

Multicrop collecting mission to Uzbekistan

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Introduction

Uzbekistan is situated in the middle of the Central Asian Centre of Origin, region 5 according to Zeven and De Wet (1982). The region is the centre of origin of more than 40 crops, including important crops such as onion, garlic, melon, spinach, radish, turnips, cotton, apple, *Prunus* spp., grapes, walnut, almond, pistachio, pulses such as lentil and several spicy plants. Recently, research groups from Poland, Israel and Japan (Kotlinska *et al.* 1990; Ladizinsky and Abbo 1993; Nakagahra and Okuno 1995) collected plant genetic resources in Uzbekistan. The first two missions were single-crop expeditions concentrating respectively on *Allium* spp. and *Lens* spp. The last mission was a true multicrop expedition, collecting a large number of horticultural and agricultural crops.

The differences in climate, soil and altitudes have highly influenced the enormous biodiversity of these crops. Their wild relatives are often found, particularly in the mountainous areas. Apart from the abundance of crops for which Region 5 is the centre of origin, the area is known to be situated at the periphery of the distribution of a number of other important crops, such as temperate grasses and fodder legumes and wild *Lactuca* spp. Furthermore, landraces of several vegetables are still cultivated by local farmers.

In 1990 a Memorandum of Understanding was signed between the Vavilov Institute of Plant Industry and the Centre for Genetic Resources, The Netherlands, to conduct a number of joint exploration missions in the USSR. Owing to the political changes in 1991, for several years thereafter it was not possible to conduct these missions, but in 1995 the two national genebanks resumed discussions in order to conduct some of the planned expeditions. VIR proposed to conduct the first mission in Uzbekistan and contacted the national genebank of Uzbekistan, the Uzbekistan Research Institute for Plant Industry (Uz-NIIR), located in Kibray near Tashkent. VIR took the initiative to make the arrangements for the expedition with the genebank of the Uz-NIIR, and Dr Karim I. Baimatov was appointed as the expedition leader. The expedition was prepared in tripartite discussions and started on 1 August 1997.

Objectives, itinerary and collecting time of the expedition

The Republic of Uzbekistan occupies a territory of approximately 447 000 km² and is about 13 times the size of The Netherlands. Before the start of the expedition it was clear that only a part of the country could be sampled. The expedition routes were chosen on the basis of the following objectives:

- to adhere to the international responsibility of the genebanks involved in the optimal conservation of genetic resources
- to broaden the collections of *Lactuca*, *Allium* and *Brassica* spp. for which CGN has accepted international responsibilities
- to collect materials of a number of other crops such as landraces of fruit vegetables, fodder crops, fruits, nuts and tulips.

The mission could thus be considered a multicrop expedition. Besides collecting material from the wild, some markets (bazaars) were also visited where seeds were purchased.

The expedition was conducted from 1 to 26 August 1997. The areas visited (Fig. 1) were in four major sectors:

1. mountainous areas southeast of Tashkent, the foothills of the Chatkal'sky mountains
2. mountainous areas northeast of Tashkent, the foothills of the Gamskiy Khrebet mountains, near the Pskem river
3. western foothills of the Gora Kyzylnura, approximately 55 km east of Tashkent
4. southeast of Tashkent to Samarkand, passing Quarshi to mountains northwest of Termiz, Baysun mountains (Samarkand, Kashkadarya and Surkhandarya provinces)

During the four trips markets (bazaars) were visited at Tashkent, Angren, Chirchik, Gulistan, Jizzak, Samarkand and Guzar. The team travelled approximately 2500 km in different ecological regions and at altitudes ranging from 250 to 1600 m asl.

Results and discussion

The mission collected germplasm from different sources as summarized in Table 1. Most of the material was collected in the wild vegetation and particularly in the mountainous regions of Uzbekistan around Tashkent. Nearly all the collected material from these areas can be classified as wild material. Only some of the collected apple materials may be considered as primitive cultivars: that part of the apple material collected in the 'living' collections. The accessions collected at the markets are predominantly of the cultivated type, mainly landraces but occasionally commercial cultivars.

