THE ACTUAL FLORA OF CULTIVATED PLANTS: THE RESULT OF AUTOCHTHONOUS DEVELOPMENTS AND FOREIGN INTRODUCTIONS

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RESUMEN: La flora de las plantas cultivadas de una región específica se puede analizar conforme a los mismos principios utilizados para las floras silvestres (número de táxones, composición taxonómica, diferenciación en elementos corológicos). Una clasificación básica de la flora cultivada se da entre elementos autóctonos y alóctonos, es decir, desde la domesticación de las especies indígenas o desde la introducción de cultivos foráneos. Los elementos alóctonos pueden ser subdivididos según su origen geográfico (geoelementos), y los diferentes crono-elementos indican el tiempo de establecimiento como plantas cultivadas en esa región (arqueófitos, paleófitos y neófitos). Los neófitos americanos desempeñan un importante papel en las floras cultivadas del Viejo Continente.
PALABRAS CLAVE: Flora cultivada, historia, agricultura.

SUMMARY: The flora of cultivated plants of a specific region can be analyzed according to the same principles as it is done usually for the wild floras (number of taxa, taxonomic composition, differentiation into elements). A basic classification of a cultivated flora is into autochthonous and allochthonous elements, that means either from domestication of indigenous species or from introduction of foreign cultigens. The allochthonous elements can be subdivided according to their geographic origin (geoelements) and the different chrono-elements indicate the time of establishment as crop plants within that region (archaeophytic, palaeophytic and neophytic elements). American neophytic elements play an important role in all Old World cultivated floras.
KEY WORDS: Cultivated flora, history, agriculture.

INTRODUCTION

Floras of cultivated plants (FCPs) can be made objects of scientific studies according to the same principles as it is done usually for wild floras and FCPs of different regions can be compared and analyzed botanically in the same manner as the floras of wild plants. Up till now however that has been done very inadequately and therefore even simple basic data for FCPs are mostly lacking.

Species number: Only for a few FCPs a realistic estimation of their species number is known: The total number of cultivated species of the world, including forestry taxa, but excluding ornamentals, had been calculated as more than 6.000 (SCHULTZE-MOTEL 1966, 1986). The total number of cultivated species including ornamentals has been estimated for Europe as 12.000 (WALTERS & al. 1986) and for Germany as 2.700 (JÄGER 1992), see Table 1 for some further data. It is obvious from these data that in countries or regions with a rather depauperate wild flora the FCPs in the broad sense can be equal or even surpass the wild ones by the species number. In floristically rich regions, e.g. in the tropics or in Mediterranean countries, the proportions are shifted significantly in favour of the wild taxa.

Taxonomic composition: Apparently the spectrum of taxonomic families comprising the

FCPs even of very diverse regions differ much less than that of the wild floras. According to the compilation of cultivated plants of the world (besides ornamentals) the 10 most important families are Leguminosae, Gramineae, Rosaceae, Compositae, Euphorbiaceae, Labiatae, Solanaceae, Liliaceae s.l., Rutaceae and Umbelliferae (closely followed by Moraceae, Myrtaceae and Cruciferae) (SCHULTZE-MOTEL 1986). From Table 2 follows that most of these families predominate also in the FCPs of geographically extremely distant regions as Germany, Italy or Cuba. Of course there are distinct differences regarding single families or in the family sequence but the main bulk of the FCPs consists of a very similar family spectrum. The relations are changed however if one includes ornamentals into these calculations what could be done however only for the Germany flora (Tab. 2). Much stronger differences are to be observed between the taxonomic composition of wild and cultivated floras of the same region (Tab. 3), caused by the different economic importance of the plant families as well as by the ± high percentage of alien species within the FCPs.

