Priorities and strategies for conservation of crop wild relatives at Indian National Genebank

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ENHANCED GENEPOOL UTILIZATION – Capturing wild relative and landrace diversity for crop improvement , NIAB Innovation Farm, Cambridge, UK, 16–20 June 2014

To act as nodal institute at national level for acquisition and management of indigenous and exotic plant genetic resources for food and agriculture, and to carry out related research and human resource development, for sustainable growth of agriculture.

NBPGR's long term goal is to develop scientific consensus on a broad PGR management strategy, which encompasses, *inter-alia*, the role and responsibility of different disciplines in research with an aim of enhanced utilization of the PGR for achieving food and nutritional security for all times to come.

CONSERVATION STRATEGIES FOR PLANT GENETIC RESOURCES

Plant biodiversity	Genetic material	Conservation strategy/ method		Place of conservation
				
			*Ex situ* Static Conservation	
				
				
			*In Situ* Dynamic conservation	
	Populations			

The Indian National Genebank (NGB) consisting of

Seed Genebank (-18^{0}C),

Cryogenebank (-170 to -196^{0}C) and

in vitro Genebank (25^{0}C)

conserves the national heritage of PGR in the form of seeds, vegetative propagules, tissue culture, budwoods, embryos/embryonic axes and pollen and caters to long-term as well as medium-term conservation.

About 0.4 million accessions belonging to nearly 1,800 species are conserved in the NGB comprising 0.39 in the seed genebank, 9,000 in cryogenebank, 2,000 in the in vitro genebank.




WHY THE CWRs are IMPORTANT

- Wild relatives of cultivated crops ----- vital source of untapped genetic diversity

- Traits allowing them to be successful at the current extremes of a crop's range

- Wild relatives possess genes to cope with a wider range of environments and stresses ---heat and drought tolerance, pest and disease resistance and the ability to thrive in saline soils.

Genet Resour Crop Evol (2014) 61:861–874
DOI 10.1007/s10722-014-0085-6

RESEARCH ARTICLE

Stem and leaf rust resistance in wild relatives of wheat with D genome (*Aegilops* spp.)

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Received: 17 May 2013 / Accepted: 13 January 2014 / Published online: 30 January 2014

Abstract Resistance to stem rust and leaf rust in five D genome species of wheat viz., 267 accessions of *Aegilops tauschii* Coss., 39 of *Ae. cylindrica* Host, 17 of *Ae. ventricosa* Tausch, 4 of *Ae. crassa* Boiss. and 8 of *Ae. juvenalis* (Thell.) Eig were evaluated at adult plant stage. Two hundred and thirty nine (90 %) accessions of *Ae. tauschii*, 30 (77 %) of *Ae. cylindrica*, 16 (94 %) of *Ae. ventricosa*, 3 (75 %) of *Ae. crassa* Boiss. and 5 (62.5 %) of *Ae. juvenalis* were resistant to stem rust pathotypes prevalent in South India at Wellington under field condition. Invariably, all the accessions of the five species were resistant to leaf rust pathotypes. Quantitative measurement of disease using area under the disease progress curve revealed the slow progress of disease in the resistant accessions compared to susceptible check (Agra Local). Since all the five species have D genome, it could be concluded that the genes present in D genome might play a vital role in leaf rust resistance, but in case of stem rust resistance wide range of differential response was noticed. Among the species evaluated, *Ae. tauschii* was exploited to a larger extent, followed by *Ae. ventricosa* and *Ae. cylindrica* for leaf and stem rust resistance because of the homology of D genome with hexaploid bread wheat. While, *Ae. crassa* and *Ae. juvenalis* could not be utilized so far, possibly due to partial homology which makes the transfer of traits difficult. So, these species have considerable potential as a source of rust resistance and may enhance the existing gene pool of resistance to stem and leaf rusts.

