SCIENTIFIC PAPER

Prospection and collection of species of interest for livestock production in two Cuban provinces

Odalys C. Toral, Marlen Navarro and J. Reino

Estación Experimental de Pastos y Forrajes Indio Hatuey, Universidad de Matanzas, Ministerio de Educación Superior Central España Republicana, CP 44280, Matanzas, Cuba
E-mail: otoral@ihatuey.cu

ABSTRACT: A mission of prospection was carried out in Las Tunas and Camagüey provinces, in order to collect samples of herbaceous, shrub and tree species of multipurpose use in the livestock production sector, to create a germplasm bank. When abundant population was found a random sampling method was used, and in small populations individual sampling was made, in which species were repeated in different sites. The information was gathered through several descriptors related to the location, natural habitat, vegetation, soil and damage caused by insects and microorganisms. In the prospected zones a high genus and species diversity was concentrated, for the accessions of herbaceous type (17 genera with 23 species) as well as for the tree and shrub accessions (13 genera with 15 species). A total of 55 accessions of 38 herbaceous and 17 shrub and/or tree species were collected. The highest diversity of species was found on the soils of the Brown and Fersialitic groupings, which are more fertile and show better permeability. Species that have been used with diverse purposes were collected, belonging to the genera: *Teramnus*, *Lablab*, *Cynodon*, *Clitoria*, *Canavalia*, *Centrosema* and *Leucaena*; as well as new materials (*Sesbania* sp. and *Cassia* sp.) which could be used as living fence, cover plants and green manure. It is considered that the collection provides a material with excellent multiuse perspectives in the livestock production sector, and contributes to the increase of the existing germplasm reserve with naturalized ecotypes.

Keywords: germplasm, legumes, plant collection

INTRODUCTION

The plant genetic resources for food and agriculture (PGRFA) comprise the fraction of biological diversity that includes the plant species with current or potential value, and provide the raw material for diverse studies related to the breeding programs and to livestock production sustainability. These resources are basic to increase the productivity and sustainability of livestock production, and contribute to the development of nations; the world food security and the decrease of poverty depend on them (FAO, 2001).

On the other hand, it is important to emphasize that the problem of genetic erosion is aggravated with the disappearance of species and wild forms of cultivated plants, because of such processes as massive deforestation or the degradation and contamination of natural habitats, which are the result of the abusive exploitation of the resources of the planet.

The loss of genetic variability supposes the limitation of the capacity of response to the new needs, as well as the increase of the vulnerability of crops to environmental changes or to the emergence of new pests and diseases.

The above-explained facts show the importance of the prospection and collection of native and/or naturalized materials, in order to rescue these resources and other species of interest. In addition, it is necessary to enrich the germplasm with new national acquisitions and to evaluate their forage potential (Toral *et al*., 2003); as well as to improve the genetic basis of pastures and forages (Olivera *et al*., 2003) and to promote forage areas, from varieties identified in this activity (Oquendo *et al*., 2013).

The objective of this research was to collect samples of herbaceous, shrub and tree species of multipurpose use in the livestock production sector, from a prospection mission in Las Tunas and Camagüey provinces –Cuba–, to create a germplasm bank.

MATERIALS AND METHODS

Region of collection. The collection mission was carried out in zones belonging to Las Tunas

and Camagüey provinces, for which some basic principles exposed in the methodology for the collection, conservation and characterization of herbaceous, tree and shrub species useful for livestock production (Machado *et al*., 1999) were taken into consideration. In this sense, a map with scale 1:1 000 000 (ACC, 1998), in which the existing populations and soil groupings were indicated, was taken as reference.

In the sampling priority was given to the sites located in marginal areas, with diversity of lands (flat, undulated and mountainous), deep roadsides with scrubland vegetation (soil covered by diverse types of plants, including natural and naturalized pastures), clearings, limiting fences of naturalized –or not naturalized– pastures and other crops, hills and perimeter forest areas, as well as thickets and disturbed woodland.

The samples were collected on soils of the genetic groupings Brown and Fersialitic, which showed moderate to high fertility, with organic matter content between 3 and 9 %.

Sampling method and descriptors. For most species an individual sampling method was used, because, regularly, the seeds were taken from small populations. A random sampling was also used, when a high number of individuals of a certain species was encountered. From each plant the highest quantity of samples was collected, and the species were repeated in the places where it was possible, so that higher variability was achieved. The species considered useful were sampled, independently from their vigor, but those which showed severe damage caused by pests and/or diseases were avoided.

