Ethnobotanical and Ethnobiodiversity Studies for *in situ* Protection of Horticultural Plant Genetic Resources in Alp-Balkan-Carpath-Danube Area

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Keywords: Hungarian Ethnobiodiversity Model, invasion, introgression, *Malus, Prunus, Phaseolus, Adonis, Telekia, Galanthus*

Note: This paper is the merged and edited version of lecture S21-O-13 and the poster S21-P-10 presented on the 26th International Horticultural Congress (IHC2002) in Toronto, Canada.

Dedicated to: *the martyrdom of **N.I. VAVILOV**, arrested in 1940 in Northern Carpathians, sentenced to death secretly, killed in prison by torture and starvation on 16th January 1943.*

Abstract

In continuation of former studies on ethnobotany and ethnobiodiversity the present stage of Hungarian ethnobotanical research is reviewed, the possible role of ethnobotanical approach and the importance of ethnic components (human diversity, language, traditions) in supporting *in situ* protection of horticultural plant genetic resources (HPGR) is examined, an "exotic" human case, the non-Indo-European *Hungarian Ethnobiodiversity Model (HEM)*, and its possible role in understanding Horticultural Plant Genetic Resources (HPGR) in *Alp-Balkan-Carpath-Danube (ABCD) Area* are presented. In addition some case studies are mentioned: the "*Malus*-Case" and "*Prunus*-Case" illustrating Asian roots in HEM, the "*Matthiola*-Case" for Mediterranean influences, the "*Phaseolus*-Case" for Amer-Indian connections, the "*Adonis*-Introgression" as a possible consequence of Curgan Invasions, the "*Telekia*-Case" which may be connected with Ottoman Invasions, and finally the "*Galanthus*-Case" as an example of the influence of globalisation on HPGR. Possibilities and limitations in ethnobiodiversity studies are also discussed. Based on personal experience accumulated during decades of ethnobotanical field studies and long-term clonal transplantation experiments performed in ABCD-Area a possibility of an *European Ethnobotanical Database* and of a *Specially Protected Horticultural Plant Genetic Resource Registration Network* is outlined in the conclusions.

INTRODUCTION

Diversity and Equality

Biological diversity and interactions among living entities, including plants, animals and humans, is a fact of evolution to be studied. Human equality is a moral need and a human value to be respected (Dobzhansky 1973). Human (biological, cultural) diversity influences and will influence non-human biological diversity both in negative and positive sense. *In-situ* and *ex-situ* plant genetic resource (PGR) protection intends to enhance the positive trends. Any steps which guide us in the right direction, even if on "trial and error" base, are worth consideration. Ethnobotanical and ethnobiodiversity studies may be regarded as steps in this direction. There is a general gap in this field in

international science. Time is ripe to discuss the outlines of an Ethnobotanical Database for Europe (EDE), and the organisation of a Specially Protected Horticultural Plant Genetic Resource Registration (SP-HPGRR) for the values identified by EDE. This is in the interest of *in situ* preservation of both biological and human diversity.

Is science in the position to raise a general awareness toward this important and complex problem? That depends only on willingness. Kerry ten Kate (2002) in a review regarding the "Decade of Biodiversity" presented a series of fascinating results of the "Convention on Biological Diversity". Time is ripe now to draw attention on the importance of ethnobiodiversity in conservation.

Aims:

1. **To evaluate** the possible role of ethnobotanical approach in supporting *in situ* protection of horticultural plant genetic resources (HPGR),
2. **To draw attention** on the importance of ethnic components (human diversity, language, traditions) for in situ protection of HPGR,
3. **To review** an "exotic" human case – that of non-Indo-European Hungarians,
4. **To present case studies** with plants connected with *Hungarian Ethnobio-diversity Model.*

Previous Studies

Hungarian ethnobotanical research has been reviewed recently by István Szabó (Szabó I. et al. 2000) in a volume presenting agrobiodiversity and plant genetic resource (PGR) studies in Hungary and dedicated to the memory of Andor Jánossy, the founder of PGR science in this country (Gyulai ed. 2000).

The first Hungarian ethnobotany guide-book has been edited by two of the authors of his paper, Attila T. Szabó (dr.biol.) and János Péntek in Romania (Szabó and Péntek 1976). The ethnobiodiversity concept was launched about a decade ago and it may be regarded as a trial in understanding sustainability and supporting genetic resource protection (Szabó 1990/1992, 1996a, 1997, 1998, 1999).

Ethnobotany is complementary to agrobotany and economic botany. It has many possible approaches and definitions. According to Harshberger (1896), Davis (1995) and others, ethnobotany is the study of plant use and of 'botanical' knowledge accumulated in primitive, indigenous and aboriginal societies as opposed to 'economic botany', which is about plant use and related knowledge in advanced agro-industrial societies (Schultes and von Reis 1995; Turner 1995). Here we just point out that even if the knowledge of traditional societies is the main concern of this field (Anderson 1993; Prance 1995) ethnobotany remains important for "modern" societies, especially for *in situ* PGR protection.

European ethnobotany has a long history rooted deeply in different national (ethnic) traditions but also in medieval and renaissance herbalism (Arber 1971; Szabó 1978). This herbalism has produced the first independent printed books containing ethnobotanical and ethnomycological data, including information on horticultural plants and fungi (Clusius and Beythe 1583; Clusius 1603; Szabó et al. 1992). Renaissance herbalism, which is derived mostly from Greek, Roman, Judaeo-Christian (Biblical) and national (folk) traditions, flourished during the 16th century and may be regarded as a transition between traditional and scientific botany. In herbalism, oral ethnobotanical knowledge was slowly merged into organised science. Herbalists gradually recognised the value of natural biological categories (genera and species in a pre-Linnaean sense) creating the foundation for scientific nomenclature. They also preserved ethnobotanical categories (folk names and knowledge) in European science for centuries.

Ethnobiodiversity is a complementary concept to *agrobiodiversity* (Hammer 1998; Gyulai, ed., 2000) and even to *socioethnobotany* (Toledo 1995). It is a new approach, a new way of thinking about man-and-plant interactions by focusing on the study of interactions of the different human cultural (ethnic, language) traditions of the communities as factors in the evolution, distribution (destruction and/or preservation) of

plant diversity. Even if the ethnic component is a minor part of traditional PGR studies and in (agrobio) diversity protection, it is a main focus in ethnobiodiversity studies**.**

The idea emerged in 1990 in Budapest during a preparatory conference of the environmental Rio-summit (Vida 1990; Szabó 1990 in Polunin and Bennet 1990/1992), but the term was coined later (Szabó 1996a).

There are many empirical facts supporting this concept, but the correlation between ethnicity and plant biodiversity is far from clear. Even the correlation between biodiversity *sensu latissimo* and sustainability is subject of controversial scientific discussions (references not cited here).

During the Hungarian ethnobotanical and ethnobiodiversity studies some new subfields were also named: **ethnogeobotany** dealing with traditional knowledge on and denomination of different plant communities by different ethnic groups and **aedobotany**, a field of newly emerging environmental botany that includes the botanical (taxonomical, geneoecological, evolutionary etc.) problems related with plants used around and inside human constructions (Péntek and Szabó 1980; 1985; Szabó 1996e).

Main Responsibilities of the Co-operating Authors

Ethnobotanical field studies have been performed in ABCD-Area beginning with 1970 by the senior authors: Professor János Péntek (linguist and anthropologist), Professor István Szabó (botanist, agricultural scientist), Professor Attila T. Szabó, dr. biol. (botanist, geneticist). For Historical Ethnobotanical Databases A.T. Szabó, I. Szabó and PhD student Kata Frendl are responsible.

Case studies. 1) *Malus*-Case: A.T. Szabó, J. Péntek and I. Szabó; *Prunus*-Case: A.T. Szabó and J. Péntek; *Phaseolus*-Case: J. Péntek and A.T. Szabó; 2) *Adonis*-Case: A.T. Szabó; 3) *Matthiola*-Case: N. Bauer and A.T. Szabó; 4) *Telekia*-Case: A.T. Szabó and L. Balogh; and 5) *Galanthus*-Case

The review of the history of Hungarian ethnobotany is compiled by I. Szabó and will be presented elsewhere for space reasons. For the review of ethnobiodiversity studies and for the text and editing the corresponding author is responsible.