Indigenous vs. alien elements: A major differentiation must be made for the components of a FCP between species that have been intro-duced from other regions of the world and those ones which have been domesticated from taxa occurring spontaneously in the area concerned. The proportion between these indigenous or autochthonous and the alien or allochthonous elements may vary in different FCPs; alien elements will dominate in regions where agriculture and horticulture had been introduced rather late in history but can be favoured also by other historical or economic factors (e.g. population movements, structural changes of the agriculture). Grouping of the species into alien and indigenous elements will be somewhat problematic only in those cases where the wild counterpart of a cultivated species does occur in the area of the FCP but had been domesticated outside this region: Currant species (e.g. *Ribes rubrum*) belong to the wild flora of Germany but had been introduced into Central Europe as berry crop from Western Europe where the domestication took place in the late Middle Age.

Forage grasses or clovers as *Lolium multiflorum* or *Trifolium repens* are native to Central Europe but had been taken into cultivation at first during the 12th century in Northern Italy resp. in the 17th century in Western Europe and only later on brought to Middle Europe. For these crops we would prefer a broader concept of the indigenous cultivated species and include them into this category, mainly because afterwards also true local population of these taxa had been included into the breeding programmes. There are a few other strange taxa as the garden strawberry *Fragaria x ananassa* which arose in Europe as an spontaneous hybrid between the two American species *F. chiloensis* and *F. virginiana*; that justify the inclusion of the strawberry into the alien crops in the FCP of Europe.

Geographical elements: The allochthonous crop species of a FCP can be arranged

	wild flora	cultivated flora	
Europe [1,2]	11.600[1]	12.000[2]	1 Tutin et al. 1980; 2 Walters & al. 1986, including ornamentals; 3 Rothmaler 1976; 4 Jäger 1992, including ornamentals; 5 Pignatti 1982; 6 Hammer & al. 1990, no ornamentals, mainly S-Italy; 7 Esquivel & al. 1989, 1990, no ornamentals
Germany	2.700[3]	2.700[4]	
Italy	5.600[5]	5206	
Cuba	6.000[7]	8207	

TABLE 1: Species numbres in wild and cultivated floras.

according to their origin into geographically defined geoelements. This should be based upon accepted phytogeographic subdivisions into floristic regions and provinces; later on mainly the scheme proposed by TACHTADZJAN (1978, 1986) will be followed. The decisive criteria for the arrangement of the crop species are the spontaneous area of the wild forms of the crop or of the —at least— presumable ancestral species where usually also the crop domestication took place (but see the Fragaria example!). Transit countries will not be considered because the eco-physiological profile of a crop is mainly stamped by the environmental conditions of its primary area, e.g. maize came to Central Europe from West-Mediterranean countries and to the Caucasus region from Lazistan in Turkey, but in both cases it will be treated as a New World geoelement.

Chronological elements: Cultivated species can be divided according to the period of establishment or introduction as crop in the area concerned. Because these dates are often known insufficiently a rather simple division of the crops into three chronoelements is favoured (compare HANELT & BERIDZE 1991) and their terms are adapted from the plant-geographic literature: Cultivated plants will be recognized as archaeophytes, palaeophytes or neophytes, ranging from crops already established in prehistoric times to those ones which have been introduced historically more recently. If necessary and if the history of crop plants is well-known a more detailed subdivision can be applied. There is no overlapping between chronoelements and the division between allo- and autochthonous crop species: Archaeophytes can be alien crops (e.g. the cereals in Central Europe) and neophytic

