Agricultural Research Department
Centre for Plant Breeding and Reproduction Research
Centre for Genetic Resources, The Netherlands

Report of expedition to Uzbekistan in1997

Itinerary, collected materials and data

Louis J. M. van Soest

cpro-dlo

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Foreword

This report gives an overview of the itinerary and the details of materials and data obtained during a joint multi-crop collecting expedition of the Uzbekistan Research Institute of Plant Industry, the Vavilov Institute of Plant Industry and the Centre for Genetic Resources, the Netherlands, of CPRO-DLO.
The joint efforts and commitment of these three institutes and the tenacity of its staff members involved rendered the expedition possible and made it into an important success. This success can be deduced from the large numbers of interesting crop materials collected.
The expedition fits a longstanding tradition of mutual collaboration concerning the collection of plant genetic resources, based on the policy of permanent and unrestricted accessibility of collected materials regardless the locations of origin and storage. This policy has been most explicitly formulated in the FAO International Undertaking.
It is hoped that a revision of the International Undertaking, to bring it in line with the provisions of the Convention on Biological Diversity and to acknowledge the souvereign rights of national states on its genetic resources, will not appear detrimental to this spirit of international collaboration.
It is also hoped that more joint expeditions between the institutes involved will follow and will be as fruitful to all parties involved, in line with the objectives of the international plant genetic resources community.

Bert Visser
director
Centre for Genetic Resources,
the Netherlands (CGN)

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1. Introduction

Since its establishment the Centre for Genetic Resources, the Netherlands (CGN) has conducted several collection expeditions. These expeditions were focussed on broadening the collections of CGN of broad international relevance. The crops concerned are lettuce, cabbages, onions and, in the framework of the German-Dutch cooperation, beet and tuber-bearing *Solanum* species.

In 1990 a 'Memorandum of Understanding' was signed with the Vavilov Institute of Plant Industry (VIR) at St. Petersburg to conduct a number of joint exploration missions in the USSR. Due to the political changes of 1991, for several years, 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 with the genebank of the Uz-NIIR, and Dr. Karim I. Baimatov was appointed as the expedition leader. All arrangements necessary for the organization of the expedition such as expedition routes, transport, equipment ,crops to be collected, financial aspects, etc., were made in tri-partite discussions and the expedition was able to start at the first of August, 1997.

Uzbekistan is situated in the middle of the Central Asian Centre of Origin (Fig.1), region 5 according to Zeven en 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, several pulses and spicy plants.
The differences in climate, soil and altitudes has highly influenced the enormous biodiversity of a number of important crops. Wild relatives of the mentioned crops are often found, particularly in the mountainous areas. Besides the crops of which Region 5 is the Centre of Origin, the area is also situated at the periphery of the distribution of a number of other important crops, such as temperate grasses and pasture legumes, wild *Lactuca* spp. and *Tulipa* spp. Furthermore, landraces of several vegetables are still cultivated by local farmers in the country.

2. Objectives of the expedition

Uzbekistan is about 13 times the size of the Netherlands, and 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 for the conservation of genetic resources
- to broaden the basic collections of CGN with germplasm of *Lactuca, Allium* and some *Brassica* spp.
- to collect material of a number of other crops of which CGN maintains collections, in particular landraces of fruit vegetables (tomato, cucumber and Bulgarian pepper)
- to collect a number of other crops such as garlic, apple, tulip, temperate grasses and fodder legumes.

The mission was clearly a multi-crop expedition and the expedition routes were chosen in the line with these objectives. Besides collecting material from the wild vegetation, some markets (bazaars) were also visited and seeds collected.
The expedition members of Uzbekistan collected also material of wild almonds and *Prunus* spp.

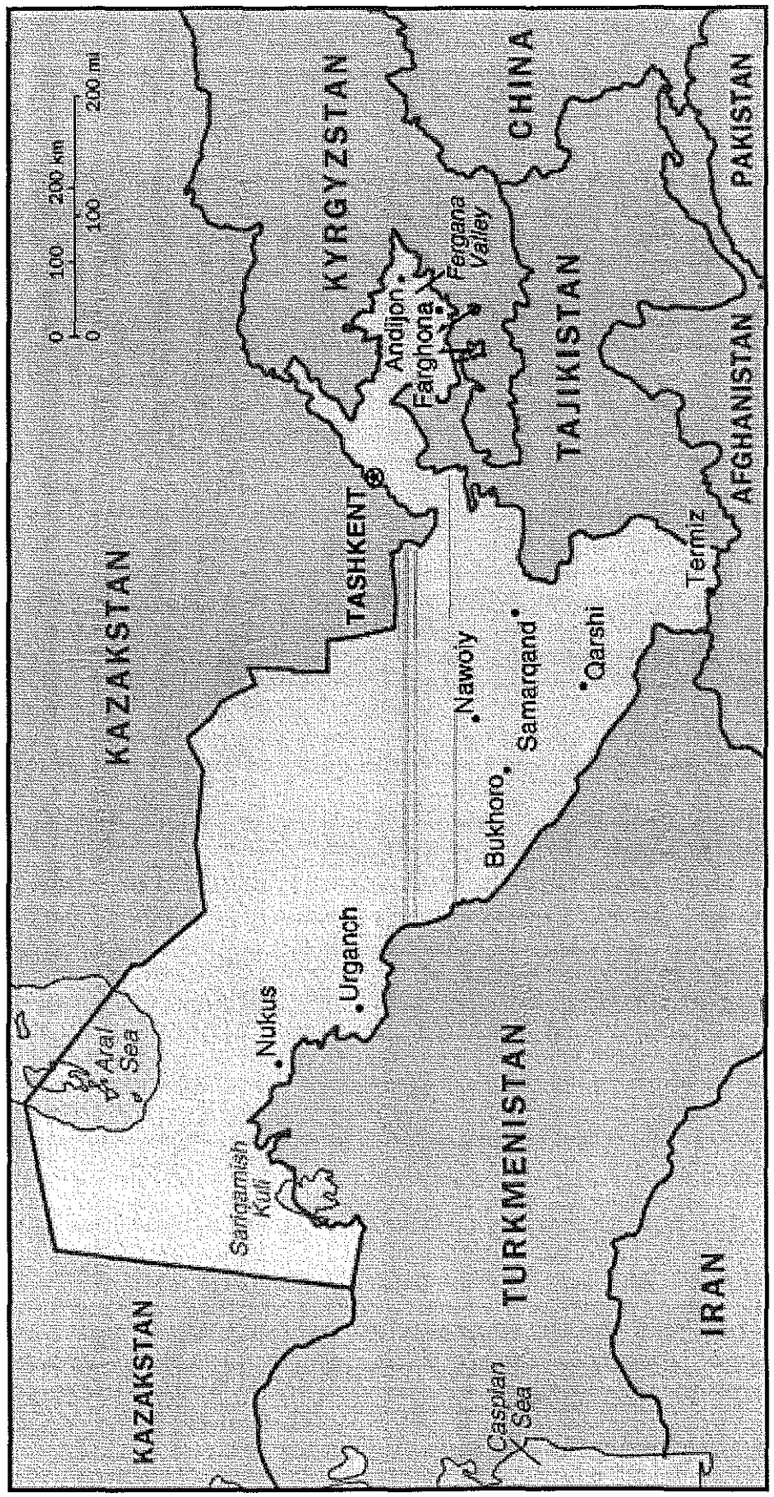

Figure 1. Map of Uzbekistan

3. Members of the collecting team

Only one collecting team was formed and the members were:

- **Dr. Karim I Baimatov** (expedition leader), Head of the Department of Fruit Crops of the Uzbekistan Research Institute of Plant Industry, Tashkent, Uzbekistan.
- **Dr. Vladimir F. Chapurin**, Leading Researcher of the Vavilov Institute of Plant Industry, St. Petersburg, Russia.
- **Dr. Aleksey P. Pimakov**, Head of the Department of Vegetable Crops of the Uzbekistan Research Institute of Plant Industry, Tashkent, Uzbekistan
- **Ir. Loek J.M. van Soest**, Head of the section Crops and Conservation of the Centre for Genetic Resources, the Netherlands, Centre for Plant Breeding and Reproduction Research, Wageningen, The Netherlands.

The two expedition cars used were driven by drivers of the Uzbekistan Research Institute of Plant industry.

4. Routes of explorations and markets visited

The expedition was conducted from August 1 till 26, 1997. The areas visited can be divided in the following five mayor sectors:

A. Mountainous areas south-east of Tashkent, the foothills of the Chatkal'sky mountains
Route: Tashkent - Akhangaran - Angren - Vangiabad - mountains north of Vangiabad - Agren - road east of Angren - the southern foothills of the Gora Kyzylnura some 35 km to the east of Angren in direction of Irtash.
Collecting period:1 to 5 August 1997
Number of localities collected: 18; L 1 to L 18
Altitude range:310-1520 m. a.s.l.

B. Mountainous areas north-east of Tashkent, the foothills of the Gamskiy Khrebet mountains, near the Pskem river
Route: Tashkent - Chirchik - Gazalkent - Charvak, around the large dam and waterreservoir near Burchmilla - Burchmilla - Nanay - Tepar - circa 5 km south of Pekem - return to Tashkent via the road on the other side of the dam and waterreservoir.
Collecting period: 6 to 14 August 1997
Number of locations collected: 19; L 19 to L 37
Altitude range: 400 - 1210 m. a.s.l.

