

COLLECTING LOCAL LANDRACES OF MAIZE AND CEREALS IN SOUTH EASTERN EUROPE DURING 2009 AND 2010

Emilija Simeonovska^{1*}, Drena Gadžo², Zoran Jovović³, Danela Murariu⁴,
Danijela Kondić⁵, Dragan Mandić⁶, Shukri Fetahu⁷, Hrvoje Šarčević⁸, Fetah Elezi⁹,
Slaven Prodanović¹⁰, Ludvik Rozman¹¹, Efimia Veverita¹², Kolio Kolev¹³,
Nadia Antonova¹³, Eva Thörn¹⁴

^{1*}Institute of Agriculture, Blvd. Aleksandar Makedonski b.b., 1 000 Skopje, Republic of Macedonia

*Corresponding author. E-mail: emilija_simeonovska@yahoo.com

²Faculty of Agriculture and Food Sciences, Zmaja od Bosne 8, 71 000 Sarajevo, Federation Bosnia and Herzegovina

³Biotechnical Faculty, Blvd. Mihaila Lalica 1, 81 000 Podgorica, Montenegro

⁴Suceava Genebank, B-dul 1Mai nr. 17, Suceava 720224, Romania

⁵Faculty of Agriculture, University of Banjaluka, Bulevar Vojvode Petra Bojovica 1A
78 000 Banja Luka, Republika Srpska, Bosnia and Herzegovina

⁶Agricultural Institute of Republika Srpska, Knaza Miloša 17, 78 000, Banja Luka, Republika Srpska,
Bosnia and Herzegovina

⁷Faculty of Agriculture, Str. "Bill Clinton", 10 000 Prishtina, Kosovo

⁸University of Zagreb, Faculty of Agriculture, Svetošimunska 25, 10000 Zagreb, Croatia

⁹Agricultural University of Tirana, Kodër Kamëz str., Tirana, Republic of Albania

¹⁰Faculty of Agriculture, 6 Nemanjina Str., 11 080 Zemun, Belgrade, Serbia

¹¹Biotechnical Faculty, University of Ljubljana, Jamnikarjeva 101, 1000 Ljubljana, Slovenia

¹²Institute of Genetics and Plant Physiology, 20, Padurii street, MD-2002, Chisinau, Republic of Moldova

¹³Institute of Plant Genetic Resources "K. Malkov", 4122 Sadovo, Plovdiv Area, Bulgaria

¹⁴Swedish University of Agricultural Sciences, Swedish Biodiversity Centre, Box 57, S-230 53, Alnarp, Sweden

ABSTRACT

Within the framework of South East European Development Network on Plant Genetic Resources program, collecting missions in twelve countries were conducted under the regional project "Collecting local landraces of maize and cereals (wheat, barley, rye, oat, millet and buckwheat) in South Eastern Europe (2009-2010)". The main goal of this project was preservation of local landraces of maize and cereals in the participating countries with the aim to make them available for breeding, research and other purposes at national, regional and international level. The project participants were the national teams from Macedonia (as project coordinator), Federation Bosnia and Herzegovina, Montenegro, Romania, Republic of Serbia, Kosovo, Croatia, Albania, Serbia, Slovenia, Moldova and Bulgaria. Each national team carried out the collecting missions in its own country. During 2009 and 2010, over 589 localities were inventoried in the predicted regions. The result of the project was a total number of 867 maize and cereals accessions collected. Maize prevailed with the total number of 637 collected accessions (73.47%), followed by 47 wheat accessions (5.42%), then barley 43 (5.07%), rye 40 (4.61%), oat 52 (5.99%), millet 8 (0.92%), buckwheat 9 (1.02%) and other species (*Sorghum sp.*, *Triticum monococcum*, *Triticum spelta*, *Triticum turanicum*, einkorn) 31 accessions (3.58%). Regarding the status of the samples, accessions are mainly landraces, which are still grown by some farmers and used as a source of high quality animal and human food.

Key words: biodiversity, maize; cereals; local landraces; collecting missions; SEEDNet program.

INTRODUCTION

Most of the territory of South Eastern Europe (including the Balkan countries) belongs to the Mediterranean

Basin, a region defined as a biodiversity hotspot (Médail and Quézel, 1999).