World[+]		S-Italy[++]		Cuba[x]		Germany[xx]		Germany[§]	
Leguminosae	658	Leguminosae	73	Leguminosae	94	Leguminosae	26	Compositae	~270
Gramineae	596	Gramineae	54	Gramineae	64	Gramineae	22	Rosaceae	~190
Rosaceae	226	Rosaceae	41	Rutaceae	50	Labiatae	22	Gramineae	~170
Compositae	215	Compositae	32	Myrtaceae	41	Compositae	19	Liliaceae	~170
Euphorbiaceae	136	Labiatae	27	Compositae	37	Rosaceae	16	Leguminosae	~150
Labiatae	127	Cruciferae	20	Euphorbiaceae	31	Solanaceae	15	Cruciferae	~110
Solanaceae	115	Rutaceae	18	Labiatae	25	Umbelliferae	12	Labiatae	~105
Liliaceae	88	Solanaceae	18	Solanaceae	24	Chenopodiaceae	11	Ranunculaceae	~105
Rutaceae	78	Umbelliferae	16	Cucurbitaceae	21	Liliaceae	10	Srophulariaceae	~65
Umbelliferae	75	Liliaceae	14	Moraceae	20	Cruciferae	10	Solanaceae	~60
Moraceae	73	Cucurbitaceae	11	Annonaceae	16	Cucurbitaceae	6	Campanulaceae	~60
Myrtaceae	71	Chenopodiaceae	11	Umbelliferae	14	Scrophulariaceae	5	Caryophyllaceae	~60
								Saxifragaceae	~60
								Primulaceae	~60

TABLE 2: Taxonomic composition of cultivated floras. Most important families are ordered according to their number of cultivated species. + = Schultze-Motel 1986 (no ornamentals and forestry plants). ++ = Hammer & al. 1990 (no ornamentals and forestry plants). x = Esquivel & al. 1989 (no ornamentals and forestry plants). xx = Jäger 1992 (no ornamentals and forestry plants). e = Jäger 1992 (including ornamentals and forestry plants).

crops can be autochthonous, e.g. some medicinal plants as the chamomile or valerian in Germany, introduced into cultivation from the wild in the 20th century.

Obviously the different chronoelements cannot be generally defined but must be circumscribed specifically for every regional FCP. The regionally different age of agriculture and its diverse historical development will render generalized definitions of chronoelements rather formal groupings: To start the neophytic era in America with the discovery of Columbus seems to be justified, because from that time onwards a new chapter of the American agriculture began. (Neophytes are defined in the wild flora as plants introduced or immigrated in historical times at a ± exactly known date, and established ± since then).

In Europe however it seems to be appropriate to start with the neophytic period of cultivated plants already earlier during the 15th century with the beginning of the Renaissance epoch; at that time numerous plant introductions from the Orient (mostly ornamentals) but also from Mediterranean countries, often vegetables, took place and meant a real break in the history of plant cultivation which gradually continued into the Era of Discoveries with its —among others— American introductions.

In defining a crop plant as a distinct chronoelement one had to distinguish at least sometimes first introductions and later establishment as a widely and commercially grown species, e.g. the tomato is in Europe an early neophytic plant species, introduced for the first time already in the beginning of the 16th century as a curiosity but is in Central Europe a late neophyte as a vegetable widespread-grown not before the end of the 19th century.

CASE STUDIES

In the following the general notes will be exemplified by two case studies for the cultivated flora of Germany, representative for

Italy wild flora^{+}		**cult. flora**$^{++}$		**Germany wild flora**^{x}		**cult. flora**^{xx}	
Compositae	687	Leguminosae		Compositae	310	Leguminosae	
Gramineae	438	Gramineae		Gramineae	196	Gramineae	
Leguminosae	393	Rosaceae		Cruciferae	147	Labiatae	
Cruciferae	279	Compositae		Cyperaceae	144	Compositae	
Caryophyllaceae	249	Labiatae		Rosaceae	140	Rosaceae	
Rosaceae	237	Cruciferae		Leguminosae	120	Solanaceae	
Umbelliferae	222	Rutaceae		Caryophyllaceae	117	Umbelliferae	
Scrophulariaceae	213	Solanaceae		Scrophulariaceae	96	Chenopodiaceae	
Labiatae	195	Umbelliferae		Umbelliferae	90	Liliaceae	
Cyperaceae	188	Liliaceae		Labiatae	77	Cruciferae	
Liliaceae	175	Cucurbitaceae		Ranunculaceae	75	Cucurbitaceae	
Ranunculaceae	170	Chenopodiaceae		Chenopodiaceae	46	Scrophulariaceae	

TABLE 3: Taxonomic composition of wild and floras. Most important families are ordered according to their species. + = Pignatti 1992. ++ = Hammer & al. 1990 (no ornamentals, numbers see Table 2). ^{x} = Rothmaler 1976. xx = Jägere 1992 (no ornamentals, numbers see Table 2).

