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INSTITUTUM AGRONOMICUM "DR.PETRU GROZA" CLUJ-NAPOCA (ROMANIA)
NOTULAE BOTANICAE HORTI AGROBOTANICI, 1982, XII.

VARIATION AND DISTRIBUTION OF SOME CULTIVATED TRITICEAE AND ASSOCIATED WEEDS COLLECTED IN ROMANIA

S.SAKAMOTO, H.KOBAYASHI

Abstract:

SAKAMOTO S., KOBAYASHI H., 1982, Variation and distribution of some cultivated Triticeae and associated weeds collected in Romania. Not.bot.hort.agrobot., Cluj., XII., 3-14. Based on the Preliminary report of Comparative Studies on the Agrico-Pastoral Peoples in Southwestern Eurasia, II, 1980 (Ed.Y.Tani), the results obtained by the research group from the Plant Germplasm Institute, Fac.Agr., Kyoto University are briefly presented. Collections and preliminary evaluations were made on Triticum monococcum, T.aestivum, Hordeum vulgare, Secale cereale, Avena sativa, Panicum miliaceum, Agropyron spp., and weeds (Bromus secalinus, Lolium temulentum) associated with grain fields.

Index words: Germplasm resources, domestication, secondary crop evolution, Triticum, Hordeum, Secale, Avena, Panicum, Agropyron, Bromus, Lolium, Romania, Japan.

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Southwestern Eurasia includes an especially important center of a characteristic agriculture, which had originated in the Middle East during the Neolithic time. Important adaptations had been added here to the Mediterranean climate or to the European deciduous forest conditions. The Middle East, the Mediterranean basin and the surrouding areas are the most important differentiation centers of the

genera and species of the Triticeae tribe. Therefore, comparative studies of genetic variation and ecological adaptation of cultivated wheats, barley, rye, their wild relatives and their associated weeds are of utmost importance in understanding the origin of differentiation of cultivated cereals in relation to the adaptation to this area.

For this purpose, in the first exploration year (1978) field work was made in Romania at Mamaia, Cluj-Napoca and its surroundings, and in the county of Bistriţa-Năsăud (Mt.Ineu) in collaboration with and assitance of the Cluj branch of the Academy of the Socialist Republic of Romania (SAKAMOTO, 1980).

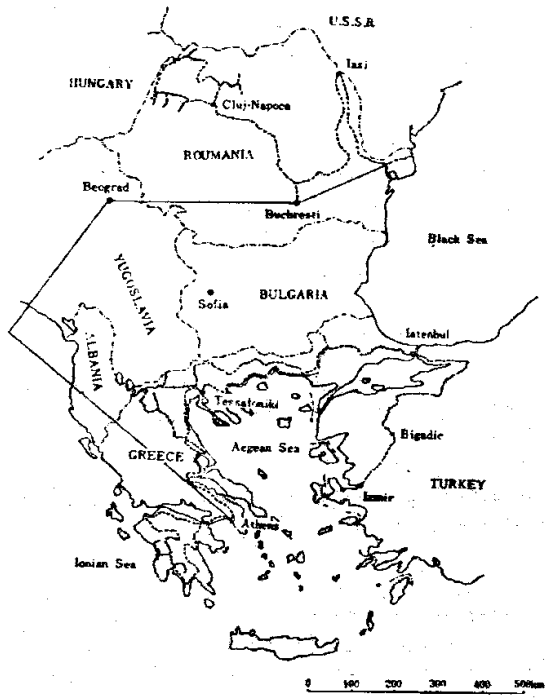


Fig.1. The routes of the Botany Team in 1980.

The field research of the second exploration year (1980) was carried out in western Turkey, Greece and Romania (fig.1). In Romania we made our field research in distr.Cluj, Bistriţa-Năsăud, Bihor, Satu Mare, Iaşi and Tulcea, by the official arrangement and cooperation of Consiliul Culturii şi Educaţiei Socialiste a Republicii Socialiste Romania, Bucureşti. An abstract of prelimnary results of the second year activities in Romania is presented in this article (SAKAMOTO et KOBAYASHI, 1982).

Material and Method

During the field research special attention was paid to the collection of local varieties of cultivated cereals and their main wild relatives. For studies on the ecological analysis of crop-weed complex found in crop cultivation fields, weed species samples were randomly collected and herbarium specimens were prepared.

