



Review of Genetic Resources of Grain Legumes in Albania

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Summary: Activities regarding grain legumes genetic resources in Albania started in 1963, at first collecting, conservation, evaluation and utilization of landraces and old cultivars, later importing cultivars from European countries. Initially, all the work was done by the Agricultural Research Institute (ARI) of Lushnja, funded by the Ministry of Agriculture, with a clear plan to select and produce the commercial seeds for daily needs of agricultural cooperatives. About 180 accessions of common beans (*Phaseolus vulgaris* L.) were collected until the end of the 1980s, 53 of which were landraces and old cultivars. During 1990-2000 another project was accomplished, where several collecting missions took place, especially in the central and south-eastern regions of Albania. In 1998 the National Gene Bank (NGB) of Tirana was established to conserve the Albanian plant genetic resources.

Key words: accession, *Cicer arietinum*, grain legumes, landrace, *Lens esculenta*, old cultivar, *Phaseolus vulgaris*, *Phaseolus coccineus*

Introduction

Pulses have been cultivated in Albania for a long time, mainly for human consumption. Among the major food legumes, common bean (*Phaseolus vulgaris* L.) is the most important in Albania. Landraces are very diverse populations. They have particular properties or characteristics such as good adaptation to local climatic conditions, resistance or tolerance to diseases and pests which allow them to have high yield stability under a low input farming. For this reason, the landraces must be conserved for future generations.

Genetic erosion is widely present in Albania. A number of landraces have been lost due to former almost semi-centennial system of the concentrated economy and use of modern cultivars developed by our institution or introduced from foreign countries. Another factor of erosion in the previous years is emigration of the population from rural zones to large cities. These factors of the purest genetic erosion have affected all the crops.

Farmers are the main contributors and curators of agro-biodiversity, with landraces

in most countries being one of the most threatened components of biodiversity. Unless an appropriate action is taken, the trend is likely to continue or even worsen, in spite the fact that landraces constitute an insurance guarantee for food security and our future ability to deal with climate change, users' needs and meeting local consumers demands.

Genetic erosion factors in Albania are already very active. Nevertheless, a wide variation of environmental factors makes possible safeguard of genetic variation of species in levels, by interfering with particular programs, with objective not only for collection of some species' germplasm, whatever they may be, but also for becoming aware of the real situation, identifying the problems and putting forth proposals and solutions in order to reduce the danger of genetic erosion and protecting important species from their irrevocable extinction.

This report analyzes the recent status of the main Albanian collection of the following grain legumes: common beans, runner bean, big white bean or Spain bean (*Phaseolus coccineus* L.), lentil (*Lens esculenta* Gross el Germ.), and chickpea (*Cicer arietinum* L.).

Economic Importance of Grain Legumes

Grain legumes are important staple in many areas of the world, especially common bean (*Phaseolus vulgaris* L.) used in human diet, which has

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Table 1. Cultivated area of grain legumes in Albania (ha)

Table 1. Površina pod zrnanim mahunarkama u Albaniji

Species Vrsta	Years Godina			
	2000	2004	2006	2008
<i>Phaseolus vulgaris</i>	22,500	17,200	15,100	14,300
<i>Phaseolus coccineus</i>	300	400	200	200
<i>Cicer arietinum</i>	70	80	85	85
<i>Lens esculenta</i>	25	20	15	15
Total Ukupno	22,900	17,700	15,400	14,600

Table 2. Cultivated area (ha) and production (t) of common beans in Albania

Tabela 2. Površina (ha) i proizvodnja (t) običnog pasulja u Albaniji

	Years Godina			
	2000	2004	2006	2008
Area Površina	22,500	17,200	15,100	14,300
Production Proizvodnja	25,200	22,400	24,300	21,800

high protein content and is rich in phosphorus, iron, vitamin B₁ and fiber, while containing no cholesterol.

In Albania 4.71% of area is planted with grain legumes, 97.12% of which belong to four species given in this report (Tab. 1 and 2). Common bean is the prime most important crop in terms of planted area and production. In Albania, legumes produce is used for the home market, but the possibilities are to produce much more and for exporting. Most cultivated varieties are advanced cultivars, due to their higher yields and resistance to more races of *Colletotrichum lindemuthianum* (Sacc. et Magn) Br. Et Cav., such varieties are cv. Shijaku, Kallmeti, etc.

Major producers are located in the lowland of west and southwest of Albania.

The purpose of the work at this time is to maintain and make available to the public high quality seeds of grain legumes varieties that are produced, conditioned, and distributed as to insure proper identity and genetic purity. This process of maintaining genetic purity is performed through a nationally recognized seed certification system.

Some seed quality factors, like seed-borne diseases, are as important as genetic purity in the case of common beans.

