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Genetic improvement and conservation of range and forage species of arid region of Rajasthan state of India: Achievements and challenges

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Forage crops and grasses are important in arid region of Rajasthan state of India because most of the area is rainfed. Main occupation of the farmers in the area is animal husbandry. Important green fodder crops of this region are, viz. pearl millet, cowpea, cluster bean and sorghum in Kharif season and oats, lucerne and barley (dual purpose) during Rabi season. Three perennial fodder grasses, viz. *Lasiurus indicus*, *Cenchrus ciliaris* and *Cenchrus setigerus* are important in the region. Guinea grass and bajra x napier hybrid can also be cultivated where sufficient water is available throughout the year from canal irrigation or tube wells. Priority for forage crops and grasses of the region is as follows:

Table 1. Priority crops of the region

Region	Priority I	Priority II	Priority III
Arid*	<i>Lasiurus indicus</i> , moth, pearl millet	Guar	Other range grasses and legumes
Semi-arid**	<i>Cenchrus ciliaris</i> , <i>Cenchrus setigerus</i> , <i>Panicum antidotale</i> , pearl millet, sorghum, guar, lucerne	<i>Dihcathium annulatum</i> , maize, NB hybrid, oat, cowpea	Other forage crops like barley, etc.
Canal irrigated areas in arid and semi arid areas	Lucerne, maize	Berseem, guinea grass, NB hybrid	

* In arid areas, *Prosopis cineraria* and *Zizyphus nummularia* to be incorporated in the system.

** *Ailanthus excelsa* to be integrated as tree component.

With cultivation of the forage crops, grasses and legumes, growing of their improved varieties with their quality seed is important like other cultivated crops to get their more production and good quality. Genetic improvement work for forage crops and grasses for arid region of Rajasthan is being done at Agricultural Research Station, SKRAU, Bikaner under AICRP on Forage Crops. Some good varieties of fodder crops and grasses have been developed from Bikaner centre for higher productivity, viz. 'Raj Bajra-1' of pearl millet, 'Krishna' of lucerne, 'Bikaneri Dhaman' of *Cenchrus ciliaris* 'Jaisalmeri Sewan' of *Lasiurus indicus*. For other fodder crops and grasses, the varieties are recommended on the basis of varietal trials conducted at the centre. Main challenge in range grasses to develop improved varieties is presence of apomixis. Due to presence of apomixis, new variability through crosses is difficult to be created. Genetic improvement in the forage crops and grasses is mainly being done for higher fodder productivity with better quality but, in future, work on other aspects like climate change will also be required. For developing varieties under changed climate conditions, screening of the genotypes under different dates of sowing will be required to know their suitability under different temperature conditions. According to the present research for the region, the other recommended varieties are Giant Bajra and RBC-2 for pearl millet, Bundel Lobia-1 and UPC-5286 for cowpea, Bundel Guar-1 and Bundel Guar-3 for cluster bean, CAZRI-75 for *Cenchrus ciliaris*, CAZRI-76 for *Cenchrus setigerus*, Kent and OS-6 for oats, RL-88 and Anand-2 for lucerne and RD-2035 and RD-2552 for dual purpose barley.

Conservation efforts for some forage plant resources are also required. For example, sewan grass (*Lasiurus indicus*) is being removed from fields in western Rajasthan due to tillage practices by tractors. This grass is an important fodder source in western Rajasthan. Similarly, phog (*Calligonum polygonoides*) is an important shrub in western Rajasthan, which has fodder value also. This shrub is also reducing because of its removal for fuel purpose. Fodder trees like Khejri (*Prosopis cineraria*) are also being cut by farmers for fuel purpose. Conservation for forage plant resources can be done in many ways. Sewan grass can be conserved in cultivated field by agripasture method in which lines of the grass are grown at certain distance. In between the grass lines, cultivated crops can be grown by following the tillage methods by tractor. Depleting forage plants like phog shrub can be grown around the fields on boundaries. So, there is need for not only

saving the existing fodder plant resources but also to increase their number in appropriate way in the farmers' fields and at other places for sustainable development.

Although good varieties of the forage crops and grasses are available at this time for the region, there is high need for the region to get more and continuous attention for genetic improvement of forage crops with their quality seed production for sustainable livestock production. Bikaner centre of AICRP on Forage Crops is at present an important centre for breeder seed production of fodder pearl millet and oats. Research efforts have revealed that seed production of lucerne can be done in areas around Bikaner region with production of about 2.5 q/ha seed. Farmers should take advantage by growing improved varieties of fodder grasses and crops. Conservation of some forage plant species is also required.