C. Western foothills of the Gora Kyzylnura, approximately 55 km East of Tashkent.
Route: Tashkent - Yangibazar - Parkent - Zarkent and circa 5 km east of Zarkent following the river. Return to Tashkent
Collecting period: 15 to 17 August 1997
Number of locations collected: 3; L 38 to L 40
Altitude range: 500 - 1350 m. a.s.l.

D. Trip south- east of Tashkent to Samarkand, passing Quarshi to mountains north west of Termiz, Baysun mountains (Samarkand, Kashkadarya and Surkhandarya provinces)
Route: Tashkent (South) - Chinaz - Gullistan - Yangiyer - Jizzak - Kuropatkino Samarkand - Guzar - Dekkanabad - Shur-Ob - Ak-Kurgan - Dzhar Kurgan - Sholkon and from there into the Baysun mountains. Return to Tashkent
Collecting period: 17 to 26 August
Number of localities: 8; including several markets: L 41 to L 48
Altitude range: 200 - 1600 m. a.s.l.

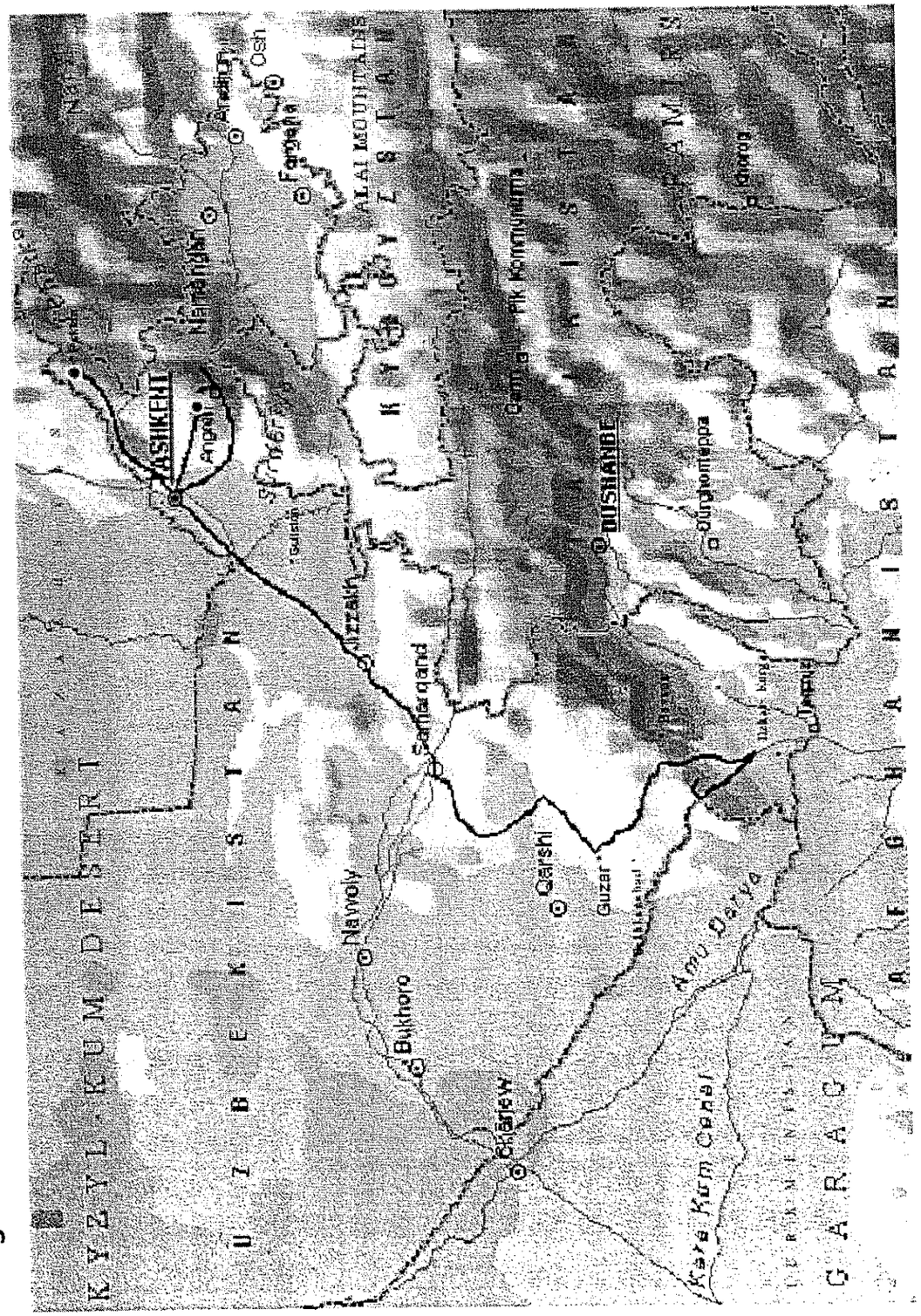

Figure 2. Collection routes in Uzbekistan

E. Markets (bazaars) visited during the four trips above mentioned.

Markets: Tashkent, 2 August, L 3
Angren, 5 August, L 16
Chirchik, 6 August, L 19
Gulistan, 17 August, L 41
Jizzak, 18 August, L 42
Samarkand, 19 August, L.43
Guzar, 20 August, L 44

Table 1. includes the description of all 48 localities from which the material was sampled. The origin of the material collected at the markets was generally not known. It was often stated that the samples were of local origin and cultivated by local farmers. With regard to the localities of the markets there are no data presented on the altitude, and the information on latitude and longitude is related to the location of the respective markets.

The members of the mission travelled approximately 2500 km and the collecting routes are presented in Fig. 2. Detailed passport data of all collected accessions, grouped into the different collected genera and/or crops are given in Appendix 1.

By coincidence the mission found two '*in situ*' collections of apple trees (L 25 and L 40). In both cases, more than 100 apple trees had been assembled from areas near the respective localities. According to a the warden of the National Park, the orchard at L 40 was already established by his father some 40 years ago. He informed the team that a wide range of apple trees had been collected from the surrounding areas and brought together in this special apple garden. The two '*in situ*' collections included both wild and primitive apple trees.

5. Field observation, data collection and taxonomic identification

A standard collector's form was used to obtain passport- and some additional characterisation data of the collected material. An example of the used collector's is presented in Appendix 2. For the collector's number the acronym NUZ (Netherlands-Uzbek Collecting Expedition 1997) has been used. Apart from the standard passport data, for most accessions also information was collected on the type of material, habitat and topography. Agro-morphological data were mainly collected for the vegetatively propagated crops onion, garlic, apple and tulip. Because of the dry and rather warm conditions, disease symptoms were very rare, and only a few symptoms could be observed.

The taxonomic identification of the wild species of *Lactuca, Tulipa, Fritillaria* and *Daucus* appeared rather complex and further studies to identify this material will be conducted. Furthermore, a number of the collected grasses could not be identified.

Table 1. Collecting localities of expedition to Uzbekistan in 1997

Locality Nr.	Date	Altitude (m)	Latitude	Longitude	Description locality
L 1	01.08.97	390	41°18'N	69°20'E	Tashkent, roadside near Hotel Sayohat, 115 Buyck Ipak Yuli
L 2	01.08.97	380	41/20'N	69/22'E	North-East of Tashkent, near Tractor factory
L 3	02.08.97		41/14'N	69/18'E	Tashkent, Kujluk Market in southern part of city
L 4	02.08.97	310	41/08'N	69/25'E	Road Tashkent to Olmaliq, 10 km (near Kaza Suv river)
L 5	02.08.97	330	41/06'N	69/27'E	Road Tashkent to Olmaliq, 16 km (roadside)
L.6	02.08.97	520	40/55'N	69/48'E	Road Akhangaran to Angren, 9km (roadside)
L 7	03.08.97	1260/1300	41/09'N	70/05'E	5 km North of Yangiabad, near second old mine
L.8	03.08.97	1300	41/09'N	70/07'E	4,5 km North of Yangiabad, c 0,7 km into valley along a river
L.9	03.08.97	1300	41/10'N	70/08'E	as L8, c. 1-2 km into same valley along a small river
L10	03.08.97	1350	41/11'N	70/09'E	as L8, c. 2-3 km into valley along small river
L11	04.08.97	1300	41/10'N	70/06'E	5,7 km North of Yangiabad, 0,7 km N. of second old mine
L12	04.08.97	1310	41/11'N	70/06'E	6,2 km North of Yangiabad, 1,2 km N. of second old mine
L13	04.08.97	1350	41/12'N	70/06'E	6,5- 7 km N. of Yangiabad, 1,5-2 km N. of second old mine
L14	04.08.97	1520	41/13'N	70/07'E	7,5-8 km N. of Yangiabad, 2,5 -3 km N. of second old mine
L15	05.08.97	1000	41/05'N	70/05'E	Road Vangiabad to Angren, 4 km (S. part of Chatkal'sky)
L16	05.08.97	800/1300	41/01'N	70/09'E	Market of Angren, apples grown around Algren
L17	05.08.97	1280	41/07'N	70/19'E	Junction road Angren to Irtash, 4,5 km(Chatkal'sky Mountains)
L18	05.08.97	1310	41/08'N	70/17'E	as L17, c. 1.5 km higher in mountains,
L19	06.08.97	1300?	41/28'N	69/35'E	Market of Chirchik, c.45 km N.E. of Tashkent
L20	06.08.97	340	41/24'N	69/28'E	Institute of Plant Industry, Kibray, 6 km N. of Tashkent
L21	07.08.97	980	41/37'N	69/48'E	Road Iskandar-Khandaylyk-Charvak, 3 km from Khandaylyk in direction to Charvak, N.W. mountains
L22	07.08.97	1120	41/38'N	69/51'E	Al-Tash, location c.3-3.5 km further (N.W) from L21, higher in the mountains, near small river
L23	07.08.97	1220	41/39'N	69/52'E	1 km further (N) from L22, near same small river
L24	08.08.97	540	41/34'N	69/46'E	Gazalkent, c. 90 km N. of Tashkent, garden in town
L25	8/9.08.97	980/1150	41/32'N	69/55'E	Gazalkent-Charvak, halfway (Hojikent) to right and 6km from junction in the mountains, apple living collection at this location