Keywords *Aegilops* spp. · D genome · Leaf rust · Stem rust

Introduction

The genus *Triticum* L. comprises of diploid, tetraploid and hexaploid species. In earlier times, several *Triticum* species were cultivated, but now production is restricted to hexaploid common or bread wheat (*T. aestivum* L. s. str.), tetraploid durum wheat (*T. durum* Desf.) and tetraploid dicoccum wheat (*T. dicoccon* Schrank). Stem or black rust (caused by *Puccinia graminis* Pers. f. sp. *tritici* Eriks. et Henn.) and brown or leaf rust (caused by *Puccinia triticina* Eriks.) continue to be a serious threat in many wheat growing regions of the world. Both diseases can cause substantial yield losses in susceptible cultivars. Resistant cultivars are the cheapest, most

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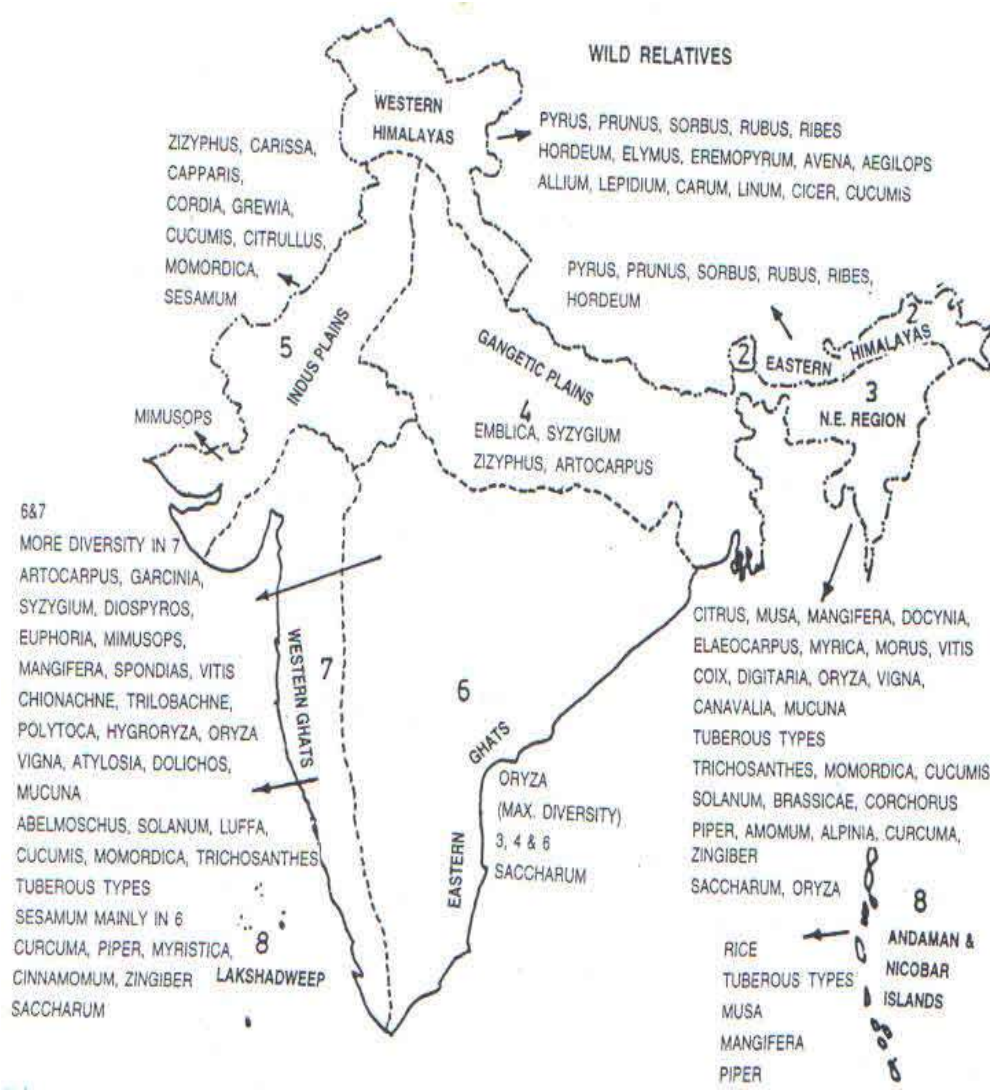
Methodology

- PGR Collection database with Genebank databases
- Surveying the authentically published literature to access the status of CWR in India
- Gap analysis for missing species and within species, which regions are not or under-represented

