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Cashew Germplasm Bank for Plain areas of Karnataka

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ABSTRACT: The cashew germplasm bank located in HREC, Hogalagere, holds 50 accessions and all of them belong to *Anacardium occidentale* L. Introduction of plants into the germplasm bank started at HREC, Hogalagere from 2012. In recent times, the focus of cashew germplasm bank is to evaluate, document and conserve the plant material for further use to enhance the nut yield characters in cashew crop and to serve as basis for agronomic and morphological characterizations of accessions for the support of breeding programs. The accessions are being evaluated for their morphological, vegetative, flowering and nut yield attributes. The genetic variability contained in the collection is being used to develop hybrids with preferred cashew clones. The genetic basis of cashew has been expanded by natural and artificial hybridization with regular cashew genotypes from the germplasm bank, to increase the nut weight, size, shelling percentage and lustering characters of nut.

Keywords: *Anacardium occidentale*, characterization, evaluation, genetic resources, plain region.

INTRODUCTION

Cashew (*Anacardium occidentale* L.) is one of the world's major edible nut crops and ranks with hazelnuts and almonds in the international trade. It was spread from tropical America to other parts of the tropics by the early Portuguese and Spanish travellers (Ohler, 1979). It is usually propagated from seeds because it is readily available and easy to germinate and grow, even under adverse soil and other conditions. The cashew is highly cross-pollinated and as a result, flowers are attractive to bees, variability between trees is wide with respect to vigour in vegetative growth parameters, times of flowering, yields, and quality traits of nuts etc. Cashew is well adapted to seasonally wet and dry tropical climates and has the capacity to grow and yield satisfactorily on well-drained, light textured soils with minimum inputs. This indicates that, cashew has a very good adaptability to wide ecological differences (Hammed *et al.*, 2008).

The current cashew crop production of 7.79 lakh tonnes under 10.41 lakh ha and productivity of 753 kg/ha (Source: ICAR–DCR, Puttur) is fulfilling only 50 per cent requirement of the cashew processing industries located in India. So there will be enormous scope for production of cashew in coastal and non coastal regions (Plain areas). Since Cashew is a crop of coastal region, but to some extent cashew crop also comes up well under plain areas of Karnataka. Hence, to create variability, to bring new varieties and to development hybrids needs lot of germplasm resources even in the non coastal regions.

It is highly cross pollinated, highly heterozygous (Murthy *et al.* 1984; Sena *et al.* 1995), so having wide variation for number of characters including growth, quality parameter, fruiting season, various colored hypocarp with different shape and size, yield, kernel nut size. The cytogenetic aspects of this crop has not been studied much, different scientist reported different chromosome 2n=24, 2n=34, 2n=40 etc, such chromosomal polymorphism (Dadzie *et al.*, 2014) is well known in many domesticated species. But, practically no information is available on genetics of

crop. *Anacardium* is important genera in the family Anacardiaceae, Cashew (*Anacardium occidentale* L.) belongs to the *Anacardiaceae* family, which comprises about 70 genera and 600 species. Cashew plants vary in size from shrubs (rarely shrubs) to large trees, and are mainly restricted to tropical and subtropical regions, with relatively few representatives in temperate climates (Barros *et al*., 1999). The cashew nut and peduncle are used for human consumption and have high nutritional importance (Santos *et al.,* 2007). The CNSL is used for making phenolic resins and friction powders for the automotive industry and it also contains bioactive substances. The wood is suitable for construction and carpentry. Large populations of cashew trees are found in natural forests and road side natural vegetation in maidan parts of Karnataka and show variability in physiological and morphological characters. However, little is known about this variability, as well as its potential use in commercialization.

Despite all the social importance and economical potential, many natural plant materials found in the wild, have a strong tendency to diminish or even disappear due to irrational exploitation of the ecosystems in which they occur (Salleh *et al.* 1989). Along with these genetic resources, a range of favorable genes and desirable traits like, e.g., fruit quality, resistance to pests and diseases, adaptation to different cropping systems and high productivity, could become extinct by genetic erosion. (Nayak, M.G. Muralidhara, 2019; Gowda *et al.,* 1989)

The introduction of material into this cashew germplasm bank, the main source of adequate materials for the development of commercial products, started in the 1980s. The aim of this presentation is to describe the main activities and goals of the cashew germplasm bank of maidan parts of Karnataka .

MATERIALS AND METHODS

The experiment was laid out under AICRP on Cashew at Horticulture Research and Extension Centre, Hogalagere.

