AD 677657

TRANSLATION NO. 2112

DATE: 29 January 1968

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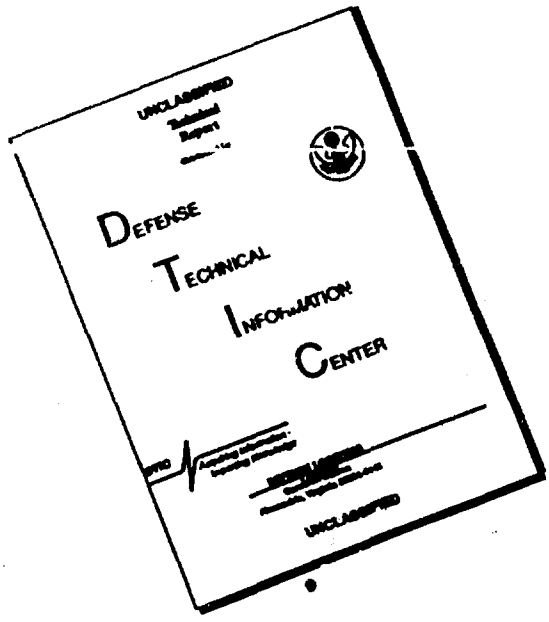

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DESCRIPTION OF WHEAT SUSCEPTIBILITY TO LOOSE SMUT
(Methodological Aids for Breeders)

Kharakteristika porazhayemosti pshenits pyl'noy golovney (Metodicheskoye posobiye selektsioneram) (English version above),
All-Union "Order of Lenin" Academy of Agricultural Sciences imeni V.I. Lenin,
Leningrad, 1965, pages 1-32

V.I. Krivchenko
and
M.M. Yakubtsiner

Introduction

At the present time by far not all of the experimental breeding institutions evaluate original collection specimens of winter and spring wheat for their resistance to loose smut [Ustilago]. For this reason, quite often vulnerable strains are used in crosses. This leads to subsequent rejection of a large amount of seeds and strains of hybrids because of their susceptibility to this disease.

Breeding wheat for resistance to loose smut can be improved considerably if in selecting the initial parental pairs for crosses the resistant strains are used. For this reason, of great importance is rating of the wheat specimens of different strains and species from the world collection of VIR [All-Union Scientific Research Institute of Plant Growing] which are used extensively by the experimental breeding network of our country in creating new productive strains.

For a number of years work was pursued at the Laboratory of Immunity of the All-Union Institute of Plant Protection dealing with evaluation of initial specimens, strains and species of wheat with respect to their resistance to loose smut.

These studies were conducted with due consideration of the distribution in the different zones of physiological forms of the pathogen, differing in their ability to infect the different strains of wheat.

Our studies established that in our country the following 14 physiological forms of loose smut are important, and they must be taken into consideration in practical breeding work.

No 1 -- isolated from strain Osetinskaya 3, North Ossetian Autonomous SSR, Kabardino-Balkarskaya Autonomous SSR.
No 3 -- isolated from strain Kishinevskaya 8, Modavian SSR.
No 4 -- isolated from local soft wheat, Armenian SSR
No 5 -- isolated from strain Novourkainka 84, Krasnodarskiy Kray
No 6 -- isolated from strain Gordeiform 48-2, Khar'kovskaya Oblast
No 7 -- isolated from strain Cesium III, Omskaya Oblast
No 9 -- isoalted from strain Narodnaya, Rostovskaya Oblast
No 10 --isolated from strain Narodnaya, Kurganskaya Oblast
No 13 --isolated from strain Milturum 553, Krasnoyarskiy Kray
No 14 --isolated from strain Albidum 43, Volgogradskaya Oblast
No 15 --isolated from strain Albidum 43, Voronezhskaya Oblast
No 18 --isolated from strain Grecum 433, Uzbek SSR.
No 22 --isolated from strain Lutescence 62, Orenburgskaya Oblast.
No 23 --isolated from strain Gordeiform 10, Omskaya Oblast.

All of our work on resistance rating was conducted with the above forms of smut.

In these studies we used wheat specimens of different origin, species composition and differing in developmental biology. They included specimens of value in hybridization.

In addition to the widely distributed species, Triticum aestivum, Triticum durum, we made a thorough evaluation of smut resistance of specimens of other rare species.