Seed samples were collected from the crop fields and markets in the case of traditional land races and associated weeds or from spontaneous flora in the case of some wild relatives. The collection method was that described in our previous publications. The collected material was cultivated for preliminary evaluation in the experimental fields and glasshouses of the Germ-plasm Institute of University Kyoto, Faculty of Agriculture. Earliness was examined by planting the samples in glasshouse in 1981. For comparative studies of variation some samples (e.g. Lolium temulentum) were planted in the experimental field, too.

Rye B-chromosomes were observed at MI of PMCS using the aceto-carmine smear technique.

Results and Discussions

A summary of collections performed in Romania, as compared with similar collections from Turkey and Greece are presented in table 1.

1. Cultivated species

1.1. Triticum

1.1.1. Triticum monococcum L. Of nine samples of T. monococcum collected in Romania the first was collected in an oat field located between Căpuşul Mare, (Dîmbul Borzica; 460 m alt.s.m., jud.Cluj). About 20 plants of this species were sporadically found on about 1000 m^2 in the oat field.

Tab.1.

Summary of collections from Romania as compared with similar samples from Turkey and Greece

	Turkey	Greece	Romania	Total
Cereals:				
Triticum monococcum	o	o	9	9
T.aestivum	16	73	43	132
Hordeum vulgare	1	3o	13	44
Secale cereale	3	9	9	21
Panicum miliaceum	2	2	5	9
Zea mays	1	o	6	7
Avena sativa	o	5	19	24
Other cultivated plants:				
Citrullus vulgaris	2	5	6	13
Cucumis melo	3	4	2	9
others	5	4	16	25
Wild, tribe Triticeae:				
Agropyron braneae	o	o	1	1
A.canium	o	1	5	6
A.cristatum	o	o	7	7
A.elongatum (lox)	o	3	1	4
A.repens	o	1	3	4
Elymus sabulosus	o	1	1	2
Other Graminaeae:				
Lolium temulentum	7	21	7	35
Lolium spp.	5	28	3	36
Avena spp.	7	6	2	15
Panicum miliaceum (weed and cultivated type)	2	2	5	9
others	24	2o	18	62
Other wild plants:				
Allium spp.	3	39	4	46
others	16	49	47	112
Weed species samples	5	27	7	39

The second sample of 15 spikes was found in a cultivated field of two types of hulled barley (Hordeum vulgare convar.distichon and convar.hexastichon) together with two types of oat (spreading and compact spikes), at Budacul de Sus, jud.Bistrița-Năsăud 45o m. s.m. The third sample of two spikes was obtained in a cultivated field of barley, mixed with oats cultivated for feeding livestocks at Budacu

de Sus - Soimuș (jud.Bistrița-Năsăud). It is assumed that T.monococcum found sporadically in barley and oat fields is the remnant of the relic cultivation of this species which ceased several years ago in those hilly regions of Romania. The remaining six samples were threashed ones and were given from the Institutul Agronomic "Dr.Petru Groza" Cluj-Napoca, Grădina Agrobotanica (SZABÓ,1981). Composition of four samples was analyzed and listed in tab. 2.

Tab. 2.

Composition of Triticum monococcum samples from four villages of County Cluj, Romania

Collection number Village; name-	8-29-2-12 Sic	8-29-2-14 Căpușul Mare	8-29-2-15 Căpușul Mic	8-29-2-17 Dumbrava
Triticum monococcum				
Spikelets	568(47.1%)	211(16.3%)	531(27.8%)	3o3(37.3%)
Grains	482(4o.o)	233(18.o)	642(33.6)	232(28.6)
Avena sativa				
Spikelets	83(6.9)	341(26.3)	324(16.9)	1o1(12.4)
Grains	32(2.7)	214(16.5)	251(13.1)	79(9.7)
Triticum aestivum	-	-	8(o.4)	-
Hordeum vulgare	-	68(5.2)	12(o.6)	-
Secale cereale	-	1(o.1)	5(o.3)	-
Linum usitatissimum	-	14(1.1)	-	-
Weeds:				
Avena fatua	-	3(o.2)	1(o,o)	-
Lolium temulentum	-	6(o.5)	-	3(o.4)
Other Gramineae	-	5o(3.9)	-	33(4.1)
Weed Leguminosae	-	17(1.3)	128(6.7)	33(4.1)
Other weeds	41(3.4)	138(1o.6)	1o(o.5)	28(3.4)
Total	12o6(1oo%)	1296(1oo%)	1912(1oo%)	812(1oo%)

It is emphasized that the present T.monococcum collections are quite important and interesting and they will represent the last remnant germplasm of a cryptic cultivation of this species which was widely cultivated in Romania in the past (BORZA,1945). In hilly regions of Transylvania, at Sic (jud.Cluj), the cultivation of T.monococcum is continued on small scale because people in Sic make a special straw hat from the culms of this species (PENTEK et SZABÓ, 1981).