Central Europe, and for the FCP of Georgia as a characteristic Transcaucasian region.

GERMANY

Species number and taxonomic composition of the FCP of this country has been described already (Tab. 1-3).

Allochthonous species prevail, agriculture had been introduced from the East/Southeast only during the late Neolithic period (Bandkeramik). Domestications from the available wild flora took place rather late and concerned only minor crops, e.g. some small fruits (*Ribes* spp., *Rubus idaeus*) and medicinal plants (see above, Tab. 4).

Most of the forage grasses and legumes however belong to the autochthonous element (*Lolium, Festuca, Poa, Dactylis, Trifolium, Lotus,* etc) although for some of them the beginning of cultivation took place outside of Germany (see p. 2) (Tab. 4).

Among the allochthonous crop species a very broad array of different geoelements can be identified within the FCP of Germany. The agriculturally most important plants are mainly from SW-Asiatic subregion (Irano-Turanian Region), e.g. our main cereals, peas, faba beans, or belong to New World elements, as potato, maize and tomatoes. The Mediterranean element is more frequently represented by horticultural crops (many vegetables, spice plants) whereas East Asiatic elements play a minor role among agricultural crops (Chinese cabbage, soybean). The climatic requirements of these so-called East Side elements are completely different from those of the western parts of the continents and make apparently an adaptation to the deviating climate very difficult (JÄGER 1968).

The East-Asiatic element however is much better represented among the ornamentals, the chrysanthemums, azaleas, some peonies, day lilies, *Callistephus*, and many woody plants may serve as examples. Decorative species represent significantly American, Mediterranean, Near Eastern and Cape elements too (see Tab. 5).

An exact calculation of the proportions of the different geoelements however is not yet available and the data concerning the geographic spectrum of the German FCP must remain rather anecdotic.

The definition of the chronoelements of this FCP can be seen from Table 6. The archaeophytic period of establishment of crop

	Germany	Georgia
Archaeophytes		Triticum aestivum, T. dicoccon, T. macha, Hordeum vulgare, Secale cereale, Vicia faba, Lens culinaris, Pisum sativum, Vitis vinifera
Palaeophytes	Humulus lupulus, Fragaria vesca, Ribes rubrum, Carum carvi, Aquilegia vulgaris, Lolium multiflorum?	Coriandrum sativum, Beta vulgaris, Prunus cerasifera
Neophytes	Ribes nigrum, R. uva-crispa, Campanula rapunculus, Valerianella locusta, Lolium perenne, Trifolium repens, Peucedanum ostruthium, Papaver rhoaeas, Nasturtium officinale, Phalaris arundinacea, Valeriana officinalis, Chamomilla recutita	Cornus mas, Laurocerasus officinalis, Staphylea colchica, Allium victorialis

TABLE 4: Autochthonous crop species of the FCPs from Germany and Georgia.

plants lasts from the beginning of agriculture in Central Europe from the 5th millennium B.C. until the pre-Roman Iron Age approximately at the beginning of the Christian era. Afterwards the strong Roman influence implied a significant increase of the number of crop plants in Germany, structural changes of the agriculture and the development of a much diversified horticulture (during the first centuries at least in the Western parts) and meant a real break in the history of the cultivated flora. Therefore the palaeophytic period begins with the age of the Roman emperors during the first centuries A.D. and lasts until the late Middle Age in the 15th century. As mentioned above the neophytic period starts with the vast introduction of new cultivated plants (ornamentals and crops) during the Renaissance and the Era of Discoveries since the middle of the 15th century and continues till now.