Table 1. (continued)

Locality Nr.	Date	Altitude (m)	Latitude	Longitude	Description locality
L26	08.08.97	1010	41/33'N	69/57'E	c 1.5 km further from L25
L27	09.08.97	1400	41/34'N	70/01'E	Road south of dam to Chimigan, location just before this town
L28	09.08.97	1460	41/33'N	70/02'E	1 km South of L27, somewhat higher in the mountains
L29	10.08.97	730	41/37'N	70/03'E	Road around dam N. of Charvak, c. 6 km before Burchmulla
L30	10.08.97	790	41/38'N	70/03'E	Road around dam, c. 4,5 km N. of Burchmulla
L31	10.08.97	800	41/44'N	70/06'E	Road Nanay to Tepar, 5 km after Nanay
L32	11.08.97	900	41/49'N	70/16'E	Road Nanay to Tepar, 5 km before Tepar, collections from area near camp at a small river near mainroad
L33	11.08.97	940	41/49'N	70/15'E	As L32 but 2-3 km along the small river to the N.E and surrounding mountains
L34	11.08.97	1080	41/50'N	70/14'E	As L32/L33, but 4-5 km along the river
L35	12.08.97	1140	41/54'N	70/21'E	Road Tepar to Pekem, 2 km before Pekem
L36	12.08.97	1160	41/55'N	70/19'E	As L35, but 3 km eastward along the valley of small river
L37	12.08.97	1020/1160	41/53'N	70/20'E	Pekem to Tepar, c. 6 km near roadside
L38	15.08.97	500	41/17'N	69/44'E	Road Parkent to Zarkent, c. 3 km from Parkent
L39	15.08.97	1190	41/16'N	69/53'E	c. 6-7 km after Zarkent, near Kumushkan resthouse
L40	16.08.97	1350	41/18'N	69/54'E	as L39, but 1-2 km furtheron, apples found in living collection
L41	17.08.97		40/31'N	68.47'E	Market of Gulistan
L42	18.08.97		40/08'N	67/49'E	Market of Jizzak (Dzhizak)
L43	19.08.97		39/40'N	66/58'E	Market (Bazar) of Samarkand
L44	20.08.97		38/40'N	66/15'E	Market of Guzar
L45	21.08.97	250	37/29'N	67/23'E	Experimental farm near Dzer Kurgan
L46	22.08.97	1100	37/50'N	66/39'E	Sholkon village on foot Baysunta mountains
L47	23.08.97	1430	37/51'N	66/37'E	5 km from Sholkon, national park in the Baysunta mountains
L48	23.08.97	1540	37/52'N	66/36'E	7 km from Sholkon, national park in the Baysunta mountains

6. Results

6.1. Introduction

The mission collected germplasm from different sources which can be summarised as follows:

- wild vegetation, 37 localities (76%)*
- markets/bazaars, 7 localities (15%)
- 'living' collections, 2 localities (8%)
- institutions, etc., 2 localities, (1%)

* in brachets the proportion of the total collected material.

Most of the material was collected in the wild vegetation and particularly in the mountainous regions of Uzbekistan. Nearly all the collected material from these areas can be classified as wild material. Only some of the collected apple material can be considered as primitive cultivars (see 6.5.). This is also the case with the apple material collected in the 'living' collections.
The accessions collected at the markets are predominantly of the cultivated type, mainly landraces but occasionally cultivars
A summary of all the collected material is presented in Table 2.

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

Genus/crop	Number of species	Total accessions
Lactuca spp (+ relatives).	4/5	23
Allium spp.	13/14	63
Brassica spp.	3	10
Malus spp.	1?	66
Tulipa spp.	3/5	42
Grasses (*Gramineae*)	6/8	37
Other crops/species	11/14	51
Total	**41/50**	**296**

6.2. Collection of Lactuca and related species

The expedition collected some 27 accessions of *Lactuca* or related species at 24 locations. The material was sampled in all four areas visited by the expedition. The altitude range of the material collected was from 250-1560 m. a.s.l., in semi-desert areas at altitudes between 200 and 500 m. and in mountainous areas up to 1550 m. This indicates that wild *Lactuca* spp. are widely distributed in Uzbekistan. At the more drier and lower situated sites *Lactuca* spp. were often found near river banks, irrigated or other moist places.
Examination of the collected seeds by CGN staff (Liesbeth de Groot), proved that 23 accessions were true *Lactuca* spp. and 4 numbers were identified as related *Chondrilla* spp.
So far, the taxonomic identification of the 24 *Lactuca* spp. has not been finalised and will be continued.in 1998 in the greenhouse facilities in Wageningen. Most likely material of *L. serriola* and *L. saligna* have been collected. A few accessions may be identified as *L. altaica* , a species morphological related to *L. serriola* with the same chromosome number and high crossability with this species (Thompson et all, 1941.). Ferakova (1977) states in a note (p. 72): '*L. altaica* has an intermediate taxonomic position between *L. serriola* and *L. saligna'*. Lindquist (1958) stated the uncertain taxonomic position of *L. altaica* and considered it as probably only a subspecies of

L. serriola.

6.3. Collection of Allium

The genus *Allium* was intensively sampled. Some 63 accessions of 13 or 14 different species were collected at 32 localities, including 7 markets where only onion (*A. cepa)* and garlic (*A. sativum)* were sampled. The collected *Allium* material can be divided into the following three groups:

- cultivated material (landraces) of onion *(A. cepa)*
- landraces of garlic (*A. sativum)*
- wild *Allium* species, including wild garlic *(A. longicuspus)*

Seed samples of cultivated onion were collected at markets. The variety 'Karatalsky' is predominantly cultivated in Uzbekistan and seeds were found on nearly all markets. The other accessions of onion, mainly local white types, were found at the markets of Samarkand, Jizzak and Guzar (see chapter 4).
Garlic was collected at all of the 7 visited markets. The samples showed a considerable variation, also reported for Uzbekistan by Nakagahra and Okuno (1995). 13 accessions of garlic were collected and the bulbs varied in size (2,5 - 6.0 cm) and color (white to violet). Moreover variation appeared in the shape of the cloves. Two accessions of the wild garlic *A. longicuspis* were sampled at a locality 18 km north of Tepar (L 36), c. 250 km. north-east of Tashkent. This material was collected in the valley of a small river at altitudes between 1160 and 1210 m. a.s.l. The violet flowering plants produced a large number of 'bulbuls' in the inflorescence. These 'bulbuls' as well as a few bulbs were collected.
Table 3. presents the wild *Allium* species collected at 25 locations ranging in altitude from 730 to 1500 m. The taxonomic identification of these wild species was conducted by the expedition member Dr. Alexsey Pimakov, who is the *Allium* expert of Uz-NIIR at Kibray near Tashkent.

Table 3. Wild *Allium* species collected in Uzbekistan

Species	Subgenus	Number
A.drobovii	*Rhiziridium*	4
A.boresheskii	*Rhiziridium* ?	4
A.scabriscapum	*Rhiziridium*	6
A.ceasium	*Haplostemom*	3
A.stipitatum	*Molium*	3
A.regelii	*Molium*	8
A.aphlatunense	*Molium*	2
A.lunatum	?	8
Others (2 or 3)	not identified	5
Total		**43**

The species included in the subgenus *Rhiziridum* are more related to the common onion which is included in the section *Cepa* of this subgenus (Kotlinska, 1996). The material may be of value for future onion breeding, although not all species collected may be easily crossable with *A. cepa.*
The species included in the subgenus *Molium* are less closely related to the cultivated onion, but may have perspectives for ornamental use. Another interested species for this purpose may be *A. stipitatum*, a wild onion with yellow colored bulbs and very large decorative inflorescences. *A. lunatum* was the species with the largest inflorescence and is certainly of value as an ornamental crop.

It can be concluded that wild *Allium* species are widely distributed in Uzbekistan. According to Pimakov there are still several more species in the country, but these could not be collected by this mission.

6.4. Collection of cole crops (Brassica spp.)

Three types of cole crops 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 a variety name (Sudya). This variety can be harvested in October. Two accessions were collected belonging to *B. rapa* group pe-tsa (Chinese cabbage). 5 accessions of the *B. rapa* group vegetable turnip, were collected at 4 different markets. Both yellow and red types were sampled.
One not further identified wild crucifer was collected. It may be an oilseed type of a *Brassica* spp.