Common bean producers that have planted small areas have used local varieties and populations, mostly for self-consumption in old people's households. Most of these native landraces and old local cultivars are distinguished

for some special characteristics, such as protein content, good taste, color, high tolerance or resistance to diseases and pests, etc.

Lentil, chickpea, and runner bean, among grain legumes species, are less interesting for production, but are always present at market.

The major pests of grain legumes in Albania are aphids (*Aphis spp.*), bruchid (*Bruchus pisorum*), and less spider mite (*Tetranychus spp.*). The widespread fungal and bacterial diseases are respectively root rot (*Fusarium ssp* (Burch) Sn. et Hn), anthracnose (*Colletotrichum lindemuthianum*(Sacc. et Magn) Br. Et Cav), and halo blight (*Pseudomonas phaseolicola* (Burk.) Young et al).

Status of the National Collections

The active preservation of genetic variability of local varieties (old varieties and landraces) plays an important role in crop improvement and food production. A clear understanding of genetic resources is an important key for their practical conservation and utilization.

The conservation work concerning legume crops from the grain legumes group was conducted in the ex-Agricultural Research Institute (ARI) in Lushnja, now called Agriculture Technologies Transfer Center (ATTC) of Lushnja.

Albania has a small collection of legumes, 133 of which are landraces grain legumes accessions stored and conserved in NGB-Tirana and ATTC-Lushnja.

Table 3. Number of accessions per grain legumes species stored in the ATTC-Lushnja

Tabela 3. Broj uzoraka zrnenih mahunarki po vrstama u ATTC u Lušnji

Species Vrsta	No. of accessions Broj uzoraka								
	Total Ukupno			Albanian Albanski			Foreign Inostrani		
	A	B	C	A	B	C	A	B	C
<i>Phaseolus vulgaris</i>	95	88	220	95	15	13	-	73	207
<i>Lens esculenta</i>	5	11	-	5	-	-	-	11	-
<i>Cicer arietinum</i>	4	6	-	4	-	-	-	6	-
<i>Phaseolus coccineus</i>	1	-	-	1	-	-	-	-	-
Total Ukupno 430	105	105	220	105	15	13	-	90	207

A - landraces and old cultivars; B - advanced cultivars; C - breeder's lines

A – lokalne i stare sorte; B – savremene sorte; C – oplemenjivačke linije

Table 4. Foreign common bean accessions countries of origin

Tabela 4. Zemlje porekla inostranih uzoraka običnog pasulja

Country of origin Zemlja porekla	No. of accessions Broj uzoraka		
	Total Ukupno	Cultivars Sorte	Lines Linije
USA SAD	108	22	86
Italy Italija	38	27	11
Greece Grčka	10	10	-
Bulgaria Bugarska	5	5	-
China Kina	5	5	-
Romania Rumunija	3	3	-
Denmark Danska	1	1	-
FAO	67	-	67
Unknown Nepoznato	43	-	43
Total Ukupno	280	73	207

These will soon be available for distribution or exchange, since during the period 2009-2010 all Albanian accessions are being regenerated.

The Seeds Department of ATTC holds a working and active collection, which has widely been used in the last thirty years, especially in basic research to develop varieties with higher yield potential and with greater yield stability. This grain legumes working collection includes 430 accessions. The largest group is common bean with 403 accessions (95 landraces, 88 cultivars and 220 breeder's lines) as the most important (mainly they are white bean accessions), following by lentil with 16 accessions (5 landraces and 11 cultivars), chickpea with 10 accessions (4 landraces and 6 cultivars), and runner bean with 1 accession (1 landrace) (Tab. 3). The accessions collected originate from 7 countries and FAO, plus anonymous (Tab. 4).

After 2005, agricultural research funding was severely reduced, leading to a decrease in some activities related to collection, evaluation and regeneration of grain legumes genetic resources. Even as a result of merging of the agriculture research institutes, the breeding activities for developing new cultivars will not be carried out for some time.

Storage and Regeneration

The seed samples are deposited and conserved in short-term storage at +4 to +6°C and 30% RH in a cooling room (ATTC-Lushnja), whereas the seed samples of accessions originated from Albania (landraces, old varieties and breeder's lines) are stored and conserved at -18°C as duplicates in NGB-Tirana.

Once they are harvested, seed samples are thoroughly dried before they are packed in paper bags. Last year, seed samples were packed in plastic box according to the international standards (Painting et al. 1993).

Regeneration is the main goal for NGB-Tirana and ATTC at this time, since several accessions need regeneration and characterization.

Every year about 1/4 to 1/5 of grain legumes collection is regenerated. During the regeneration process, international standards are adhered to and biological requirements of individual species are taken into account. All grain legumes accessions are regenerated in the open field. Each accession is represented by about 100 plants. Open-pollination method is commonly applied, by isolating each accession with a corridor 1.2 m apart. Rows were placed 0.7 m apart and in-row spacing was 0.15-0.2 m.