Table 1. Sources of the germplasm collected in Uzbekistan in 1997

Source	Number of localities	% collected accessions
Wild vegetation	37	76
Markets/bazaars	7	15
<i>In situ</i> collections	2	8
Institutions	2	1

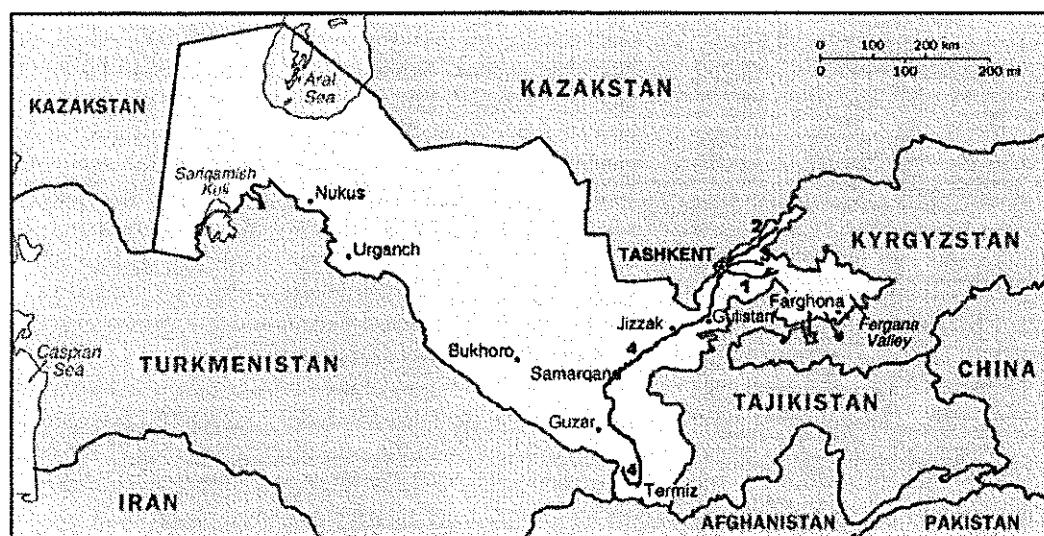


Fig. 1. Map of the four collecting routes in Uzbekistan, 1997.

Collected germplasm

A summary of the collected material is presented in Table 2. It shows that 296 accessions were collected of approximately 50 different species, not including the approximately 30 accessions of wild *Amigdalus* (almond) and *Prunus* spp.

Table 2. Number of species and accessions collected in Uzbekistan in 1997

Genus/crop	Number of species	Total accessions
<i>Lactuca</i> spp. (+ relatives)	4/5	27
<i>Allium</i> spp.	13/14	63
<i>Brassica</i> spp.	3	10
Other vegetables	4	20
Grasses and clovers	8/10	45
<i>Tulipa</i> spp.	3/5	42
<i>Malus</i> spp.	1?	66
Other crops/species	5/8	23
Total	41/50	296

Lactuca and related species were sampled at 24 locations, both in semi-desert areas at altitudes between 200 and 500 m and in mountainous areas up to 1550 m. Examination of the collected seeds proved that 23 accessions were true *Lactuca* spp., whereas 4 accessions were identified as related *Chondrilla* spp. Taxonomic identification of the 23 *Lactuca* spp. has not yet been completely finalized. The material was planted in 1998 in a greenhouse at Wageningen for regeneration. Most accessions were preliminarily identified as *L. serriola*. One accession very much resembled *L. saligna*. Some of the collected populations were very heterogenic for different morphological characters and may include two species. Most likely the other species will be *L. altaica*, a species morphologically related to *L. serriola* with the same chromosome number and a high crossability with this species (Thompson *et al.* 1941). Lindquist (1958) mentioned the uncertain taxonomic position of *L. altaica* and considered it as probably only a subspecies of *L. serriola*. Ferakova (1977) states: "*L. altaica* has an intermediate taxonomic position

between *L. serriola* and *L. saligna*". The *Chondrilla* spp. did not flower and subsequently no seed could be harvested. Further taxonomical identification of the *Lactuca* and related species will be carried out by the Department of Taxonomy of the Wageningen Agricultural University.