6.5. Collection of Malus (apple)

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 travelers have traversed it since Neolithic times. Selected cultivars, from random hybridisations and disseminated graftings, were probably well established in the civilizations of the Near East by 4,000 B.C., and were later documented by Roman authors. Later, the apple cultivars in Western Europe were more or less cut off from their parental origins and further evolved in relative isolation.
Although apple breeding has been rather successful during the last century, new germplasm for further improvement of the crop is desirable. Particularly resistances against some major pest and diseases, such as powdery mildew (*Podosphaera leucotricha)*, apple scab (*Venturia inaequalis)*, bacterial canker (*Nectria galligena)* and fire blight (*Erwinia amylovora)* are required. Furthermore, genetic variation for a number of agro-morphological properties such as color, form and size of the apple, size of tree and branching type is of great importance. In addition, the taste of the apple is an important character for the development of new varieties.
The expedition collected apple germplasm in some remote areas of Uzbekistan, particularly in the mountainous areas mentioned in chapter 4.
The expedition collected 66 accessions at 20 localities at altitudes ranging from 790 to 1460 m. a.s.l. Usually, 10 - 15 apples of a single tree, resulting in 40 to 75 seeds of each accession were collected.
Two '*in situ*' collections, representing orchards established in the past and including a wide selection of apple trees from the neighborhood, were also intensively sampled. In the orchard at locality 25 some 11 accessions were collected, whereas at locality 40 some 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, circa 60% of the collected apple germplasm, was sampled in the wild. Taking into account that the trees included in the two 'living' collections were largely established from natural habitats in the neighborhood, it can be concluded that over 90% of the accessions are originally from the wild. The localities of both 'living' are exactly known and re-collecting in these orchards is always an option and may be opportune when interesting properties are found in the already collected material. However, the impression is that long term conservation of these two 'living' collections can not be guaranteed. The local population is harvesting the trees, but there was no sign of maintenance.
The 66 collected *Malus* accessions have been subdivided in the following three population types:

- B= cultivar, large apples, Ø around 6 cm., high yielding trees
- L= landrace, large to medium size apples, Ø 4.0-5.5 cm., medium yielding trees
- W= wild type, small apples, Ø less than 4 cm., generally low yielding trees

Taxonomic identification of the collected material was not possible. It is believed however that nearly all collected accessions belong to *Malus pumila* (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 be distinguished from the cultivated *M. pumila* and others introgress easily with this species.
Only two of the collected accessions bought at the market of Angren can be considered as cultivars, but no names could be obtained. 28 accessions were classified as landraces, although the differences with wild species are not always obvious. Finally, some 36 accessions are classified as wild types.(see also Appendix 1).
There was a wide variation in properties such as form and color. Both the green to yellow-green colored types and the red type as well as intermediate colored apples were collected. The length of the trees varied from 4 to 10 m; whereas differences in branching of the trees were also found.
As far as possible, data on ripeness were taken. In general, the collected material could be roughly divided into the following three groups:

early types	: apples matured before 7 August
medium early types	: apples matured between 7 and 15 August
late types	: apples matured after 15 August

There was considerable variation in the taste of the apples but it was difficult to describe this information.
It should be stated that collected apple seeds was developed after open pollinations. The presented information and the data included in Appendix 1 are taken from 66 single trees of which the apples were collected. Nearly at all collecting localities several apple trees were growing together. This was particularly the case with the trees sampled in the 'living' collections. Thefefor, it can be concluded that the collected seeds (more than 3000) represents much more genetic variation than the information taken from the 66 single trees.

6.6. Collection of Tulipa

In literature the Central Asian Centre is not always regarded as the primary Centre of Diversity of the tulip. However, considering the large number of *Tulipa* species 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. Some of the mountainous areas of Uzbekistan can be considered as part of this Centre of Origin.
The expedition collected 42 accessions of *Tulipa* spp. at 20 localities, particularly in the mountainous areas north and east of Tashkent (see Appendix 1). The accessions were sampled at altitudes ranging from 740 - 1600 m. a.s.l. In total 11,820 seeds of 41 accessions and 46 bulbs of 23 accessions were collected.
The taxonomic identification of the material in the field was difficult as only matured and dried capsules could be sampled. At several locations more than one accession (species?) was sampled and the collected material could only be distinguished on the basis of plant length and size of the capsules. The genus *Tulipa L.* is often divided into two subgenera, *Tulipa* and *Eriostemones.* (Boissier, 1882, Van Raamsdonk and De Vries, 1992). The first subgenus is divided into five sections and the included species are more closely related and can generally crossed with the cultivated tulip. The subgenus *Eriostemones* is divided into three sections and the species of this subgenus can not be crossed or only with difficulty with cultivated tulips. Wim Eikelboom, the tulip expert of CPRO-DLO, was able to classify the collected material into the two main subgenera *Tulipa* and *Eriostemones.* The classification was mainly based on the seed size and the data available on plant length/size of the capsule. As a result of this identification the 42 collected accessions were categorised into 24 accessions belonging to the subgenus *Tulipa* and 18 accessions to the subgenus *Eriostemones.* The bulbs could be divided into 16 accessions of the subgenus *Tulipa* and 7 accessions belonging to the subgenus *Eriostemones.*
Further taxonomic studies are required in order to assign the collected material to specific species. The present information revealed that at least four different *Tulipa* species have been collected, but this number may increase after the taxonomic studies have been finalised.

6.7. Collection of grasses (Gramineae)

The expedition concentrated on the collection of grasses adapted to temperate climates. In line with this criterion the collections were made at higher altitudes ranging from 730-1470 m. a.s.l. The day and night temperatures during the growing season at these altitudes is very variable and differences of more than 25°C may occur. A large number of the accessions was collected at rather wet places, often near small mountain rivers.

Table 4 shows that mainly species of the genera *Dactylis, Lolium, Phleum* and *Poa,* important cultivated grasses in temperate climates of Europe were collected. Furthermore, interesting accessions of a number of not identified species were sampled. The collectied material may be used both for fodder production and for the establishment of greens. Table 4. shows that 37 accessions were collected and the whole group may include 6 to 8 different species (Table 2.).
The collected material of *Dactylis glomerata* (cocksfoot), was 1.00 to 1.30 m. high, and the leaves were rather broad. This type of cocksfoot is only useful for grasslands. Some accessions were collected at dry spots and this material may be drought tolerant. Only a few samples of *Lolium* species were collected and some of these accessions may be *L. temulentum.* The *Phleum* material varies very much, some accessions looked somewhat similar to *P. bertolinii.* There was also a large variation in plant height and length of the inflorescence.
Probably two or three different *Poa* species have been collected. Besides accessions with a plant height of 20 to 40 cm. also *Poa* material with a plant height in the range of 80-100 cm. was collected. There were also differences in the size of the leaves.
The group of 9 non-identified species, probably includes some *Poa* species. At least half of the accessions have not been taxonomically identified. NUZ 151B might be an interesting species as it was growing in water of approximately 4°C.

Table 4. Grasses (temperate) collected in Uzbekistan

Species	Number	Range in altitude (meters)
D. glomerata	11	730 - 1420
Lolium spp.	3	900 - 1260
Phleum spp.	6	980 - 1470
Poa spp.	8	730 - 1430
Not identified	9	800 - 1420
Total	**37**	**730 - 1470**

6.8. Other collections

The expedition concentrated particularly on the collection of material discussed in the chapters 6.2. to 6.7. However, during the trip the team came across a number of crops of interest to Dutch agriculture of which CGN also maintains collections.

Table 5. Other collections

Crop	Number	Population type *
Cucumber	6	L+B
Tomato	3	L+B
Bulgarian pepper	1	L
Carrot	10	L+B+W
Clovers (2)	8	W
Fritillaria spp.	18	W
Rest	5	L+W
Total	**51**	**L+B+W**

* B = Cultivar, L = Landrace, W = Wild

The group of other crops (Table 5), includes some vegetable crops collected at different markets and wild carrots, *Fritillaria* spp., clovers and other samples collected in the wild.
The collected vegetables are mainly local cultivars, some with names and often cultivated in the localities near the markets where the material was collected.
Five domesticated carrots and also five wild *Daucus* spp. were collected. The domesticated carrots can, according to Zeven and De Wet (1982), be divided into two groups: the Eastern or Asian (var. *atrorubus* Alef.) carrots, with mainly purple and yellow roots and the Western (var. sativus Hoffm.) carrots with mainly orange carrots. Material of var. *atrorubus* was collected at markets in Uzbekistan. The collected wild carrots include probably *D. carota* var. *sativus.*
Probably, 18 accessions of *Fritillaria* spp. were collected. Some of these accessions may be *F. imperialis,* commonly found in Central Asia. Considering, however, the variation in number of capsules, plant length and bulb size, more than one species may have been collected.
The collected clovers have tentatively been divided into *Trifolium repens* (white clover) and *T. pratense* (red clover). Further taxonomic studies need to clarify the identification of this material.
This group also includes material of red beet (*Beta vulgaris),* radish (*Raphanus sativus)* and some other bulbs including *Liliaceae.*
More detailed information on the accessions of the group 'other collections' is presented at the end of Appendix 1.

7. Conclusions

The expedition was extremely successful, having collected nearly 300 accessions of more than 45 species. This result was obtained in 23 collecting days from 1 to 26 August 1997, during which period 48 localities in Uzbekistan were sampled.

Three important base collections of CGN, *Lactuca, Allium* and *Brassica* could be broadened with additional material of this region, not present in these collections. Both wild and domesticated material was collected. Gaps present in the *Lactuca* and *Allium* collections could be filled: some species previously not or only with a few accessions represented in the collections could be added.