MATERIALS AND METHODS

The ABCD-Area

The Alp-Balkan-Carpath-Danube Area (the ABCD-Area) covers a more or less interconnected European system of mountain ranges (Alps, Carpathians and the Balkan Mountains), chains, valleys and passages, forests, pastures, arable intra-mountain and inter-mountain depressions (the largest one being the Hungarian Plain and the Transylvanian Basin). This mountain system ranges from northwest (Kolmenhof/ Donauquelle, St. Martin's Chapel, Schwarzwald, Germany) to southeast up to Sahalin Island, Delta of Danube, Black See coast, Romania. Its northern and eastern borders follow the line of the Carpathians, the western and southern border the line of the *Alpes Maritimes*, the French, Italian and Slovenian (Julian) Alps and the Balkan Mountains reaching southward even Greece. The ABCD-area is not a geographical term but a zone united by human migrations and similarities in ethnobiodiversity, especially in the ethnobotany of ornamental, vegetable, fruit and grain plants.

In ABCD-Area both the Neolithic Revolution (started in Near-East and emerged parallel with the domestication of plants and smaller animals) as well as the Curgan Invasions (started in contact zone between Asia and Europe and resulted from large animal, especially horse and cattle domestication) were deterministic for the evolution of spontaneous and athropogenous plant and animal diversity. These revolutions and invasions advanced along the Alp-Carpath-Balkan mountain system as a whole, as well as along the Danube River on roads opened for (plant, animal and human) migrations in the postglacial period. This "migration network", the similarity of human influences, motivates the cohesive and comparative treatment of genetic resources and ethnobio-diversity in the whole area. As a consequence of the traditional and frequently similar horticultural, agricultural and sylvicultural practice, the ABCD area became a gene centre

first of all for forage, later for medicinal and vegetable, and last but not least for ornamental and fruit plants and forest trees.

Grassland domestication is a distinctive feature of this range as compared with any other gene centres of the world. Many valuable grasses and clovers of agri- and/or horticultural importance all over the world trace back their ancestry to the ABCD-area. Some of them even have names indicating this ancestry: *Bromus inermis* - Hungarian brome grass, *Trifolium repens* conv. *giganteum* – Ladino clover, *Trifolium pannonicum* – Hungarian clover. The same is true for interesting vegetables and fruits, e.g. *Armoracia macrocarpa* – Hungarian horseradish, *Prunus domestica* var. *hungarica* – Hungarian plum etc., *Cucurbita pepo* var. *styriaca* – Steyer squash. The forage plant genetic resources evolved here under a specific selection pressure of alternative deforestation, grazing and ploughing and a variety of further management practices performed traditionally. This distinctive feature of the ABC mountain range and the Danube valley is rather neglected even by international projects (Prance 1995).

Another reason for looking on this ABCD-range as a unique domestication zone is its contribution to the ornamental garden flora of the European (Greek-, Roman-, Renaissance-, French-, English-, and especially the Alpine-) gardens.

Looking systematically on traditional house and churchyard gardens all over the ABCD area many simple but important questions emerge, and much more even waits formulation. Very few good research has been performed in this field.

Field Studies

A comprehensive review of Hungarian ethnobotany supporting agrobiodiverity research has been presented by I. Szabó et al. (2000). With a lack of a comprehensive Ethnobotanical Database of Europe we were unable to detect similar reviews in other ethnic communities.

Itinerary ethnobotanical studies have been performed from1967-2002 in the whole ABCD area (I. Szabó l.c.). No studies have been organised until now for monitoring the changes of ethnobiodiversity in a given territory over a period of time, including the dynamics of *in situ* HPGRs. Such studies could be performed especially in eastern parts of the ABCD-Area, on previously well studied Nösnerland (Bistrita/Beszterce region) and Kalotaszeg/Calata Area (Cuj/Kolozsvár region), both in Transylvania (Romania), Balaton Uplands (Central Hungary), etc.

Ethnobotanical Databases

In continuation of former studies of Hungarian plant names and botanical history (Gombocz 1939; Priszter 1998 and .n.c.) a series of historical ethnobotanical databases were compiled and in part edited either in printed or in electronic form. Much of the material covers the history of Hungarian Herbalism (Szabó 1978, 1990, 1992, 1994), as well as the results of field studies reviewed by I. Szabó (l.c.).

Living Collections

From 1976-2002 ethnobotanical data were documented in form of classical herbarium specimens in a separate Ethnobotanical Herbarium (Cluj-Kolozsvár and Arcus-Árkos, Romania), as well as in herbaria from Szombathely and Veszprém (Hungary).

Three different series of seed lists (*Index semina*) based in part on material from ethnobotanical field collections or evaluations from experimental fields in the living botanical collections from Cluj/Kolozsvár (Romania) Szombathely, Veszprém and Keszthely (Hungary) have been edited regularly by A.T. Szabó (1967-1987, 1988-1998), I. Szabó (1985-1998), as well as by I. Szabó and A.T. Szabó (1999, 2000, 2001, titles not cited in references).

RESULTS AND DISCUSSION

The Hungarian Ethnobiodiversity Model

The Neolithic Revolution, with the emergence of agriculture, was a key event in the evolution of Indo-Europeans. The role of horse domestication and the massive migration of horse riding populations (Curgan Invasions, Gimbutas, but s*ensu lato*) is still not generally accepted in this process of the evolution of Indo-European languages and cultures ("language steamrollers" *sensu* Renfrew n.c.h., cf. http://genetics.bdtf.hu, BioTár Electronic, Amplicon). According to our opinion, Neolithic Revolution and Curgan Invasions were not exclusive, but complementary in Indo-European ethnogenesis and language evolution.

The last ethnically successful "language steamrollers" among the non-Indo-European migratory peoples practicing large animal breeding (cattle and horse) were the horse riding Hungarians, settled here in the period when Northern Europe was dominated by Vikings. The Hungarians, as conquerors and state organisers, were not just the "Vikings of Central-Europe", but also deterministic for the ethnobiodiversity of the north-eastern part of the ABCD-Area, especially that of the Central Hungarian Plane (Puszta), but only for that.

In contrast with the general belief regarding the conquering Hungarians as "Bloody Huns", the Proto-Hungarians probably owned a well developed ethnobotanical culture. Few direct evidence is known in this respect, but the name derived from a crop plant (*Hordeum vulgare*) of one of the most lasting King-Houses of the medieval Europe ruling for 540 years the Hungarians (Árpád-ház = Barley House, 807-1342), the ancient *Griff-Tendrils-Flowers-Life-trees Haversack Jewellery* with its elements preserved up to now on folk embroidery and wood-cuttings, as well as the receptivity toward, and the lasting tradition of renaissance *Flower Songs* in historical Hungary, is a remarkable indirect evidence with respect of Hungarian interest toward cultivated and spontaneous plant world. Hungary gained a lasting fame even from early Medieval Period as a "Food Basket" and a "Famous Garden" of Europe. Gardening remained a tradition over the history, to the present (Várkonyi and Kósa 1993; Stirling 1996; Géczy and Stirling 1999; Galavics 2000).

Hungarian ethnobotanical traditions were collected and merged in official science first by Renaissance Herbalism beginning with the "ethnobotanical program" of the Transylvanian Johannes Sylvester (1536/1539, cf. Sebeok s.a.) launched in his first botanical lecture on Hungarian and Latin plant names, in the first comparative grammar of the Indo-European and Hungarian languages (Sebeok s.a.; Szabó 2001).

The analysis of further Indo-European interactions with Hungarian ethnobio-diversity, with Slavs and Germans, and with the Thraco-Romanian transhumance pastoralism in *Spatiul Mioritic* (Blaga n.c.) are out of the aims of the present paper. These interactions represent contacts with other ethnic model situations. Such models, analysed objectively by dedicated specialists, are urgently needed for comparative studies.

A general European or more exactly Eur-Asian ethnobiodiversity model cannot be outlined without its component ethnic models.

Botanical Case Studies

The botanical case studies illustrate different aspects regarding the importance of ethnic component in our HPGR research: the Central Asian connections of the Hungarian ethnobotany ("*Malus*-Case", "*Prunus*-Case"), Mediterranean influences ("*Matthiola*-Case" not presented here), and the Amer-Indian connections ("*Phaseolus*-Case").

In three other cases supposed, but still not proved, effects of human invasions on the evolution and *in situ* preservation of spontaneous HPGRs are presented: the *Adonis*-Case may be connected with Curgan Invasions, the *Telekia*-Case with Ottoman Invasions, and the *Galanthus*-Case with the present day "human invasions" on natural snowdrops genetic centres by commercial collectors. Behind all these cases there are works based on a long personal experience accumulated during field studies and long-term transplantation experiments.

1. Central-Asian roots: the *Malus*-Case, presented from ABCD-Area previously in different publications (Szabó T.A. 1996d; Nagy-Tóth 1998; I. Szabó et Kocsis-Molnár 2001; Szabó 2001, the last two in Holler et Spornberger, eds., 2001) illustrates the strong Hungarian ethnobotanical and ethnogeobotanical affinity toward this fruit. If this affinity is stronger or weaker than that of the surrounding Indo-European populations, it is difficult to say, but it could be studied with quantitative ethnobotanical methods. In this case the effect of productive advanced cultivars (and the technology used for their cultivation) is a very effective factor of genetic erosion. Successful *in situ* conservation neglecting ethnocultural traditions are quite impossible in this case.