The genus *Allium* was intensively collected at 32 localities, including at 7 markets. In total 63 accessions of 13 or 14 different *Allium* species were collected and this material can be divided into the following three groups:

- 5 accessions: most landraces of onion (*A. cepa*), seeds obtained at markets
- 13 accessions of the cultivated garlic (*A. sativum*), only bulbs collected at markets and two samples of the wild garlic (*A. longicuspis*), 'bulbs' collected from plants in a valley near a small river
- 43 accessions of more than 10 wild *Allium* species, mainly seeds collected, but occasionally bulbs. It includes some of the following wild species, *A. altissimum*, *A. drobovii*, *A. barsczewskii*, *A. ceasium*, *A. regelii*, *A. scabriscapum* and *A. stipitatum*.

The garlic samples showed considerable variation, which was also reported for Uzbekistan by Nakagahra and Okuno (1995). The wild *Allium* species were collected at 25 locations ranging in altitude from 730 to 1500 m. The collected wild species belong to the subgenus *Rhiziridum*, more related to the common onion, and to the subgenus *Molium*, a less closely related subgenus. The latter group may have potential for ornamental use. Some of the wild species did not flower in 1998 and require further identification.

Three types of *Brassica* were collected at markets in Tashkent, Chirchik, Gulistan, Jizzak and Samarkand. Most of the material collected was said to be of local origin. The accession collected of the *B. oleracea* group white cabbage had the variety name 'Sudy'. Two accessions of *B. rapa* group pe-tsa (Chinese cabbage) and five accessions of the *B. rapa* group vegetable turnip, were collected. Both yellow and red turnips were sampled. One wild crucifer (not identified) was collected.

The other vegetables collected consist of local accessions of cucumber (6), tomato (3), Bulgarian pepper (1) and carrot (10). This material includes both landraces and commercial cultivars, some with names and often said to be cultivated in areas near the markets. The fruit vegetables will be regenerated in the near future in greenhouses at Wageningen. Five accessions of domesticated carrots and also five samples of wild *Daucus* spp. were collected. The domesticated carrots can be divided into two groups (Zeven and De Wet 1982): the Eastern or Asian (var. *atrorubus* Alef.) carrots, with mainly purple and yellow roots and the Western (var. *sativus* Hoffm.) carrots with mainly orange roots. Material of var. *atrorubus* was collected at markets in Uzbekistan. The collected wild carrots probably include *D. carota* var. *sativus*. All *Daucus* accessions will be included in the collections of the genebank of Horticultural Research International (HRI) at Wellesborne, UK.

The expedition aimed at collecting grasses and clovers adapted to temperate climates and therefore collections were predominantly made at higher altitudes ranging from 730 to 1470 m. At these altitudes the day and night temperatures during the growing season are highly variable and differences of more than 25°C may occur. A large number of the accessions were found at rather wet places, often near small mountain rivers. In all, 37 accessions of 6 to 8 different grasses, including 9 accessions of unidentified grasses, and 8 accessions of two clover species were collected. In particular species of the genera *Dactylis*, *Festuca*, *Lolium*, *Phleum* and *Poa* were sampled. The collected grasses may be used both for fodder production and for the establishment of greens. A large variation in plant height, length of the inflorescence and the size of the leaves could be observed in the different grasses. Most of the collected grasses were sown at the beginning of 1998. Owing to their perennial character and vernalization requirement only a few accessions produced inflorescences and further identification needs to be conducted in 1999. Preliminary identification showed that the collected material includes the following species: *Festuca arundinacea* or *F. pratensis*, *Lolium perenne*, *Phleum panicum* and *Poa annua*. The collected clovers have tentatively been divided into *Trifolium repens* (white clover) and *T. pratense* (red clover). Further taxonomic studies are needed to clarify the identification of this material.