A number of other collections of CGN including vegetable and forage crops were extended with Uzbek germplasm.

Interesting accessions could be collected for a number of perennial crops such as apple, tulip, garlic and *Fritillaria.* This material was collected on request of two crop breeding departments of CPRO-DLO. The perennial character of this material does not allow for quick results from the breeding research and positive effects may only be observed after 5-10 years.

Several grasses with potential for temperate climates were collected and further distributed to two breeding firms who will return the material to CGN after regeneration.

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

Further taxonomic identification of mainly the collected wild species is required. These studies need to be conducted on *Lactuca, Allium, Tulipa, Fritillaria* and material of some of the forages.

The cooperation with the expedition members of Uzbekistan and Russia was excellent. It is considered to organise a second expedition to Uzbekistan (mountainous areas around the Fergana Valley and similar areas in the neighboring countries Kyrgyzstan and/or Tadzhikstan.

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APPENDIX 1. LIST OF ACCESSIONS COLLECTED IN UZBEKISTAN IN 1997

COLLECTION OF *LACTUCA* AND RELATED SPECIES

Collect. nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 1	01.08.97	L1	W	390	Plants 60-120 cm. high, irrigated
NUZ 2	02.08.97	L2	W	380	Plants 50-110 cm. high, roadside, irrigated
NUZ 10	02.08.97	L4	W	310	Plants 50-80 cm., near irrigated canal
NUZ 11	02.08.97	L5	W	330	Plants 60-90 cm. high, roadside and grazed bij animals
NUZ 12	02.08.97	L6	W	520	Plants 70-120 cm. high,roadside and grazed
NUZ 26A	02.08.97	L9	W	1330	Plants 70-100 cm., grazed bij animals
NUZ 31	03.08.97	L10	W	1330	Plants 70 cm. high, between rocks
NUZ 61	05.08.97	L15	W	1000	Plants 50-70 cm. high, near riverbank between rocks
NUZ 88	06.08.97	L20	W	400	Plants up to 80 cm. high, flowers yellow to yellow/white
NUZ 91A	07.08.97	L22	W	1100	Plants 70-100 cm. high, more common type
NUZ 105	08.08.97	L24	W	540	Plants up to 100 cm. high, leaves like arrow
NUZ 107	08.08.97	L25	W	1000	Plants 100-150 cm. high, different *Lactuca* spp?
NUZ 127	09.08.97	L28	W	1450	Plants up to 110 cm. high, leaves like arrow
NUZ 159	11.08.97	L34	W	1000	Plants up to 60 cm. high, between stones
NUZ 173	12.08.97	L35	W	1140	Plants up to 120 cm. high, rare
NUZ 186	12.08.97	L37	W	1020	Plants 100-150 cm. high, growing in grassland
NUZ 191	15.08.97	L38	W	500	Plants 80-100 cm. high, between rocks in dry riverside
NUZ 195	15.08.97	L39	W	1200	Plants up to100 cm. high, between rocks
NUZ 200	16.08.97	L39	W	1220	Plants up to 80 cm. high, small leaves
NUZ 245	19.08.97	L43	W	480	Plants 50-60 cm. high, along roadside, irrigated
NUZ 250	21.08.91	L45	W	250	Plants 90-120 cm. high, near irrigation cannal
NUZ 256	23.08.97	L47	W	1430	Plants 60-120 cm. high, growing under trees
NUZ 260	23.08.97	L48	W	1560	Plants up to 60 cm. high, yellow green flowers

Collection of *Chondrilla* spp.

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 55	04.08.97	L14	W	1490	Plants 70-90 cm., leaves hairy
NUZ 91 B	07.08.97	L22	W	1100	Type with limitated leaves and many stems and inflorescences
NUZ 165	11.08.97	L34	W	1100	Plants 70-90 cm. high, not common
NUZ 178	12.08.97	L36	W	1170	Plants 50-70 cm. high, between stones

COLLECTION OF *ALLIUM.*

Collection of *Allium cepa.*

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 6	02.08.97	L3	B		Tashkent market, cultivar 'Karatalsky',common in Uzbekistan, orange/yellow type
NUZ 235	18.08.97	L42	L		Jizzak market, local white onion
NUZ 238	19.08.97	L42	L		Samarkand bazar, local white onion
NUZ 244	19.08.97	L43	L		Samarkand Bazar, rare local white onion
NUZ 247	20.08.97	L44	L		Guzar market, local type?

Collection of *Allium sativum.*

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 13	02.08.97	L3	L		Market Tashkent, small violet type, Ø 3-5 cm.
NUZ 14	02.08.97	L3	L		Market Tashkent, mixed collection, Ø 2.5-5 cm.
NUZ 15	02.08.97	L3	L		Market Tashkent, Ø 4-5 cm.
NUZ 63	05.06.97	L16	L		Market Angren, white type with some violet stripes
NUZ 64	05.08.97	L16	L		Market Angren, large type
NUZ 226	05.08.97	L41	L		Market Gulistan, large type with violet stripes
NUZ 227	17.08.97	L41	L		Market Gulistan, smaller type with some purple stripes
NUZ 232	18.08.97	L42	L		Market Jizzak, large violet type
NUZ 236	19.08.97	L43	L		Market Samarkand, medium type with many violet stripes
NUZ 237	19.08.97	L43	L		Market Samarkand, large type, predominant white
NUZ 239	19.08.97	L43	L		Samarkand Bazar, small some with violet local garlic
NUZ 246A	20.08.97	L44	L		Market Guzar, small type, violet white
NUZ 246B	20.08.97	L44	L		Market Guzar, small type, more white

Collection of *Allium longicuspis.*

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 179	12.08.97	L36	W	1160	Wild garlic, plants 60-80 cm. high, violet flowers
NUZ 183.....	12.08.97	L36	W	1210	Wild garlic, plants 60-70 cm., violet flowers

Collection of *Allium regelii.*

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 16	03.08.97	L7	W	1260	Lilac flowers, plants 40-60 cm., growing on hills
NUZ 16A	03.08.97	L7	W	1280	Lilac flowers, plants 40-60 cm., growing on hills
NUZ 22	03.08.97	L8	W	1310	Lilac flowers, plants 30-50 cm. high, growing between rocks
NUZ 41	04.08.97	L12	W	1340	Lilac flowers, up to 60 cm. high, near river, between rocks
NUZ 43	04.08.97	L13	W	1360	Lilac flowers, 50-60 cm. high plants, between rocks
NUZ 48	04.08.97	L14	W	1510	Lilac flowers, 50-70 cm. , growing between rocks
NUZ 60	05.08.97	L15	W	1020	Lilac flowers, plants 40-60 cm. high, between rocks
NUZ 75	05.08.97	L18	W	1310	May be mixture of *A. regelii* and *A. drobovii*

Collection of *Allium drobovii.*

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 20	03.08.97	L8	W	1300	White flowers, grown between rocks near river
NUZ 26	02.08.97	L9	W	1300	Lilac flowers, some more white, 40-70 cm. high
NUZ 49	04.08.97	L14	W	1510	Flowers more white, plants 60-70 cm. high
NUZ 57	05.08.97	L15	W	1020	Same type as NUZ 49

Collection of *Allium boreshevskii.* A. barszczewski

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 92	07.08.97	L22	W	1100	Plants up to 70 cm. high, clay type of soil
NUZ 108	08.08.97	L25	W	1020	Small! violet flowers, plants 60-70 cm. high
NUZ 143B	10.08.97	L30	W	800	Plants up to 60 cm. high
NUZ 152B	11.08.97	L32	W	910	Plants up to 60 cm. high, in grassland

Collection of *Allium lunatum.* ?

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 95	07.08.97	L22	W	1160	Plants up to 70 cm. high, slope near river
NUZ 95A	07.08.97	L22	W	1110	Collected at same locality as NUZ 95, but lower altitude
NUZ 106	08.08.97	L25	W	950	White flowers, 70-80 cm. high, loam soil between stones
NUZ 124	09.08.97	L27	W	1420	Small inflorescence (Ø 2-3 cm.), 60-70 cm. high
NUZ 128	09.08.97	L28	W	1550	Small inflorescence (Ø 2-3 cm.), 60-70 cm. high
NUZ 136	10.08.97	L29	W	730	White flowers, 70-90 cm. high, in pasture
NUZ 143A	10.08.97	L30	W	800	Plants 60-80 cm. high, growing between rocks
NUZ 205	16.08.97	L40	W	1310	Plants 60-80 cm. high, white flowers

Collection of *Allium scabriscapum.*

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 155	11.08.97	L33	W	950	Plants up to 70 cm. high, growing between rocks
NUZ 162	11.08.97	L34	W	1060	Plants 50 cm. high, growing betwen stones
NUZ 181	12.08.97	L36	W	1180	Plants up to 100 cm., large inflorescence Ø 6-7 cm.
NUZ 207	16.08.97	L40	W	1320	May be mixture with other *Allium* spp.
NUZ 254	22.08.97	L47	W	1450	Plants 60 cm. high, small inflorescence
NUZ 258	23.08.97	L47	W	1470	Plants up to 50 cm. high

Collection of *Allium aphlatunense.*

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 262	23.08.97	L48	W	1500	Small white onions, plants 60-70 cm. high

Collection of *Allium altissimum.*

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 110	08.08.97	L26	W	1090	Very large inflorescence (Ø 10-15 cm.), plants up to 100 cm.