The selection of species and strains of wheat for evaluation was made by the supervisor of the Wheat Section, VIR: M.M. Yakubtsiner.

Loose smut resistance was demonstrated only under conditions of artificial infection of the plants by the vacuum method.

Wheat susceptibility was rated on the following scale:

0 -- highly resistant strains
I -- essentially resistant (up to 5% susceptibility)
II -- mildly susceptible (up to 25%)
III -- moderately susceptible (up to 50%)
IV -- strongly susceptible (over 50%)

The strains and specimens of wheat referable to susceptibility groups 0 and I were rated for resistance to the different forms of loose smut for at least three consecutive years. Those which we classified in these two groups are resistant to the set of smut forms.

Over 500 specimens are submitted in the list. Of these 46 strains and specimens of Triticum aestivum, Triticum durum and 39 other species of wheat are highly resistant. Only 85 were found to be essentially [practically] resistant, and 80 of them consisted of Triticum aestivum and Triticum durum strains.

The work on isolation of physiological forms of loose smut and description of wheat resistance to them was performed by V.I. Krivchenko under the supervision of Professor T.I. Fedotova, head of the Laboratory of Immunity, All-Union Institute of Plant Protection. M.M. Yakubtsiner (VIR), Doctor of Agricultural Sciences, classified the initial material according to ecological groups.

[source page 6]

SUSCEPTIBILITY OF WHEAT SPECIMENS TO LOOSE SMUT (Physiological forms)

[Column headings]:

1) VIR [All-Union Scientific Research Institute of Plant Growing] catalogue number
2) Variety
3) Strain
4) Origin
5) Susceptibility to loose smut [Ustilago]

STRAINS OF WHEAT RELEASED TO RAYONS IN THE USSR

Soft Spring Wheat

[Column 3]	[Column 4]
Al'bidum 43	Scientific Research Institute of the South-East
Akmolinka I	All-Union Scientific Research Institute of Grain Crops
Dublyanka 4	L'vov Agriculture Institute
Bashkirskaya 4 (Lutescence 4)	Bashkir Scientific Research Institute of Agriculture and Kinel'skaya Breeding Station
Bezenchukskaya 98	Kuybyshev Oblast State Agricultural Experimental Station
Garsas	Lithuanian Scientific Research Institute of Agriculture
Grazhuchay	" "
Dal'nevostochnaya [Far Eastern]	Primorskaya Agricultural Experimental Station
Zavol'skaya	Kinel'skaya Breeding Station
Irody 1006	Tadzhik Scientific Research Institute of Agriculture
Iskra (Milturum 1447)	Chelyabinsk State Agricultural Experimental Station

[source page 6, continued]

[column 3]	[column 4]
Kazakhstanskaya 126	Kazakh Scientific Research Institute of Agriculture
Lutescens 62	Scientific Research Institute of Agriculture of the South-East
Lutescens 758	" " " "
[source p7] Lutescens 1729	Krasnoyarsk Scientific Research Institute of Agriculture
Milturum 321	Siberian "Red Banner of Labor" Scientific Research Institute of Agriculture
Milturum 553	" " " "
Moskovka	Scientific Research Institute of Agriculture of the Central Rayons of the Nonchernozem Zone
Odesskaya 13	All-Union Institute of Breeding and Genetics
Onokhoyskaya 4	Buryatin Republican State Agricultural Experimental Station
PPG 56	b- [expansion unknown] former Kazakh Experimental Center, Main Botanical Garden, AN SSSR [USSR Academy of Sciences]
Sarrubra	Scientific Research Institute of Agriculture of the South-East
Saratovskaya 210	" " " "
Saratovskaya 29	" " " "
Skala	Tulun State Breeding Station
Smena	SibNIISKhOZ [Siberian "Order of Red Banner of Labor" Scientific Research Institute of Agriculture]
Strela	Krasnoufimskaya Breeding Station
Tulun 14	Tulun State Breeding Station
Caesium [tsezium] III	SibNIISKhOZ

[source page 7, continued]

[column 3]	[column 4]
Caesium 94	SibNIISKhOZ
Caesium 31	Altay Scientific Research Institute of Agriculture
Shortandinka	All-Union Scientific Research Institute of Grain Crops

[source page 8]:

Spring Hard Wheat

Akmolinka 5	All-Union Scientific Research Institute of Grain Crops
Gordeiforme 10	SibNIIKhOZ
Raketa	Krasnoyarsk Scientific Research Institute of Agriculture
Gordeiforme 432	Scientific Research Institute of Agriculture of the South-East
Gordeiforme 5695	" " " " "
Kubanka 3	Krasnodar Scientific Research Institute of Agriculture
Kustanayskaya 14	Kustanay State Agricultural Experimental Station
Malyanopus 26	Krasnokutsk Breeding Station
Malyanopus 69	" " "
Narodnaya	Ukrainian Scientific Research Institute of Plants, Breeding and Genetics

Winter Soft Wheat

Alty-Agach	Armenian SSR
Arazbugdasy	Azerbaydzhan Scientific Research Institute of Agriculture
Bezostaya 1(4/1) [awnless]	Krasnodar Scientific Research Institute of Agriculture

[source p 8, continued]:

Column 3	Column 4
Belotserkovskaya 198	Belotserkovsk experimental Breeding Station
Bel'tskaya 32	Moldavian Scientific Research Institute of Breeding, Seed Growing and Agricultural Technology
Veselopodolyanskaya 499	Veselopodolyansk Breeding Station

[source p 9]:

Bol-Bugda (Ferruginosum 50)	Institute of Genetics and Breeding, Azerbaydzhan SSR
Gostianum 237	Scientific Research Institute of Agriculture of the South-East
Grekum 433	Krasnovodopadskaya State Breeding Station
Gyul'geri	Dagestan Autonomous SSR
Doliyepuri 35/4	Georgian Experimental Breeding Station
Krigizskaya 3	Kirgiz Scientific Research Institute of Agriculture
Krymka mestnaya	Krymskaya Oblast
Kubanskaya 131	Krasnodar Scientific Research Institute of Agriculture
Lutescens 266	Ukrainian Scientific Research Institute of Plant Growing, Breeding and Genetics
Mironovskaya 264	Mironov Experimental Breeding Station
Motsinave	Georgian Experimental Breeding Station
Muras	Lithuanian Scientific Research Institute of Agriculture
Odesskaya 3	All-Union Scientific Research Institute of Breeding, Genetics.
Odesskaya 16	" " " "

[source page 9, continued]:

Column 3	Column 4
Stepnaya 135	Scientific Research Institute of Agriculture of the Central Chernozem Belt
Ukrainka	Mironovskiy Experimental Breeding Station
Ferrugineum 1239	Ukrainian Scientific Research Institute of Plant Growing, Breeding and Genetics

[source page 10]:

Khar'kovskaya 4	" " " "

Hard Fall Sowing

Aramdany	Azerbaydzhan Scientific Research Institute of Agriculture
Dzhafari	Azerbaydzhan Agricultural Institute
Michurinka	All-Union Breeding and Genetics Institute

Soviet Specimens of Soft and Hard Wheat

Ecological Groups of Soft Spring Wheat

Volga Steppe

Bashkirka Kugushevskaya	Bashkir Autonomous SSR
Erythrosperum 341	Scientific Research Institute of Agriculture of the South-East

Eastern Forest-Steppe

Omskaya 2078	SibNIISKhOZ
Golubka	Kustanay State Strain Plot
Natural Hybrid	
Ferrugineum 9	
Ural'skaya 16	
Lutescens 23	Krasnoufimsk Breeding Station

[Source page 11]:

Column 3	Column 4
	Southern Forest-Steppe
Milturum 162	Ukrainian Scientific Research Institute of Plant Growing, Breeding and Genetics
Lutescens 491	Ivanov Experimental Station (Ukrainian SSR)
Lutescens 1326/32	Orlov Agricultural Experimental Station
Ferrugineum 13	Krasnodar Scientific Research Institute of Agriculture
	Circumpolar
Sibirka 1818	Tulun State Breeding Station
Udarnitsa	" " " "
	North-Russian Forest
Kauka	~~[illegible]~~ Yugava Breeding Station
Tayka	Lithuanian SSR
	Sakhalin
Kaba 135	Sakhalin Base of USSR Academy of Sciences
	Central Asian Bogar [dry, unirrigated] Region
Pseudoturcicum 2115	Krasnovodop. State Breeding Station
Alborubrum 22308	" " " "
Vatan	Scientific Research Institute of Bogar Agriculture, Uzbek SSR
Abi-Yaleguri	Uzbek SSR
	Central Asian Lowlands (Irrigated)
Kelek M-I	Turkmen State Breeding Station