The date of first heading of all Romanian T.monococcum samples grown in Kyoto condition (35°N) was extremly late as compared with

that of T.durum and T.aestivum collected in Turkey, Greece and Romania (difference of 10-50 days between the earliest and latest types).

1.1.2. Triticum aestivum L. Variation of spike coloration, awnedness and glume hairiness of common wheat collected in Romania is listed in table 3.

Tab. 3.

Color of spikes, awnedness, glume hairiness of Triticum aestivum collected in Turkey, Greece and Romania

Country	No. of samples	Color of spikes: yellow	brownish-yellow	yellow	Awns: awned	awnless	Glume hairs: hairy	glabrous
Turkey	13	6	2	5	11	2	3	10
Greece	59	36	10	13	36	23	0	59
Romania	33	19	1	13	18	15	0	33

Romanian collections include only few samples of local varieties with brownish-yellow spikes. Samples with hairy glumes could not be obtained in Greece and Romania. It is interesting to note that more than one third of Greek samples were early varieties; on the contrary, of 33 Romanian samples examined, 25 (75,7 %) were late or very late.

1.2. Hordeum vulgare L. In nine Romanian samples five were six-rowed and four were two-rowed. The ratio of early: intermediate: late varieties was approximately 1:2:1 in Greek samples, while in Romanian ones the ratio was 1:1:1.

1.3. Secale cereale L. Of eight Romanian samples, five were collected from rye fields, two from plants admixed in wheat fields and the remaining one was a threashed sample (Dimâ, jud. Satu Mare). Using those rye samples, a special attention was focused to analyze the frequency of B-chromosomes (or extra accessory chromosomes) in cultivated populations. Among 53 plants of three Turkish samples, six plants (11,3%) had B-chromosomes; of 114 plants examined in six Greek samples 6 (5,3 %) had B-chromosomes. However, no plants having B-chromosomes were found in Romanian, nor were in Spanish rye populations (table 4). The frequent occurrence of B-chromosomes in Afghan, Iranian, Korean, Turkish and Yugoslav rye populations are reviewed by JONES, 1975.

Tabl.4.

Summary of B-chromosome frequency in Secale cereale

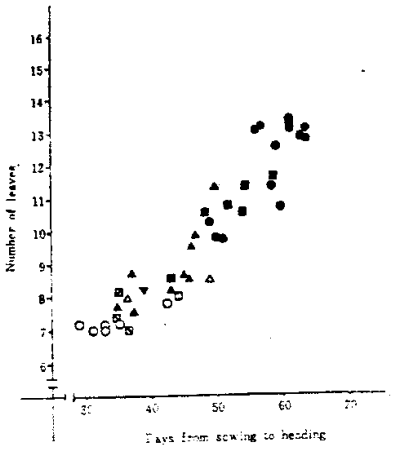
Country	No. of strains examined	No. of plants examined	No. of plants with: -Bs	+Bs
Turkey	3	53	47	6(11.3 %)
Greece	6	114	108	6(5.3 %)
Romania	8	132	132	0(0.0 %)
Spain	7	126	126	0(0.0 %)

1.4. Avena sativa L. Most of hexaploid oat samples were collected in Greece and Romania. A few of them were sporadically found in barley fields but most of them were collected in the admixed fields of barley and oat, particularly in Romania. Both weak and drooping spike type, and upright and stiff spike types were identified in the present collection.

1.5. Panicum miliaceum L. Millet had been cultivated extensively in Romania and people prepared, before the advent of maize culture (XVII century), a kind of food, made traditionally from the grains of this millet with boiled water. A total of nine samples, two from Turkey, two from Greece and five from Romania were collected in the present botanical survey. The collected samples were planted in the glasshouse with one Belgian, two Czechoslovak, one Bulgarian, six Russian and six Japanese strains. At the same time, 15 Afghan and three Romanian samples, which were collected in 1978 (SAKAMOTO, GUL and KAWARA 1980; SAKAMOTO 1980) were also compared. The correlation between the number of days from sowing to heading and the number of leaves are illustrated in fig.2; a highly significant correlation ($r = 0.912$) was found between the two characters.