Collection of *Allium ceasium.*

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 168	12.08.97	L35	W	1140	Plants 60-70 cm. high, growing between stones
NUZ 189	12.08.97	L36	W	1160	Plants 70-80 cm. high
NUZ 204	16.08.97	L39	W	1210	Plants 65 cm. high, small inflorescence, ∅ 1.5 cm.

Collection of *Allium stipitatum.*

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 251	22.08.97	L47/48	W	1450/1600	Bulbs received, flowers violet, plants 90 cm. hoger, yellow bulbs
NUZ 257	23.08.97	L47	W	1440	Plants up to 1.20 m., large inflorescence, yellow bulbs → karativiense ?
NUZ 259	23.08.97	L48	W	1510	Violet flowers, plants up to 1.20 m. high, yellow bulbs

Collection of *Allium* spp.

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 131	09.08.97	L28	W	1600	Only plants (bulbs?), plants 70-90 cm.high
NUZ 144	10.08.97	L31	W	810	Not identified *Allium* spp., 50-60 cm. high
NUZ 152A	11.08.97	L32	W	910	Not identified *Allium* spp., found in grassland
NUZ 158	11.08.97	L33	W	1000	Plants up to 1 m. high, may be new species

Collection of *Allium* mixture

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 137	10.08.97	L29	W	730	Mixture of *A. lunatum* and *A. boreshevskii*

COLLECTION OF *BRASSICA*

Collection of *Brassica rapa* group pe-tsai (Chinese cabbage)

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 3	02.08.97	L3	L		Local variety obtained from Korean seedshop on market Tashkent.
NUZ 85	06.08.97	L19	L		Local grown Korean cabbage, obtained in market Chirchik.

Collection of *Brassica oleracea* group white cabbage

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 4	02.08.97	L3	L	250-500	Local variety named Sudya, grown around Tashkent

Collection of *Brassica rapa* group vegetable turnip

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 8	02.08.97	L3	L	350-500	Local turnip, Tashkent market. grown around Tashkent.
NUZ 229	17.08.97	L41	L		Local turnip, yellow type, market Gulistan.
NUZ 234	18.08.97	L42	L		Local turnip, red type, market Jizzak.
NUZ 241	19.08.97	L43	L		Local turnip, yellow type, market Samarkand.
NUZ 242	19.08.97	L43	L		Local turnip, red type, market Samarkand.

Collection of not identified wild Crucifer

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 138	10.08.97	L29	W	720	Plants up to 80 cm. high.

COLLECTION OF *MALUS*

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 19	03.08.97	L7	W	1260	No disease symptoms, early type, Ø 3-4.5 cm.
NUZ 32	03.08.97	L10	W	1330	Early type, Ø 3-4 cm., collected from several trees.
NUZ 36	04.08.97	L11	W	1300	Early type, Ø 3.5-5 cm., yellow apples.
NUZ 37	04.08.97	L11	W	1310	Medium late type, Ø 2-2.5 cm., one apple Ø 3.5 cm., green apples.
NUZ 39	04.08.97	L12	L	1310	Interesting tree, high yielding, medium late type, Ø 4.5-5 cm, green apples.
NUZ 40	04.08.97	L12	W	1320	Medium late type, Ø 3-3.5 cm., green-yellow apples.
NUZ 43a	04.08.97	L13	L	1330	Healthy nice tree, late type, Ø 3-4 cm.
NUZ 62	05.08.97	L16	L	800-1300	Early type, Ø 3-4.5 cm., bought at market Angren.
NUZ 65	05 .08.97	L16	B/L?	800-1300	Round apples,Ø 5-6.5 cm., bought at market Angren, popular type, probably local selected
NUZ 66	05.08.97	L16	L/B?	800-1300	Ø 5-6 cm., interesting type, bought at market Angren.
NUZ 68	05.08.97	L17	W	1250	Late type, Ø 2.5-3 cm., healthy tree, green-yellow apples.
NUZ 69	05.08.97	L17	L	1280	Early, high yielding type, rather sweet, Ø 4-5 cm.
NUZ 70	05.08.97	L17	W	1280	Branched healthy tree, Ø 3-4.5 cm., green-yellow apples.
NUZ 73	05.08.97	L18	W	1300	Medium early type, branched tree, Ø 3-3.5 cm., green-yellow apples.
NUZ 74	05.08.97	L18	W	1310	Early type, healthy tree, Ø 3-4.5 cm., green-yellow apples.
NUZ 76	05.08.97	L18	W	1310	Medium early type, red wood, not diseased, Ø 3.4-4.5 cm., green-yellow apples.
NUZ 77	05.08.97	L18	W	1310	Early type, apples with red flesh, Ø 3-4 cm.
NUZ 78	05.08.97	L18	W	1320	Early type, healthy tree, red wood, apples with red flesh Ø 3-4.5 cm.
NUZ 79	05.08.97	L18	W	1320	Medium early type, healthy tree, late ripe, Ø 3-4 cm., green apples.
NUZ 80	05.08.97	L18	W	1300	Early type, healthy tree with red wood, Ø 3-3.5 cm., yellow apples with red stripes.
NUZ 87	06.08.97	L19	L	1300	Early type, large healthy apples, Ø 4-6 cm., green-yellow apples, with red stripes.
NUZ 102	07.08.97	L23	W	1220	Early type, healthy tree, small round apples Ø 3-3.5 cm., apples yellow/orange.
NUZ 103	07.08.97	L23	W	1200	Late type, interesting, locally eaten, less acid, Ø 3-4 cm., apples yellow with red stripes.
NUZ 104	07.08.97	L23	L	1210	Early type, nice looking trees, locally eaten, Ø 4 cm., yellow apples.
NUZ 113A	08.08.97	L26	L	1010	Medium early type, good taste, turns brown quickly (iron?), Ø 4-4.5 cm., green apples.
NUZ 113B	08.08.97	L26	L	1010	Medium early type, somewhat sour, is eaten,Ø 4 cm., green apples.
NUZ 115	08.08.97	L25	W	980	Medium early type,.Ø 3-3.5 cm., many worms, collected in orchard.
NUZ 116A	09.08.97	L25	W	1150	Ø 3-3.5 cm., red/yellow apples with deep holes, collected in orchard.
NUZ 116B	09.08.97	L25	W	1150	Ø 2-3 cm., very small yellow apples, collected in orchard.
NUZ 116C	09.08.97	L25	W	1150	Ø 2.5-3.5 cm., nearly completely red apples, collected in orchard

Collection of *Malus* (continued)

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 117A	09.08.97	L25	W	1150	Medium ealry type, small apples with brown spots, Ø 3-3.5 cm., collected in orchard.
NUZ 117B	09.08.97	L25	W	1150	Medium early type, round flat yellow-green apples, Ø 3-4 cm., collected in orchard.
NUZ 118A	09.08.97	L25	L	1150	Medium early type, medium small apples, yellow-green, Ø 4,5-5 cm., collected in orchard.
NUZ 118B	09.08.97	L25	L	1150	Medium early type, medium to small apples, Ø 3-4 cm., collected in orchard.
NUZ 119A	09.08.97	L25	L	1100	Early type, apples predominantly red Ø 4-4.5 cm., collected in orchard.
NUZ 119B	09.08.97	L25	L	1100	Medium early type, predomominantly red with some yellow apples, Ø 4-5 cm., collected in orchard.
NUZ 119C	09.08.97	L25	L	1100	Medium early, interesting type, high yielding tree, yellow-green apples, Ø 5-7 cm., collected I in orchard.
NUZ 126	09.08.97	L28	W	1460	Late type, green-yellow apples, Ø 2-2.5 cm.
NUZ 130	09.08.97	L27	W	1420	Late type, red apples, Ø 2-3 cm.
NUZ 142	10.08.97	L30	W	790	Medium early type, red apples, Ø 2-3 cm.
NUZ 160	11.08.97	L34	W	1000	Medium early type, apples with not a very good taste, yellow-green apples, Ø 2.5-3.5 cm.
NUZ 161	11.08.97	L34	W	1020	Medium early type, similar to NUZ 160, brown spots on apples, Ø 2.5-3.5 cm.
NUZ 163	11.08.97	L34	W	1080	Late type, good taste, yellow apples with red stripes, Ø 3-4 cm.
NUZ 177	12.08.97	L36	L	1160	Medium early type, tree healthy, apples nice shape, green-yellow, Ø 3.5-4.5 cm.
NUZ 182	12.08.97	L36	W	1160	Early type, yellow apples, Ø 3-3.5 cm., good yielding tree.
NUZ 184	12.08.97	L36	L	1180	Medium early type, good yield, Ø 3-4.5 cm.
NUZ 187A	12.08.97	L37	L	1020	Late type, cultivated, interesting type, yellow-green apples with red flesh, Ø 4-5.5 cm.
NUZ 187B	12.08.97	L37	L	1020	Late type, cultivated, interesting type, yellow-green apples with red flesh, Ø 4-5.5 cm.
NUZ 188	12.08.97	L37	L	1160	Medium early type, large apples, Ø 6-8 cm., with red stripes.
NUZ 192	15.08.97	L39	L	1190	Late type, healthy tree, apples nice shape, yellow-green, Ø 4.5-5.5 cm.,interesting.
NUZ 193	15.08.97	L39	L	1190	Late type, tree of ballon type, taste 'sour-sweet', Ø 3.4-4.5 cm.
NUZ 194	15.08.97	L39	L	1190	Late type, tree of ballon type, excellent taste (Elstar alike), Ø 4-5.5 cm.
NUZ 196	15.08.97	L39	L	1200	Late type, good yield and taste 'sour-sweet', yellow-green apples, Ø 3.5-4.5 cm.
NUZ 197	15.08.97	L39	W	1200	Late type, small apple, green to yellow, Ø 1.5-2.5 cm., with acid taste.
NUZ 214	16.08.97	L40	L	1350	Medium early type, yellow apples, Ø 7-8 cm., much eaten, collected in living collection of apple trees .
NUZ 215	16.08.97	L40	L	1350	Oval yellow green apples, Ø 4-4.5 cm., collected in living collection of apple trees.
NUZ 216	16.08.97	L40	W	1350	Nice red apples, oval, Ø 3.5-4,5 cm., collected in living collection of apple trees.

