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NATIONAL RESEARCH COUNCIL OF CANADA

PROCEEDINGS

OF THE

SIXTEENTH MEETING

OF THE

SUBCOMMITTEE ON FOREST TREE BREEDING

OTTAWA

20 MARCH, 1946

NATIONAL RESEARCH COUNCIL

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Held in the office of the Dominion Forester,
20 March, 1946.

Members present:

Mr. D. A. Macdonald, Chairman
Dr. E. S. Archibald, Vice-chairman
Mr. J. L. Farrar, Joint-secretary
Dr. N. H. Grace
Dr. C. C. Heimburger
Dr. L.P.V. Johnson, Joint-secretary
Mr. C. G. Riley
Mr. W. M. Robertson
Dr. H. A. Senn

Visitor present:

Mr. A. Leslie (Ont. Dept. of Lands and Forests).

166. Minutes — The Minutes of the Fifteenth Meeting were approved without change.

167. Disease garden — Referring to Minute 163, Mr. Riley expressed concern about the continuity of the pathological and breeding work dependent upon materials growing in the white pine blister rust disease garden at the N. R. C. Annex.

Dr. Johnson said he was unable to give any assurance that these materials would not be molested by future building operations, and advised a new site for the disease garden.

Proposals that a disease garden be established at the Petawawa Forest Experiment Station did not meet with the approval of Messrs. Macdonald and Robertson, who pointed out the fact that the disease garden could not be located at the station without menacing established white pine plantations and sample plots.

Dr. Archibald suggested that suitable land might be made available for disease garden purposes on the tract (in the Connaught Ranges area) leased by the Department of Agriculture from the Department of National Defense. It was agreed that the suitability and availability of this land be investigated by a committee composed of Mr. Riley, Dr. Heimburger and Dr. Johnson. It was further agreed that this committee should have the power to make such arrangements as might be necessary to facilitate immediate utilization of the land in the event that it was suitable and available.

Discussion on the size of disease garden required brought general agreement on an area of ten acres with prospects for expansion. It was considered feasible to move materials now in the Annex disease garden. Between one and two acres of prepared ground would be required to accommodate these materials.

168. Provincial representation

The subject of provincial representation on the Subcommittee arose out of Minute 164. It was pointed out that the issues of the Dominion-Provincial Conferences were still unsettled and that it may be inopportune to go further into the matter.

Mr. Leslie, visiting representative of the Ontario Department of Lands and Forests, said he was greatly interested in the proceedings and that he felt his organization would be favorable toward any move for its closer identification with the Subcommittee's work. He did not believe that the status of the Dominion-Provincial Conferences should hold up preliminary arrangements with provincial forestry officials.

Dr. Johnson stated that three provinces, Ontario, Alberta, and British Columbia were already co-operating with the Subcommittee. There was no doubt that as time went on provincial facilities for the production and distribution of planting stock would become increasingly important in multiplying and distributing Subcommittee materials.

Dr. Johnson read Mr. Walker's comment on provincial representation, which stressed Ontario's annual distribution of planting stock (see Appendix D).

The meeting agreed that a letter should be sent to the proper forestry official in each province outlining the work of the Subcommittee and inviting active participation in the undertaking. It is hoped that this will advance the interests of forest tree breeding and prove

mutually beneficial to both federal and provincial departments.

169. Dr. Johnson's report

Dr. Johnson's report, appended hereto as Appendix A, had been previously circulated to the members and was only briefly presented to the meeting.

Discussion centered upon prospective work during the coming season. Dr. Johnson said that he believed provisions would be made to enable him to operate along the same lines as in the past. He felt that some hybridization work in conifers might be undetaken at Petawawa should the season be favorable. The policy, in general, would be to complete work already underway and to arrange transfer of materials already on hand rather than to undertake new work or to produce new materials.

170. Dr. Heimburger's report

Dr. Heimburger's report, attached hereto as appendix B, had been also circulated previous to the meeting.

Dr. Heimburger emphasized the fact that the plans for 1946 outlined in the report were based on the assumption that a qualified person would be present at the Petawawa station to take charge of the work.

171. Mr. Riley's report

Mr. Riley's report, attached hereto as Appendix C, had been presented at the Fifteenth Meeting (see Minute 160) and subsequently circulated to the members.

172. Letter from Mr. Walker

Dr. Johnson read a letter dated 14 March from Mr. John Walker (appended hereto as appendix D). The various points raised in the letter were considered and it was agreed that positive action should be taken where possible. In another letter Mr. Kerr stated that Mr. Walker in submitting the above proposals was speaking on their joint behalf.

173. Circulation of reports

It was proposed by Mr. Riley that sufficient copies be made of all reports prepared for circulation to permit submission of a special copy to the Secretary, which would insure that a draft of the report would be available for reference and for inclusion in the proceedings. The Meeting agreed that this should be done.