We have no direct evidence that the Hungarian name of *Malus* "*alma*" learned by Proto-Hungarians in Central Asia, in the evolutionary centre of cultivated apples (Watkins 1976), and the traditional Hungarian affection and knowledge related with apple cultivation and use have a continuity in ethnobiodiversity traditions. Archeological findings may reveal such a continuity (Gyulai 2001).

In Kalotaszeg sample area (Zona Calata), situated in the north-eastern borderline of the Munții Apuseni (R), Erdélyi-szigethegység (H) the ethnic diversity is represented by a Romanian (61.5%), Hungarian (37%) and about 2,5% Gypsy population. During the ethnobotanical field studies carried out here between 1972 and 1982 in 52 settlements, the apple was just one of the questions asked everywhere for the 984 studied taxa.

We compare here our results with those of F. Nagy-Tóth (1998) who studied apple diversity in a much larger territory (Transylvania) in the 1950s. The list illustrates that about the half of the apple landraces found between 1951-1955 in Transylvania were still present 30 years later on a much smaller sample territory, as well.

The following landrace-names were registered here:

A: Hungarian apple-landraces (the names registered also by Nagy-Tóth 1998 in Transylvania are in bold): ***ananászranett*** *(found in 1 settlement),* ***aranykormos*** *(3), aranypál (1),* ***aranypármen*** *(9), aranypepin (1),* ***aranyrenet*** *(2), árpánérő (1), bánfipál (2),* ***batul, batur*** *(22), belföl/di cf.* ***Belle fleur*** *! (3),* ***borízű*** *(3), bürüzdi (1),* ***cigányalma, cigánypiros*** *(5),* ***citromalma*** *(10),* ***csipkealma*** *(1),* ***darualma*** *(1),* ***édes/ides alma*** *(4), eperalma (2),* ***fű****zides (1),* ***jegesalma*** *(4),* ***jonatán/jónathány*** *stb. (17),* ***kanadai*** *alma (1), kaszás alma (1),* ***kolozsvári*** *(1), kúti (1),* ***leánycsöcsű*** *(1),* ***londonpepin/londonpeti*** *(4), mucskos (1),* ***muskotály*** *(1), nagyídes (1),* ***narancsalma*** *(2),* ***nyárialma*** *(8),* ***párisalma*** *(1), pármen (cf. aranypármen !), pesti alma (1), pirosbélú (1),* ***pónyik*** *(19),* ***sóvári*** *(14), szennyesalma (2),* ***tányéralma*** *(2),* ***taplósídes*** *(1), tincsesalma (1), tótelki alma (1),* ***törökbálint*** *(6),* ***tulipán****piros (1), úrmós alma (1),* ***vajalma*** *(1), vajasídes (1),* ***zörgősalma*** *(1).*

B: Romanian apple landrace names in Péntek and Szabó (1985) and Nagy-Tóth (1998): ***batul (5), ionatan (6), ponici (2), sovar (4)****,* ***mere aur****ii (1), mere bercene (1),* ***mere cormose*** *(1), mere de aur (1),* ***mere de vara*** *(2****), mere dulce (2), mere lamaioase (1), mere rosii de Cluj (1)****, mere domnesti (1),* ***parmene*** *(1).*

Borza (1965, with further references) indicates under *Malus pumila* Mill. more than 1800 ethnobotanical references regarding cca. 600 traditional Romanian apple landrace names from the eastern border of the ABCD-Area. Here is a sample of the first 20 names (number of ethnobotanical references in parenthesis, if more than one): ***Mere acre (2), M. acrisoare, M. acrute, M. de alamie, M. albastre tiganesti, M. albe (2), M. ariuse (5), M. ariusi, M. ariug, M. ariuse de vara, M. astrakhan, M. astrakhan alb (3), M. astrahanca alba, rosie, rosu (3), M. atagane (2), M. de aur (3), M. de aur de vara, M. auriu, M. auriu de Petrinzel etc***.

Krauss (1943) collected in a restricted territory in Nössnerland (Northern Transylvania, Romania) under the old name *Pyrus malus*, Gemeiner Apfelbaum (l.c. pp. 362-414) 420 landraces and cultivars and about 5500 (!) Transylvanian German ("Saxon") apple landrace and cultivar names and name varieties from a small sample area. Just to illustrate this enormous diversity we cite here the first 20 names. The number of individual ethnobotanical data registered by Krauss, i.e. that of name varieties/localities, in are indicated in brackets, the Roman numerals indicates homonyms,

(!) indicates a specific local or regional landrace: ***Adelsberger Kalvill*** (4), ***Alexander*** (7), ***Amerikanischer*** (1), ***Ananas/renett*** (30), ***Anikot*** (1), ***Anis*** (1), ***Asch*** (3), ***Ascher*** (1), ***Astrachan*** (41), ***August*** I+II (42+2), ***Augustsommer*** (1), ***Baldwin*** (2), ***Bamberger*** I+II(39+2), ***Bänkäsch Hanzi*** (3!), ***Baron*** (12 !), ***Bart*** (1), ***Bartsüsser*** (2), ***Batull*** White, Green (69! with many local varieties), ***Baumann/Renette*** (33), etc.

This exhausting variability is present also in the central part of ABCD-Area, in the Pannonian zone covering Hungary, Austria, Slovakia, Slovenia and Croatia. We tried to evaluate and present in different exhibitions the diversity of these landraces in Western Hungary and in Eastern Austria, i.e. in Burgenland, once part of the Hungarian Empire (Szabó 1996d; I. Szabó et Kocsis-Molnár 2000; Szabó 2000, l.c.).

The preferences of different ethnic communities, their contribution to the generation and preservation of this apple diversity was never studied by scientifically sound, comparative methods. So the Hungarian Ethnobiodiversity Model with regard to apple diversity needs further comparative work, especially the badly needed German, Romanian and (Northern/Southern) Slav Ethnobiodiversity Models.

2. Slav and Mediterranean connection*:* The *Prunus*-Case. The traditional name of plums (*szilva*) and sweet cherries (*cseresznye)* are of Slav origin in Hungarian. Almond (*mandula*) is of Mediterranean Latin, sour cherry (*meggy*) of Finno-Ougric origin.

The scientific taxonomy (systematics and nomenclature) in the case of plums, peaches, cherries, almonds etc (Prunus s.l.) is complicated and controversial: **almond** is *Prunus dulcis* syn. *Amygdalus communis,* ***apricot*** is *Prunus armeniaca* syn. *Armeniaca vulgaris*, ***sweet (mazzard) cherry*** is *Prunus avium* syn. *Cerasus avium*, ***myrobalan plum*** is *Prunus cerassifera*, ***sour cherry*** is *Prunus cerasus* syn. *Cerasus vulgaris*, ***garden plum*** is *Prunus domestica* ssp. *domestica*, ***damason plum*** is *Prunus domestica* ssp. *instititia* syn. *P. instititia*, *etc.*, ***mahaleb cherry*** is *Prunus mahaleb* syn. *Cerasus mahaleb* or *Padus mahaleb*, ***black cherry*** is *Prunus serotina*, ***peach*** is *Prunus persica* (con)var. *persica* syn. *Persica vulgaris*, ***nectarine*** is *Prunus persica* (con)var. *nectarina* or convar. *nucipersica* syn. *Persica vulgaris* var. *nectarina* etc. (cf. Hanelt et al. 2000 for details). The diversity of forms cultivated for food is a further source of confusion, especially in scientific nomenclature. Folk taxonomy is pragmatic, focuses on clear differences useful for communication in a community and sometimes (treated properly) is even a quicker source of information than scientific nomenclature.

A basic problem for scientific (but also for ethno-) taxonomy in this group is the interspecific hybridisation, both natural and artificial. (Watkins 1976a, in Simmonds 1976).

The diversity generated by genetic variability (induced also by hybridisation) is high in the ABCD-Area and microevolution is active especially in the case of European plums: *Prunus domestica* var. *hungarica* has been accepted even by Linneaus, beside *Prunus avium, Prunus cerasus* and *Prunus spinosa*. This is reflected also by the number of data extracted from different historical and modern ethnobotanical sources (Melius 1578; Lencsés 1593; Krauss, 1943; Péntek et Szabó 1985; Vickery 1995).

