

AGRICULTURAL SCIENCES

EX SITU CONSERVATION AND DOMESTICATION PROCESS OF A NUMBER OF WILD EDIBLE PLANTS SPREAD IN ARMENIA

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Abstract

Having been rich in valuable key amino acids, vitamins, proteins and mineral salts vegetables plants, many of whose are successfully used as food, play an important role in the human diet.

Unsystematic and not proper (in terms of time and location) utilization of valuable plant species results in irreversible loss of threatened species, which in its turn significantly impoverishes the Armenian flora. That is why the conservation of such plant species in the wild, their involvement in cultivation process is a very important issue, which will ultimately contribute to prevent the extinction of these valuable species in nature. Activities targeted on domestication and involvement in cultivation process of valuable wild vegetable plants is being carried out in "Scientific Center of Agrobiotechnology" the branch of the Armenian National Agrarian University (ANAU), there is already some successes recorded in this direction for four plant species (*Falcaria vulgaris* L., *Chaerophyllum bulbosum* L., *Rumex confertus* Willd. *Leonurus cardiaca* L.). Cultivation technology cards have been developed for them, which can serve as a guide for farmers dealing with those species.

Keywords: *ex situ* conservation, domestication, mallow, sickleweed, sorrel, chervil cultivation technology.

Armenia is one of the few countries in the world where many useful wild plants rich in proteins, fats, minerals, sugars, carbohydrates, vitamins (B, C, A), microelements are growing; they currently make up 10-15% of the traditional diet of the Armenian people. Every year about 180 tons of wild officinal and vegetable plants are sold in the markets of Yerevan city. Even far back in the past, people always used the fruits of wild plants, green mass, flowers, and roots in their everyday food [5].

Even in the conditions of development of agriculture and expansion of a composition of plants involved in cultivation practices, wild edible and spicy plants have not been forgotten by man, there is hardly an Armenian who is indifferent to wild vegetable and spicy herbs. But, unfortunately, a part of the population, taking advantage of the "Green Cuisine" of our Republic, ignoring the peculiarities of plant reproduction and their invaluable role in science, ruthlessly uproot many endangered plants, not realizing that among wild edible and spicy herbs there are rare and high value species such as chick-pea species *Cicer anatolicum* Alef., 9 species of wild onions (*Allium* L.), 2 species of beet (*Beta* L.) and others, which are registered in the Red Book of Armenia [3]. Unsystematic and not proper (in terms of time and location) utilization of valuable plant species results in irreversible loss of threatened species, which in its turn significantly impoverishes the Armenian flora. From this point of view, the importance of conservation and sustainable use of plant genetic resources is becoming more and more important.

Back in the beginning of the last century, academician N. I. Vavilov (1928) was the first to

suggest possible directions for genetic erosion prevention [4]. It was to use the genetic potential of crop wild relatives to improve varietal composition of cultivated plants. This idea formed the basis of genebanks and seed collections establishment, whose role in the conservation of plant genetic resources is invaluable, especially given that many *ex situ* conserved species are no longer found in the wild (Esquinas-Alcazar, 2005) [1].

Nowadays there are possibilities in genetic banks to use molecular marking methods to control the dynamics of plant gene pools diversity involved in breeding. According to studies, the greatest loss of genetic diversity is observed at the data collection stage, therefore, in case of insufficient number of wild plants in collections, there is a high risk of losing valuable alleles, which were not of interest to our distant ancestors, but are very relevant today [7]. In this respect, the traditional activity of gene banks is very important, which is aimed at the collecting and long-term conservation relatives (-18° C), which is successfully implemented in the gene bank of the "Scientific Center of Agrobiotechnology" the branch of the Armenian National Agrarian University.

The Science Center's seed collection includes seeds of wild edible plants such as sorrel (*Rumex* L.), beet (*Beta* L.), chervil (*Chaerophyllum* L.), wild carrot (*Daucus carota* L.), purslane (*Portulaca* L.), plantain (*Plantago* L.), sickleweed (*Falcaria* Host.), mallow (*Malva* L.), lettuce (*Lactuca* L.), asparagus (*Asparagus* L.), which have been collected from different marzes of Armenia (Table 1).