Local landraces are an important part of agricultural biodiversity. They have for a long time played an important role due to a high

genetic variability, making them a potential source of valuable genes coding for economically significant characteristics of importance for agricultural crops, such as disease resistance, drought resistance, quality traits etc. (Camacho Villa et al., 2006). Beside their use in breeding programmes (Murariu et al., 2010), they might also be used in small scale farming especially in mountainous districts, due to their adaptability to the specific environmental conditions where they have evolved (Frankel et al., 1998). Modern agriculture is however becoming more and more predominant and use of modern cultivars and hybrids giving higher yields and thereby being more profitable are taking over the market (Prodanovic and Surlan-Momirovic, 2005). This is causing a continuous loss of old, traditional cultivars and landraces.

Inventorying of local landraces of maize and cereals in South Eastern Europe was therefore initiated by a team of experts from twelve countries of the region (Macedonia, Federation Bosnia and Herzegovina, Montenegro, Romania, Republic of Srpska, Kosovo, Croatia, Albania, Serbia, Slovenia, Moldova and Bulgaria). A regional network SEEDNet (South East European Development Network on Plant Genetic Resources), established in 2004 from all above mentioned countries provided a platform for facilitating project collaboration. During a preparatory survey all the partners reported about the presence of local landraces in certain rural areas of the respective countries, as well as the danger of their extinction (Jaric et al., 2010). Within the framework of SEEDNet, collecting missions were thereafter conducted in twelve targeted countries under the regional project: "Collecting local landraces of maize and cereals (wheat, barley, rye, oat, millet and buckwheat) in South Eastern Europe (2009-2010)".

MATERIAL AND METHODS

The members of the regional research team were the members of the SEEDNet Regional Working Group for Maize and Cereals. Therefore, prioritised species for

collecting were mainly maize and cereals, belonging to the Mandate species list of the group.

The determination of the collecting sites was based on long-term experience of collecting missions in some of the project countries during which regions with very rich agro-biodiversity had been identified. For example, in Romania such regions are the geographic zones Bucovina, Maramures and Apuseni Mountains. In these geographic zones there are approximately 250 villages placed between 800-1620 m altitudes. Many of them are even now absolutely isolated without car roads access. In these villages old varieties are still commonly found. Both Romanian and Bulgarian partners pointed out that the main part of old landraces and cultivars are preserved in certain remote and marginal areas in the mountainous depressions where old farmers still cultivate them. In Rodopy Mountain in Bulgaria, maize populations with very short vegetative period were found in 2008, although more than 500 maize landraces had been collected during many previous expeditions (1950, 1954, and 1957) in Eastern, Central and Northwest Bulgaria. Significant number of maize and cereal populations could be found in eastern part of Serbia (Homolje, Zaječar, Negotinska Krajina). This was confirmed after several expeditions during the last 15 years, organized by local institutions and two national institutes. A lower number of populations of maize and cereals have been grown on farm in other parts of the country (Podrinje, the Southern part of Serbia).

Some of the partners (Slovenia, Republic of Srpska, Albania) stated that local maize populations as well as other cereal landraces still exist on higher elevation under less suitable growth condition, where modern hybrids have not yet been widely spread.

In Macedonia, according to the "Country Study for Biodiversity of the Republic of Macedonia" (2003), "the diversity of a large portion of the local species has not been adversely affected because agricultural production is not intensive in many regions. In such areas, indigenous species and locally-bred varieties are grown, representing an

important source of genetic material no longer appearing within the genotype of commercial species". In addition to known facts, the Macedonian team as well as the collecting teams in Montenegro, Kosovo and Albania took into account information about the presence of specific landraces and old varieties gathered from local people in different regions of the respective countries. This was especially helpful in determination of the targeted collecting sites.

Collecting missions were conducted during 2009 and 2010 by each partner in his/her own country.

During both years of the project, activities were carried out according to the following plan:

1. *Organizing collecting missions in predicted rural areas in each of the partner countries:*

- April-May: planning the expeditions (detailed terrain plans - itinerary, documentation and information on geographical, soil, climatic and agro-socio-economic data); preparing informative materials (leaflets) for the local population;

- June-October: collecting expeditions in targeted areas.