It is worth to mention here that the largest ethnobotanical data sets (Table 1A) belong to the Transylvanian German ("Transylvanian Saxon" cf. Krauss 1943) and Transylvanian Hungarian (Péntek et Szabó 1985) ethnicity. The German ethnic community of Transylvania struggled successfully in Historical Hungary for 800 years, i.e. between 13th and 19th centuries (up to 1919) to preserve his ethnic identity, but was eroded and disappeared almost completely in 80 years, i.e. between 1919-1989, in the newly created Romanian state. The Hungarian ethnicity settled in the same territory around the 9th century AD also declined sharply after 1919 reaching now an extinction rate of about 10% per decade (according to the data of population census from 1991 and 2001).

We have no idea about the correlation between the erosion of ethnic communities (the loss of ethnic diversity), and the erosion of horticultural genetic resources, i.e. the loss of HPGR diversity in these territories. Even the comprehensive data of Krauss (1943) and those of Péntek and Szabó (1985) are not enough for a sound monitoring of both (i.e.

the ethnic, human genetic, and the horticultural, plant genetic) erosion phenomena (Table 1B).

How strong are ethnic erosion and plant genetic erosion connected? We did not find any good research in this respect, but the ABCD-Area would be a good sample territory for such studies. For example in the formerly-mentioned Nösnerland the ethnobiodiversity dramatically decreased after 1945, because the Germans disappeared almost completely. How this affected HPGR diversity is an open question. The same is true for the whole of Transylvania, where a Hungarian *epitheton ornans*: *hétszilvafás nemes* (i.e. a poor noble man owning just 7 plum trees) indicates in an ironical form the ethnic importance of plum culture.

Changes of political boundaries, changes of sociocultural (political) and economical (agricultural) systems surely have dramatic effects demonstrated in our field studies as well (Péntek and Szabó 1985).

For example the almond (*Prunus amygdalus*) culture, started in Hungarian Central Mountains (around Lake Balaton and Balaton-Uplands) in Roman times, once flourished (Borbás 1900; Mészáros in Bauer et al. 2000/2001; Szabó, *idem*), but eroded slowly around the Lake in the period of "socialist agriculture" between 1945-1989. This erosion has seemingly accelerated in the last decade, in a period of return from socialism to capitalism (1990-2002). What can be expected during the coming integration period of Hungary into the European Union, is an open question. The same is true for the fig (*Ficus carica*) culture of the area (I. Szabó 2000). Monitoring (and influencing positively) these phenomena have both theoretical and practical, as well as local and global importance: the invasion of the new landowners from the rich Western-European countries may cause the local and regional erosion of horticultural genetic resources and result not only in vanishing crop diversity, but a severe losses in ancient almond (*Prunus amygdalus*), fig (*Ficus carica*), vine (*Vitis vinifera*) diversity in Pannonia.

3. Amer-Indian connections: The *Phaseolus*-case. In the case of American bean (*Phaseolus*) varieties introduced in ABCD-Area around 1570 (cf. e.g. *Phaseolus purkircherianus* Clusius 1583) marker genes correlated with economically important traits were selected first by American Indian tribal communities. This genetic system was rediscovered by folk taxonomy in different parts of the world where *Phaseolus* beans were introduced. In our field studies in ABCD-Area *Phaseolus* GR diversity was correlated with, and reflected by ethnonomenclatural diversity. This means that the Transylvanian Hungarian and Romanian population rediscovered in a sense the original role of morphological marker genes in the identification of different *Phaseolus* GRs suited for different cultural, nutritional and even ornamental needs and/or cultivation practice (Table 2A). Beside the rediscovery of Phaseolus-Zea multicropping (see later), even the original Amer-Indian practice to name specific marker gene combinations according to different persons or families whom these belong became a quite common practice here. A homologous series of parallel variations are also present here (Table 2B) in different *Phaseolus* species (e.g. *Ph. coccineus, Ph. lunatus, Ph. vulgaris* etc.), as well as in the different convarieties of the same species (e.g. *Ph. vulgaris* convar. *vulgaris* and convar. *nanus*).

Genetic sedimentation: Rediscovery of co-adapted *Zea, Cucurbita* and *Phaseolus genodemes,* and HPGR (landrace) conservation.

Traditional American Indian multicroping is correlated generally with that of the ***Zea, Cucurbita and Phaseolus*** diversity**.** This means almost surely that a series of co-adapted genotypes (infraspecific taxa, landraces) evolved in America under a "co-selection" pressure of the different environments and ethnic communities.

During field work in the ABCD-Area (especially in Kalotaszeg) we found that the rediscovery of the Amer-Indian ***Zea-Phaseolus-Cucurbita*** multicroping contributed to the *in situ* preservation and even a secondary increase of HPGR diversity (genetic sedimentation, cf. Szabó 1980) in all taxa included in this multicroping practice. When this practice emerged after the introduction of the exotic crops is difficult to say, but the

phenomenon is surely connected with the historically well documented multicropping tradition in Transylvania (Szabó T.A. sen. 1976-2002).

4. The "*Adonis*-Case" and its possible connections with "Curgan Invasions". Phytocoenological and chorological analysis of the different Central-European early flowering perennial *Adonis* (fam. *Ranunculaceae, sect. Consiligo*) taxa occurring on a small isolated sites of the disjunctive distribution of *Adonis volgensis* auct. non Stev. revealed complex microevolutive phenomena as a result of introgressive and recurrent hybridisation among different perennial *Adonis* taxa of horticultural importance.

It can not be excluded that the introgression originally emerged due to human migrations belonging to Curgan Invasions (Gimbutas) *sensu latissimo*. Curgans frequented the territory of Szénafüvek/Fînațe (Cluj/Kolozsvár, Romania). The population structure on the habitats was influenced permanently by intensive grazing, ethnopharmacological and, in last two centuries, by botanical, and perhaps also by horticultural collections.

In Transylvania the *Adonis* notomorpha of the Finate (Szénafű) topodeme (terminology according to Gilmour and Heslop-Harrison 1954, reference cited in Szabó 1983) were integrated in ruderal "ecotone situations" in a *Pruno-Crataegetum robinietosum*, and in secondary meadows (*Brachypodio-Caricetum montanae*). The habitat is disturbed by landslides, causing a fragmentation into drier and moister sites. During the first period of *Adonis* population census (1970-80) performed for monitoring purposes in the whole distribution area, which was not much larger than a football field, the topodeme contained about 585 individual *Adonis* plants. The members of the topodeme were divided in different ecodemes (depending on soil moisture and light/shadow ratio) and many different phenogenodemes. Among these 21 individuals were identified formally as *Adonis transsilvanica* Simon. corrected A.T. Szabó var. *latisecta* A.T. Szabó., syn. *A. volgensis* auct. non Stev., 138 plants as *A. hybrida* (Wolff) A.T. Szabó, and 426 plants were the here common *A. vernalis* L.

Comparing similar *Adonis* introgressions, the "Szénafű" topodeme (Romania), the "Csorvás" topodeme (Hungary), and topodemes from Moldova (Romania), Moldavia, and Ucraina, active microevolution was detected in the whole Eastern- and Central Europe. Ecological, coenological, palinological and chemotaxonomical studies revealed the competitive advantages of *A. vernalis* versus *A. hybrida sensu* A.T. Szabó. In case of the "Fînațe" introgression this was due to larger flowers, more pollen and seed production and higher glycoside content in A. vernalis, as well as to increased drought tolerance, all important characters on heavily grazed pastures (cf. Szabó 1973, 1977, 1978a).

However, long-term cultivation experiments (1975-2002) demonstrated differences in reproductive ability and decorative value in favour of the hybrids (Szabó not published). These results analysed in the light of recent studies (Wang 1994; Hoffmann 1998; Szabó 2002 in prep.) indicates that the active speciation processes generate topogenodemes with high potential ornamental value. The qualitative and quantitative analysis of the karyotypes revealed even some cytological, genetic backgrounds: the presumed parent types (*A. vernalis* L. and *A. volgensis* auct. non Stev., both lower in stature) had quite similar DNA content expressed by the total length of the chromosomes present in the nuclear genome as compared with the more robust, much taller hybrid phenodemes (notomorpha), with larger leaves, presenting higher or smaller DNA values (cf. Szabó 1980, for details).

Perennial *Adonis* taxa from the section *Consiligo* were used traditionally in ethnoveterinary practice in healing horses and cattle, using the alkaloids accumulated in the underground organs, mostly in thick, black roots named "tályog-gyökér" or ""táragy" in ancient Hungarian. This (nomadic?) practice was associated with active collection and long distance transport. Those the human introduction of pontic *Adonis* taxa in ABCD-Area by peoples of Curgan Invasions can not be excluded. The veterinary use is still part of the traditional knowledge and was until recent times one of the major endangering factors of *in situ* preservation of the isolated, very vulnerable small *Adonis hybrida* (Wolff) A.T. Szabó populations.

The micoevolution of introgressive Adonis hybrids from *Consiligo* section refers to a narrowly distributed hybridogen taxon complex, and illustrates the possible role of a 1000s years old human interferences with this HPGR diversity in the ABCD-Area.