[source page 12]

olumn 2]	Column 3	Column 4
		Various Hybrids
	PPG 1115	Main Botanical Garden, USSR Academy of Sciences
pulation	Sharovidnaya	TSKhA (Timiryazev Agricultural Academy)
		Ecological Groups of Hard Spring Wheat
		Eastern Forest-Steppe
	-----	Kirgiz SSR
		Mediterranean Falcate
	Zogal-Bugda	Azerbaydzhan SSR
		Ecological Group of Soft Winter Wheat
		Southern Steppe (North Caucasian)
	Zernogradka	Don Zonal Agricultural Institute
	Voroshilovskaya	Stavropol' Experimental Breeding Station
	Hybrid 481	" " " "
	Stavropol'skaya 328	" " " "
	Stavropol'skaya 4	" " " "
		Southern Steppe (Maritime ["Primorskaya"])
	Mestnaya [local]	Krymskaya Oblast
	------	" "
	Zemka	All-Union Breeding and Genetics Institute

[Source page 13]

	Stepnyachka	" " " "
	Odesskaya 12	" " " "
	Novokrymka	Krymskaya Oblast Agricultural Experimental Station
	Novokrymka 102	" " "

[source page 13]

Column 2	Column 3	Column 4
	Lutescens 17	Cherkass State Agricultural Experimental Station
	Kishinevskaya 10	Kishinev Agricultural Institute
	Kishinevskaya 8	" " "
population	-------	Moldavian SSR
	Volga Steppe	
	Saratovskaya 28	Scientific Research Institute of Agriculture of the South-East
	------	Volgogradskaya Oblast
	North Caucasian Forest-Steppe	
	Skorospelka L-1	Krasnodar Scientific Research Institute of Agriculture
	Skorospelka 2	" " " "
	Skorospelka 3	" " " "
	Bezostaya 4	" " " "
	Ferrugineum 013	" " " "
	Kubanskaya 24	" " " "
	Kubanskaya 133	" " " "
	Kubanskaya 122	" " " "
[source p 14]		
	Dannyaya 28	" " " "
	Novoukrainka 84	" " " "
	N-43	" " " "
	Improved Osetinskaya	North Ossetian Agricultural Experimental Station
	Jubilee Osetin	" " " "
	Osetinskaya 5	" " " "

[source page 14 continued]

Column 3	Column 4
Erythrospermum 1562	North Ossetian Agricultural Experimental Station
Erythrospermum 1585	" " " "
Erythrospermum 1580	" " " "
Erythrospermum 1563	" " " "
Osetinskaya 3	" " " "
Skorospelka 937	" " " "
Germaniya 199	" " " "
Ukrainian Forest-Steppe	
Albidum 676	Ukrainian Scientific Research Institute of Plant Growing, Breeding and Genetics

[source page 15]

Shampanka	Ukrainian SSR, Khersonskaya Oblast
Pimenka	All-Union Scientific Research Institute of Sugar Beets
Lutescens 17	Cherkass State Agricultural Experimental Station
Erythrospermum 15	" " " "
Ivanovskaya (20/430)	Ivanov Experimental Breeding Station
Dyurabl'	" " " "
Forest Steppe of Mountainous Region of Ukraine	
Zarya mestnaya	Ivano-Frankovskaya Oblast
North Russian Forest	
Erythrospermum 529	Falen Breeding Station
Moskovskaya 3251	TSKhA
Moskovskaya 2411	"

[source page 15, continued]

Column 3	Column 4
	Eastern Forest-Steppe
Yelovka	Altayskiy Kray
Kazachinskaya	Krasnoyarskiy Kray
	Forest-Steppe of Caucasian Mountain Region
Dzali-Sura 35/3	Georgian Experimental Breeding Station
Caesium 3/10	" " " "

[source page 16]