2. *Compiling the passport data of the collected samples:*

- July-October: immediately after collecting, EURISCO Passport Descriptor was

used to compile passport data of the collected samples.

3. *Conservation of the collected accessions (active, base and safety-base collections):*

- July-November: the seeds of the collected accessions of cereal and maize local landraces were prepared for conservation according to international standards (active, base and safety-base collections were established, depending on the amount of available material).

4. *Documentation, analyzing and comparing obtained data:*

- October-November: obtained data were documented, computerized, collated and analysed among partners in the project.

7. *Progress reports writing:*

- December: in the last decade of November, the project partners compiled the results and achievements in progress reports which were submitted to the project coordinator. On the base of all individual reports, the project coordinator prepared a final report.

RESULTS AND DISCUSSION

The region of South Eastern Europe and the countries where the collecting expeditions were carried out is presented on the map in figure 1.



Figure 1. Map of the South Eastern Europe, the region where the collecting expeditions were conducted

During the whole project period, the project partners inventoried in total 586 geographical localities (331 in 2009 and 255 in 2010). Data per country are presented in table 1.

For almost all collecting sites (over 97%), longitude, latitude and altitude were recorded with GPS and registered in passport data files. The analysis of these data shows the extent of the inventoried territory of the entire region:

- at the northern latitude of 4812797 N at the village of Tauli in Moldova;
- at the southern latitude of 40360215 N at the village of Starje in Albania;

- at the eastern longitude of 02858374 E at the village of Sipoteni in Moldova and
- at the western longitude of 0132548 E at the village of Breginj in Slovenia.

With regards to altitude inventorying was carried out from near the sea level, from 2 m in the village of Totosi at the Ulcinj municipality in Montenegro, up to mountain regions at the village of Lëpushë in Albania at an altitude of 1,603 m. More than 75% of visited villages (localities) were situated on altitudes between 0 and 750 m; approximately 6.5% were situated at 1,000 meters or more above the sea level (Figure 2).

Table 1. Inventoried localities during the collecting missions in 2009 and 2010

Project partner	Number of inventoried localities by project partners		
	Project year 2009	Project year 2010	Whole project duration (2009-2010)
Macedonia	21	19	40
Bosnia and Herzegovina	31	30	61
Montenegro	63	13	76
Romania	32	9	41
Republic of Srpska	3	6	9
Kosovo	35	25	60
Croatia	28	18	46
Albania	45	24	69
Serbia	10	19	29
Slovenia	26	22	48
Moldova	23	25	48
Bulgaria	14	45	59
<i>Total number of inventoried localities</i>	<i>331</i>	<i>255</i>	<i>586</i>