Seven samples from Romania displayed very similar heading time to that of Turkey and Greece. Among them two samples had compact spikes and one had hairy stem, which is quite a rare character in common millet.

It is interesting to mention that a weed form of Panicum miliaceum was collected along the road from Iaşi to the Experimental Farm of Institutul Agronomic "Ion Ionescu de la Brad". This form occured abundantly, forming a belt between the road and the maize fields and partly invaded the cultivated fields.



The correlation between the number of days from sowing to heading and the number of leaves in *Panicum miliaceum* grown in a glasshouse. ●: Afghanistan; ▽: Belgium; ▭: Bulgaria; ☒: Czechoslovakia; △: Greece; ■: Japan; ▲: Romania (cultivated type); ▼: Romania (weed type); △: Turkey; ○: U.S.S.R.

The morphological characteristics of this form are similar to the cultivated common millet except having shorter stature, more sparsely opened spikes, smaller number of spiklets per spike, smaller floral glumes and brittle spiklets. The average heading time of this strain grown in glasshouse was 38,8 days, which was very much the same as those of cultivated forms from Romania (fig.2). Based on the resemblance of this form to the cultivated one, it was tentatively classified as Panicum miliaceum L. ssp.ruderale (Kitag.) Tzvel., originally named as Panicum miliaceum L. var.ruderale Kitag. for specimens collected in Manchuria (KITAGAWA 1937, TZVELEV 1976).

The origin of common millet is not known yet. More detailed study of this weed form found in Romania may provide some idea on the origin of this crop, although it is often difficult to distinguish wild form from weedy race, which sometimes may possibly be derived from the escape of cultivation.

2. Wild relatives and associated weeds

Tribe Triticeae includes 15 cytologically examined genera and it has many closely related species to cultivated wheats, barley, and rye. According to their geographical distribution, they were classified into two main groups: the Arctic-temperate group and the Mediterranean group. Turkey, Greece and Romania are thought to be one of the most important areas in considering the phylogenetic differentiation of the tribe Triticeae (SAKAMOTO 1973). During the botanical field research in 1980 33 species belonging to nine different genera of the tribe had been found and collected.

Agropyron Gaertn.

2.1. Agropyron brandzae Pantu et Solacolu, found on the rocky top of a limestone hill at Murighiol, jud.Tulcea, is quite interesting. This species is distributed only in southern U.S.S.R., southeast Romania and northeastern Bulgaria (ANGHEL and MORARIU 1972). Cytological examination of root-tip cells indicated that it is a tetraploid species (2n=28). It is a cross-pollinated species and is characterized by the formation of many sterile shoots tillered at the base of culms. At the same collection site a diploid species, Agropyron cristatum (L.) P. Beauv (2n=14) was also collected.

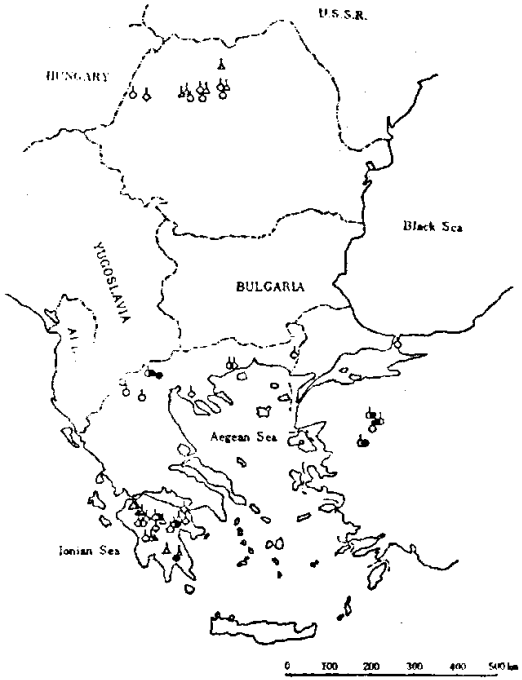
2.2. Weeds Associated with Crop Fields and Pastures

The same evolutionary history of cultivated plants can be accepted for that of weed species closely associated with them. Therefore, it can be expected that the comparative studies of genetic variation and ecological adaptation of those weed species provide additional information on the origin and differentiation of cultivated plants for different aspects. From this view-point, composition of weed species in cultivated fields, their adjacent road sides and pastures were observed and herbarium collections were made for identification and study. At the same time threshed grain samples of wheats, barley, rye and oats were obtained from local farmers in order to analyze the degree of weed seed contamination and to estimate the admixed situation of weed species in growing fields.

