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A report on the studies in the field of forest genetics 1964/65

In the time period since the last report was published (Arb. Kór. 9; 289—292) the tree breeding research program in Kórnik has been considerably expanded. To some extent this is a result of the growing interest in tree breeding of practical foresters, who are helping with many aspects of the research and conversely their interest is undoubtedly stimulated by the studies conducted at Kórnik and publicized in forestry magazines.

SELECTION OF PLUS TREES

The program of plus tree selection is continuing. As of Sept. 30th 1965, the total number of plus trees selected is 1231. In table 1 the distribution of the

Table 1

The list of selected plus trees by species and region
Figures for the 1st of October 1965

Forest Regions	Species																Total				
	<i>Abies alba</i>	<i>Acer platanoides</i>	<i>Acer pseudo-platanus</i>	<i>Alnus glutinosa</i>	<i>Betula sp.</i>	<i>Carpinus betulus</i>	<i>Fagus sylvatica</i>	<i>Fraxinus excelsior</i>	<i>Larix decidua</i>	<i>Larix polonica</i>	<i>Picea abies</i>	<i>Pinus sibirica</i>	<i>Populus alba</i>	<i>Populus tremula</i>	<i>Prunus avium</i>	<i>Pseudotsuga menziesii</i>		<i>Quercus sp.</i>	<i>Salix sp.</i>	<i>Tilia cordata</i>	<i>Ulmus sp.</i>
Białystok	—	8	—	70	10	9	—	21	2	—	34	118	—	16	—	—	20	3	1	1	313
Gdańsk	—	—	—	—	1	—	27	2	22	—	4	57	—	—	—	1	6	—	5	—	125
Katowice	5	—	—	24	4	—	3	1	—	—	58	—	—	—	—	—	—	—	—	—	95
Kraków	25	—	—	—	6	—	3	3	3	—	65	18	—	—	—	—	—	—	15	—	138
Lublin	4	—	—	—	—	—	1	1	—	—	—	5	—	—	—	—	—	—	—	—	11
Łódź	—	—	—	—	—	—	—	—	—	—	—	13	—	—	—	—	—	—	—	—	13
Olsztyn	—	—	—	—	—	—	—	—	—	—	7	46	—	—	—	—	—	—	—	—	53
Opole	2	—	—	—	—	—	—	—	8	—	1	—	—	—	—	—	1	—	—	—	12
Poznań	—	—	—	4	—	2	—	2	7	—	11	—	—	—	—	—	23	—	2	—	51
Przemysł	3	—	1	—	—	—	1	1	2	—	—	—	1	—	1	—	1	—	—	—	11
Radom	11	—	—	13	1	—	2	—	—	32	—	22	—	—	—	—	6	—	—	—	87
Siedlce	—	—	—	—	—	—	—	—	—	—	30	—	—	—	—	—	—	—	—	—	30
Szczecin	—	—	—	2	2	—	13	—	—	—	1	3	—	—	—	1	1	—	—	—	23
Szczecinek	—	—	—	—	—	—	—	—	—	—	—	20	—	—	—	—	—	—	—	—	20
Toruń	—	—	—	—	2	1	15	1	38	—	3	60	—	—	—	25	4	—	—	—	149
Wrocław	4	—	—	—	1	—	—	—	32	—	33	17	—	—	—	—	—	—	—	—	87
Zary	—	—	—	—	4	—	2	—	—	—	—	5	—	—	—	—	1	1	—	—	13
Total	54	8	1	113	31	12	67	32	114	32	206	425	1	16	1	27	63	4	23	1	1231

plus trees according to species and forest regions is presented. In comparison with the last report the Forest Regions in central Poland (Toruń, Siedlce, Łódź and Poznań) have been much improved as regards their representation in our plus tree registry. The program of plus tree selection was started with the peripheral Forest Regions since these contain the best and most interesting forest areas. This has resulted in the central part of the country remaining little worked over. Much effort was made during the last year to find plus trees in these poorer forest areas. Since our criteria for the selection of plus trees are comparative to the local standards, it was found possible to include several fine trees from these forests in our plus tree registry. A paper on the protection of plus trees and forest stands in Poland has been presented by S. Białobok to the Section 22 IUFRO meeting at Zagreb in Sept. 1965.

GRAFTING

The program of grafting our plus trees has been steadily continued. Most time was devoted to the grafting of pine and spruce. It is intended to have in our clone bank all the plus trees represented. During this report period the grafting of spruces selected in the Istebna Forest District was completed. In table 2

Table 2
Grafting of plus trees in the years 1964 and 1965

Species	Greenhouse		Nursery				Total
	1964	1965	1964		1965		
			spring	summer	spring	summer	
<i>Alnus glutinosa</i>	—	150	—	—	—	—	150
<i>Larix decidua</i>	—	—	—	—	1050	—	1050
<i>Picea abies</i>	—	—	450	745	—	860	2055
<i>Pinus silvestris</i>	—	—	490	850	120	650	2110
Total	—	150	940	1595	1170	1510	5365

the number of grafts made during the two years covered by the report is presented. As a normal practice 50 grafts are made per clone, however some grafts had to be repeated where the number of takes was too low to provide enough individuals for our seed orchards.

SEED ORCHARDS AND CLONE BANKS

In the report period 4 seed orchards (pine, spruce, larch and ash) have been planted. Also some areas of the forest were planted with clone banks. In table 3 areas and year of planting of the seed orchards and clone banks is presented. These areas are all located in our experimental forest Zwierzyniec. No attempt has been made to isolate the seed orchards from stray pollen, because that would

require locating them outside the area belonging to the Institute of Dendrology, and at a considerable distance from the Institute itself. Since these seed orchards are regarded as experimental objects as contrasted to commercial seed production areas, it was considered more advantageous to have the orchards close at hand, in order to be able to perform artificial crosses and flower induction studies more easily. It is hoped to develop methods of tending seed orchards, that would provide guide lines for the practical foresters engaged in the cultivation of commercial seed orchards.