5. The *"Telekia-Case"* and its possible connections with Ottoman Invasions. *Telekia speciosa* (Schreb.) Baumg., the splendid Teleki-flower, is a perennial *Asteraceae* distributed along the creeks and forest edges in the ABCD mountain ranges, Caucasus and Asia Minor. The species is protected on its spontaneous (?) habitats in Hungary, but tends to be invasive in the mountains of the ABCD-Area. The genus is "almost monotypic": the other species (*Telekia speciosissima)* has a very restricted distribution and seems to be problematic taxon. Even its specific epithet is misleading: *T. speciosa* is much more spectacular as *T. speciosissima*, which is practically never cultivated as an ornamental.

Based on morphological and ecological differences between these two taxa we include *T. speciosa* in a separate section of the genus, i.e. in sect. *Speciosae* A.T. Szabó *nomen novum prov., hoc loco*. The preliminary diagnosis of the section: plants robust, flowering stems generally exceeding 80 cm in height, calathidia more than 25 mm in diameter, high ecophysiological adaptability and wide distribution.

Long term clonal transplantation experiments (CET) carried out with clones of 50 different topodemes collected in Alps and in the Carpathians, planted between 1988-2002 in 6 different experimental gardens (3 in Szombathely, 1 in Kőszeg, 2 in Veszprém, all in Hungary) revealed a large genotypic variability reflected in morphological, phenological, chemotaxonomical characters, high ecological (and morphological) plasticity. The majority of the examined populations were pre-adapted for cultivation.

The splendid Teleki-flower was "domesticated" first perhaps in the royal Botanical Garden of Vienna (not counting now its possible decorative role in the aristocratic parks from Transylvania). Beginning with 19th century it is largely distributed for parks, botanical and home gardens as a flowering and leaf ornamental. Now it is in cultivation almost everywhere in the Atlantic-temperate climate zone landscape gardens and botanical collections. In certain ecological condition, where enough moisture and shadow is available for the development of the seedlings, tends to be invasive, but in our CETs just in one garden (in Veszprém 1.), and only in a specific ecological situation (along northern house walls, in the vicinity of a well) became invasive. In other sites was unable to survive when human care (cultivation) has been abandoned. In Szombathely, under Pre-Alpine climatic conditions for example no invasion has been observed during the last 15 years in any of the 3 gardens involved in the long-term experiment.

We assume that *Telekia speciosa* reached the ABCD-Area massively during Ottoman Invasions, i.e. beginning with 16th century. Distribution patterns, the almost complete lack of ethnobotanical data related to this very spectacular flower, and other information may support this assumption. Introgression and hybridisation between the different Asian *Telekia* populations can not be excluded: the Turkish topodemes are different from those observed in the ABCD area and perhaps belong to a separate taxon with a distribution area of its own: ssp. *turcicum* A.T. Szabó *nomen novum prov., hoc loco*, a taxon characterised by plants distributed in Asia Minor, developing 1-3 strongly reddish coloured flowering stems of more than 120 cm high, as compared to ssp. *transylvanicum* A.T. Szabó n.n., h.l. distributed in ABCD-Area, bearing more (4-10) and higher (about 100 cm) greenish stems in our experimental conditions. An other topogenodeme of *T. speciosa* with distinctive morphological and cultural characteristics, collected from Durmitor Mountains (Balkan Peninsula) has been also described earlier by Szabó and Balogh (n.p.) as a **Registered Hungarian Plant Genetic Resource.**

The *Telekia*-Case refers on a largely distributed taxon and illustrates a possible interference of a 400 year's old human invasion with the evolution of a rather neglected, potential HPGR.

6. The *Matthiola*-Case: Mediterranean Influences in the Gardening, Music and Folk Art of ABCD-Area is not discussed here for reasons of space. For details see Szabó and Péntek (1980), Péntek and Szabó (1985), Bauer and Szabó (n.p.).

7. The "*Galanthus*-Case": possible effects of "Global Human Invasions" on snowdrop Genetic Resources. After a series of ethnobotanical evaluations (Szabó and Péntek 1976; Péntek and Szabó 1985; Szabó 1990), followed by long-term transplantation experiments carried out between 1989-2002, more than about 150 different snowdrop (*Galanthus, Amaryllidaceae)* population samples were collected and evaluated in Western Hungary. The samples have been transplanted between 1989-1997 in three gene-ecological experimental gardens situated in different parts of the city of Szombathely (Hungarian Pre-Alpine climate) and in one garden in Hungarian Central Mountains (Veszprém, continental climate) on more sites. The variability and phenotypical plasticity of different vegetative and generative traits have been registered. Results regarding the variability of vegetative parts (bulbs, leaves), flowers, fruits, seeds as well as some ecological, phenological and anatomical characters have been analysed.

The transplantation experiments demonstrated the genetic background and stability of many differential traits (e.g. flowering time, plant size, tepal shape, "green heart sign" of the inner tepal, fruit and seed size, shape and colour etc.). The influence of human environmental pressure especially that of selective spring collection on *Galanthus* microevolution has been also demonstrated. The assumption is formulated that in Western Hungary *Galanthus* populations, evolved not far from the Mediterranean speciation zone of the genus, accumulated during the post-Pleistocene period a considerable variability. So for example many of the snowdrop populations growing in Szigetköz, a "Continental Delta" of Danube, environmentally very endangered by the new hydroenergetic constructions (Bös-Grabcsikovo Danube Dam), harbour still undescribed infraspecific variability, emerged spontaneously due mostly perhaps to introgressive hybridisation between the topodemes carried and deposited here by the high waters of Danube and originated from different parts of the water-basin, transported here by the river, before the dam constructions, as seeds, or even as bulbs.

The *in situ* preservation of *Galanthus* genetic resources is endangered mainly by two factors, the first not related, the second related with ethnobiodiversity, but both related with global human invasions:

1. dam constructions (both protective and hydro-energetic) affecting the habitats harbouring large populations of snowdrops (especially in Szigetköz, in the border zone between Hungary and Slovakia,
2. large scale collection and commercialisation of bulbs, due to advanced "domestication" of, and need for snowdrops.

Commercialisation implies large scale bulb collections (which is a common practice in Asia Minor, and even perhaps in ABCD-Area), endangering in situ preservation both of local and global scale: around cities, along roads running through forests harbouring snowdrops, in regions, or even on country scale, as for example in Greece or Turkey (references not cited).

Domestication resulted in garden introgressions of different taxa with different geographical origins, the emergence of a series of new microtaxa (hybrids, cultivars) with peculiar ornamental value and the raise of the possibility of gene flow from introduced toward autochthonous populations. The consequent "genetic pollution" of spontaneous snowdrop genetic resources are difficult to discover in due time, but this is perhaps the case everywhere along the northern limits of the natural distribution of the *Galanthus nivalis* in Europe: the sparse spontaneous populations became genetically invaded by new introductions.

The *Galanthus*-Case refers on a taxon group in its full post-glacial evolution and expansion heavily influenced by new type of human interference: the Globalisation. In the modern evolution of snowdrop GRs also an exciting phenomenon of "non tribal", global ethnobotany may play a role: its early flowering habit, with a growing symbolic value in modern temperate zone "ethno-gardening", especially in churchyards (rebirth after death), on flower markets, but also in private gardens and university campuses as symbols of tender and love.

CONCLUSIONS

Ethnobotanical and ethnobiodiversity studies open new possibilities in understanding the success (or failure) of *in situ* Horticultural Plant Genetic Resource Protection, especially if these studies cover a sufficiently large area which are also interconnected with historical migration routs for plants, animals and humans, and are populated with ethnic communities having a long tradition.

The ***ACBD-Area***, and the ***Hungarian Ethnobiodiversity Model*** are working concepts elaborated to support and/or initiate such comparative studies.

Main limitations in ethnobiodiversity studies are the lack of good historical and modern ethnic, botanical and ethnobotanical surveys, well organised databases, as well as the misinterpretations regarding the role of ethnicity in biodiversity protection.

Based on personal experience accumulated during decades of ethnobotanical field studies, and long-term clonal transplantation and evaluation experiments performed in ABCD-Area, an ***Ethnobotanical Database for Europe (EDE***) and a system of ***Specially Protected Horticultural Plant Genetic Resource Registration (SP-HPGR)*** supporting the European, continental, and consequently the global scale *in situ* HPGR protection is proposed.

ACKNOWLEDGEMENTS

The data of oral and poster lectures summarised here are based on field research, experimental studies and database building supported by a series of grants and institutions. We are especially grateful to the Hungarian Academy of Science (MTA;TKI), to the different Hungarian OTKA grants, and to the Hungarian Ministry of Health supporting our research in historical ethnobotanical databases.