Kyrmyzy-Bugda 9704/2	Azerbaydzhan Scientific Research Institute of Agriculture
	Steppe of Caucasian Mountain Region
Zarda	Armenian SSR
-----	" "
Yenilik	Azerbaydzhan SSR
	Subtropical of Caucasian Mountain Region
Rachula	Georgia SSR
Gomborka	" "
	Transcaucasian Lowland-Foothills
----------	Nagorno-Karabakhskaya Autonomous Oblast
	Central Asian Lowland Irrigated
Belen'kaya	Kazakh SSR, Dzhambulskaya Oblast
Almaatinskaya	Kazakh Scientific Research Institute
Kollyanbugday	Uzbek SSR
	FOREIGN SPECIMENS
	Ecological Groups of Soft Spring Wheat

[source page 16, continued]

Column 3	Column 4
	Pakistan
-----	Pakistan
-----	"
Soor ghanum	"
-----	"
-----	"

[source page 17]:

	Chinese (in the broad sense)
	China
	"
	"
Tsun-iy-hun-hua-mai	"
	"
	"
	Central Asian (Kashgar)
	China, Kashgar
	" "
	" "

[column 2]	
	Central Asian
population	Mongolia
"	Iran
	Anatolian
"	Turkey
	Near Eastern
	Israel
	Yemen

[source page 17, continued]

column 3	column 4
	Mediterranean
	Morocco
	Eritrea
	Algeria
	Greece, Rhodes

[source page 18]

	Balkans
	Yugoslavia
	Bulgaria
	"
	Danube Region
	Austria
	"
Strain 691	Yugoslavia
	"
	Czechoslovakia
	Andes
	Brazil
	Uruguay
	Mexico
	Hybrid Groups of Soft Spring Wheat
	Kenya
	Kenya
	Appenines
	Italy

[source page 18 continued]

column 3	column 4
	<u>Scandinavian</u>
Diamant	Sweden
Fil'giya	"

[source page 19]

	<u>Central European</u>
	German Democratic Republic
	" " "
	" " "
	" " "
	" " "
	" " "
	" " "
	" " "
	France
	"
	Holland
	<u>North American</u>
	Canada
	"
	"
	"
	"
	"
	"
	"
	"
	"
	"

[source page 19, continued]

column 3	column 4
	USA
	"
	"
[source page 20]: DS II	"
	"
	"
	"
	"
	Argentinian
	"
	"
	"
	"
	"
	"
	"
	"
	"
	"
	"
	"
	"
	"
	"
	"
	"
	"

[source page 20, continued]

column 3	column 4
Kleyn 66	Argentina
Complex hybrid	"
[source page 21] Kleyn 33	"

Australian

Australia
"
"
"
"
~~UAR~~ South Africa Republic
Tunisia

Ecological Groups of Hard Spring Wheat

Near Eastern

Jordan
Malta

Cypriite

Cyprus
"

Egyptian

United Arab Republic
" " "

East Mediterranean

Tunisia
"
"
"
"

[source page 22]

column 3	column 4
	Algeria
	"
	Morocco
	"
	Republic of South Africa
	" " "
West Mediterranean	
	Italy
	"
Balkans	
	Turkey
	Greece
Pyrenees	
	Spain
	"
	"
	Portugal
	"
Hindustan	
	India
North American	
	USA
	"
	"
[source page 23]:	"
	"
Various Forms	
	USA
	Czechoslovakia

[source page 23, continued]

column 3	column 4
Ecological Groups of Soft Winter Wheat	
Kashmir	
	India
	"
	"
	"
	"
East Asian	
Yuk-Son No 3	Korean People's Democratic Republic
Ten-Yuk No 1	" " " "
Ten-Yuk No 12	" " " "
	Japan
	"
	"
Chinese (in the broad sense)	
Ching-yang 302	China
Hsi-Pei-Chtan' No 2	"
Chinese 2	"
	"
	"
	"
[source page 24]:	
Yen-ta 1817	"
Te-hsing 208	"
	"
	"
	"
	"
	"
Hsen-men-mai	"
Zjus-mai	"
Pai-hsiao-mai	"
	"
Huo-sang-t'ou	"
"	"

[source page 24, continued]

column 3	column 4
	China
	"
	"
An-sung-to-yang-Mai	"
Ta-Ya-Tz'u-tsui	"
	"
Hung-huo-Kang-t'ou	"
Chinese I	"
	"

[source page 25]

	"