The cashew germplasm bank of maidan parts of Karnataka at HREC, Hogalagere (Fig. 1) which comes under Region III, Zone-5 (Eastern Dry Zone) of Karnataka and the coordinates are 13°19' North latitude and 78°16′ East longitudinal at an altitude/elevation of 854 m above Mean Sea Level (MSL). Among the agro-climatic zone of Karnataka, Hogalagere has benefits of both South-West and North-East monsoons. The type of soil was lateritic Sandy in texture and recommended RDF (500:250:250 NPK) 10 kg FYM making of round trench of 30cm × 20cm size was followed uniformily for entire trees at experimentation. The annual average rainfall for the last 115 years is 722 mm per year. The principal activities of the germplasm bank are conservation, collection, characterization and documentation of the accessions of cashew. Collection activities started from long back and have been continued till date. The cashew trees are planted at 6m × 6m, with a minimum of six replications. Experimental data presented refer to the observations in the years 2018 to 2020.

RESULTS AND DISCUSSION

The cashew germplasm bank holds 50 accessions and morphologically, this species shows variability in many of the morphological traits of vegetative growth and yield (Figs. 1 and 2) (Dorajeerao *et al*., 2002). Results from observations (five years age trees) of yield characters are presented (Table 1) and germplasms selected as male parents for hybridization work are listed along with the characters of importance based on which they have been selected for breeding work. Nut weight ranged from 4.7 g to 12.0 g, Nut yield ranged from 0.4 Kg to 4.8 Kg per tree, Shelling percentage ranged from 25 % to 31 %. The highest nut weight was recorded in HREC-11 (12.0g), highest nut yield was recorded in HREC-27 (4.8Kg/tree) and Maximum shelling percentage was noticed in HREC-44 (31 %). Some studies says that there is positive correlation (Anitha *et al.,* 1991; Manoj *et al.* 1994) between nut yield and flowering per shoot. Also, the total canopy area, number of perfect flowers, percent of fruit drop. weight of kernel, mean canopy spread, number of nuts/panicle, girth of tree, leaf area, duration of flowering, height of tree are also important biometric traits considered to be correlated with yield. High percent of perfect flowers are good for high yield (preferably medium sized nuts contribute towards higher yield.) (Samal *et al*. 2006; Dasmohapatra *et al.* 2012). Similarly positive correlation between nut weight & apple weight was observed. Yellow apples are often astringent & heavier than red apple. This material is still under evaluation. The high variability found among genotypes demonstrates a potential use for breeding (Masawe, 1994).

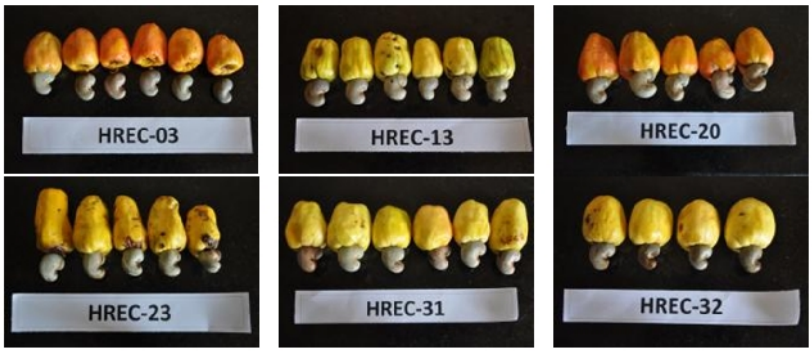

Fig. 1. Different types of Cashew fruits with nuts found in HREC, Hogalagere Germplasm Bank.

Fig. 2. Different types of Cashew fruits found in HREC, Hogalagere Germplasm Bank.

Table 1: Comparative performance of ten germplasm over three years for important economic traits maintained at HREC Hogalagere (date of planting 25-09-2014).

Sr.No.	Accession No.	Single Nut weight (g)			Yield/plant (Kg)			Shelling (%)		
Year		2018	2019	2020	2018	2019	2020	2018	2019	2020
1.	**HREC-03**	7.2	7.1	7.9	0.8	1.0	4.0	27	27	25
2.	**HREC-04**	6.6	6.4	5.8	0.6	0.5	2.9	28	29	27
3.	**HREC-06**	9.0	6.8	5.0	3.5	3.5	2.4	29	30	30
4.	**HREC-10**	7.5	6.8	5.0	2.4	1.6	4.8	26	27	25
5.	**HREC-11**	12.5	11.4	10.0	0.8	0.8	2.1	27	26	25
6.	**HREC-13**	7.4	7.1	6.3	1.1	0.5	2.9	27	28	27
7.	**HREC-14**	7.6	7.8	5.5	1.7	1.7	3.7	29	27	29
8.	**HREC-27**	7.0	7.3	5.6	4.8	4.8	3.8	13	29	29
9.	**HREC-39**	7.6	6.8	5.0	0.4	0.6	2.2	29	31	28
10.	**HREC-44**	7.5	6.5	4.7	0.6	0.7	3.9	30	31	28
	SEM ±	**0.21**	**0.17**	**0.21**	**0.27**	**0.03**	**0.08**	**0.82**	**0.58**	**1.16**
	CD at 5%	**0.61**	**0.50**	**0.62**	**0.81**	**0.08**	**0.23**	**2.44**	**1.73**	**3.43**
	CV %	**4.47**	**3.97**	**5.73**	**8.05**	**3.08**	**4.13**	**3.92**	**3.55**	**7.33**

Table 2: List of germplasm accessions used in the experiment.