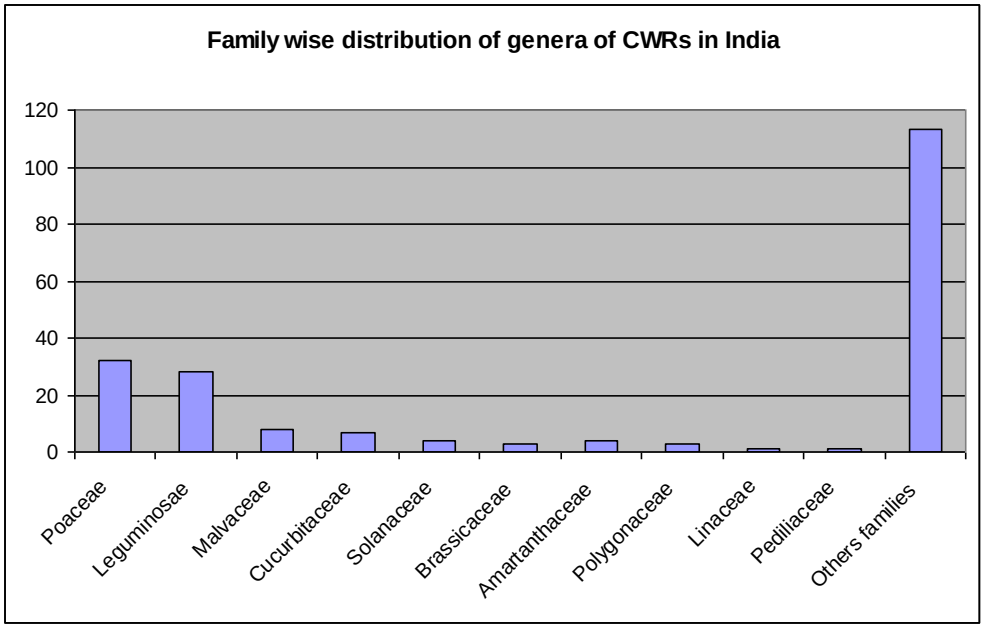
Distribution of Crop Wild Relatives in India

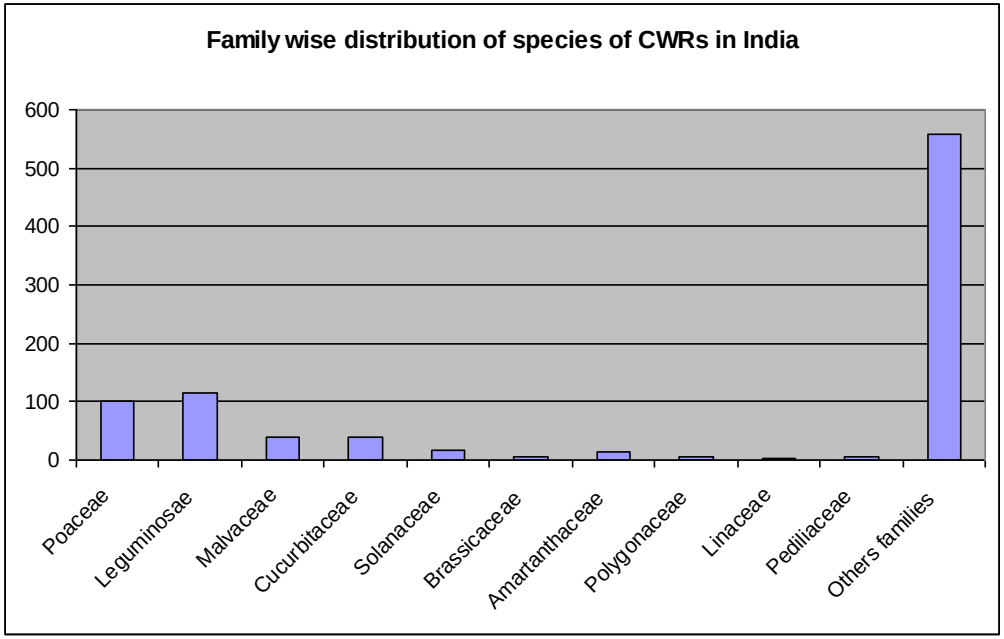


Source NBPGR Agro-Biodiversity (PGR) - 41 on Wild Relatives of Crop Plants in India-Collection and Conservation

