Indian J. Pl. Genet. Resources 9(1): 161-165, 1996

Short Communication

MANAGEMENT OF PASTURE LEGUME GENETIC RESOURCES IN INDIA

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Key words : Pasture legumes, Genetic resources

Native pasture legumes as forage crops substantially improve quality and productivity of natural pastures and provide nutritious diets to grazing livestock. These legumes help improve soil productivity with addition or organic matter and atmoshperic N_2 to the soil and this largely obviate the need for costly nitrogeneous fertilizers. In mixed sward of grasses, these are generally more effective in controlling water runoff and soil erosion. These rangelegumes, therefore, constitute an important component of soil-plant-animal nutritional cycle (Walker, 1983)

Indian sub-continent is endowed with richness of genetic diversity in pasture legumes. Nearly 400 species belonging to over 60 genera spread over different agro-ecological zones are endemic to this area (Arora and Singh, 1988). However, the exponential increase in human and livestock population, land degradation, overgrazing and expansion of crop land into previously uncultivated areas threaten to extinct these valuable genetic resources of natural rangelands. This warrants for prudent management of pasture legume genetic resources in India.

Collection

The Indian Grassland and Fodder Research Institute (IGFRI), Jhansi, has been designated to take responsibility for holding collections of germplasm of pasture legumes under the IN-PGR system. The variety of genera and species within this group create a challenging task for genetic resources activities. A total number of 355 accessions of 12 species has been collected (Tabe 1). But very few of these are working collections for research. This collection also includes a number of exotic species. The number of accessions per species is,

however, very limited. Complementary collecting activities are therefore urgently needed to establish and maintain genetic variability.

IPGRI (International Plant Genetic Resources Institute) supported pasture collection in India was carried out in 1984 by the Queensland Department of Primary Industries, Australia in collaboration of National Bureau of Plant Genetic Resources (NBPGR). However, under IPGRI prgramme, genera and species of 13 tropical pastures legumes (*Aeschynomene, Centrosema, Desmenthus, Desmodium, Lablab, Leucaena, Lotononis, Macroptilium, Macrotyloma, Neonotonia, Pueuraria, Stylosanthes and Zonia*) merited a priority rating for collection on the basis of their potential as forages (IBPGR, 1983).

Since information available on the biology, taxonomy, species relationships, etc., is inadequate for many of these potentially useful species, the attention need to be drawn for further research. Ecological and geographical surveys need to be conducted to maximize the sampling of genetic diversity in areas of high diversity.

Rhizobium germplasm resources collections

For the success of the introduction programme, it is essential to collect *Rhizobium* in the case of new or exotic species and where there are known difficulties with nodulation. But in presenting the *Rhizobium* gene pool the major constraints are the extra resources needed in terms of time, facilities for storage and maintenance of cultures. Moreover, there are very few rhizobia cultures of pasture legumes and so it would be useful if the collection of rhizobia from pasture legumes were made standard practice. Details for the collection of nodules for the isolation of rhizobia and of the recording of site information have been described by Date and Halliday, (1979).

Characterization and Preliminary Evaluation

In pasture legumes the number of accessions to define, maintain and despatch is limited. But as soon as the number of accessions exceed the processing capacity of holder, a choice has to be made either to eliminate extra accessions or form a gene pool. But it is very difficult to preserve all samples collected for accession present in the gene bank. Following the IPGRI definitions, passport data, characterization and preliminary evaluation of the accession are referred. With passport data no special problem arises, since the data are not crop specific. But characterization and preliminary evaluation do present some difficulties. Morphological i.e. vegetative plant data, those on inflorescence, pod and seed are specific for each species or atleast cluster of related species. Seasonal type is an important physiological trait. Quite a number of species are biennial and mostly are perennial. Persistency and perenniality are two important aspects. Agronomical characters can be evaluated either in field experiments or, if necessary, in net houses.