In the autogamous species, the seed collected from each plant was maintained separated; and in the case of trees, the collection was made in the highest possible quantity of individuals, in order to maximize the heterosis of the material from allogamous plants.

The propagules were kept wrapped in moist newspaper, to prevent their desiccation during the collection period. The seeds were maintained in paper envelopes, conveniently identified, separated and sealed, to avoid the contamination of their contents.

Afterwards, the collected germplasm was transported to the Pastures and Forages Research Station Indio Hatuey –Matanzas, Cuba– in order to make the corresponding bank, for which a nursery was previously created.

Besides the sample number, several descriptors were used (location, natural habitat and vegetation of the area, specific site, soil and damage caused by phytophagous insects and pathogen microorganisms) related to the general information, which was recorded in forms elaborated for that purpose.

The distance between a collection site and the next depended on the changes in the landscape and the soil, and on the simple visualization of the plants. In each collection site an area of approximately 1,0 ha was traveled, in all directions, when the natural obstacles allowed it.

RESULTS AND DISCUSSION

In the collection areas a high genus and species diversity was concentrated (table 1), for the herbaceous (17 genera with 23 species) as well as for the tree and shrub accessions (13 genera with 15 species). It is important to emphasize that the most adequate date for the collection of herbaceous species does not always coincide with the most opportune moment to find woody plants with seeds, aspect implicit in the methodology for the collection of useful germplasm for livestock production (Machado *et al*., 1999). This indicates that for certain environments and species seeds can be found, although the collection does not coincide with the phenological patterns that regulate the reproductive period for species with different habits, because it can depend on the specific patterns imposed by the climate and edaphic variables, aspect to which attention should be paid.

Such results could be associated to the excellent possibilities of legumes to grow in wild ecosystems, in which neither agrochemicals nor other inputs are used. Hernández *et al*. (1999) stated that most of the species collected in several livestock production regions, under low or no fertilization conditions, were legumes. This is due to their scarce possibilities –depending on their physiological characteristics– of living together with grasses and other plants in fertilized areas, which is highly important when conceiving the current and future livestock production systems without irrigation and fertilization.

At present there are important species and commercial varieties of legumes which are product of the collection, and have turned out to be potentially useful for different purposes in commercial livestock production. Such is the case of *Albizia lebbeck*, *Bauhinia purpurea* and *Leucaena leucocephala*, among the woody types (Simón *et al*., 1998; Hernández, 2000); while in the herbaceous

Table 1. Collected species and accessions.

Genus	Number of species	Number of accessions
Herbaceous types		
Centrosema	3	11
Cajanus	1	1
Galactia	1	3
Mucuna	1	1
Desmodium	1	2
Cynodon	1	1
Crotalaria	3	4
Indigofera	2	2
Neonotonia	1	3
Phaseolus	1	2
Teramnus	1	1
Canavalia	2	2
Panicum	1	1
Clitoria	1	1
Lablab	1	1
Vigna	1	1
Maranta	1	1
Subtotal	23	38
Tree and shrub types		
Albizia	1	1
Bauhinia	2	2
Morus	1	1
Acaciela	1	1
Ateleia	1	1
Spondias	1	1
Leucaena	1	2
Senna	1	1
Sesbania	2	2
Cassia	1	2
Moringa	1	1
Jatropha	1	1
Aloysia	1	1
Subtotal	15	17
Total	38	55

types *Centrosema molle* and *Teramnus labialis* have stood out (Paretas *et al*., 1989). For such reason, the collected material of these taxa is extremely interesting, because it contains specific genetic information for the particular environments where they were found, which differ from other ecosystems (Toral *et al*., 2001). Of this material, *Desmodium* sp., *Galactia* sp. and *Cannavalia ensiformis* could be used as cover plants and green manure; and *Cassia biflora*, for living fence and green manure.

From the 38 collected species, 47 % was found on soils of the Fersialitic grouping and 53 % on Brown soils (table 2), which had excellent to regular external and internal drainage and low to acceptable fertility, respectively. It is considered that the soil conditions and the climate indicators in these regions propitiated a high presence of herbaceous and shrub legumes, which corroborates the report by Álvarez *et al*. (2001).

Table 3 shows that most of the collected species were found in areas of flat topography; only four accessions, belonging to the species *Desmodium sp.*(1), *Centrosema sp.* (2), *Canavalia* sp. (1) and *Ateleia cubensis* (1), were located in mountainous areas with great natural elevation, in the Camagüey province.