The Central Asian Centre is not generally regarded as the primary centre of diversity of the tulip. However, considering the large number of *Tulipa* spp. of Central Asian origin, Hoog (1973) regards this area as the primary gene centre for tulip, with the birthplace and true home being located within the Tien Shan and Pamir-Altai regions. Therefore, some of the mountainous areas of Uzbekistan can be considered as part of the centre of origin of the genus *Tulipa*. The expedition collected botanical seeds of 42 accessions of *Tulipa* spp. at 20 localities, particularly in the mountainous areas north and east of Tashkent. The accessions were sampled at altitudes ranging from 740 to

1600 m. The genus *Tulipa* L. is often divided into two subgenera, *Tulipa* and *Eriostemones* (Boissier 1882; Van Raamsdonk and De Vries 1992). Accessions of both subgenera were collected. Preliminary taxonomic identification of a group of 22 accessions whose bulbs were collected showed that 13 accessions belong to the subgenera *Tulipa* and 8 to the subgenera *Eriostemones*. One accession was not identified as a *Tulipa* species and may be a *Fritillaria* spp. This information revealed that at least three different *Tulipa* species were collected, including *T. kaufmanniana* (subgenera *Tulipa*) and *T. polychroma* and *T. turkestanica* (subgenera *Eriostemones*).

Central Asia is part of the centre of origin of *Malus*. The Old Silk Road from the Black Sea to western China played an important role in the evolution and spread of the cultivated apple. The Old Silk Road passed through Uzbekistan and travellers have traversed it since Neolithic times. Selected cultivars, from random hybridizations and disseminated graftings, were probably well established in the civilizations of the Near East by 4000 BC, and were later documented by Roman authors. In the course of history, the apple cultivars in Western Europe were more or less cut off from their origins and evolved in relative isolation. The expedition collected apple germplasm in some remote areas of Uzbekistan, particularly in the mountainous areas north and east of Tashkent. In total 66 accessions were collected at 20 localities at altitudes ranging from 790 to 1460 m. Usually, 10-15 apples of a single tree, resulting in 40 to 75 seeds of each accession, were collected. Two *in situ* collections, from orchards established in the past and including a wide selection of apple trees from the neighbourhood, also were sampled. In one orchard 11 accessions were collected; in the other living collection 12 accessions were sampled. Both 'living' collections contained more than 100 trees. A selection had to be made and more or less similar trees were sampled only once. Three samples were obtained from the market in Angren and the rest, about 60% of the collected apple germplasm, was sampled in the wild.

Taxonomic identification of the collected material was not possible. It is believed, however, that most of collected accessions belong to *Malus domestica* (cultivated apple). According to Zeven and de Wet (1982), three other species of *Malus* can be found in the Central Asian centre of diversity. However, some of these are difficult to distinguish from the cultivated *M. domestica* and others introgress easily with this species. There was wide variation in many properties such as form, colour, size and taste of the apples, the length and type of branching of the trees, the colour of the stems and maturation. The collected material was sown in January 1998 and planted in the field early in the summer.

The expedition also collected materials of several wild almonds, *Prunus* spp., three accessions of *Lilliaceae*, one red beet and one radish, not further reported here. The 18 accessions of the bulbous plant *Fritillaria* includes mainly the species *F. severtzovii* and *F. stenanthera*.

Conclusions

The expedition was extremely successful, having collected nearly 300 accessions of more than 45 species. This was accomplished in 23 collecting days, during which 48 localities in Uzbekistan were sampled.

Three important base collections of *Lactuca*, *Allium* and *Brassica*, for which CGN has international responsibility, can be broadened with additional material of this region, not yet present in these collections. Both wild and domesticated material was collected. Gaps present in the *Lactuca* and *Allium* collections can now be filled. Some species previously not present or with only a few accessions represented in the collections could be added.

Interesting accessions were collected of some fruit vegetables, carrots, forages and a number of perennial crops such as apple, almond, *Prunus*, tulip and *Fritillaria*.

The field observations in Uzbekistan on most of the crops collected clearly indicated a broad genetic variation of the material. The different ecological regions and altitudes, ranging from 250 to 1600 m, explain the enormous biodiversity sampled in this area.

Further taxonomic identification of the collected wild species is particularly required on *Lactuca*, *Allium*, *Tulipa*, *Fritillaria* and material of some of the forages.

Materials collected will be available following multiplication and characterization.

The cooperation between the expedition members of Uzbekistan, Russia and The Netherlands was excellent. It was decided to organize a follow-up expedition to Uzbekistan to include mountainous areas around the Fergana Valley and perhaps similar areas in the neighbouring countries.

Acknowledgements

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