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REPORT OF THE DEPARTMENT OF DENDROLOGY AND KÓRNIK ARBORETUM, POLISH ACADEMY OF SCIENCES FOR 1967

(Sprawozdanie z działalności Zakładu Dendrologii i Arboretum Kórnickiego PAN za 1967 r.)

Research work concerned seven themes, which were defined and agreed upon by the Polish Academy of Sciences Botanical Committee. Some of it is related with research conducted in other European countries by international organizations or individual researchers. Work on themes 1–III is concerned with systematics, and that on theme IV and, partly, theme V can be counted in the group of geobotanical and ecological research. This line of research can also be considered to include work on the introduction and ecology of trees and shrubs of foreign origin grown in Kórnik Arboretum, other botanical gardens, and in forest areas.

Themes VI and VII are dealt with in numerous projects which belong into morphological-genetic and physiological-biochemical research. Out of the 31 research subjects 18 fall within the range of these themes. It should be stressed that within the range of theme VI, which includes work on the genetics of trees, several projects have the character of collective research on many species of forest trees.

T h e m e I. Description of Poland's flora of vascular plants. The greatest progress was recorded by Associate Professor Dr. K. Browicz and Eng. Cz. Kaczmarek in their work on the genus *Rosa* L. in the south of Wielkopolska (i.e. Poznań Province), which is rich in a variety of rose species. Herbarium specimens have been collected covering the species *Rosa canina* L., *R. dumetorum* Thuill, *R. glauca* Vill., *R. pomifera* Herrm., *R. corrifolia* Fries, *R. eglanteria* L., *R. elliptica* Tausch, *R. omissa Déségl,* and *R. scabriuscula* H. Br., as well as *R. Jundzillii* Bess., which was discovered here for the first time. Associate Professor Dr. W. Bugała's systematic research on white poplar and gray poplar is continuing and a number of individuals have been propagated vegetatively in order to obtain uniform material. Work by Dr. M. Jakuszewska on the systematics of the genus *Crategus* L. in Poland is expected to be completed in 1971, although much material has already been assembled.

Theme II includes systematic work of a monographic type conducted by Associate Professor Dr. K. Browicz. The monograph on the genus *Paliurus* now in preparation has been preceded by a number of other monographs by the same author (*Colutea, Periploca*). They are proof of a very vigorous development of work on the systematics of trees and shrubs, previously rare in Poland as a research subject. Work on these genera is linked with that on the floras of the Near East by botanists from Great Britain, a revision of the European flora, as well as with Professor Rechinger's floristic research in Iraq. It therefore arouses the interest of many European botanists who specialize in the flora of these parts of Eurasia.

As regards theme III, Associate Professor Dr. K. Browicz is engaged in research on the subfamily Prunoideae for "Flora Iranica", which will be completed in 1967. Latin keys and diagnoses, a critical systematic analysis of the established species in this flora, and their distributions are now under preparation.

Similar research, but much broader in scope, is conducted by Associate Professor Dr. K. Browicz for the publication "The flora of Turkey", in which he is working on the Turkish material of Professor Davis of Edinburgh covering the subfamilies Spiraeoideae, Pomoideae, and Prunoideae. Work on the Prudoideae and partly Pomoideae has so far been completed. Hence, what remains to be described by 1968 is still the genera *Pyrus, Eriolobus, Erniobotrya, Crataegus,* and *Spiraea.*

Thanks to these studies by Associate Professor Dr. K. Browicz our institution has joined in the preparation of (1) Flora Europea, (2) The Flora of Turkey, and (3) Flora Iranica.

Studies on the geographical distribution of trees and shrubs, conducted by Associate Professor Dr. K. Browicz and Dr. M. Gostyńska-Jakuszewska, fit within this theme.

Theme IV includes research on geobotanical zoning as the basis for the country's rural and urban planning. The seventh part of an atlas showing the distribution of trees and shrubs in Poland (Atlas rozmieszczenia drzew i krzewów w Polsce) is now in print; it contains point maps covering the species *Juniperus sabina* L., *Myrica gale* L., *Myricaria germanica* Desv., *Rosa pendulina* L., and *Erica tetralix* L. The publication fills an important gap in our knowledge of the distribution of our native tree and shrub species, which is changing very rapidly owing to the intensive interference by man with nature. The geographical distribution of trees and shrubs in Poland for the atlas "Flora Europeae" is being prepared by Dr. Maria Gostyńska-Jakuszewska according to the scheme adopted by this publication. Maps of the distribution of gymnosperms have already been prepared and work has begun on angiosperms.