Sr. No.	Accessions	Sr. No.	Accessions	Sr. No.	Accessions	Sr. No.	Accessions	Sr.No.	Accessions
1.	HREC-01	11.	HREC-11	21.	HREC-21	31.	HREC-31	41.	HREC-41
2.	HREC-02	12.	HREC-12	22.	HREC-22	32.	HREC-32	42.	HREC-42
3.	HREC-03	13.	HREC-13	23.	HREC-23	33.	HREC-33	43.	HREC-43
4.	HREC-04	14.	HREC-14	24.	HREC-24	34.	HREC-34	44.	HREC-44
5.	HREC-05	15.	HREC-15	25.	HREC-25	35.	HREC-35	45.	HREC-45
6.	HREC-06	16.	HREC-16	26.	HREC-26	36.	HREC-36	46.	HREC-46
7.	HREC-07	17.	HREC-17	27.	HREC-27	37.	HREC-37	47.	HREC-47
8.	HREC-08	18.	HREC-18	28.	HREC-28	38.	HREC-38	48.	HREC-48
9.	HREC-09	19.	HREC-19	29.	HREC-29	39.	HREC-39	49.	HREC-49
10.	HREC-10	20.	HREC-20	30.	HREC-30	40.	HREC-40	50.	HREC-50

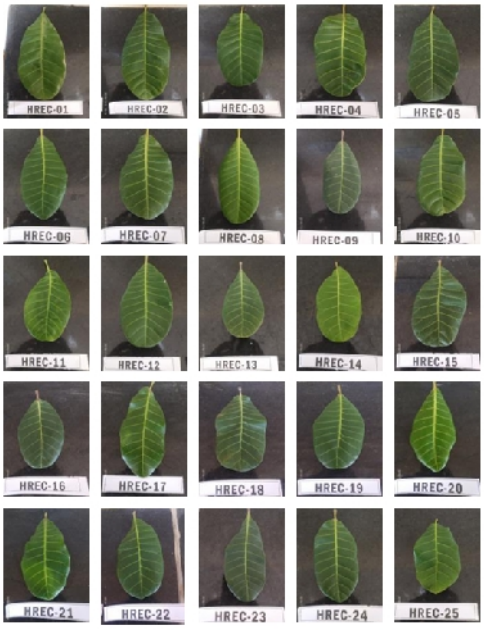

Fig. 3a. Leaf morphological variation at HREC, Hogalagere Cashew Germplasm Bank.

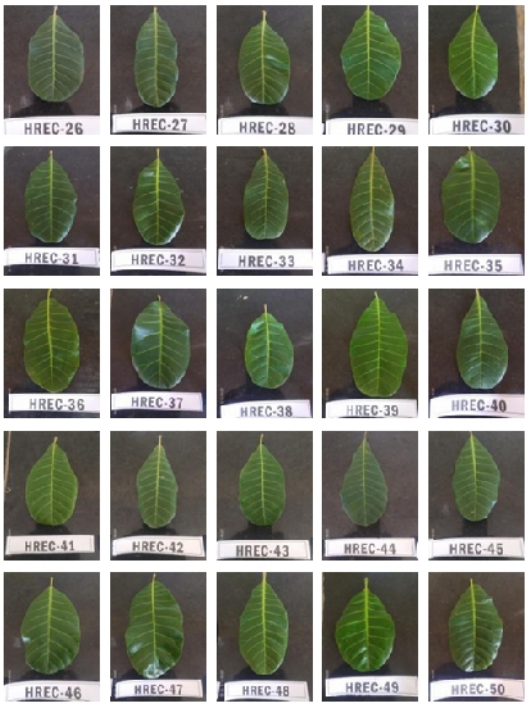

Fig. 3b. Leaf morphological variation at HREC, Hogalagere Cashew Germplasm Bank.

Fig. 4. GPS Location of HREC Hogalagere Cashew Germplasm Bank.

SUMMARY

Cashew being an important crop for commercial cultivation in plain areas in recent days need lot of genetic resources to study for bringing new varieties or hybrids with bold nut size, high yielding, dwarf, semi dwarf, CNSL free, disease and pest tolerant germplasm for dryland areas etc Being a coastal crop the cashew germplasm collection and conservation shall become a priory for its improvement at plain region, Horticulture Research and Extension Centre, Hogalagere (UHS Bagalkot) is trying in this direction.

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Conflict of Interest. None.

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