It is planted with two rows wide by 10 m long per each accession.

Documentation and Characterization

The data on common bean and other grain legumes collections were gathered from breeders. Passport/collecting and storage data have already been documented and computerized.

The evaluation and characterization work on grain legumes species within the framework of the National Program for Plant Genetic Resources is mainly conducted at the ex-Agricultural Research Institute (Hyso & Canko 2001, Canko et al. 2003, Canko et al. 2006). Characterization has been done for all accessions of grain legumes, according to IPGRI descriptor list, slightly modified (IBPGR 1983, Salillari et al. 2007), including morphological and agronomic traits, disease resistance and reaction to stress conditions.

A computerized grain legumes database is available and operational.

Collecting Missions and Research Activities

The last uttermost collecting mission was organized during 1999-2003 in some areas of eastern and southeastern regions of Albania. A total of 63 common bean accessions were collected, including 39 seed colored accessions and 24 white beans, according to international standards (Hawkes 1980, Guarino 1995, Adham 1999).

From the collected landrace germplasm, the common beans are mainly used in the genetic breeding activities. Among them only white beans can be mentioned. During the last 10 years 12-13% of white bean accessions have been used. The main objectives of genetic breeding activities were focused in the developing new varieties with specific characteristics as the disease resistance, tolerance to stress conditions, etc. In ex-Agricultural Research Institute of Lushnja four new varieties have been developed and registered (Canko et al. 2004).

The relations between genetic conservation, plant breeding, seed production and production need to be improved. In this context, the institutional reform has to be completed (including qualified staff of ex-Agricultural Research Institutes in this process), and the way of the barrier financial and technical overcoming which actually restrain the activities in those fields.



Figure 1. Examples of the common bean landraces in the districts of Shkodër and Skrapar
 Slike 1. Neke od sakupljenih lokalnih sorti pasulja u okruzima Skadar i Skapar

Owing to its conditions, Albania is a rich country with a wide diversity of plant genetic resources. There are some micro-zones with a lot of grain legume landraces.

During 2009, in a short time collecting mission funded by SeedNet project, in the district of Skrapar (situated in the middle part of Albania) 28 samples of landraces were collected (Fig. 1). These samples will be characterized and evaluated to avoid synonymous accessions.

Some of local grain legumes varieties are not yet included in the collection and are under pressure of genetic erosion. The activities of the NGB of Albania and ATTC-Lushnja are being started, but organizational and financial problems make it impossible to launch an expedition in order to collect new accessions, especially in the northern and north-eastern regions. Therefore we invite friends and colleagues to send seeds of old varieties and local populations.

Conclusions

Grain legumes for food (especially common bean) are crops with a great potential for high, quality and stable yields and the results of its evaluation show that there is a considerable genetic variation.

It is important to know that there are a lot of districts that have a rich diversity of grain legume crops which have not yet been explored. In some of those districts, common bean is the most important food resources for their population, e.g. Dibra, Puka, etc. There is a need to collect the diversity of dry bean in those districts, because a lot of people are leaving their old settlements for the urban zones, and these landraces will be lost forever. Therefore, we need to have a chance to undertake some collecting missions on those districts to get as much as possible of the common bean diversity before it is lost.

On the other hand, the facts express the importance of these materials not only for conservation, but also for their use in breeding programs and need for their improvement.

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Pregled genetičkih resursa zrnenih mahunarki u Albaniji

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Izvod: Aktivnosti na genetičkim resursima zrnenih mahunarki u Albaniji počele su 1963. godine, najpre sakupljanjem, čuvanjem, evaluacijom i korišćenjem lokalnih i starih sorti, a potom i uvozom sorti iz evropskih zemalja. U početku je ovo sprovodio Poljoprivredni istraživački institut (ARI) u Lušnji, osnovan od strane Ministarstva poljoprivrede, sa jasnim planom da odabere i proizvede komercijalno seme za svakodnevne potrebe poljoprivrednih kooperanata. Do kraja osamdesetih godina prošlog veka, sakupljeno je oko 180 uzoraka običnog pasulja (*Phaseolus vulgaris* L.), od kojih su 53 bili lokalne i stare sorte. U razdoblju 1990-2000, izveden je drugi projekat, u okviru kojeg je obavljeno nekoliko sakupljačkih ekspedicija, posebno u središnjim i jugoistočnim oblastima zemlje. Godine 1998. u Tirani je osnovana Nacionalna banka gena, kako bi organizovala rad na očuvanju biljnih genetičkih resursa u Albaniji.

Ključne reči: *Cicer arietinum*, genotip, *Lens esculenta*, lokalna sorta, *Phaseolus vulgaris*, *Phaseolus coccineus*, stara sorta, zrnene mahunarke