In addition, it could be observed that the species were mixed, to a higher or lesser extent, with scrub vegetation, pastures and shrubs-trees, which presupposes the high level of associative ability shown by these species (particularly the herbaceous ones) with regards to those that achieve high growth and development, as in the case of shrub and tree types, and the grasses of different habits, which are characteristic of this vegetation.

On the other hand, it was interesting that none of the collected species showed affectations caused by insects or diseases.

With the exception of nine accessions, of the species *Centrosema plumieri* (1), *Bauhinia* sp. (1), *A. lebbeck* (1), *C. biflora* (1), *Centrosema pubescens* (1), *Phaseolus lunatus* (1), *Sesbania sesban* (1), *Crotalaria* sp. (1) and *S. glandiflora* (1), which were found in areas where the soil was completely uncovered by vegetation, the others were located on a surface with certain degree of cover, which was classified into slight, moderate and abundant. This is propitious for the implementation of silvopastoral systems, in which there should be a first plant stratum, mainly formed by grasses and/or herbaceous legumes, and was corroborated for *A. lebbeck*, *G. sepium* and *L. leucocephala* by Simón *et al*. (1998), and for *A. lebbeck* by Pentón (2000). The degree of shade received by such accessions varied between soft or none, and the herbaceous plants as well as the trees tended to be heliophilous.

It is concluded that the collection provided a material with excellent multiuse perspectives in the livestock production sector, and in turn contributes to the increase of the existing germplasm reserve with naturalized ecotypes.

Table 2. Distribution of the collected species per soil grouping and type.

Species	Fersialitic	Brown	Province
Centrosema molle	x (DF, RBF)	x (GB)	Las Tunas
Crotalaria retusa	x (DF)	x (FB)	Las Tunas, Camagüey
Jatropha curcas	x (DF)	–	Las Tunas
Mucuna pruriens	x (DF)	–	Las Tunas
Cassia biflora	x (DF)	–	Las Tunas
Lablab purpureus	–	x (BC)	Las Tunas
Phaseolus lunatus	–	x (BC, GB)	Las Tunas
Cajanus cajan	–	x (BC)	Las Tunas
Moringa oleifera	–	x (BC)	Las Tunas
Galactia sp.	x (RBF)	x (GB)	Las Tunas
Spondias myrobalanus	–	x (GB)	Las Tunas
Bauhinia sp.	x (DF)	–	Las Tunas
Centrosema plumieri	x (DF, RBF)	–	Las Tunas
Albizia lebbeck	x (DF)	–	Las Tunas
Cynodon dactylon	x (DF)	–	Las Tunas
Panicum maximum	x (DF)	–	Las Tunas
Teramnus labialis	x (DF)	–	Las Tunas
Maranta arundinacea	–	x (GB)	Las Tunas
Bauhinia sp.	–	x (GB)	Las Tunas
Clitoria ternatea	–	x (GB)	Las Tunas
L. leucocephala cv. Perú and cv. Ipil–Ipil	–	x (GB)	Las Tunas
Canavalia ensiformis	–	x (GB)	Las Tunas
Aloysia triphylla	x (GBF)	–	Las Tunas
Vigna antillana	–	x (GB)	Las Tunas
Neonotonia wightii	x (RBF)	x (GB)	Las Tunas
Indigofera suffruticosa	–	x (BWC)	Camagüey
Crotalaria incana	–	x (BWC)	Camagüey
Senna sp.	–	x (BWC)	Camagüey
Indigofera tinctoria	x (RF)	–	Camagüey
Desmodium sp.	x (FBF)	–	Camagüey
Centrosema sp.	x (FBF)	–	Camagüey
Canavalia sp.	x (FBF)	–	Camagüey
Sesbania sesban	–	x (FB)	Camagüey
Crotalaria sp.	–	x (FB)	Camagüey
Sesbania grandiflora	–	x (FB)	Camagüey
Acaciela angustissima	–	x (FB)	Camagüey
Ateleia cubensis	–	x (FB)	Camagüey
Morus nigra	–	x (FB)	Camagüey

BC: Brown with carbonate, GB: Grayish Brown, BWC: Brown without carbonates, FB: Ferromagnesian Brown, DF: Degraded Fersialitic, GBF: Grayish Brown Fersialitic, RBF: Reddish Brown Fersialitic, RF: Reddish Fersialitic, FBF: Ferromagnesian Brown Fersialitic

Table 3. Distribution of the collected species with regards to the environment.

