

Sustainable conservation and utilization of genetic resources of two underutilized crops – finger millet and foxtail millet – to enhance productivity, nutrition and income in Africa and Asia

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

Country/Region:	India, Kenya, Tanzania and Uganda
German participation	University of Hohenheim
Leading scientist:	Dr Hari D. Upadhyaya
Duration:	Jan 2008 – Dec 2010

Initial situation

Both finger millet and foxtail millet, unlike other cereals, have remained neglected from the mainstream of crop improvement research; however, they are widely grown in Asia and Africa. In addition to narrow genetic base, researchers have had limited access to genetically diverse germplasm with beneficial traits. In both the crops, representative core collections (10% of entire collection) are now available, which can be used to identify new sources of variation. The developments in marker technology and high throughput assay should enable us to dissect the population structure and diversity in these subsets to identify trait-specific genetically diverse germplasm.

Approach of the project

Using multilocation data on core collections, it is proposed to develop mini core collections and identify trait-specific germplasm, which will be further multilocally evaluated to identify 10-15 genetically diverse germplasm with beneficial traits for sustainable conser-

vation and use by farmers and researchers across the globe. Molecular profiling will be done to dissect population structure and diversity to identify trait-specific genetically diverse germplasm. It is proposed to present to the farmers the extent of genetic diversity locked in genebank, which will give them the opportunity to select the germplasm that they think might do well in their environments. Multidisciplinary approach will be used to enhance rural livelihoods and household food and nutritional security of the farmers engaged with cultivation of these crops in Asia and Africa. The participating National Agricultural Research Systems (NARS) will also be encouraged to use the DNA marker technology in diversity assessment and marker-aided genetic enhancement.



Major results achieved

Using multilocation core collections evaluation data, a mini core collection (10 % of core or 1% of entire collection) in finger millet (80 accessions) and foxtail millet

(35 accessions) were developed, which are being further evaluated to identify 10-15 germplasm lines for on-farm evaluation, conservation and use by farmers and researchers in Asia and Africa.



A number of trait-specific germplasm, i.e., early maturity, high grain and fodder yield, and seed micro nutrient (Fe and Zn) dense, were identified. Using mini lysimeter or pot screening technique, a number of drought and salinity-tolerant finger millet germplasm were identified. Greenhouse screening technique for blast (*Magnaporthe grisea*) has been standardized, a progressive 1-5 scale (where 1= <1% area infected and 5=>50% leaf area infected with typical lesions of blast) has been developed, and few finger millet accessions with resistance to neck and finger blast were identified. Finger millet (622 accessions) and foxtail millet (155 accessions) core collections were molecularly profiled, respectively, using 32 and 23 Simple Sequence Repeats (SSR), with plans to generate additional 20 SSR loci

data in both the crops to assess population structure and diversity.

Expected impact

The availability of mini core collections will enable researchers to identify new sources of variation associated with beneficial traits, which will be used to enhance the genetic potential of these crops, leading to the development of new cultivars. Researchers will have access to methodology and protocol to screen for resistance to biotic and abiotic stresses. Farmers will have access to agronomically superior and seed micronutrient-dense lines for on-farm evaluation and conservation to enhance their food and nutritional security.



Collaborating institutions: Acharya N G Ranga Agricultural University, Rajendranagar, India; University of Agricultural Sciences, Bangalore, India; Rajendra Agricultural University, Dholi, India; Kenya Agricultural Research Institute (KARI); Uyoile Agricultural Research Institute, Tanzania; National Semi-Arid Resources Research Institute (SAARI), Uganda

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