We are especially thankful to the organisers and convenors of the Symposium 21 (Plant Genetic Resources: The Fabric of Horticulture s Future) and personally to P.L. Forsline and H. Knüepffer, as well as to the Finance Task Force of IHC 2002 (Chair: P. Toivonen) for their continuous help and support.

Literature Cited

Anderson E. 1993. Plants and People of the Golden Triangle. Dioscorides Press, Portland.

Arber A. 1971. Herbals, their Origin and Evolution. Cambridge.

Balick M.J., Cox P.A. 1996. Plants, People, and Culture. The Science of Ethnobotany. Sci.Am. Libr., New York.

Bauer, N., Pál-Fám, F. and Szabó, T.A. (eds.) 2000/2001. Borbás Memorial Lectures 2000, Collecta Clusiana 6., Veszprém University Press, Veszprém, pp. 1-203.

Borza Al. 1968. Dictionar etnobotanic. Ed. Acad. RSR, Bucuresti.

Clusius C. and B(eythe) St. 1583/1584. Stirpium Nomenclator Pannonicus. Németújvár/ Antverpen.

Clusius C. 1603. Fungorum in Pannonis …, Antwerpen.

Davis E.A. 1995. Ethnobotany: An Old Practice, A New Discipline. In: Schultes and von Reis S.(eds.), 1995: 40-51.

Galavics, G. (ed.) 2000. Historic Gardens in and around Hungary. Studies on Research and Restoration (In Hungarian). MTA/MT, Mágus Kiadó, Budapest.

Géczi, J. and Stirling, J. (eds.) 1999. Old Hungarian Gardens (In Hung.). Vár Utca Tizenhét, Veszprém.

Gombocz, E. 1939. The History of Hungarian Botany. (In Hung.). MKTT, Budapest.

Gyulai F. (ed.) 2000. The Preservation and Valorification of Agrobiodiversity (In Hung.). Budapest-Tápiószele.

Gyulai, F. 2001. Archeobotany. The History of Cultivated Plants in The Carpathian Basin in the Light of Archeological-Botanical Studies. (In Hung.). Jószöveg Műhely Kiadó, Budapest.

Hammer K. 1998. Agrobiodiversität und pflanzengenetischen Ressourcen – Herausförderung und Lösungsatz. Schriften zu Genet. Res., Bd. 10, IGR, ZADI, Bonn.

Hanelt, P. and Institute of Plant Genetics and Crop Plant Research (eds.) 2001. Mansfeld's Encyclopedia of Agricultural and Horticultural Crops. Springer, Berlin, Heidelberg, New York, etc. Vols. 1-6.
Harshberger J.W. 1896. Purposes of ethnobotany. Botanical Gazette 21, 3: 146-154.
Hoffmann M.H. 1998. Ecogeographical differentiation patterns in *Adonis* sect. *Consiligo (Ranunculaceae).* Plant Syst. Evol., 211: 43-56.
Holler, Ch., and Spornberger, A. (eds.), 2001. Beiträge zum Streuobstbau in Europa. Stand, Entwicklungen und Probleme. Internationale Streuobstbau-Fachtagung "Pomillenium 2000", Burg Güssing, Burgenland 23-25. Oktober 2000. Conference Papers, Wien, 28: 1-94.
Kate, K .ten 2002. Science and the Conservation on Biological Diversity. Policy Forum: Global Genetic Resources. Science, 295: 2371-2372.
Krauss, F. 1943. Nösnerländische Pflanzennamen. Ein Beitrag zum Wortschatz der Siebenbürgen Sachsen. Erdélyi Tudományos Intézet. Buchdruckerei Carl Csallner, Beszterce – Bistriz.
Martin G.J. 1995. Ethnobotany. A Methods Manual. Chapman and Hall, London etc.
Mészáros, A. 2000/2001. Traditional Orchards and Fruit Landraces in the Balaton-Uplands. (In Hung.). In: Bauer, N., Pál-Fám, F. and Szabó, T.A. (eds.) 2000/2001. Borbás Memorial Lectures 2000, Collecta Clusiana 6., Veszprém University Press, Veszprém, pp. 109-113.
Nagy-Tóth, F. 1998. Ancient Hungarian Apples. (In Hung.). Erdélyi Múzeum Egyesület, Kolozsvár, pp. 1-352.
Péntek, J. and Szabó, T.A. 1980. Historical vegetation and its changes in the light of geographical names of Kalotaszeg. [Ethnogeobotany]. (In Hung,). Nyelvészeti Tanulmányok, Kriterion, Bucharest, pp. 131-172.
Péntek J. and Szabó T.A. 1985. Man and the Plant World. Plant Kingdom and Traditional Human Life, (In Hung,). Kriterion, Bucharest.
Prance G.T. 1995. Ethnobotany Today and in the Future. In: Schultes and von Reis S.(eds.), 1995: 60-68.
Priszter, Sz.1998. Növényneveink. A Magyar és tudományos növénynevek szótára. (Our Plant Names. The Dictionary of Hungarian and Scientific Plant Names. In Hung.). Mezőgazda, Budapest.
Schultes R.E. and von Reis S. (eds.),1995. Ethnobotany. Evolution of a Discipline. Dioscorides Press, Portland, Oregon.
Sebeok , Th.A. s.a.. Grammatica Hungaro-Latina by Iohannes Sylvester Pannonicus. With a Foreword by Thomas A. Sebeok. Indiana University, Bloomington, Mouton et Co., The Hague, The Netherlands.
Simmonds N.W. (ed.) 1976. Evolution of Crop Plants. Longman, London and New York.
Stirling, J. 1996. Hungarian Renaissance Art of Gardening in 16th – 17th centuries. (In Hung.). Enciklopedia, Budapest, pp. 1-304.
Szabó, I. 2000. Hungarian Land-race Collections in the Georgikon Botanical Garden: I. Fig (*Ficus carica*) Collection in Tihany Experimental Garden. II. List of Fig (*Ficus carica*) Land-races in Tihany Experimental Garden. In: Szabó, I. (ed.), 2000, Index Seinum 1999 ex Horto Botanico Georgicon Facultatis Agriculturae (Universitatis Scientiarum Agrarium Pannon Nominatae) Universitatis Veszprimensis. Keszthely, pp. 27-28.
Szabó I., Grynaeus T. and Szabó L.Gy. 2000. The role of ethnobotany in the study of agrobiodiversity. (in Hung.) In: Gyulai ed. 2000. The Preservation and Valorification of Agrobiodiversity (In Hung.). Budapest-Tápiószele.
Szabó, I., and Kocsis-Molnár, G. 2001. Sammlung von Obstlandrassen in Keszthely, Ungarn. (In German). In: Holler, Ch., and Spornberger, A., (eds.), 2001, Beiträge zum Streuobstbau in Europa. Stand, Entwicklungen und Probleme. Internationale Streuobstbau-Fachtagung "Pomillenium 2000", Burg Güssing, Burgenland 23-25. Oktober 2000. Conference Papers, Wien, 28: 59-61.