Table 1. Genetic Resources of Pasture Legumes in India

	Species	Common name	Scope of collection	Accessions at IGFRI, Jhansi
1.	*Centrocema pubescens*	Centro	Central- eastern U.P., Madhya Pradesh, Southern Gujrat, Bihar, Assam, West Bengal, Orisa and Coastal Tamil Nadu	12
2.	*Clitoria ternatea*	Butterfly pea	Central Punjab, Rajasthan, Gujarat, Southern U.P., West M.P., A.P., Karnata and Northern Tamil Nadu.	96
3.	*Desmodium intortum*	Green leaf Desmodium	West Bengal, Assam and Orissa.	13
4.	*Desmodium uncinatum*	Silver Leaf Desmodium	Eastern M.P., Central Eastern M.P., and Rajastan	11
5.	*Desmenthus virgatus*	Hedge lucerne	Punjab, Haryana, U.P., Northern M.P., Gujrat and Maharashtra.	07
6.	*Lablab purpureus*	Field bean	Rajasthan, Punjab, Himachal Pradesh, Gujarat, Western U.P., Madhya Pradesh, Maharashtra, Andhra Pradesh, Tamil Nadu, and Hills of Bihar/ West Bengal	170
7.	*Macroptilium atropurpureum*	Siratro	Southern U.P., Madhya Pradesh, Gujarat, Bihar, Andhra Pradesh, Karnataka and Coastal Tamil Nadu.	15
8.	*Stylosanthes guinanensis*	Stylo	Punjab, Himachal Pradesh, and U.P.	07
9.	*Stylosanthes humilis*	Townsville Stylo	Rajasthan & Northern Gujarat, Maharashtra, Western M.P. and Andhra Pradesh.	05
10.	*Stylosanthes hamata*	Carbian stylo	Tamil Nadu, Karnataka and down hills of West Bengal	11
11.	*Stylosanthes viscosa*	Viscosa stylo	-do-	03
12.	*Stylosanthes scabra*	Scabra stylo	-do-	05

Conservation

Pasture genetic resources can be conserved in gene banks (*ex situ*) or in nature (*in situ*). All the species of pasture legume can be stored in orthodox fashion in gene banks. Seeds are stored according to whether these are to form (1) an active collection or (2) a base collection. Until such time, as there are adequate national programmes the IGFRI serve as an active collection centre. A long term (–20°C) storage facility is available at NBPGR, New Delhi. However, this security deposit should also be complemented by Institutional seed stores (where adequate facilities are available) which will, of course, hold national material. For this a medium term (–5°C) storage facility is being developed at IGFRI to hold pasture genetic resources.

In situ methods are preferred for pasture legume species which have germplasm that at present time cannot be practically maintained in genebanks (Anon, 1984). But all efforts to date suffer from the lack of plant inventories of reserve areas. This requires to set up the task of making an inventory of existing natural reserves and other valuable areas, of their botanical compositions etc. The careful management of these reserve areas is very crucial as in pasture species the loss of germplasm is usually associated with overgrazing.

Therefore, both *in situ* and *ex situ* conservation are needed. These two approaches complement each other. It is not realistic to expect these species and their populations can all be covered by nature reserves, national parks and other protected areas. Nor are protected areas always inviolate they remain vulnerable to loss of destruction. Likewise *ex situ* seed conservation and field gene bank are vulnerable to human failings, natural disasters and technical problems such as power cuts, fires and floods. Also *ex situ* conservation disrupts the process of evolution in population. So both approaches are needed in varying mixed for different species.

Information Management

For the pasture legume genetic resources the quality and complexity of information involved as well as the diversity of the information to be provided, require comprehensive and efficient data management system. Data is documented using a computerized data bank based on a standardized system of descriptor and descriptor states of pasture legumes introduced by Anderson and Davies (1984).

A national programme has to be looked at also in the International context International action to collect, preserve and exploit pasture legumes has been taken by IBPGR in 1983. Cooperative ties have been enhanced for forage germplasm collections with ICARDA, CSIRO, CIAT and ILCA. The institutes like CSIRO, Australia; Fooder Crops and Pasture Institute, Greece; Belize Forage Legume and Pasture Research Programme, Belize; INIA, Spain

have been entrusted for characterization work. For security and long term storage the IBPGR designated INIA (Spain), Bari (Italy), Greek Genebank (Thessaloniki), ICARDA (Syria) and CSIRO (Australia). These security deposits are being complemented by collections made by different nations (Anon, 1985).

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