Table 1

List of wild edible plants conserved *ex situ* at the Scientific Center

N	Plant name (in Latin)	Collecting place (marz)	Accessions number
1	<i>Beta macrorhiza</i> Stev., <i>B.lomatogona</i> Fisch.et C.A.Mey., <i>B.corolliflora</i> Zoss. Et Butler	Kotayk, Aragatsotn	22
2	<i>Plantago major</i> L.	Tavush	2
3	<i>Asparagus officinalis</i> L., <i>A.persicus</i> Baker	Armavir, Vayots Dzor	5
4	<i>Falcaria vulgaris</i> Bernh.	Armavir, Ararat	8
5	<i>Chaerophyllum bulbosum</i> L.	Gegharkunik, Shirak	3
6	<i>Lactuca saligna</i> L., <i>L.serriola</i> L., <i>L.georgica</i> Grossh., <i>L. altaica</i> Fisch. Et C.A.Mey.	Ararat, Armavir, Kotayk, Vayots Dzor, Gegharkunik	22
7	<i>Rumex acetosa</i> L.	Aragatsotn, Syunik	2
8	<i>Daucus carota</i> L.	Armavir, Ararat, Aragatsotn, Tavush	5
9	<i>Portulaca oleraceae</i> L.	Ararat	2
10	<i>Allium atrovioleaceum</i> Boiss., <i>A.rotundum</i> L., <i>A.fuscovioleaceum</i> Fumin.	Aragatsotn, Shirak, Kotayk	4
11	<i>Malva neglecta</i> Wallr	Ararat, Armavir	3
Total			78

The breeding activities carried out in this direction at the Scientific Center, as well as the application of intensive technologies of agricultural practices are aimed at cultivation of valuable wild plant species and establishment of their production plantings. It will greatly contribute to a noticeable increase in the volume of plant biomass from the unit area and to the unprecedented increase in cultivation efficiency [6].

In addition to the above-mentioned functions, the Scientific Center is carrying out breeding activity using the wild relatives of the mentioned plant species as parental forms. These works in the Center started in 2017.

The main goal of the research is to encourage farmers to cultivate these valuable plants (conserving the species in their habitats) at the same time increasing the area under cultivation of new, non-traditional vegetable crops, which can significantly enrich the assortment of cultivating vegetable crops and significantly increase a volume of vegetable crops production.

The sowing of sickleweed (*Falcaria vulgaris* L.), turnip-rooted chervil (*Chaerophyllum bulbosum* L.), Russian dock (*Rumex confertus* Willd.), motherwort (*Leonurus cardiaca* L.) was done in the conditions of Ashtarak region of Aragatsotn marz.. As a result of three-year (2019-2021) experience the technological cards for cultivation were developed; they will serve as a guide for cultivation technology.

One population-ecotype lines were isolated from the plants of sickleweed and turnip-rooted chervil for further improvement by analytical breeding and submission for State Variety Testing.

Sickleweed is a valuable biennial, sometimes perennial herb, which contains a significant amount of vitamins A, C and mineral salts. It is used both freshly cooked, dried, deep-frozen, as well as pickled [8]. The works on domestication of sickleweed and its involvement in cultivation started with a basic cultivation of the land. For this purpose, in autumn the soil was fertilized with 40 t / ha manure, P₁₀₀K₆₀ rate, deep tillage

was done at a depth of 28-30 cm. In the spring, ploughing was carried out, soil bursting was done at a depth of 12-15 cm, sowing with stratified seeds was implemented at the rate of 6-8 kg/ha [2].

Sickleweed seeds were sown applying 2-3 lines tape type method using 45x25x5 scheme. During the vegetation, inter-row bursting were done twice, and after the first bursting soil was fertilized applying N₆₀ rate. The leaves's harvest began in the first decade of May, when there were large, delicate leaves on the plant. Second and further cultivation of inter-row spaces was accompanied by the simultaneous renewal of the existing furrows. In the second decade of May, the young flower -bearing stems were harvested. They were sorted and used again for food purposes, mainly canned.

Chervil is a biennial herbaceous plant whose first year vegetative mass (leaf rosette) is a valuable food; it is used fresh or canned. In the second year of vegetation, flower stems and seeds are formed, and sometimes they are formed in the first year of vegetation. In addition to the leaf rosette, the second year flowering stems are also used, which are delicate, white and very tasty at a young age [2].