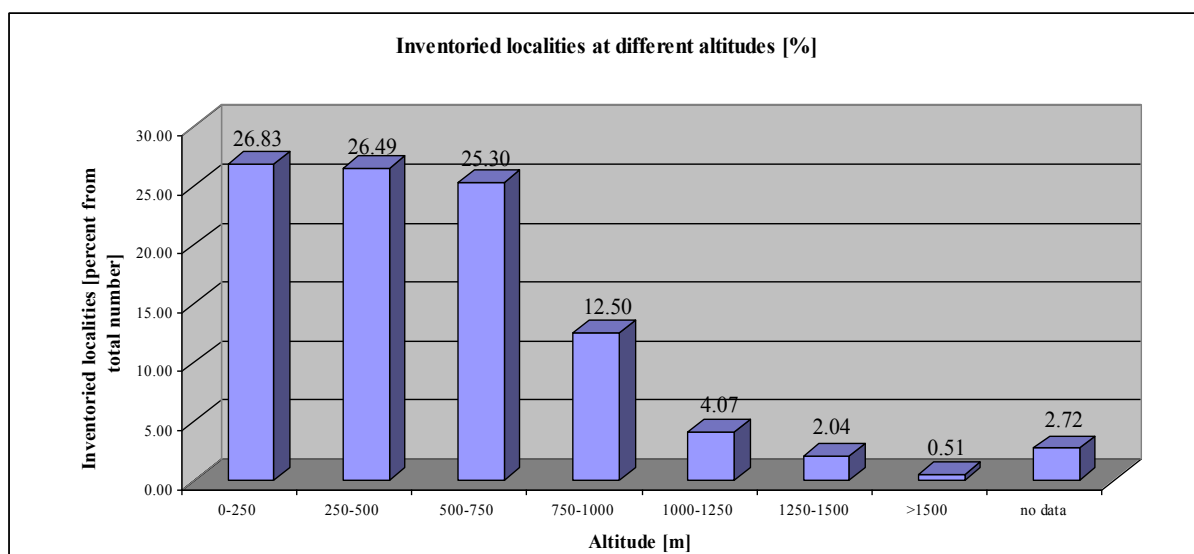


Figure 2. Inventoried localities at different altitudes

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The result of the collecting expeditions during both years of the project was a total number of 867 accessions of maize and cereals (481 accessions in 2009 and 377 in 2010). A detailed result per partner and crop is presented in table 2. Maize, constituting 637

accessions (73.5% of the total number of collected accessions) significantly prevailed among the cereal accessions (Figure 3). Wheat, barley, rye and oat accessions amounted to 5-6% respectively, millet and buckwheat even less (around 1%).

Table 2. Total number of the collected accessions during the collecting missions in 2009 and 2010

Project partner	Collected accessions by crops								
	Maize	Wheat	Barley	Rye	Oat	Millet	Buck-wheat	Other*	TOTAL
Macedonia	90	11	17	14	19	2	0	0	153
Bosnia and Herzegovina	12	4	2	0	0	0	1	0	19
Montenegro	68	7	10	4	4	0	6	0	99
Romania	49	4	3	0	6	1	0	3	66
Republic of Srpska	7	0	3	0	3	0	0	0	13
Kosovo	49	0	3	0	8	0	0	0	60
Croatia	56	0	0	0	0	0	0	0	56
Albania	34	9	2	0	3	0	0	1	49
Serbia	15	0	0	0	0	0	0	0	15
Slovenia	66	3	1	3	5	1	2	0	81
Moldova	157	5	2	0	1	0	0	13	178
Bulgaria	34	4	0	19	3	4	0	14	78
<i>Total</i>	<i>637</i>	<i>47</i>	<i>43</i>	<i>40</i>	<i>52</i>	<i>8</i>	<i>9</i>	<i>31</i>	<i>867</i>

*Other species than defined in the project title (*Sorghum* sp., *Triticum monococcum*, *Triticum spelta*, *Triticum turanicum*, einkorn)

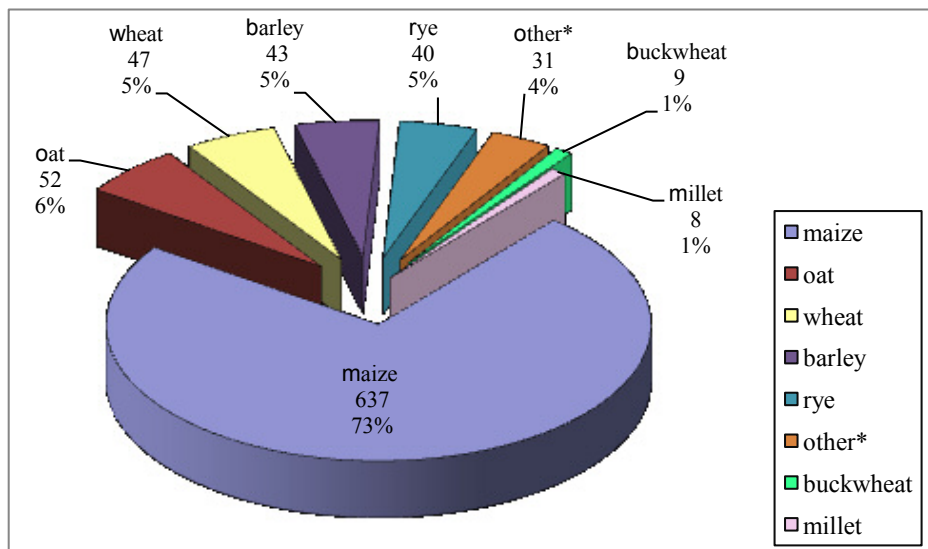


Figure 3. Distribution of the collected accession by crops

Few valuable accessions of *Sorghum* sp., *Triticum monococcum*, *Triticum spelta*, *Triticum turanicum* and einkorn were collected, although not defined in the project

title. The value of these species comes from the fact that it is rather difficult to find and collect them. They also represent an interesting material for scientific and breeding

purposes, production under conditions of organic farming, and possible use for quality improvement of functional food and special products.

