GCP Sub-Programme 1: 2006 Commissioned Research Project #30

Development of composite collection and genotyping of foxtail millet [*Setaria italica* (L.) Beauv.] composite collection

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Diversity in foxtail millet germplasm.

Regeneration of foxtail millet germplasm.

Introduction

- Foxtail millet belongs to family *Poaceae* and subfamily *Panicoideae*
- A self-pollinating crop with chromosome number 2n=18
- Domesticated in highlands of central China, possibly about 4000 BC
- Cultivated in 26 countries, and ranks second in total world production of millets
- Produces six million tons of food mainly in southern Europe and in temperate, subtropical, and tropical Asia (Marathee 1993)
- An important crop in China, India, CIS countries, and Syria
- Possesses high nutrient quality.

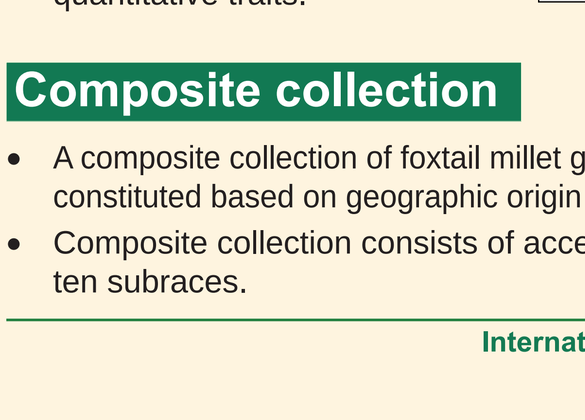
Nutritional value of foxtail millet grain (100 g^{-1})

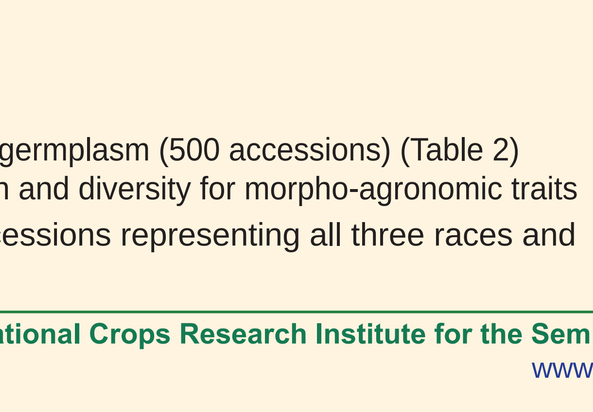
- Protein content: 10% to 12%
- Lysine content: 2.29% to 2.7%
- Fat content: 4% to 5%
- Energy: 351 kcal
- Thiamin: 0. 59 (mg)

Classification of foxtail millet germplasm

Two *Setaria* species are known:

1. *S. glauca* and *S. italica (*Sub sp*: viridis and italica)*
2. *S. italica* consists of three races*:* Moharia, Maxima and Indica; and ten subraces*:* Aristata, Fusiformis, Glabra, Compacta, Spongiosa, Assamense, Erecta, Nana, Glabra and Profusa.





Status of foxtail millet germplasm at ICRISAT

- The entire foxtail millet germplasm (1535 accessions) characterized for important morpho-agronomic characters following descriptors for *S.italica* and *S.pumila* (IBPGR 1985)
- Collection consists of 1470 landraces, 11 improved cultivars and 54 wild accessions
- A core collection (155 accessions), representing entire diversity, was developed based on geographic origin and quantitative traits.

Table 1. Major holdings of foxtail millet germplasm in the world.

Genebank/Country	Number of accessions
ICRISAT, India	1535
AICSMIP, UAS, Bangalore, India	1300
National Genebank, China	26222
NIR, Russia	4745
ORSTOM-Montpellier, France	3500
Others	17487
Total	**54789**

Composite collection

- A composite collection of foxtail millet germplasm (500 accessions) (Table 2) constituted based on geographic origin and diversity for morpho-agronomic traits
- Composite collection consists of accessions representing all three races and ten subraces.

Table 2. Accessions in foxtail millet composite collection.

Trait	Number of accessions
1000 grain weight > 3.7 g	9
Grain weight per plant > 19 g	5
Basal tillers > 29	25
Core collection	155
Dwarf (<= 50 cm)	21
Early flowering accessions (< 40 days)	77
Improved cultivars	10
Short inflorescence length (<=50 mm)	40
Long Inflorescence length (>299 mm)	18
Short inflorescence width accessions (=5 mm)	23
Widest inflorescence accessions (>39 mm)	25
Mono culm types (single tiller per plant)	59
Agronomically elite accessions	33
Total	**500**

Genotyping

Leaf sample of 20-day old seedling of single representative plant from each of 500 accessions taken and DNA extracted by high-throughput procedure.

Primer optimization

- No SSR markers are available in foxtail millet
- SSR markers from closely related species identified
- Thirty-one unlabelled pearl millet SSR markers selected to genotype 8 diverse foxtail millet accessions (representing five countries)
- Primer optimization with Taguchi method (Taguchi et al. 1986) as described in Cobb and Clarkson (1994)
- Twelve markers showed polymorphism
- Additional SSR markers will be selected from other closely related species such as maize and sorghum.

Future plan

- Genotyping 500 accessions of composite collection using 20 SSR markers
- Identifying a reference collection consisting of most diverse accessions for use in crop improvement program.

References

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