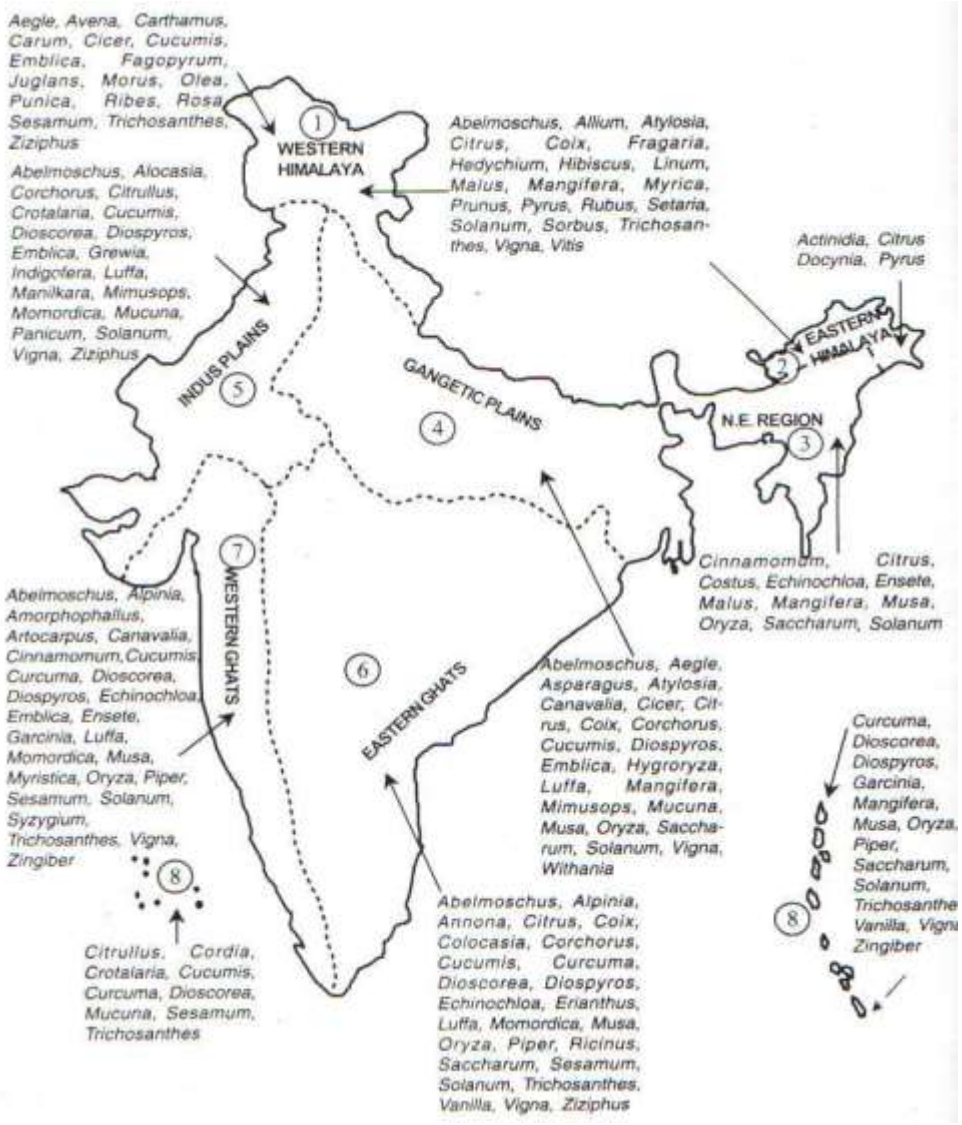
Hygrorhiza aristata, a closely related species of genus *Oryza* in its natural habitat (Kanjia lake of Nandankanan, Orissa)

A red-seeded, awned wheat landrace (*Pahari geyun-Ryat*) from Bageshwar district, Uttarakhnad


Family wise distribution of genera of CWRs in India
120
100
80
60
40
20
0
Poaceae
Leguminosae
Malvaceae
Cucurbitaceae
Solanaceae
Brassicaceae
Amartanthaceae
Polygonaceae
Linaceae
Pediliaceae
Others families


Family wise distribution of species of CWRs in India
600
500
400
300
200
100
0
Poaceae
Leguminosae
Malvaceae
Cucurbitaceae
Solanaceae
Brassicaceae
Amartanthaceae
Polygonaceae
Linaceae
Pediliaceae
Others families