Collection of *Malus* (continued)

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 217	16.08.97	L40	L	1350	Red-yellow apples, Ø 4-5 cm., collected in living collection of apple trees.
NUZ 218	16.08.97	L40	L	1350	Round flat, yellow apple, Ø 3-3.5 cm., collected in living collection of apple trees.
NUZ 219	16.08.97	L40	W	1350	Small oval apples, green-yellow, Ø 3-3.5 cm., collected in living collection of apple trees.
NUZ 220	16.08.97	L40	W	1350	Red-yellow apple, round/flat, Ø 3.5-4.5 cm., collected in living collection of apple trees.
NUZ 221	16.08.97	L40	W	1350	Small apples, yellow with red stripes, round/flat, Ø 3.5-4 cm., collected in living collection of apple trees
NUZ 222	16.08.97	L40	W	1350	Round yellow apples, Ø 4-4.5 cm., collected in living collection of apple trees
NUZ 223	16.08.97	L40	L	1350	Large round apples, Ø 5-6 cm., collected in living collection of apple trees
NUZ 224	16.08.97	L40	W	1350	Small oval red apples, Ø 3-4 cm., collected in living collection of apple trees
NUZ 225	17.08.97	L39/L40	L	1210	Large tree, up to 8 m. high, popular tree, interesting type, apples yellow, Ø 6-8 cm

Remark: early type : harvest before 7 August
medium early type : harvest 7 - 15 August
late type : harvest after 15 August

COLLECTION OF *TULIPA*

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 24	03.08.97	L8	W	1320	Mixture of 2-3 species, 6 bulbs.
NUZ 25	03.08.97	L8	W	1320	Size capsules very variable (5-8.5 cm.), mixture of 2 species, 6 bulbs.
NUZ 28	03.08.97	L9	W	1310	Small capsule, 3,5 cm.
NUZ 30	03.08.97	L10	W	1330	Small capsule, 4 cm.
NUZ 34	04.08.97	L7	W	1300	Probably mixture of 2 species.
NUZ 42	04.08.97	L13	W	1370	Large capsule, 6-7 cm, bulbs Ø 4-5 cm.
NUZ 44	04.08.97	L13	W	1370	Rare in area, small capsules 3.5 cm.
NUZ 50	04.08.97	L14	W	1520	Small capsules (3-4 cm.), plants ± 30 cm. high, one bulb.
NUZ 51	04.08.97	L14	W	1520	Probably mixture of small and larger capsules, two bulbs.
NUZ 93	07.08.97	L22	W	1100	Small capsules, mixed with some larger capsules, bulbs 30 cm.
NUZ 93A	07.08.97	L22	W	1100	Larger capsules, but mixed with some smaller capsules, different bulbs.
NUZ 97	07.08.97	L23	W	1210	Large capsule type (c. 6 cm.), one bulb.
NUZ 97A	07.08.97	L23	W	1210	Small capsule type (c 4 cm.), one bulb.
NUZ 101	07.08.97	L23	W	1200	Small capsules (3-4 cm.), bulb oval, Ø 3.5 cm.
NUZ 109	08.08.97	L25	W	1090	Very small capsules (1.5-3 cm.), plants 20-30 cm. high, small bulbs (Ø 2 cm.).
NUZ 114	08.08.97	L26	W	1070	Very small capsules (1.5-3 cm.), and small bulbs, up to 6 capsules on stem.
NUZ 129	09.08.97	L28	W	1600	Mixture of NUZ 129A and NUZ 129B.
NUZ 129A	09.08.97	L28	W	1600	Medium size capsule (4-6 cm.), plants 30 cm. high, one bulb.
NUZ 129B	09.08.97	L28	W	1600	Small size capsule (3-4.5 cm.), plants 20 cm. high, one bulb.
NUZ 135A	10.08.97	L29	W	740	Very small capsules (2-2.5 cm.), plantlength 20 cm., no bulbs.
NUZ 135B	10.08.97	L29	W	740	Medium small capsules (3-3.5 cm.), plantlength 30 cm., no bulbs.
NUZ 135C	10.08.97	L29	W	740	Large capsules (5-6 cm.), plantlength 40-60 cm., few bulbs.
NUZ 141A	10.08.97	L30	W	810	Medium small capsules, plants up to 30 cm., one bulb + two heads.
NUZ 141B	10.08.97	L30	W	810	Very small capsules, plants up to 20 cm (few seeds), only one head collected.
NUZ 149A	10.08.97	L31	W	820	Very small capsule (1-2 cm.), few seeds, no bulb.
NUZ 149B	10.08.97	L31	W	820	Medium size capsules (2-4 cm.), one bulb.
NUZ 150	10.08.97	L31	W	820	Large capsules (4-6 cm.).
NUZ 156	11.08.97	L33	W	950	Only two capsules, limited seeds, two bulbs.
NUZ 169	12.08.97	L35	W	1190	Medium size capsules, plants ± 30 cm. high, one large bulb.
NUZ 170	12.08.97	L35	W	1140	Large capsules (5-6 cm.), plants 35-40 cm. high.
NUZ 171A	12.08.97	L35	W	1140	Very small capsules (1.5-2.5 cm.), plant up to 20 cm., one small bulb.
NUZ 171B	12.08.97	L35	W	1140	Medium size capsules (3-5 cm.), plants ± 30 cm. high

Collection of *Tulipa* (continued)

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 180	12.08.97	L36	W	1180	Large capsules (4-6 cm.),plants 40 cm. high.
NUZ 185A	12.08.97	L36	W	1180	Small capsules (2.5-3.5 cm.).
NUZ 185B	12.08.97	L36	W	1180	Very small capsules (1.5-2.0 cm.).
NUZ 199	16.08.97	L39	W	1210	Small capsules (2.5-3.5 cm.), rare, only two plants.
NUZ 203	16.08.97	L39	W	1230	Medium size capsules (3.5-4.5 cm.), plants 25-30 cm. high, quite rare.
NUZ 208	16.08.97	L40	W	1320	Small size capsules (1.5-2 cm.), up to 25 cm. high.
NUZ 209	16.08.97	L40	W	1320	Large capsules (4-6 cm.), plants 40-50 cm. high.
NUZ 210	16.08.97	L40	W	1330	Very small capsules (1-1.2 cm.), plants up to 20 cm.
NUZ 212	16.08.97	L40	W	1330	Large double capsules, plants up to 40 cm. high (*(Tulipa* spp.?)
NUZ 261	23.08.97	L48	W	1540	Very small capsules (1-1.5 cm.), plants 10-15 cm. high, three bulbs.

COLLECTION OF GRASSES

Collection of *Dactylis glomerata*?

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 27	03.08.97	L9	W	1300	Grazed, drought tolerant, up to 1.20 m. high.
NUZ 29	03.08.97	L10	W	1350	Grazed, up to 1.20 m. high, grows between rocks.
NUZ 54	04.08.97	L13/L14	W	1350	Up to 1.20 m. highgrows at dry spot.
NUZ 67	05.08.97	L17	W	1260	Grazed, up to 1.20 m. high.
NUZ 94	07.08.97	L22	W	1120	Grazed, up to 1.20 m. high.
NUZ 120	09.08.97	L25	W	1050	Grazed, up to 1.20 m. high, under apple trees.
NUZ 123	09.08.97	L27	W	1420	Grazed, up tp 1.20 m. high, dry grassland
NUZ 134	10.08.97	L29	W	730	Grazed, 1.00-1.20 m. high.
NUZ 145	10.08.97	L31	W	800	Up to 1.30 m. high, rather broad leaves (10-15 mm.).
NUZ 175	12.08.97	L35	W	1140	Up to 1.20 m. high, black spots on inflorescence
NUZ 213	16.08.97	L40	W	1340	Up to 1.10 m. high, poor seedset.

Collection of *Lolium* spp.

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 17	03.08.97	L7	W	1260	Grazed, plants 70-120 cm. high, (*L. temulentum?)*
NUZ 56	05.08.97	L15	W	1000	Up to 1.20 m. high, near riverbank between stones.
NUZ 151D	11.08.97	L32	W	900	± 60 cm. high, along river.

Collection of *Phleum spp.*

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 18	03.08.97	L7	W	1260	Grazed, plants 20-50 cm. high, *(P. bertolinii?)*
NUZ 21	03.08.97	L8	W	1300	Grazed, plants 20-50 cm. high, *(P. bertolinii?)*
NUZ 46	04.08.97	L14	W	1470	Plants up to 1.20 m. high, 8-12 cm. long seed head.
NUZ 89	07.08.97	L21	W	980	Grazed, 30-50 cm. high, good seedset, *(P. bertolinii?).*
NUZ 98	07.08.97	L23	W	1220	Grazed, inflorescence 6.5 cm. long.
NUZ 121	09.08.97	L25	W	1000	30-50 cm. high, small inflorescence, 3-5 cm.

