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Reasons and Processes Leading to the Erosion of Crop Genetic Diversity in Mountainous Regions of Georgia

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Agriculture has a long history in Georgia; it has led to a great variety of ancient crops. However, this diversity is under threat for many reasons. First, introduced crops have caused a loss of traditional cultivars, because the introduced crops are preferred due to their higher yield. Moreover, agricultural machines such as forage and grain combine harvesters imported to Georgia are constructed for widely distributed, imported crops and cannot be used to harvest local cultivars. Until recently, genetic erosion of ancient crop varieties was not a problem in the mountain areas of Georgia, which until the 1990s constituted a depository of local crop varieties of wheat, barley, rye, oat, common millet, traditional legumes, vegetables, herbs, and spice plants with specific varieties adapted to mountain conditions. These mountain areas worked as a depository because local mountain communities preserved their traditional ways of life and socioeconomic structures. Their traditional agricultural equipment, used on a large scale until the 1990s, still allows them to maintain areas under cultivation (with grain or other crops) on steep slopes and at high elevations where modern tractors cannot be used. Moreover, some old landraces of wheat and barley are still being used to prepare bread and beer for religious rituals. Currently, many endemic and native representatives of crop plants are in danger of extinction. International nature conservation institutions and Georgian scientific and nongovernmental organizations have developed plans to preserve the genetic resources of local cultivars.

Keywords: Agrobiodiversity; genetic erosion; germplasm conservation; Caucasus; Georgia.

Introduction

Agriculture in Georgia has a long history and is characterized by a great diversity of local landraces, varieties and even endemic species of cultivated plants. Many of them are adapted to mountain habitats and represent local high-mountainous landraces (Ketskhoveri 1957; Figure 1). Georgia is a mountainous country made up of two separate mountain systems: the Greater Caucasus Mountain Range, lying northwest to east-southeast between the Black Sea and Caspian Sea; and the Lesser Caucasus Mountains, which run parallel to the greater range, at a distance averaging about 100 km south. Two thirds of the country is mountainous, with an average elevation of 1200 m. The highest peaks are Mount Shkhara (5068 m) in the Western Greater Caucasus and Mount Didi Abuli (3301 m) in the Lesser Caucasus (Figure 2).

There are many threats to these oldest of crops in the modern period. In our opinion, the main threat to agrobiodiversity in Georgia is the loss of local and ancient crop varieties. These varieties are characterized by a high level of adaptation to local climatic conditions and often have high resistance to diseases. Protection measures in the country are still not being implemented at an appropriate rate. National policies and comprehensive measures are urgently needed to address the problem of conserving the genetic resources of ancient crops in Georgia.

Diversity of ancient crop varieties

The origin of ancient crop varieties and landraces in Georgia coincides with the period of their primary domestication (Vavilov 1987). Archeological data clearly show that the Caucasus, and particularly Georgia, was settled from prehistoric times, and agriculture was developed there during the Early Neolithic period (Javakhishvili 1930). The oldest archaeological findings of grape pips in the vicinity of village (v.) Shulaveri, southeast Georgia (Figure 2), are dated from approximately 6000 BC (Ramishvili 1988). Further archaeological evidence of prehistoric winemaking has been found very close to the Caucasian region, for example, in northern Iran at the Hajji Firuz Tepe site in the northern Zagros mountains, dating from circa 5400–5000 BC (McGovern 2003), and in the Levant and Jericho in the Near East, where archaeological findings date from circa 4000–3200 BC (Zohary and Spiegel-Roy 1975; Zohary and Hopf 2000). The great genetic and morphological variability of grapevines might be considered another indicator of the possible origin of the grapevine in the Caucasus. About 500 autochthonous grapevine varieties are known in Georgia (Javakhishvili 1930; Ketskhoveri et al 1960). These varieties are characterized by a wide range of color gamma and shapes of berries and pips; all these indicators hint at Georgia being an evolutionary center of origin (Vavilov 1931). Besides grapevines, other fruit trees such as pear, apple, cherry, cornel cherry, and plum have been domesticated from