In variable crop species different cultivar groups or infraspecific taxa may belong to

Mediterranean	**Anterior Asiatic / Irano-Turanian**	**East Asiatic**
Lactuca sativa	Triticum dicoccon	Fagopyrum esculentum
Beta vulgaris	Triticum aestivum	Brassica rapa pekinensis
Brassica oleracea p.p.	Hordeum vulgare	Persica vulgaris
Allium porrum	Secale cereale	Chrysanthemum x hortorum
Raphanus sativus	Avena sativa	Callistephus sinensis
Papaver somniferum	Vicia faba	Iris kaempferi
Lathyrus odoratus	Lens culinaris	Paeonia suffruticosa
Lilium candidum	Medicago sativa	Hemerocallis lilioasphodelus
Hyacinthus orientalis	Allium cepa	Rhododendron simsii
Lupinus albus	Fritillaria imperialis	Ginkgo biloba
Lupinus luteus	Tulipa gesneriana	Metasequoia glyptostroboides
Andean	**Mexican Highlands / Sonoran**	**Cape**
Solanum tuberosum	Zea mays	Amaryllis belladonna
Phaseolus vulgaris p.p.	Phaseolus vulgaris p.p.	Gladiolus hybr. spp.
Amaranthus caudatus	Nicotiana tabacum	Kniphofia spp.
Tropaeolum majus	Dahlia x cultorum	Crocosmia x crocosmiiflora
Alstroemeria spp.	Lycopersicon esculentum	Erica spp.
Rocky Mountain	**Californian / Sonoran**	**Atlantic N-American**
Pseudotsuga menziesii	Escholtzia californica	Robinia pseudocacia
Chamaecyparis lawsoniana	Lupinus nanus	Dicentra eximia
Picea sitchensis	Clarkia spp.	Silphium perfoliatum
Mahonia aquifolium	Godetia grandiflora	Maclura pomifera
Pentstemon spp.	Phacelia tanacetifolia	Helianthus tuberosus

TABLE 5: Allochthonous geoelements of the FCP of Germany.

different chronoelements: In *Brassica oleracea* Brussels's sprout and marrow-stem kale (var. *gemmifera* and var. *medullosa*) are late neophytic crops for Germany, kohlrabi and cauliflower (var. *gongylodes* and var. *botrytis*) early neophytes, known from the 16th century whereas true cabbage (var. *capitata*) was grown as a late palaeophyte already in the late Middle

Archaeophytic period	
(5th mill. B.C. until beginning of our era)	
early	
(beginning of agriculture)	Triticum dicoccon, Tr. monococcum, Tr. aestivum, Hordeum vulgare, Panicum miliaceum, Pisum sativum, Lens culinaris, Linun usitatissimum, Papaver somniferum
late	
(from Bronze age)	Vicia faba, Cannabis sativa, Triticum spelta, Avena sativa, Secale cereale
Palaeophytic period	
(first centuries A.D. until 15th century)	
early	
(Roman period)	Vitis vinifera, Cerasus avium, Juglans regia, Apium graveolens, Anethum graveolens, Allium cepa, Beta vulgaris, Brassica oleracea, Raphanus sativus
late	
(high Middle Age)	Fagopyrum esculentum, Spinacia oleracea, Asparagus officinalis, Amaranthus lividus, Carthamus tinctorius, Lilium candidum, Aquilegia vulgaris
Neophytic period	
(during 15th century until present)	
early	
(Renaissance, discovery of America)	Tulipa gesneriana, Narcissus pseudonarcissus, Hyacinthus orientalis, Fritillaria imperialis, Cichorium endivia, Tragopogon porrifolius, Phaseolus vulgaris, Solanum tuberosum, Lycopersicon esculentum, Zea mays
middle to late	
(17th to 19th century)	Trifolium pratense, Lupinus luteus, Ornithopus sativus, Scorzonera hispanica, Valerianella locusta, Amaryllis belladonna, Alstroemeris spp.
recent	
(20th century)	Brassica rapa pekinensis, Allium tuberosum, Silphium perfoliatum, Chamomilla recutita, Valeriana officinalis

TABLE 6: Allochthonous geoelements of FCP of Georgia (modified from Hanelt and Beridze 1991).