Collection and Conservation of CWRs



Crop group	No. of Species reported in India	No. of species available in NGB	Not Present in NGB
Cereals & Millets	61	15	46
Grain legumes	48	20	28
Oil seeds	12	8	4
Fibers	28	12	16
Vegetables	69	39	30
Total	218	94	124

Source NBPGR Agro-Biodiversity (PGR)-41 on Wild Relatives of Crop Plants in India-Collection and Conservation

S.No.	No of Species of CWR	Representation in NGB (Accessions)
1	44	Zero
2	19	1-10
3	22	10-50
4	*Carthamus oxycantha*	96
5	*C. ensiformis*	106
6	*Vigna trilobata*	167
7	*Sesamum mulayanum*	430

Priority areas for Amaranth species –A neglected underutilized species (NUS species)

- *Amaranthus atropureus* Roxb. (Amaranthaceae) from Gangetic delta region of West Bengal
- *Amaranthus mangosteanus* Linn. Eastern Ghats and Western Ghats
- *Amaranthus polygamus* Linn. Syn. *A. tricolor* Linn. from Eastern Ghats and Western Ghats

Priority areas

- *Chionachne koenigii* (Spreng.) and *Chionachne semiteres* (Benth.) from Tarai region, Dehra Dun Valley (Uttaranchal), Western Ghats, Maharashtra and southwards; Tamil Nadu
- *Sorghum halepense* (L.) Pers.) from Deccan Penninsular Region
- *Cajanus platycarpus* from Semi- arid and Dry forests from Jammu to Bihar, Orissa to Dadra 7& Nager Haveli, Dhaman & Diu, Gujarat, Rajasthan
- *Vigna khandalensis* --Western Ghats, Pune,Khandala (Maharashtra)
- *Cicer microphyllum Royle* from North Western Himalayas (2700-3550 m)
- *Cajanus rugosus* (Wight &Arn.) Maesen. From Eastern and Western Penninsular tract of India

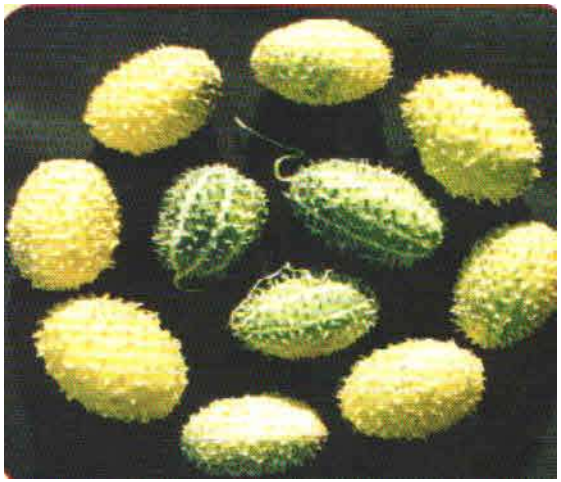
Dysoxylum malabaricum

Calamus pseudotenuis

पश्चिमी घाट से लाई गई उपरिभूमि
धान की लैंडरेसेज में विभिन्नता

मोमोर्डिका चरनतिया, एक दुर्लभ लैंडरेस (रूद्रकशहली)
जिसे कर्नाटक के पश्चिमी घाट से एकत्र किया गया

'Aanakkodan', a salinity tolerant deep water rice landrace



Cucumis prophetarum

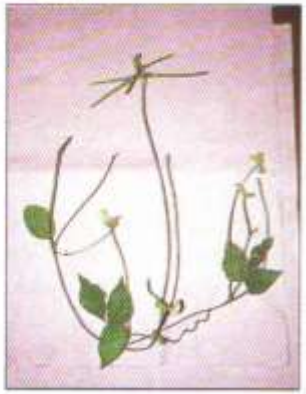
WILD SPECIES GERMPLASM COLLECTED UNDER NATP PROGRAMME FROM PARTS OF RAJASTHAN

Vigna radiata var subtobata

Abelmoschus ficulneus

Cucumis hardwickii

Sesamum mulayanum



Vigna verittata

Sesamum alatum

Thanks to the organizers for this opportunity to participate and witness this CWR Knowledge Ocean

To my authorities in India (ICAR, DARE and NBPGR) for allowing me to attend this conference.

To Bioversity International for supporting my participation,

Finally to Almighty God for making this happen rightly.

Thanks to all for patient hearing