Table 3

Seed orchards and clone banks established in the years 1964 and 1965 (in ha)

Species	Seed orchards		Clone banks	
	1964	1965	1964	1965
<i>Pinus silvestris</i>	0.80	—	0.11	—
<i>Picea abies</i>	—	0.80	—	—
<i>Larix decidua</i>	0.60	0.20	—	0.07
<i>Fraxinus excelsior</i>	0.40	—	0.05	—
<i>Fagus sylvatica</i>	—	—	—	0.04
<i>Quercus spp.</i>	—	—	0.02	—
<i>Alnus glutinosa</i>	—	—	0.01	—

One of the first problems that was tackled was the arrangement of clones in a seed orchard. This arrangement has been a source of considerable difficulty to those engaged in the establishment of seed orchards. Optimal systematic lay-outs were prepared for all numbers of clones from 9 to 65, and certain numbers of clones (9, 13, 17, 25, 29, 37, 41, 45, 49, 53, 61, 65) were recommended as giving particularly advantageous lay-outs (reported by M. Giertych in *Las Polski* 1965 2; 6—8. and *Silv. Genet.* 1965, 14; 91—94).

Presently experiments are laid out using various fertilizer combinations on the grafts, and applying different pruning methods. It is intended to study the effect of these treatments on the development of floral organs and the productivity of seed.

PROVENANCE STUDIES

In 1964, 0.4 ha of a spruce provenance trial has been established in the experimental forest Zwierzyniec. The seedlings (2+1) have been obtained from the Institute of Forest Research, Warsaw. They represent 11 provenances from the northern part of the country. The trial is laid out in a complete block design with 8 replicates and 49 trees per plot. Use was made of the good cone crop in 1964 to collect cones of *Picea abies* from 26 different provenances scattered throughout the species range in Poland. In each case the cones were collected from no less than 10 trees, mixing them in proportional quantities. The cones were extracted during the 1964/65 winter and are presently being subjected to a taxonomic investigation of their variability. The seeds are being used for the

establishment of large scale provenance studies planned on 4 different localities scattered throughout the country, for experiments on seedlings under controlled greenhouse conditions and for international exchange.

The greenhouse experiments have only been started in 1965. They are aimed at establishing differences between provenances in their ability to utilize mineral nutrients supplied in limited quantities under competitive conditions.

The small provenance trial of *Pinus silvestris* planted in 1963 has already yielded its first results. In 1964 the plantation was considerably damaged by *Lophodermium pinastri*, and R. Siwecki was able to establish statistical differences between the provenances in their resistance to the disease.

In 1965 two small provenance studies of *Pinus silvestris* (2,07 ha) were established. They include three provenances, one from Łopatyn in the USSR, one from the Białowieża area and one local.

Suggestions for the standardization of methods in the establishment of international provenance experiments have been presented by M. Giertych to the IUFRO section 22 meeting at Nancy and Zagreb in September 1965.

PROGENY TRIALS

In the spring of 1965, 0,07 ha of a pine progeny trial was planted out. The seeds are half-sib progenies from 9 wind pollinated trees growing in a fine pine stand in the Forest District Dłużek. The progeny trial is laid out in a complete block design with 4 replicates and 24 trees per plot.

POLLEN MIGRATION STUDIES

In 1964 studies were initiated on the migration of pollen. In the Arboretum and in the stands of the experimental forest Zwierzyniec pollen traps were positioned 1 m above the ground. In 1965 15 mast poles, hinged 1 m above the ground and therefore easily brought horizontal, were positioned in the stands of the Zwierzyniec forest, enabling the establishment of pollen catches 1 m, 5 m, and 10–11 m above the ground. The pollen studies form a part of a major study conducted by T. Przybylski on the origin *Pinus silvestris* populations in Poland. Some thoughts on the subject were presented in a paper to the IUFRO section 22 meeting at Zagreb in September 1965.

STUDIES ON CURLY BIRCH

The natural stand of *Betula verrucosa* in Tylmanowa (the valley of Dunajec near Krościenko) contains a large proportion of trees with the characteristic „curly” pattern, otherwise known as „czeczotka” or „Karelian birch”. Open pollinated progenies of these trees are being collected and grown in Kórnik. Anatomical studies of these seedlings are in progress. A full-sib breeding program has been initiated.

COOPERATION WITH FOREST PRACTICE

During the report period, the number of Forest Regions interested in the establishment of seed orchards has grown from 3 (Poznań, Wrocław, Białystok) to 7 (the afore mentioned plus Toruń, Gdańsk, Olsztyn, Szczecinek). Throughout the country the foresters have been a great help in pointing out prospective plus trees. Three times a demonstration of grafting methods was organised in Kórnik for forest employees designated to perform the grafts for production seed orchards. Numerous excursions of practical foresters visited the forest genetics experimental areas established at Kórnik. Many articles published by the staff of the Institute of Dendrology in the forestry bi-weekly magazine „Las Polski” have maintained contact between forest practice and research. In the spring of 1964 a Symposium was organised in Kórnik on the genetics of forest trees. The meeting was attended by 66 persons of which 14 were practical foresters. At the symposium 43 papers and communications were presented and the experiments in the field were visited. The meeting provided an opportunity for practical foresters to see the research conducted at Kórnik and for the research workers to discuss the development of forest genetics programs.



Picea jezoensis Carr. — świerk ajański
<http://rcin.org.pl>

Fot. K. Jakusz