The dominance of the maize landraces among the collected accessions is due to several factors. Firstly, maize is very often cultivated on small plots in backyards and home gardens together with vegetables, as a complement to the larger field plots. Secondly, it is too expensive for peasants (small farmers) to buy hybrid maize seeds for own household cultivation and consumption. Instead they maintain their own seeds which very often have been grown for generations. This is predominantly the case in poorer regions with extensive agricultural practise. Genetic uniformity, as well as high yielding ability, is not of crucial importance in these areas, rather adaptability to the frequently limited growing conditions. A maize landrace with quite short ears, collected in the southern part of Macedonia in a relatively isolated region, is taken as an example of this.

The population which had been cultivated for years, usually without irrigation, was reported to have very good drought resistance (Figure 4).



Figure 4. Local landrace from southern part of Macedonia, drought resistant, grown without irrigation

Another important factor for maintaining maize landraces is the source of high quality human and animal food. An interesting example is a collected maize landrace from

the western part of Macedonia named “brzak” which means “speedy” and refers to short vegetation period. Even more important is the specific use of its flour which is considered the best in cooking of traditional dishes called “bakrdan” compared to other populations and hybrids in the region. This is the favourite meal of the local population and also very appreciated in ethno-tourism.

Unlike maize landraces, collecting landraces of other small cereals, especially wheat and millet, becomes more and more difficult. For oat, barley and wheat, the demand for advanced cultivars is increasing. Certified seeds of these crops are not so expensive compared to maize hybrids and could in addition be reproduced once or twice on farm still maintaining the genetic integrity. Also, cultivation is usually on larger fields. During the collecting of accessions of these crops, it was considered necessary to receive detailed information from growers in order to find out whether their “old seeds” were old traditional cultivars or landraces or self propagated seed from advanced modern cultivars.

For 313 accessions from a total of 867 accessions, the collectors provided information about collecting source and recorded it in files together with passport data. Most of these accessions were collected from farm stores (63%), another important source were fields (22%), backyards, kitchen or home gardens (over 6%). Green markets are still a valuable source of old, traditional varieties and landraces. Around 5% of the collected accessions derived from green markets. Many peasants were offering “old domestic seeds” of various cereals for sale, however in smaller quantities, for home use (cooking whole grain meals, use in traditional medicine etc.). Sometimes, interesting material, which was difficult to find during collecting expeditions in villages, could be collected at the green markets.

All collected material was put under conservation and is now maintained in the gene banks of each project partner, under mid-term or long term conditions, according to available conservation capacities.

CONCLUSION

The region of South Eastern Europe is still rich in agricultural biodiversity, represented by local landraces. This fact was supported by the result of conducted collecting missions during 2009 and 2010, where 867 accessions of maize and cereal local landraces were collected. There is however an impending danger of extinction caused by many factors, such as intensive agricultural practices and use of modern cultivars and hybrids, migration of the population from villages to the cities, aging of the population in rural areas that traditionally cultivated local populations etc. Therefore it is considered necessary to continue with collecting expeditions in the region.

In general, the result of this project has had significant positive impact on the present and future work of the project partners and their institutions, not only in the field of plant genetic resources, but also in the field of plant breeding and entire crop production. For some of them this was a first attempt to organize and conduct collecting missions in their own countries, to collect the first local populations of cereals and maize and to include them in the newly established national collections. The collected 867 accessions represent richness of biodiversity, that is now prevented from being lost and will soon be available for breeding and research in the region, as well as for the entire scientific community. The next and very important steps will be to regenerate, characterize and evaluate the collected material.

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