Species	Topography	Type of vegetation	Specific habitat	Soil cover	Degree of shade
Centrosema molle[1]	Flat	Thickets	Mixed with scrub	Uncovered	Soft
Crotalaria retusa[1]	Flat	Thickets, grassland	Mixed with pastures	Slight	No shade
Jatropha curcas[1]	Flat	Grassland	Hedge	Moderate	No shade
Macuna pruriens[1]	Flat	Scrubland	Mixed with pastures	Abundant	No shade
Cassia biflora[1]	Flat	Scrubland	Mixed with pastures	Uncovered	Soft
Lablab purpureus[1]	Flat	Thickets	Mixed with shrubs-trees	Slight	No shade
Phaseolus lunatus[1]	Flat	Thickets	Mixed with shrubs-trees	Uncovered	No shade
Cajanus cajan[1]	Flat	Thickets	Mixed with shrubs-trees	Abundant	No shade
Moringa oleifera[1]	Flat	Thickets	Mixed with scrub	Slight	No shade
Galactia sp.[1]	Flat	Scrubland	Fences and mixed with scrub	Moderate	No shade
Spondias myrobalanus[1]	Flat	Grassland	Fences	Slight	No shade
Bauhinia sp.[1]	Flat	Thickets	Mixed with scrub	Uncovered	Soft
Centrosema plumieri[1]	Flat	Thickets, grassland	Mixed with scrub and with trees-shrubs	Uncovered	Soft
Albizia lebbeck[1]	Flat	Thickets	Mixed with scrub	Uncovered	Soft
Cynodon dactylon[1]	Flat	Thickets	Fence mixed with shrubs-trees	Abundant	No shade
Panicum maximum[1]	Flat	Thickets	Mixed with pastures	Slight	No shade
Teramnus labialis[1]	Flat	Thickets	Fence mixed with shrubs-trees	Abundant	No shade
Maranta arundinacea[1]	Flat	Grassland	Mixed	Moderate	Soft
Bauhinia sp.[1]	Flat	Forest	Mixed with shrubs-trees	Slight	No shade
Clitoria ternatea[1]	Flat	Forest	Mixed with shrubs-trees	Slight	No shade
L. leucocephala cv. Perú[1]	Flat	Grassland	Mixed with pastures	Moderate	No shade
L. leucocephala cv. Ipil-Ipil[1]	Flat	Grassland	Mixed with pastures	Abundant	No shade
Canavalia ensiformis[1]	Flat	Grassland	Clearing	Abundant	No shade
Neonotonia wightii[1]	Flat	Grassland, thickets, scrubland	Mixed with pastures, scrub, and in fence	Abundant	Moderate
Aloysia triphylla[2]	Flat	Scrubland	Mixed with scrub	Moderate	No shade
Vigna antillana[2]	Flat	Grassland	Mixed with pastures	Slight	No shade
Indigofera suffruticosa[2]	Flat	Grassland	Mixed with pastures	Abundant	No shade
Crotalaria incana[2]	Flat	Grassland	Mixed with scrub	Moderate	No shade
Senna sp.[2]	Flat	Grassland	Mixed with pastures	Moderate	Soft
Indigofera tinctoria[2]	Flat	Grassland	Mixed with scrub	Slight	No shade
Desmodium sp.[2]	Mountainous area	Forest	Mixed with shrubs-trees	Moderate	No shade

Table 3. *(Continuation)*

Species	Topography	Type of vegetation	Specific habitat	Soil cover	Degree of shade
Centrosema sp.[2]	Mountainous area	Forest	Mixed with shrubs-trees	Moderate	No shade
Canavalia sp.[2]	Mountainous area	Forest	Mixed with shrubs-trees	Moderate	No shade
Sesbania sesban[2]	Flat	Grassland	Clearing	Uncovered	No shade
Crotalaria sp.[2]	Flat	Grassland	Clearing	Uncovered	No shade
Sesbania grandiflora[2]	Flat	Grassland	Mixed with pastures	Uncovered	No shade
Acaciela angustissima[2]	Flat	Grassland	Mixed with pastures	Abundant	Soft
Ateleia cubensis[2]	Mountainous area	Forest	Mixed with shrubs-trees	Abundant	Strong
Morus nigra[2]	Flat	Backyard	Clearing	Slight	No shade

1: Las Tunas, 2: Camagüey

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