Age and leafy kales had been introduced even earlier by the Romans during the first centuries A.D.

The spectrum of a FCP may undergo rather rapid changes. Therefore one cannot be surprised that from the archaeophytic or palaeophytic crops some disappeared already completely and their cultivation had been abandoned sometimes long ago. Einkorn and emmer (*Triticum monococcum* and *T. dicoccon*) had been largely replaced already during the palaeophytic period and were grown as relic crops only to the beginning of this century on a very minor scale. The same is true for millet, *Panicum miliaceum*, and also for some root or leafy vegetables which could not compete with the more productive carrots or spinach and have been neglected during the neophytic period (e.g. the early neophytic *Tragopogon porrifolius*, *Campanula rapunculus*, or the even older *Amaranthus lividus* and *Atriplex hortensis*, the latter however sometimes still grown as a decorative plant). A very rapid turn-over can be observed among the ornamentals in which species are coming often quickly en vogue and will be forgotten in the same manner.

GEORGIA

There are no exact data on species number and taxonomic composition of the FCP of this country. One can speculate however that it is very similar to the FCP of Italy in both these regards (compare table 1-3). In contrast to the FCP of Germany the percentage of autochthonous species within the Georgian cultivated plants is much higher and they represent even staple food plants among the cereals, legumes and fruits. To be sure the economic importance of some of the them, especially of grain legumes decreased recently very much and they have been ± replaced by

Mediterranean	**Turkestanian (Irano-Turanian)**	**East Asiatic**
Brassica oleracea	Allium cepa	Glycine max
Apium graveolens	Allium sativum	Allium fistulosum
Allium porrum	Cucumis melo p.p.	Raphanus sativus p.p.
Lupinus albus	Prunus armeniaca	Persica vulgaris
Vicia sativa		Aleurites fordii
Indo-Chinese	**African**	**Australian**
Camellia sinensis	Citrullus lanatus	Eucalyptus spp.
Citrus spp.	Vigna unguiculata	
Ocimum basilicum	Solanum aethiopicum (Gilo group)	
Cucumis sativus		
Orthosiphus aristatus		
Mexican Highlands (Sonoran)	**Andean**	**Brazilian**
Zea mays	Solanum tuberosum	Acca sellowiana
Phaseolus vulgaris p.p.	Phseolus vulgaris p.p.	
Nicotiana tabacum	Cucurbita maxima	

TABLE 7: Basicchronoelements of the FCP of Georgia (modified from Hanelt and Beridze 1991).

allochthonous elements (e.g. garden beans). With the exception of the endemic Georgian wheat species (*Triticum macha, T. timopheevii, T. karamyschevii, T. carthlicum*) the domestication of this indigenous group of cultivated taxa did not took place obviously within Georgia or Transcaucasia itself but in other parts of the Anterior Asiatic Floristic subregion, mainly in the Mesopotamian, Central-Anatolian and the Armeno-Iranian province ("the fertile crescent"). Also rather many minor crops (vegetables, spice plants, small fruits) belong to the indigenous component of the FCP of Georgia (Tab. 4).

Among the allochthonous introductions there can be observed in Georgia too a broad spectrum of different geoelements (Tab. 7): In regard to the economic importance New World elements are pre-vailing, especially in Western Georgia but also among the garden flora for which the species combination maize/garden bean/cucurbits is a very characteristic feature (Hanelt and Beridze 1991). *Phaseolus vulgaris* and *Zea mays* had developed here even a secondary centre of variability with a very broad array of infraspecific variants. Contrasting to Germany East Asian and Indo-Chinese elements are important crops of the FCP of Georgia, reflecting similar climatic parameters, especially rather hot summers with much precipitation. Plantations of Indo-Chinese elements determine in the Colchic area of Georgia the landscape (tea and *Citrus*). Among the East Asiatic crops are vegetables, grain legumes and fruit trees and nearly the same is true for the Mediterranean geoelement within the FCP of Georgia. More thermophilous species from East Asia are also among typical Georgian decorative woods (*Lagerstroemia indica, Sophora japonica, Albizia julibrissin, Cryptomeria japonica* etc) but for the ornamentals in general there is still no comprehensive compilation available and so —as in Germany— a calculation of the

