

RGCB Scientists revealed the evolutionary history of the prehistoric rice *Shashtika* (Njavara) through genetic analysis

Dr. George Thomas and his team at Department of Biotechnology's autonomous institute Rajiv Gandhi Centre for Biotechnology (RGCB), Thiruvananthapuram analyzed the DNA sequence level relationships between 600 samples including Njavara individuals, the rice cultivars belonging to the five ancestral sub-groups: *indica*, *tropical japonica*, *temperate japonica*, *aromatic* and *aus* and the populations of the wild rice. The cultivated rice is domesticated from the wild rice species, *Oryzafipogon*, presumably, 5000-8000 years ago at different parts of Southeast Asia. The rice cultivars are extensively transported across the geographic boundaries in the past for cultivation, whereas the progenitor wild rice remained in their native habitat as they possess no economic value. The geographic center of domestication of a rice cultivar can, therefore, be determined based on the place of the occurrence of wild rice, which is genetically closest to the rice cultivar in question.

Dr. Thomas's team showed that Njavara is a distinct *aus* strain, and domesticated in the Central India-Southeast Asia region. Presumably, Njavara reached Kerala concomitant with the spread of Ayurveda, which is assumed to be orchestrated by Buddhist monks during the late BC or early AD, from the North Indian region of Indo-Gangetic plains, an epicenter of ancient rice cultivation. Development of several important treatments by Ayurveda physicians (*Vaidyas*) of Kerala in the past using Njavara grains may have perpetuated its cultivation in Kerala. It is possible that farmers abandoned *Shashtika* strains in other parts of India due its very low yield. The on-farm selection of Njavara performed by farmers using 60 days maturity may have helped to retain its genetic purity over millennia as days to maturity and several morphological traits are co-regulated in rice. Further, the data strongly indicate a possibility that Njavara is the earliest domesticate of rice in India and is developed from local wild rice populations and not a secondary product of *japonica* hybridizations, the method postulated by Chinese workers for the evolution of rice in India.

The *Yajur Veda* and the *Atharva Veda* (circa 1900 – 500 B.C.) as well as the seminal Ayurveda compendium like *Charaka Samhita* (circa 660 - 1000 B.C.) and many subsequent Sanskrit literature have described a set of rice with 60 days maturity called *Shashtika*. *Shashtika* is known Njavara in Dravidian etymology and Njavara is the only *Shashtika* known today. Paradoxically, Njavara cultivation is localized in Kerala and people believe that Njavara is evolved here. Its grains are indispensable for traditional Ayurveda treatments such

as the most acclaimed *Njvarakizhi* therapy. Here emerges an interesting question, how Njavara, which is referred in Sanskrit literature circulated in Northern India for over four thousand years became geographically localized in the southernmost state, Kerala.

References:

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