Szabó, T.A. sen. et. al. (ed.) 1975-2002. Historical Thesaurus of the Transylvanian Hungarian Language, I-IV (CD-ROM version: Szabó, T.A. jn., 1990. Minta Sztár, Budapest. Vol. I-IV: Kriterion Publishing House Bucharest, V-X: Kriterion Publishing House Bucharest and Academy Publishing House, vol. IX-XI. Academy Publishing House Budapest and Transylvanian Museum Society, Kolozsvár.
Szabó T.A. 1973. Chorology and phytocoenological integration of *Adonis volgensis* Stev. In R.S. Romania. Not. Bot. Hort. Agrobot. Cluj. 7: 39-47.
Szabó T.A. 1977. Fenomene microevolutive la o populație de *Adonis* L. (Sect. *Consiligo* DC.) de la Fînatele Clujului. Contrib. Bot. Cluj: 231-241.
Szabó, T.A. (ed.) 1978, 1979. Melius Péter: Herbarium (1578). Kriterion Publishing House, Bucharest.
Szabó T.A. 1978a. Gametic production in *Adonis* (Subsection *Vernales*. Rev. Roum. Biol. Vet., 23., 1: 31-36.
Szabó T.A. 1980. Date cariologice pentru genul *Adonis* L. Sect. *Consiligo* DC. din Transilvania, Romania. Bul. Inst. Agr. Cluj., 76-80.
Szabó, T.A. 1981. Problems of genetic erosion in Transylvania, Romania. Kulturpflanze, 29: 47-62,
Szabó T.A. 1983. Applied Botany in the Evolution of Cultivated Plants. (In Hung.). Ceres. Bucharest.
Szabó, T.A. 1990. *Galanthus nivalis* L. An Ethnobotanical Approach. (In Hung.) Collecta Clusiana 1. Ethnobotanical Collections. Szombathely.
Szabó, T.A. 1990/1992. Comments on biodiversity. In: N. Polunin and J. Burnett (Eds.) 1992. Surviving with the Biosphere. Edinburgh Univ. Press, pp. 183-186.
Szabó, T.A. 1994. MED – The Hungarian Ethnobotanical Database. CMED – Clusius – Beythe – Cvittinger (1583, 1584, 1711), Stirpium Nomenclator Pannonicus. Historical Thesaurus of Hungarian Ethnobotany. Application: Essays on History of Biology. Appendix to Stirpium Nomenclator Pannonicus (1992, 1994). Szombathely, Collecta Clusiana 2: 147-174.
Szabó, T.A. 1996a. Human diversity and plant genetic diversity in the evolution of crop plants. Ethnobiodiversity (1). In: R. Fritsch and K. Hammer (Eds.) (1996): Evolution und Taxonomie von pflanzengenetischen Ressourcen. Festschrift für Peter Hanelt. ZADI, Bonn, Schr. Genet. Ressourcen 4: 130-161.
Szabó, T.A. 1996b. The Study of Plant Environment of Human Constructions: Aedobotany and in situ genetic conservation. In: M. Cseri (ed.) 1996. Traditional Architecture of West-Transdanubian area. Budapest etc., pp. 509-536.
Szabó, T.A. 1996c. Environmental botanical study of constructions: aedobotany and *in situ* genetic resource protection. Preliminary report on interactions between ethnobotany and folk architecture. (In Hung.). In: M. Cseri (ed.), 1995, Nyugat-Dunántúl népi építészete (Folk Architecture in Western Transdanubia). Szentendre-Szombathely, pp. 509-536.
Szabó. T.A. 1996d. Fruit Landraces from Káld (Western Hungary). (In English and Hungarian). Bio Tár, Germoplasma. Szombathely.
Szabó, T.A. 1996e. Environmental botanical study of constructions: aedobotany and *in situ* genetic resource protection. Preliminary report on interactions between ethnobotany and folk architecture. (In Hung.). In: M. Cseri (ed.), 1995, Nyugat-Dunántúl népi építészete (Folk Architecture in Western Transdanubia). Szentendre-Szombathely, pp. 509-536.
Szabó, T.A. 1997. Biology and ethnicity in the study of the plant environment of human communities. Ethnobiodiversity (2). In Gy. Viga (ed.), 1997, Aus Europa ins Europa. Festschrift für Iván Balassa zum 80. Geburtstag. Budapest-Debrecen. Pp. 139-157.
Szabó, T.A. 1998. Ethnobiodiversity and plant genetic resources in the Alp-Balkan-Carpath-Danube (ABCD) area. [Ethnobiodiversity 3]. In L. Bérard and Ph. Marchenay (Eds.) (1998): Patrimoin montagne et biodivérsité. Héritage and Biodiversity in Mountain Areas. Rev. Geogr. Alp. 86, 4: 131-140.

Szabó T.A. 1999. Genetic Erosion, Human Environment and Ethnobiodiversity Studies. In Serwinski, Faberova (eds.), 1999, Proc. Techn. Meeting on the Methodology of the FAO World Information and Early Warning System on Plant Genetic Resources. FAO Res. Inst. Crop Prod., Prague, pp. 76-83

Szabó, T.A. 2000. A historical survey of studies related to living Einkorn (*Triticum monococcum* ssp. *monococcum*) populations found in Carpathian Basin. (In Hung.). In: F. Gyulai (ed). 2000. Preservation and Use of Agrobiodiversity. A Lecture Dedicated to Aandor Jánossy (1908-1975), the Founder of the Hungarian Agrobotanical Institute and Genebank. Agricultural Museum, Budapest and The Institute of Agrobotany, Tápiószele. Pp. 239-247.

Szabó, T.A. 2000/2001. Ethnobotanical Data in the Balaton-monograph of Vince Borbás (1900). (In Hung.). In: Bauer, N., Pál-Fám, F. and Szabó, T.A. (eds.), 2000/2001, Borbás Memorial Lectures 2000, Collecta Clusiana 6., Veszprém University Press, Veszprém, pp. 41-56.

Szabó, T.A. 2001. Alte ungarische Obstsorten. (In German). In: Holler, Ch., and Spornberger, A., (eds.), 2001, Beiträge zum Streuobstbau in Europa. Stand, Entwicklungen und Probleme. Internationale Streuobstbau-Fachtagung "Pomillenium 2000", Burg Güssing, Burgenland 23-25. Oktober 2000. Conference Papers, Wien, 28: 55-58.

Szabó T.A. 2001a. Hungarian botany in 16th and 17th centuries. Medical botany and the emergence of Hungarian scientific language. (In Hung.). In: Glatz, F. (ed.), 2001, Millenium in the Hungarian Academy. Proceeding of the Lectures of Members' Meeting from May 2000, Hungarian Academy of Sciences, Budapest, III: 1205-1225.

Szabó, T.A. 2001b. The study of phenotypical variability, multiplication and dispersal of *Telekia speciosa* in the Prealpin Area of Hungary. In: Borhidi, A. and Botta-Dukát Z. (eds.), 2001, Ecology on the Turn of Millennia. Diversity, Conservation, Succession, Regeneration. (In Hung.). Hungarian Academy of Sciences, Budapest, III: 59-73.

Szabó T.A. 2002. Introgression and hybridisation in genus *Adonis* (sect. *Consiligo*) in the Carpathian Basin. (In Hung., with English Abstract published in Proceedings of the: 5th Conference on Floritic and Vegetation Research in Carpathian Basin. Pécs, 8-10 March 2002. (Manuscript of the Presented Lecture available in electronic format: Szta@almos.vein.hu).

Szabó, T.A. and Péntek, J. 1975/1995. Centaurium. Ethnobotanical Guide Book (in Hung.). Kriterion Publ. House, Bucharest (1975), Tankönyvkiadó Budapest (1995).

Szabó, T.A. (in prep.) 2002. Definitions, concepts and methods in the ethnobotany of food plants. In: Macbeth, H. and MacClancy, J. (Eds.) 2002. Research Methods in the Anthropology of Food. Berghahn Publ., Oxford.

Szabó, T.A. and Péntek, J. 1976/1996. Centaurium. Ethnobotanical Guide Book. (In Hung.). Kriterion Publ. House, Bucharest (1976), Tankönyvkiadó, Budapest (1996).

Szabó, T.A. and Péntek, J. 1980. Garden flowers and ornamental plants in Kalotaszeg. (In Hung.). In: Kós, K. and Faragó, J. (eds.), 1980, Népismereti Dolgozatok. Kriterion Publ. House, Bucharest, pp. 100-114.

Szabó, T.A., Szabó, I. and Wolkinger, F. 1992. The Beginnings of Pannonian Ethnobotany: Stirpium Nomenclator Pannonicus edited by Stephanus and Beythe (1583), Carolus Clusius (1583/84), David Czvittinger (1711). Collecta Clusiana. Ethnobotany and Ethnobiodiversity Series of the Bio Tár. Steinamanger - Graz - Güssing.

Toledo, V.M. 1995. Socioethnobotany. New Paradigms for a New Ethnobotany. Reflections on the case of Mexico. In: pp. 73-88.

Turner N.J. 1995. Ethnobotany Today in Northwestern North America. In: Schultes and von Reis S.(eds.), 1995: 264-283.

Várkonyi, Á. and Kósa, L. (eds.) 1993. The Famous Garden of Europe. Historical Ecological Studies from Hungary. (In Hung.). Orpheusz Publishers, Budapest, pp. 1-282.

Vavilov N.I. 1992. Origin and Geography of Cultivated Plants. (D. Löve, transl.), Cambridge Univ. Press.

Vickery, R. 1997. A Dictionary of Plant-Lore. Oxford University Press, Oxford, New York.