Archaeophytic period	
(5/6th mill. B.C. to 6th century B.C.) beginning of agriculture	Triticum dicoccon, T. aestivum, T. spelta, Hordeum vulgare, Secale cereale, Panicum miliaceum, Pisum sativum, Vicia faba, Lens culinaris, Vitis vinifera, Vicia ervilia
Palaeophytic period	
(6th century B.C. to beginning of 16th century A.D.) alien introductions from neighbouring Old World regions	Allium porrum, Brassica oleracea, Cicer arietinum, Lupinus albus, Apium graveolens, Ocimum basilicum, Citrus limon, Allium cepa ?
Neophytic period	
(16th century A.D. until present) beginning of crop introductions from America and other distant regions	
early (16th cent.)	Zea mays, Phaseolus vulgaris, Cucurbita spp.,
middle to late (17/19th cent.)	Tagetes spp., Glycine max, Nicotiana tabacum, Camellia sinensis
recent	Aleurites fordii, Acca sellowiana, Vigna radiata

TABLE 8: Basic chronoelements of the FCP of Germany.

proportion of the different geoelements cannot be made.

The definition of the chronoelements of the FCP of Georgia can be seen from Table 8 (Hanelt and Beridze 1991). It deviates from that for the German cultivated flora: The archaeophytic period begins earlier within the 5/6th millennium B.C. (the origin of Old World agriculture took place in the neighbourhood of that region). It lasts only till the 6th century B.C. when according to our recent knowledge numerous introductions of cultivated plants began in the course of the establishment of permanent Greek settlements along the Eastern coast of the Black Sea, especially within the Colchic region.

With these events the palaeophytic period starts, characterized by important introductions of allochthonous elements into the FCP of Georgia, at first from the Mediterranean countries, later from other Oriental regions by the Persian and Arabian influence. This period lasts to the beginning of the 16th century and takes a much longer time than the same period of the German flora. Because of the lack of prehistoric and historic data a further differentiation of the Georgian palaeophytic crops is not yet possible for the moment.

The neophytic era starts during the 16th century when the first New World crops had been incorporated into the agricultural system of Georgia (maize, garden bean) and continues till now.

Once more infraspecific groups of variable crop species may belong to different chronoelements, e.g. leafy kales of *Brassica oleracea* to the palaeophytes, cabbages and cauliflowers to rather late neophytes.

In historical times significant changes of the geoelement spectrum within the FCP of Georgia happened. As in Germany there are many crops of the old archaeophytic and palaeophytic stock which have more recently or even earlier ± completely disappeared from the cultivation. That is true not only for the above mentioned endemic wheat species but also for *Triticum dicoccon*, *T. spelta*, *Lupinus albus*, *Lens culinaris*, *Vicia ervilia*, *Gossypium herbaceum*, *Cannabis sativa*, *Linum usitatissimum* and the millets *Panicum miliaceum* and *Setaria italica*, once staples foods in Western Georgia. Many of them have been replaced or seriously reduced to very rarely cultivated relic crops by the introduction of neophytic American species, among them maize and garden beans mainly. Their prevailing cultivation since rather long times is the most important cause of the disappearance of the indigenous cereals and grain legumes (Hanelt and Beridze 1991) and of their loss of any economic importance nowadays. This is not true for fruit crops, among them still the old and mostly indigenous species dominate and is only partly true for distinct regions of Georgia, especially for the Eastern parts, where the cultivation of the indigenous cereal crops (although as modern cultivars) is still more widespread.

The intention of both these case studies was to show that by accepting the flora of cultivated plants as a research subject one can contribute very much to origin, history and evolution of crop plants as well as to the regional history of agriculture. It would be highly welcomed if these remarks could stimulate similar or complementary studies for the countries considered above or for other regions of the world.

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