The cultivation of chervil started in the autumn of the previous year, when 35-40 t / ha of manure and P₈₀K₆₀ were applied as a main soil fertilization. After deep ploughing, the field is left without leveling until spring for maximum moisture accumulation. In the spring, the sowing was done applying a three-line tape type method using inter-tape distance of 45 cm. During the vegetation period, the crops are thinned in two ways, the first when the plants form the second true leaf, and the second thinning 15-20 days after the first, so that the plants are at a distance of 7 cm from each other.

To obtain a high quality leave mass used in food, the plants during the cultivation were enriched with nitrogen fertilizers of N₇₀ active ingredient rate. The green mass was harvested when the edges of rosette

have not yet hardened and their commercial qualities have not deteriorated. Irrigation was carried out six times during the growing season, as per necessity, at the rate of 600 m³.

Sorrel is a very valuable food vegetable, the leaves of which are used both fresh and dried, preparing various dishes [10]. It is spread in the wild from the lowlands of the Republic (500-600 m above sea level) to the high mountainous regions (2200 m above sea level). It is also considered a valuable officinal plant, for this purpose its decoction and tincture are used. The nutritional value of the sorrel is high, containing A; B₁; B₂; PP and S vitamins [9].

Sorrel, as a perennial plant, grows in the same site and gives a good harvest for 3-4 years, after which the productivity of the plants decreases; the flower-bearing stems are mainly forming [2]. Considering that, the plantations need to be updated and replanted. Planting was carried out in a two-line strip at a distance of 45-50 cm between strips and 25 cm between rows. Planting was carried out in a two-line tape type way at a distance of 45-50 cm between tapes and 25 cm between rows. Sometimes, in weed contaminated fields, planting can be done in a row way, in this case the sowing norm reaches a minimum of 4-5 kg/ha, while in the case of tape type sowing way it makes up 8-10 kg/ha. The thinning done in time is considered as an important measure; 4 cm distance is kept in the first year of sowing, then at a distance of 30 cm is used. Sorrel is harvested 3-4 times, starting in early spring, when the leaves have not yet hardened, and the length reaches 18-20 cm. After each leaf harvest, the field is fed with manure and ammonia nitrate (N₆₀), which promotes intensive leaf formation. If properly cultivated and all agricultural rules are observed, a high-quality yield of 15-20 centner per hectare can be obtained.

Mallow is the most widely used vegetable plant, which is widespread in almost all regions of Armenia at 800-1800 m above sea level. It also has a great therapeutic value, for this purpose the flowers and leaves are used. Mallow is no less important as a fodder, the rough stems are harvested in late summer and used as a green forage. In the same place the mallow can grow and form exuberant foliage for up to 5 years, after which it must be replanted. Mallow forms a deep vertical root system (up to 1 meter), due to that it grows well in soils with deep arable layer. The plant is not demanding towards nutrients in the soil and to the light, thanks to those features mallow can be cultivated in inter-row spaces of perennial plantings [2].

Mallow plants were cultivated with seeds, which were sown in the fall in a two-line tape way at a distance

of 45-50 cm between tapes and 20 cm between rows. In the fields contaminated by weeds mallow seeds can be sowed using linear method; in this case sowing rate makes 9-10 kg per hectare, and in case of line tape sowing way - 14-15 kg/ha. During the vegetation, weeding-bursting were carried out 2-4 times and watering 5-6 times. After each harvest, the field was fed with N₆₀. The harvest was carried out starting from early spring to mid-summer, until the leaves were rough, with intervals of 10-15 days, which allows to get a yield of up to 10 tons per hectare.

CONCLUSIONS

As a result of implemented scientific experiments, it becomes clear that the work we have done to provide the population with quality vegetables, to enrich the assortment of cultivated plants and to involve wild vegetables in the cultivation practices is quite effective. These works are especially useful in the sense that the mentioned vegetable plants provide food to the population mainly in early spring, at the time of the year when the food problem becomes more urgent. At the same time, it should be noted that these plants can be grown on plots that are considered unsuitable for other crops; farms, can get more high-quality vegetables per unit area through application of proposed cultivation technology.

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