Wang, W-T. 1994. Revision of *Adonis (Ranunculaceae).* Bulletin of Botanical Research, 14, 2: 105-138.
Vida, G. 1990/1992. Genetic Resources. In: N. Polunin and J. Burnett (Eds.) 1992. Surviving with the Biosphere. Edinburgh Univ. Press. Pp. 174-183.
Watkins, R. 1976. Apple and Pear. *Malus* and *Pyrus* spp. (*Rosaceae*). In Simmonds, N.W. 1976. Evolution of Crop Plants. Longman, London and New York. Pp. 247-250.
Watkins, R. 1976a. Cherry, Plum, Peach, Apricot and Almond. *Prunus* spp. (*Rosaceae*). In Simmonds, N.W. 1976. Evolution of Crop Plants. Longman, London and New York. Pp. 242-247.
http://genetics.bdtf.hu (BioTár: Amplicon, Collecta Clusian)
http://mansfeld.ipk-gatersleben.de (Mansfeld Database of Cultivated Plants)

Tables

Table 1 A: Data summarised according to species.
Historical (Melius, Lencsés, Krauss,) and modern ethnobotanical data (Borza for whole Romania, Péntek and Szabó for a small sample territory from Transylvania, Romania) from ABCD-area with regard to *Prunus* s.l. species as compared with one modern reference from United Kingdom (Vickery 1995)

Taxon	1578 H	1593 H	1943 G	1968				1985			1995	**T**
				R	H	G	T	R	H	T	E	
P. domestica	7	18	700	230	2	2	**234**	10	39	**49**	1	**1009**
P. armeniaca	*	1	58	31	10	8	**49**	1	6	**7**	*	**115**
P. persica	1	24	202	36	13	24	**83**	5	4	**9**	*	**309**
P.amygdalus	2	5	5	22	13	13	**48**	0	1	**1**	*	**61**
P. avium	3	10	321	36	20	28	**84**	9	32	**41**	5	**464**
P. cerassus	*	*	70	18	9	22	**50**	1	6	**7**	*	**126**
P. spinosa	5	13	106	90	12	11	**113**	12	22	**34**	24	**295**
Total	**18**	**71**	**1462**	**463**	**79**	**108**	**660**	**38**	**110**	**148**	**30**	**2379**

Notes:
1578 = Melius: Herbarium (Hungarian Ethnobotanical Database: Historical Data)
1593 = Lencsés: Ars Medica (Hungarian Ethnobotanical Database: Historical Data)
1943 = Krauss: Nösnerlandische Pflanzennamen (European Database in Ethnobotany)
1968 = Borza: Ethnobotanical Dictionary (European Database in Ethnobotany)
1985 = Péntek and Szabó: Man and Plant (Hungarian Ethnobotanical Database)
1995 = Vickery: Plant Lore (in consideration to European Database in Ethnobotany)

E: English data, G: German data, H: Hungarian data, R: Romanian data, T: Total

Differences in numbers of data in Romanian (R), Hungarian (H) and German (G)P. data indicates differences in ethnic interest of the author (cf. also Péntek and Szabó in Table for *Phaseolus*)

Table 1B. Analytical data correlated with hybridisation abilities among taxa.

Taxa	**Major hybrids with taxa from:**	**Minor hybrids**	**Ethnobotanical Relevance**
Prunus domestica E: European plum G: Zwetschke H: szilva R: prune ***Prunus instititia*** (Damason plum)	Subgen. *Prunophora*, Sections: *Euprunus*, *Prunocerasus*	Subgenus *Cerasus*, sect. *Microcerasus*. Subgen *Amygdalus*, Sect. *Euamygdalus*	Melius -1578: 7 Lencsés -1593: 18 Krauss -1943:700- ! incl. *P. cerassifera* Borza – 1968: 234 Péntek al.-1985:49 Vickery -1995: 1
Prunus armeniaca E: Apricot G: Aprikose, Marille H: kaiszibarack R: cais(e)	Subgen. *Prunophora*, Sections: *Euprunus*, *Prunocerasus*, *Armeniaca*	Subgenus *Cerasus*, sect. *Microcerasus*. Subgen *Amygdalus*, Sect. *Euamygdalus*	Melius -1578: - Lencsés -1593: 1 Krauss -1943: 58 Borza – 1968: 49 Péntek al. -1985: 7 Vickery -1995: -
Prunus persica E: Peach G: Pfirsich H: őszibarack R: piersic	Subgen. *Prunophora*, Sections: *Euprunus* Subgen *Amygdalus*, Sect. *Euamygdalus,* *Chamaeamygdalus*	Subgenus *Cerasus*, sect. *Microcerasus,* Subgen. *Prunophora*, Sect. *Prunocerasus,* *Armeniaca*	Melius -1578: 1 Lencsés -1593: 24 Krauss -1943: 202 Borza – 1968: 83 Péntek al. -1985: 9 Vickery -1995:
Prunus amygdalus E: Almond G: Mandelbaum H: Mandula(fa) R: amygdale	Subgen *Amygdalus*, Sect. *Euamygdalus,* *Chamaeamygdalus*	Subgen. *Prunophora*, Sections: *Euprunus*, *Armeniaca*	Melius -1578: 2 Lencsés -1593: 5 Krauss -1943: 5 Borza – 1968: 48 Péntek al. -1985: 1 Vickery -1995: -
Prunus avium E: Sweet cherry G: Süsskirsche H: Cseresznye(fa) R: cires(e)	Subgenus *Cerasus*, sect. *Microcerasus,* *Pseudocerasus,* *Eucerasus*	Subgenus *Cerasus*, sections *Mahaleb,* *Lobopetalum*	Melius -1578: 3 Lencsés -1593: 10 Krauss -1943: 321 Borza – 1968: 84 Péntek al. -1985: 41 Vickery -1995: 5
Prunus cerasus E: Sour cherry G: Sauerkirsche H: meggy(fa) R: visin	Subgenus *Cerasus*, sect. *Microcerasus,* *Pseudocerasus,* *Eucerasus*	Subgenus *Cerasus*, sections *Mahaleb,* *Lobopetalum*	Melius -1578: ? Lencsés -1593: ? Krauss -1943: 70- ! Borza – 1968: 49 Péntek et al. –1985: 7 Vickery -1995:
Prunus spinosa E: Blackthorn G: Schlehdorn, Schwartzdorn H: kökény(fa) R: porumbar	Subgenus *Cerasus*, sections *Mahaleb,* *Lobopetalum*	Subgenus *Cerasus*, sect. *Microcerasus*	Melius -1578: 5 Lencsés -1593: 13 Krauss -1943: 106 Borza – 1968: 113 Péntek al -1985: 34 Vickery -1995: 24

Notes:

1. The number of data calculated for German (KMED: Krauss 1943), Romanian (BMED: Borza 1967) and Hungarian (SMED: Péntek et Szabó 1985) ethnobotanical databases comprise both the biological (genetic) and linguistic (ethnic) diversity.
2. The number of data calculated from Hanelt et al. (2000) indicates only the infraspecific units accepted for the taxon

Table 2A. *Phaseolus* used as a model plant for ethnobiodiversity studies in a sample territory of the ABCD-Area (Zona Calatei – Kalotaszeg, Transylvania, Romania)-Data summarised according to species and convarieties:
Meaning of the morphological codes applied for character combinations in *Phaseolus*: First digit (seed size) *1=microspermus, 2=mesospermus, 3=macrospermus; Second digit (seed form) 1=sphaericus, 2=ellipticus, 3=oblongus, 4=compressus; Third digit (seed colour) 01=albus, 02=luteus, 03=roseus, rubra, 04=carneus, 05=fuscus, 06=violaceus, 07=niger, 08=punctatus, 09=dimidiatus maculates luteus, 10=dimidiatus maculates roseus et rubra, 11=dimidiatus maculates fuscus, 12=dimidiatus maculates violaceus, 13= dimidiatus maculates niger, 14=virgatus, 15=trimidiatus, 16=variegates virgatus, 17=marmoratus virgatus, 18=striatus virgatus.*

Phaseolus taxon Names	Number of Phaseolus Phenogenodemes (morphotypes)	Number of Romanian Data	Number of Hungarian Data	Total ethnobotanical Data/taxon
Total ***P.coccineus***	7	24	34	**58**
Total cv. *vulgaris*	47	82	236	**318**
Total *nanus*	26	39	130	**169**
Total *P. vulgaris*	**73**	**121**	**366**	**487**
Total *Phaseolus*	**80**	**145**	**400**	**545**

Note: Seed characters used to differentiate between *Phaseolus* landraces, local and familial varieties based on marker genes of ecological and nutritional importance with corresponding ethnobotanical data number in a sample area of Transylvania Calculated from data in Péntek and Szabó (1985) for this study. The differences in numbers of data in Romanian and Hungarian may indicate both differences in use and/or difference in ethnic interest of the researchers (cf. also Borza in Table for *Prunus*)

Table 2B. Data according to phenogenodemes (marker character/gene combinations).

Phaseolus taxon Names	Morphological Code	Number of Romanian Data	Number of Hungarian Data	Total Data	Percent of Total ***Phaseolus***
Ph. coccineus	32.01	6	5	11	2,02
	32.07	0	1	1	0,18
	32.11	0	1	1	0,18
	32.14	0	3	3	0,54
	32.16	3	0	3	0,54
	32.18	1	3	4	0,72
	Not identified	14	21	35	6,30
Total *coccineus*	**7**	**24**	**34**	**58**	**10,44**
Ph. vulgaris Convar. *vulgaris*	11.01	3	10	13	2,34
	11.02	0	3	3	0,54