Theme V. We have been concerned with studies on the acclimatization of trees and shrubs for many years; they are an important part of our work carried on either in forest areas or in arboretums and parks. Associate Professor Dr. W. Bu-

gała, Mr. T. Bojarczuk, M.Sc., and Dr. J. Poszwińska are engaged in studies on the practicability of the cultivation of trees and shrubs of the genera *Abies* and *Deutzia,* and *Cornus* and *Viburnum* and their degree of adaptation to the conditions in the Arboretum of Kórnik. Phenological observations of 53 tree and shrub species are continuing and the results of 1953–1962 meteorological observations, prepared by Dr. H. Chylarecki and Mr. H. Straus, M Sc., were sent to the printers. Doctor H. Chylarecki is close to concluding his work on the practicability of the cultivation of the common Douglas fir, for which material has been collected from the Poznań Province Kujawy area, in the Forest districts of Boruszynek, Brójce, Durowo, Nakło, Pniewy, and Porażyn.

T h e m e VI. Research on the foundations of forest tree genetics was initiated in the fifties in Kórnik and has since been developing with sustained intensity. The work done so far in this field is merely a part of extensively conceived biological studies on our native forest trees, which should be undertaken in Poland owing to the need for a clarification of some still little known phenomena for the purpose both of a biological characteristic of these trees and supplying a scientfic foundation for forest production. The instituted population studies on morphological and physiological variability are fundamental for a general characterization of our trees. They are conducted by a team composed of Professor Dr. S. Białobok, Dr. M. Giertych, Mr. T. Jakuszewski, M.Sc., Mr. L. Mejnartowicz, M.Sc., Dr. T. Przybylski, and Mr. K. Siwecki, M. Sc.

Scots pine. Doctor T. Przybylski set up experimental areas with 30 geographical races from Poland and five from Sweden, chiefly its southern part. Each experimental plot is about 1 hectare in area and the experiments are made in octuplicate. For the sake of a more distinct picture of interpopulational variability they are made under different climatic conditions — in the north-east, north-west, center, and south-east of Poland. In addition, in order to define more strictly the range of variability due to different factors laboratory experiments involving mineral nutrient media have been set up.

Mr. R. Siwecki, M.Sc., together with Dr. K. Chwaliński, of the Department of Forest Phytopathology of the College of Agriculture, Poznań, investigate 29 geographical races of Scots pine in respect of the resistance of seedling to *Lophodermium pinastri* Chév. The experiments are made outdoors in the Zwierzyniec Forest Subdistrict and in cold frames under partly controlled conditions in triplicate and involve repeated artificial infection with the spores of the fungus.

Studies of great importance for forestry on the individual and interpopulational resistance of Scots pine to heart rot *Fomes annosus* Cke. have also been undertaken. They are conducted by Professor Dr. Białobok and Mr. K. Siwecki, M.Sc., together with Professor Dr. K. Mańka and his associates from the Department of Forest Phytopathology, College of Agriculture, Poznań. Seeds and scions for grafting have been taken from the forest districts of Klęka, Suleczyce, Mrągowo, Wronki, and

Pniewy and a comparative experiment will be set up in the Zwierzyniec Forest Subdistrict.

Norway spruce. One-year seedlings of 35 geographical races are grown in nurseries and will be planted out later in experimental plots in several different climatic areas both within and outside the natural range of spruce. The project is managed by Dr. M. Giertych. The results of studies on the variability of the characters of cones by the classical method (Dr. H. Chylarecki) have also been worked up with the use of novel statistical methods (Dr. M. Giertych).

Seedlings of the same geographical races are used by Dr. M. Giertych and Mr. Fober, M.Sc., in physiological research relating also to points of interest in the genetics of trees.

Birch. Mr. T. Jakuszewski, M.Sc., engaged in research on the morphological variability of the Karelian variety (var. *carelica*) of the European white birch from Pieniny as compared with the European white birch from the same habitats. Shoots, leaves, and natural-pollination seeds of 27 trees of the Karelian variety and 50 trees of the European white brich were collected. Seeds of 8 trees of the Karelian variety were also collected from experimental areas in Zwierzyniec in order to gather information about generation F_2. Oak seeds collected in the natural tree stands of eight geographical races were sown out in a nursery. The planting stock will serve to start a provenance experiment in the Zwierzyniec Forest Subdistrict. From a biometrical analysis of acorns Dr. M. Giertych found introgression between *Quercus-robur* L. and *Q. petrea* Liebleim.

Common alder. Seeds were collected from 10 natural stands in different climatic regions for starting a provenance experiment in several parts of Poland with a view to investigating the morphological variability of the species, which do not have a very wide ecological range. This project is the responsibility of Mr. L. Mejnartowicz, M.Sc.

Preparation of material for studies on the individual heredity of trees is continuing. So far 1386 select trees have been picked and scions have been prepared for the establishing of further research areas and supplementing existing ones.

