced/article\\_20d710af-4603-5a0a-89aa-5f37f6608fe0.html](https://agupdate.com/agriview/news/crop/first-crops-genome-sequenced/article_20d710af-4603-5a0a-89aa-5f37f6608fe0.html)

An ***international team*** of researchers recently ***sequenced the complete genome of Einkorn wheat*** – considered to be the ***world's first domesticated crop***. The team traced its evolutionary history, which is expected to help researchers ***identify genetic traits such as tolerance to diseases, drought and heat***.

“The most exciting thing about having this genome sequenced is that ***Einkorn is truly a model species*** that we can use for ***research*** not only as a reference ***for bread wheat***, but for ***other small grains such as rye, barley and oats***,” said Adam Schoen, the study's co-first author and a doctoral student working with Vijay Tiwari, an assistant professor in the University of Maryland-Department of Plant Science and Landscape Architecture.

***Einkorn was farmed as early as 12,000 years ago*** but as ***agriculture expanded*** around the world, people ***replaced it with bread wheat***. Bread wheat was ***selectively cultivated*** for ***traits*** such as ***large grain size and easy threshing***, according to the researchers.

***Through centuries of intensive cultivation and selection bread wheat lost its natural resistance to drought, heat and pests***. But ***Einkorn***, which is ***still grown in a variety of environments*** and used in certain rustic breads, hasn't undergone such intense selective breeding. That means ***it maintains many of its resilient properties***. Both wild and domesticated varieties of Einkorn exist, according to the researchers.

***Determining*** which of the hundreds of thousands of ***genes in bread wheat is responsible for resilient properties is daunting***. That's where Einkorn enters. Tiwari leads a ***large-scale breeding program that aims to reintroduce resilience genes into bread wheat and is using Einkorn to help***.

By ***comparing the Einkorn genome*** with the ***bread wheat genome***, which was sequenced in 2018, ***researchers can now look for mismatches***. That ***narrows potential targets for genetic traits*** that differ between ancient and modern grains.

The ***researchers sequenced*** both the ***domestic and wild variety of Einkorn***. They ***identified about 5 billion base pairs*** that combine to ***comprise individual genes and placed them in order***.

***Einkorn can be used to map traits in bread wheat***. The researchers showed that ***both grains share the same gene for influencing the number of shoots a plant produces***. They've ***begun identifying economically important genes*** and are ***selectively breeding them*** into bread wheat.

The ***reference genome*** enables scientists to ***trace the evolutionary history of Einkorn wheat***, which provides ***insight into human history***. The researchers found ***Einkorn has been hybridized many times since its initial domestication*** and ***dispersal throughout Europe and Central Asia***. An ***analysis of the genome*** could ***inform anthropological studies of human migration and settlement***.

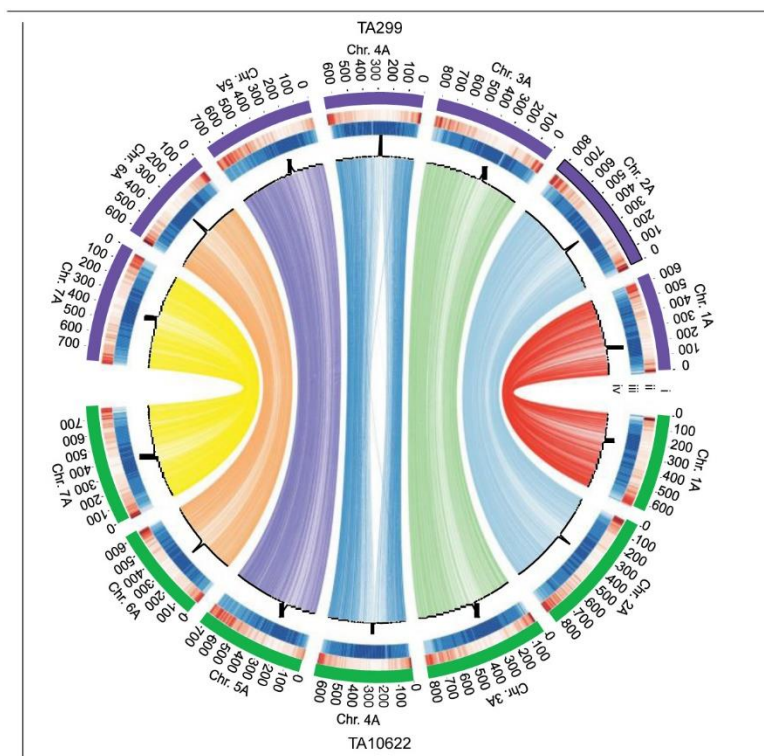
***Another advance*** from the study was the ***speed with which researchers sequenced the Einkorn reference genome***. Although it took more than a ***decade for researchers to sequence the bread wheat genome***, the

current study was ***completed in little more than a year***. The researchers credit the ***collaboration of international experts in the wheat breeding*** consortium that Tiwari leads. With ***experts in six countries on four continents***, the team has applied advanced methods and technologies from various specialty areas to the task.

Tiwari said, “We’re ***not only breeding einkorn genes into bread wheat***, we now have a chance to ***improve Einkorn to make it easier to grow and harvest.***”

The study recently was published in ***Nature***. Visit [nature.com](http://nature.com) – search for “***Einkorn***” – for more information.

**Comparison of wild and domesticated einkorn wheat. Einkorn is thought to be an ancestor of modern wheat.**



**Phylogenetic relationship between wild and domesticated einkorn wheat genotypes. The domesticated genotypes represent only a subset of the full variation found in the wild population. Notice that the “yellow” sequence background (=  $\alpha$  einkorn background) is not represented in the domesticated genotypes.**