For example Lolium temulentum and Agrostemma githago, have ripe florets or seeds which do not shatter from plant so easy as usual wild or weed species. Therefore, they are harvested and sown unintentionally year after year along with the cereal grains. The difficulty to separate L.temulentum from wheat is well understood ever since biblical times.

Along the route 53 samples of L.temulentum (fig.3) were collected and they were classified into two groups: 42 awned and 11 awnless samples were found. Both types were collected in Turkey and Greece, but only the awned type was detected in Romania. In samples planted in experimental field a wide variation in grain size, size of upper glumes, texture of culm and growth form was recognized. The heading date

of Romanian samples were later than those from Turkey and Greece.



Geographical distribution of awned and awnless types of *Lolium temulentum* in Turkey, Greece and Romania. ○: awned type in wheat field; ●: awnless type in wheat field; ◇: awned type in barley field; △: awned type in oat field; ▲: awnless type in oat field

Another associated weed in rye and wheat fields, noticed in Romania was Bromus secalinus L. collected at Budacu de Sus, jud.Bistrița-Năsăud, rye field and wheat field; Hidișelu de Sus and Julești in rye fields.

In order to estimate the contamination degree of B.secalinus in a rye field (Budacu de Sus), of the 293 spikes in 1 m^2 174 (59,4 %) were rye spikes and the remaining 119 (4o,6 %) were those of B.secalinus. According to NEVSKI (1934), from the fairly large seeds of B.secalinus alcohol can be produced and its straw is eaten by livestock. The analysis of close association of L.temulentum and B.secalinus as described above will also provide useful information which give some ideas on the origin and domestication process of the secondary crops.

3. Wild species of genus Allium (Liliaceae)

Along the expedition route, 44 samples of wild Allium were collected for prof.dr.SHOZO MODA (Osaka Gakuin Univ.). In two samples, one of Greece and the other from Romania, one or two B-chromosomes were found. The basic chromosome number of the present Allium samples is all x=8. Their karyotypes mostly consist of metacentric chromosomes.

Studies on species identification, life form, seed fertility, interspecific crossibility and genome constitution of each sample are now being undertaken by Dr.MODA.

4. Herbarium specimens

Weed species were collected rather intensively along the route. The total number of herbarium specimens is 1,349 plants. The identification of most herbarium specimens collected in Romania were carried out in collaboration with specialists from the Agrobotanical Garden of the Institutul Agronomic "Dr.Petru Groza" Cluj-Napoca. In particular samples belonging to Asteraceae, Apiaceae, Brassicaceae, Poaceae, Lamiaceae, Fabaceae, Polygonaceae and Scrophulariaceae were intensively collected.

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INSTITUTUM AGRONOMICUM "DR.PETRU GROZA" CLUJ-NAPOCA (ROMANIA)
NOTULAE BOTANICAE HORTI AGROBOTANICI, 1982, XII.

GENETIC RESOURCES IN THE CULTIVATED FLORA OF THE APUSENI MOUNTAINS

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Abstract:
SZABÓ T.A., 1982, Genetic resources in the cultivated flora of the Apuseni Mountains. Not.bot.hort.agrobot.Cluj., XII,15-28
In order to detect genetic resources formed during specific relations between plant life, and human activity in a sample territory situated in the North-Eastern border of the Apuseni Mountains (Transylvania, Romania) 416 cultivated plant species were identified, and reliable ethnobotanical material was collected. The influence of different geographical regions of the world on the flora of the territory was characterized by an influence index. The influence index "I" of the American, African and Australian species on the spontaneous flora of the sample territory was very low, (I_1 = 2,o1), but on the cultivated flora it was very high (I_2 = 58,48), reflecting the strong impact of foreign floras and agricultures. The cultivated flora of the territory was characterized according to following descriptors: geographical origin, life form, main traditional usage, main place of cultivation, frequency of cultivation, degree of domestication, ethnobotanical knowledge related to different species, local variability, territorial dynamics (related to genetic erosion or sedimentation), and territorial distribution.

Key words: cultivated flora, ethnobotany

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One of the main research tasks outlined recently in economic and applied botany is to analyze mutual relationships between plant