Collection of *Poa* ssp.

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 133	10.08.97	L29	W	730	Grazed, 80-100 cm. high.
NUZ 148	10.08.97	L31	W	800	Up to 90 cm. high, small leaves.
NUZ 151A	11.08.97	L32	W	900	Very similar to *P. annua*(?), however appears to be a perennial.
NUZ 151C	11.08.97	L32	W	900	Up to 90 cm. high, small leaves, 3-6 mm. broad.
NUZ 157	11.08.97	L33	W	940	*Poa* spp?, 40 cm. high, inflorescence 10-15 cm.
NUZ 166	11.08.97	L34	W	1120	*Poa* spp?, dark green plants, up to 1 m. high, not much grazed.
NUZ 198	16.08.97	L39	W	1150	*Poa* spp?, small plants up to 20 cm. high.
NUZ 255	23.08.97	L47	W	1430	*Poa pratensis*?, small plants up to 30 cm.

Collection of not identified grass species.

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 33	03.08.97	L9	W	1290	Small leaves, rosette type of plants, fine grass.
NUZ 35	04.08.97	L7	W	1300	Up to 1m. high, poor seedset.
NUZ 38	04.08.97	L11	W	1300	Tiny grass, up to 50 cm. high, leaves up to 5 mm. broad.
NUZ 52	04.08.97	L13-L14	W	1420	Tiny grass, 20-30 cm. high, few leaves.
NUZ 58	05.08.97	L15	W	1000	± 1.00 m. high, rosette type of plants.
NUZ 59	05.08.97	L15	W	1000	Up to 50 cm. high, small leaves
NUZ 90	07.08.97	L21	W	980	Up to 1.10 m. high, light green leaves, poor seedset.
NUZ 147	10.08.97	L31	W	800	1.20 m. high, broad light green leaves.
NUZ 151B	11.08.97	L32	W	900	Growing in cold water (4° C), 60 cm. high

OTHER COLLECTION

Collection of *Cucumis sativus.*

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 5	02.08.97	L3	B	250-500	Variety Tashkentkaye 740, grown around Tashkent, susceptible to mildew,market Tashkent.
NUZ 83	06.08.97	L19	L		Local variety named Uzbekistan, market Chirchik.
NUZ 84	06.08.97	L19	L		Local variety named Margylan, market Chirchik.
NUZ 228	17.08.97	L40	L		Local variety named Pazad, market Gulistan.
NUZ 243	19.08.97	L43	L		Local Samarkand variety, market Samarkand
NUZ 248	20.08.97	L44	L		Local landrace from Guzar, small fruits, ca. 15 cm., market Samarkand

Collection of *Lycopersicon esculentum.*

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 81	06.08.97	L19	L		Variety Yablochnii, grown around Chirchik.
NUZ 230	17.08.97	L41	L		Local type, large tomato, market Gulistan.
NUZ 231	17.08.97	L41	B		Variety Volgagrad, large dark pink tomato, market Gulistan.

Collection of *Capsicum annuum.*

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 240	19.08.97	L42	B		Bulgarian paprika from Tashkent, collected market Samarkand.

Collection of *Daucus carota.* (cultivated)

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 7	02.08.97	L3	B	250-500	Variety name Nantskaya, red type, common around Tashkent, market Tashkent
NUZ 9	02.08.97	L3	L	250-500	Variety name Mirzamushuk, yellow type, market Tashkent.
NUZ 232	18.08.97	L42	L		Yellow local type, market Jizzak.
NUZ 233	18.08.97	L42	L		Red local type, market Jizzak
NUZ 249	20.08.97	L44	L		Local variety grown around Guzar, market Guzar

Collection of *Daucus* spp. (wild)

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 112	08.08.97	L26	W	1010	Wild carrot up to 1 00 m. high, unripe seeds.
NUZ 153	11.08.97	L32	W	880	White flowers, up to 1.20 m. high.
NUZ 176	12.08.97	L36	W	1150	Plants up to 1.50 m. high, not all seeds ripe.
NUZ 190	15.08.97	L20	W	340	Plants up to 1.10 m., small population.
NUZ 252	22.08.97	L46	W	1100	Plants up to 1.40 m. high.

Collection of *Trifolium repens*?

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 53	04.08.97	L13-L14	W	1420	Very small leaves, large dominant population.
NUZ 71	05.08.97	L17	W	1280	Small leaves, up to 15 cm. high, irrigated.
NUZ 122	09.08.97	L27	W	1360	10-20 cm. high, in grassland with scrubs.

Collection of *Trifolium pratense*?

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 72	05.08.97	L17	W	1280	Larger leaves, up to 40 cm. high, irrigated.
NUZ 132	09.08.97	L27	W	1400	40 cm. high, om grassland with scrubs.
NUZ 167	12.08.97	L31	W	940	± 30 cm. high, light red flowers
NUZ 174	12.08.97	L35	W	1140	Large plants, up to 35 cm.
NUZ 253	22.08.97	L46	W	1100	± 30. cm high, light red flowers

Collection of *Fritillaria* spp.

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 23	03.08.97	L8	W	1320	2-3 capsules on stem,plants 30-40 cm. high
NUZ 35A	04 08.97	L7	W	1320	2 capsules on stem, plants c. 40cm. high (no seed)
NUZ 45	04 08 97	L13	W	1370	2-3 capsules on stem, 3 bulbs, Ø 3-4 cm.
NUZ 47	04.08.97	L14	W	1500	2-3 capsules on stem, two bulbs.
NUZ 96	07.08.97	L22	W	1120	2-3 capsules on stem, small bulbs Ø 1.5 cm.

Collection of *Fritillaria* spp. (continued)

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 99	07.08.97	L23	W	1220	3 capsules on stem, small bulbs Ø 1 cm., two bulbs.
NUZ 100	07.08.97	L23	W	1200	2-3 capsules on stem, large white bulbs (3-4 cm.).
NUZ 111	08.08.97	L26	W	1000	Large capsules (3-4 cm.)
NUZ 139	10.08.97	L29	W	750	3-4 capsules on stem, very small (2-3 cm.), plants 15-20 cm. high.
NUZ 140	10.08.97	L30	W	810	Few seeds, some bulbs, plants up to 20 cm.
NUZ 146A	10.08.97	L31	W	820	3-4 capsules on stem, large bulb Ø 4-5 cm., plants up to 50 cm. high.
NUZ 146B	10.08.97	L31	W	820	3-4 capsules on stem, small bulbs, Ø2-3 cm., plants 20 cm. high.
NUZ 154	11.08.97	L32	W	900	Large capsules (4-6 cm.), bulb Ø 4 cm.
NUZ 164	11.08.97	L34	W	1100	2-3 large capsules, plants 30-40 cm. high.
NUZ 201	16.08.97	L39	W	1220	Two large capsules on stem, up to 35 cm. high.
NUZ 202	16.08.97	L39	W	1230	Small bulbs, 2-3 capsules on stem, plants 20-25 cm. high.
NUZ 206	16.08.97	L40	W	1310	Small capsules (1-1.5 cm.), 2-3 capsules on stem, plants ± 20 cm. high.
NUZ 211	16.08.97	L40	W	1330	2-3 large capsules on stem, plants 40 cm. high.

Collection of other Liliaceae

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 125	09.08.97	L27	W	1440	Plants 70 cm. high, unripe capsules, two bulbs.
NUZ 172	12.08.97	L35	W	1140	Two small capsules on stem, plants 25 cm. high, no bulbs.

Collection of other bulbs

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ X	05.08.97	L17	W	1250	Not identified bulb species

Collection of *Beta vulgaris*.

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 82	06.08.97	L19	L		Local red beet, grown around Chirchik

Collection of *Raphanus sativus.*

Collect.nr.	date	Locality	Pop-type	Altitude	Remarks
NUZ 86	06.08.97	L19	L		Local grown radish, market Chirchik.

Explanation of used acronyms in Appendix 1.

NUZ= Netherlands-Uzbekistan Expedition 1997

Pop-type= Population type
- B= cultivar or variety
- L= landrace or local/primitive cultivar
- W= wild species or accession collected in wild vegetation

L1, L2, L3, etc. means number of collecting locality (see Table 1.)

Appendix 2. Collecting form expedition

Netherlands-Uzbek Collecting Expidition in 1997

Team/collector(s): ..... *Collector's No.:* .....

Date: ..... *Photo No.:* .....

Crop name: ..... *Vernacular/Cultivar name:* .....

Species name: .....

Locality: .....

.....

Latitude: ..... ° ..... ' *Longitude* ..... ° ..... ' *Altitude:* ..... m

Material: Seed Bulbs Vegetative parts

Sample: Population Clone Individual Random Non random

Status: Cultivated Weedy Wild

Source: Field Market Garden Wild vegetation Institute

Frequency: Abundent Frequent Occasional Rare

Habitat: .....

.....

Topography: Swamp Flood plain Level Undultating

Hilly Hilly dissected Steeply dissected

Mountainous

Season: ..... *Sowing date:* ..... *Harvesting date:* .....

Disease Symptoms: .....

.....

Other Properties: .....

.....

Agronomic description: .....

Remarks: .....

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