In the field of genetic research with poplar as an example Dr. Z. Stecki was concerned with studies of the dynamics of increments of various clones during the vegetation period. He continues research on the ecological properties of poplar clones and found that in the north of Poland higher increments are achieved by hybrids from the section Tacamahaca than Aigeiros, and especially certain clones reared in Kórnik and the American hybrid No. 194.

The heritability of the resistance of 14 poplar hybrids to *Cryptodiaportha populea* But. was investigated in outdoor and greenhouse experiments involving artificial infection with the spores of this fungus.

Since various *Populus canescens* hybrids differ in their susceptibility to infection with *Venturia tremulae* Adern, Mr. R. Siwecki, M.Sc., undertook to check

whether the resistance of some individuals is inherited or due to environmental factors. His experiments have shown that the high resistance of five gray poplar trees of the race PK-53 was genetically determined.

Further research by Mr. R. Siwecki, conducted jointly with Dr. K. Danielewicz of the Department of Microbiology, Warsaw University as a matter of cooperation between the two institutions, concern simultaneous infection of poplars with *Aplanobacter populi* and *Dothichiza populea* Sacc. et Briard.

The inheritance of 15 selected useful characters of apricot and cherry trees is investigated by Mrs. J. Suszkowa, M.Sc., in hybrids produced beforehand for this purpose. Furthermore, she is working up the results of a long-standing experiment on the effect of inserts restricting the increment of scions on the growth and fruit crop of plum trees.

Decorative varieties of shrubs characterized in the first place by hardiness and also high decorative value of their flowers continue to be reared.

Forsythias are cultivated by Associate Professor Dr. B. Suszka, who already has 128 new seedlings of hybrids produced by crossing *Forsythia viridissima* with own clones.

Associate Professor Dr. W. Bugała has been working for years on the production of new lilac varieties. He selected 15 individuals from previously produced hybrids and, having propagated them by vegetative means, established experimental plots in three different localities in order to test their hardiness.

Doctor J. Poszwińska observed the flowering, morphological variability of the flowers, shoots, and leaves, and the hardiness of hybrids of the genera *Deutzia* and *Weigela*. Deutzias were also crossed in order to produce generation F_2.

As may be seen, the range of these researches into the genetics of trees and shrubs is fairly wide and covers problems which are novel or have received more modest consideration in the past.

T h e m e VII. Physiology of growth and development. Physiological-biochemical research may be divided into the following groups: (a) growth regulators in Scots pine, (b) the physiology of tree seeds, (c) the physiology of flowering of forest trees, (d) the ability of Norway spruce seedlings to utilize mineral nutrients, and (e) other physiological phenomena.

One of the basic research subjects of Associate Professor Dr. M. Tomaszewski is the effect of gibberellins and cytokinin on the content of growth substances in, and growth of, *Pinus silvestris* L. seedlings. Among other things, the growth of callus tissue in Scots pine is stimulated in the presence of synthetic cytokinin-benzylaminopurine — and of a hydrolyzate of casein and cyclitols.

Studies of the germination of pine seeds showed that gibberellic acid (GA), which promotes their germination, stimulates the activity of proteolytic enzymes, and that given together with indoleacetic acid (IAA) or tryptohane (TRY) at the point of the amputation of the top of a shoot it inhibited the formation of interfascicular buds more strongly than did pure auxin or its precursor. Mrs. E. Tomaszewska,

M.Sc., investigated the interaction of auxins and phenols in the processes occurring during the senescence of leaves in *Deutzia magnifica* Rehd., and was concerned in the year under report chiefly with determinations of the activity of abscisin.

Research on the effect of the thermal factor on the germination of tree and shrub seeds was a field of particularly intensive work by Associate Professor Dr. B. Suszka.

Prunoideae. Research was started on the relation between the source of cherry seeds, the harvest year, and their germination capacity. Research on dormancy breaking in the seeds of *Armeniaca sibirica* and *Amygdalus pedunculata* from Mongolia was concluded. Owing to the need of investigating the growth of seedlings on artifical media in a phytotrone, a technique for their cultivation was developed and, also, studies on the growth of cherry tree seedlings obtained from isolated embryos were continued.

Quercus. Work on multiannual storing of acorns was continued.

Fagus. Work on the storing of beech nuts over a period of seven seasons was continued.

Taxus. Negative results of the stratification of seeds under the conditions of warm-cool stratification were recorded, but research was undertaken concerning the effect of high temperatures on this process.

Carpinus. The results of many years of research on dormancy breaking in seed germination under controlled and field conditions and on their storage were prepared for print.

Associate Professor Dr. B. Suszka initiated also studies on the dynamic of growth factors, chiefly abscisin, in tree seeds, having done the relevant methodological work in the Laboratory of Physiology, Research Institute of Pomology.