Adriatic Large Grain

	China

Balkans

I-I	Yugoslavia
	"
Strain 781	"
	"
	"
	"
	"
Maks Cryzh VI	"
Okkerman	Bulgaria
No 2315	"
Ferrugineum 113	"
Dunavka	"
No 11	"
	"
	"
(ER-25)	"
(ER-23)	"
ER-134	"
IZR-408	"
	"

[source page 26]

column 3	column 4
	Bulgaria
Kr"stoska 67	"
Kulitsa belaya	"
	Albania
Danube Region (Forest-Steppe)	
	Czechoslovakia
	"
	"
	"
Godoninskaya	"
Tsianeshty	Rumania
	"
Teyskaya	Hungary
	"
Ostatka Mikulitska	Poland
Alps	
	Italy
Hybrid Groups of Winter Soft Wheat	
Appenines	
	Italy
	"
[source page 27]:	"
	"
West European	
	England
	"
	France
	"
	German Democratic Republic
	" " "

[source page 27, continued]

column 3		column 4
	North American	
		USA
		"
	Argentinian	
		Argentina
		"
	Various Forms	
		USA
		"
		"
		"
		"
		"
		"
[source page 28]:		"
		"
		"
		German Democratic Republic
RPG 26/49		
	Fall Planting Hard Wheats	
	Karabashek	Yugoslavia
	Hordeiforme No 132	Bulgaria
column 2 population of hard and soft wheat	Chirpan 13	"
		"
		Roumania
	Rare Hexaploid Species of Spring Wheat	
	Dwarf Wheat (Tr. compactum Host.)	
		Tadzhik SSR
		Turkmen SSR
		USA
		Afghanistan

[source page 28, continued]

column 3	column 4
	Spherical Grain Wheat (Tr. sphaerococcum Perc)
	India
	"
	Pakistan
	"
[source page 29]:	**Spelta (Tr.spelta L.)**
	Spain
	Lvov Oblast
	Rare Tetraploid Species of Spring Wheat
	Turan Wheat (Tr. turanicum Jakubz.)
	Dagestan Autonomous SSR
	Tadzhik SSR
Gendum dossiya	Iran
	Ethiopian Wheat (Tr. aethiopicum Jakubz.)
	Ethiopia
	"
	"
	"
	"
	Persicum or Kakhtalinskaya Wheat (Tr. carthalicum Nevski; Syn. - Tr. persicum Vav.)
	Georgian SSR
	" "
Dika 9/14	" "
	Dagestan Autonomous SSR
	North Ossetian Autonomous SSR
	Armenian SSR
[source page 30]	**Turgidum Wheat (Tr. turgidum L.)**
	Turkey
	Spain
	Portugal
	Chile

[source page 30, continued]

column 3	column 4
Polonicum Wheat (Tr. polonicum L.)	
	Altayskiy Kray
	Kazakh SSR
	Georgian SSR
	Turkey
	German Democratic Republic
Spelt (Tr. dicoccum Schrank)	
	Bashkir Autonomous SSR
	Ul'yanovskaya Oblast
	Drogobychskaya Oblast
	Nakhichevanskaya Autonomous SSR
	India
	Ethiopia
	"
	Yemen
	Morocco
	Yugoslavia
	German Federal Republic

[source page 31]:

Rare Diploid Single Grain Forms (Tr. monococcum L.)	
	Azerbaydzhan SSR
	Turkey
	Bulgaria
	Spain
Genus Haynaetricum Zhuk.	
	TSKhA

[source page 31, continued]

column 2	column 3	column 4
		Rare Hexaploid Species of Winter Wheat
		Dwarf Wheat (Tr.compactum Host)
		Georgian SSR
		Turkmen SSR
		Afghanistan
population		"
		Iran
		China
	Ch'ui-wa-shui	"
		"
		"
		Wheat imeni Vavilov (Tr.vavilovi Jakubs.)
		Armenian SSR
		Tr. Macha Dek. et Men.
		Georgian SSR
[source page 32]:		**Tr. Spelta L.**
		German Federal Republic
		Rare Tetraploid Species of Winter Wheat
		Tr. turgidum L.
		Azerbaydzhan SSR
		" "
		Georgian SSR
	Migovskaya	Lvovskaya Oblast
population		Yugoslavia
		Poland
		German Democratic Republic

[source page 232, continued]

column 3

column 4

Spelt (Tr. dicoccum Schrank)

Italy

Wild Spelt (Tr. dicoccoides Schweinf.)

Israel