Research on the flowering of forest trees is important for population genetics. Studies on the number and development time of male and female flowers of conifers and deciduous trees are conducted (a) in experimental areas, where the effect of bud removal and defoliation on flowering is investigated, and (b) in seed plantations, where the influence of different mineral fertilizers on flowering is studied.

Doctor M. Giertych and Mr. H. Fober, M.Sc., investigate the ability of the seedlings of different geographical races to utilize mineral foods. Work on the influence of nitrogen has been completed and preparations for experiments covering the effect of different concentrations of Ca, K, and Mg are now on. Research on the utilization of different doses of phosphorus by spruce seedlings is in its final stage.

Among the other investigations we should note the work on the physiological activity of triacanthin in *Gleditschia triacanthos* L., which shows that the substance cannot replace the presence of cytokinin in the tissues of this plant.

The present report shows a considerable development of research on the systematics and geography of trees and shrubs in Poland and other regions of

Europe and Asia. It was particularly vigorous in the field of the genetics of forest trees and shrubs and of decorative native and introduced species. There is also more and more intensive work relating to the physiology of trees and shrubs, especially physiology of seeds, which is extending to an increasing number of species and variety of problems. Research on regulators in trees is developing more and more in regard of analysis of the action of different substances in the control of the reaction involved in the activation or inhibition of development and growth processes.

The Department's small staff of only 16 researchers was very active in scientific and publishing work, as is reflected in the publication of 27 scientific papers and articles and 18 popular articles as well as preparation for print of 21 scientific papers and 15 popular articles.

The Arboretum

A total of 390 specimens of deciduous trees and shrubs and some 900 conifer trees and shrubs were added and planted to supplement existing collections or start new ones.

The inventory list was expanded by 378 items. This concerns especially *Syringa vulgaris* varieties received from the Arnold Arboretum, USA, and Arboretum of Wegeningen, Holland, which raised the collection of lilacs to a total of 200 varieties.

The systematic updating of collection plans was continued by inventorizing sections II, III, XXIV, and XXV.

The exchange catalogue of tree and shrub seeds comprised 518 species, with the seeds of 27 species from natural stands.

The Herbarium

The Herbarium now comprises 30,488 sheets. In the year under report 362 sheets were obtained through exchange with the USSR and USA, and 1014 sheets were prepared from our own collection. Doctor M. Gostyńska-Jakuszewska and Eng. C. Kaczmarek are in charge of the work.

The Dendrological Museum

The Museum has cones and tree samples on show. Through exchange with M. Kučera, Czechoslovakia, cones of 23 conifer species were added, whereas cones of Norway spruce from Slovakia and Poland were obtained from our own collection. The carpological section received exhibits of 18 tropical trees.

The Library

The Department's Library also is growing thanks to extensive exchange of our own publications. It now has 17,587 volumes. During the year under report the following additions were made:

Books:		Periodicals and serial publications	
purchased	269 vol.	purchased	13 vol.
gifts	63 „	gifts	396 „
exchange	507 „	exchange	216 „
		subscription	59 „
total	839 vol.	total	684 vol.

The Department's cooperation with other scientific centers in Poland and abroad is very active and involves the following institutions:

(1) The Arboretum of the Slovak Academy of Sciences in Mlyniany, with respect to the phenological appearances of trees and shrubs;

(2) Naturhistorisches Museum, Botanische Abteilung, Wien; description of the subfamily Prunoideae for the floristic publication "Flora Iranica";

(3) Royal Botanic Garden, Edinburgh; description of the family Rosaceae for the floristic publication "Flora of Turkey";

(4) Department of Forest Phytopathology, College of Agriculture, Poznań; work on methods of controlling heart rot;

(5) Department of Microbiology, Warsaw University; work on the diseases of poplar.

Furthermore, the Department cooperates with the Research Institute of Pomology and Department of Plant Physiology, University of Toruń in research on the growth regulators of trees.

Training of Personnel

Two adjoints received the degree of Associate Professor, namely Dr. W. Bugała and Dr. B. Suszka, Mrs. E. Tomaszewska, M.Sc., and Mr. R. Siwecki, M.Sc., completed their doctoral theses and will defend them in the first half of 1968. Mrs. L. V. Runkova, of the USSR Academy of Sciences Botanical Garden in Moscow, is at the Laboratory of Physiology for a one-year postgraduate training period, and Mrs. Tatiana Dalecka, of the USSR Academy of Sciences Institute of Botany, Leningrad, was in the same laboratory for a three-week postgraduate training period.

The Department organized a conference on Norway spruce in Poland. The conference surveyed the subjects relating to this forest tree species and proved to

be a valuable means of disseminating relevant information and stimulating research along definite lines.

The Department received visits from many scientists from Poland, among others participants in the conference on Norway spruce in Poland, and from abroad, as for instance a delegation of the USSR Central Forest Administration, and the United States Undersecretary for Forestry.

Translated by W. Kulerski