174. Election of a second secretary

Dr. Johnson drew attention to the possibility of his leaving his Subcommittee work within a few months, and suggested that a new Secretary be placed in office. Upon the Chairman's call for nominations, Dr. Johnson named Mr. Farrar (at the moment a non-member). Dr. Archibald proposed Mr. Farrar for membership. This was seconded by

Mr. Riley and carried. Mr. Farrar was then elected to the office of Secretary. Dr. Archibald suggested that Mr. Farrar and Dr. Johnson serve jointly in office pro tem. The Meeting agreed that this procedure should be followed until Dr. Johnson's departure.

The action of the Subcommittee in proposing Mr. Farrar for membership, and in subsequently electing him to the office of Secretary, will be submitted to the Associate Committee on Forestry for confirmation.

APPENDIX A

Progress Report for 1945

By L.P.V. Johnson

I-A-10 Selection and testing for prairie shelterbelts

A trip was made to the prairies during the fall in the interests of this work, and a complete report was given in Progress Report 17-18/45.

Briefly, the work undertaken on the trip consisted of the following:

1. Extension of selection work in the older prairie shelterbelts and in severe natural habitats. Emphasis was placed on selecting burr oak forms, and in this connection arrangements were made to test materials already growing in the provincial forest nursery at Oliver, Alberta.

2. Examination of Subcommittee materials already being tested on the prairies. Of the older hybrid poplars at Indian Head, Brooks-10 appeared most promising. It was considered premature to pass judgment on the one- and two-year-old poplars (which includes all poplars on test in southern Alberta). The ash hybrids were generally promising at Indian Head and in southern Alberta. Fraxinus Richardi X F. americana showed low vigour. F. lutea X F. pubescens was variable with some very good individuals in the population.

Green ash lines selected last year from the best of surviving trees in old prairie shelterbelts appeared, on the basis of first year seedlings, to fall into two growth-rate classes — one characterized by high-vigour, the other by low-vigour populations. Relating these growth rate classes to the habitats from which the lines were selected strongly indicates that the vigorous types come from habitats capable of supporting vigorous growth, and that the non-vigorous types come from habitats incapable of supporting vigorous growth. These non-vigorous forms are probably highly adapted to severe prairie conditions and, if the habitat cannot be improved to support the more vigorous type, we should follow the natural principle of balancing the organism and the environment by distributing these slow-growing forms to the more severe prairie regions.

3. A study of the question of whether or not available tree materials, facilities, etc. would justify the immediate employment of a full-time, resident breeder on the prairies. The answer was in the affirmative, but later developments made it unnecessary to go into the matter here.

I-B-1 Interspecific hybridization in forest tree genera

Fairly extensive cross pollinations were made, on a

cooperative basis, in spruce and pine at the Petawawa Forest Experiment Station and at the Dominion Arboretum. Details of this work have already been given in Progress Reports Nos. 9-10/45 and 11-12/45, and seed-set results from the spruce crosses were indicated in Dr. Heimburger's Quarterly Report for July-September, 1945.

Briefly, these cross pollinations represented: in spruce, 216 bags involving white (four strains), black, Norway and Serbian spruces; and in pine, 279 bags involving red, jack, Scotch, Austrian, Japanese and Russian pines.

Dr. Heimburger reported good seed sets from the work on spruce. Seed from the pines will be collected next fall.

Other hybridization activities included work in poplar, ash and elm, the most notable result being about a hundred seedlings of Populus berolinensis x Lombardy poplar.

I-B-2 The development of crossing technique in forest tree genera

The following report was published: Development of sexual and vegetative organs on detached forest tree branches cultured in the greenhouse. Forestry Chronicle 21: 130-136. 1945.

I-B-3 Studies on storage and artificial germination of forest tree pollen

The following report has been prepared for publication: Further results on the viability of pine pollens after eight and twelve months of storage.

I-C-1 Production of polyploid forms of forest trees by the colchicine method

This work was continued in both greenhouse and nursery, emphasis being placed on systematic treatments to growing points of young seedling and cutting material grown in the nursery, especially for that purpose. The material included all nursery stock commonly distributed by the prairie Forest Nursery Stations and by the Ontario Forest Stations. It would be premature to discuss the effects of these treatments at this time.

In the older colchicine-treated materials (treated 2 to 4 years ago), which includes all conifers commonly grown in Canada, there is a wide variety of treatment effects ranging from dwarfing through variously distorted intermediate types to giant forms. The most striking effects are to be found in Abies grandis and in lodgepole pine.

Selections from non-hardy genera were sent to the Green Timbers Nursery, New Westminster, B. C.

I-E-1 Studies of reaction to blister rust of selected natural and artificial white pine materials

Observations on materials in the blister rust disease garden have been reported in Progress Report 19-20/45 and in Mr. Riley's Annual Report.

Among the older lines of white pine in the garden, disease reaction appears to vary from high susceptibility to complete resistance. Methods of further testing are being devised to provide conclusive data on lines and individuals withstanding the ordinary disease garden infection.

I-Z-1 Studies on self sterility in forest trees

Two papers have been prepared which deal with this subject. The first, entitled "Reduced vigor, chlorophyll deficiency, and other effects of self-fertilization in Pinus" appeared in Can. J. Research, C, 23: 145-149. 1945; the second, entitled "Fertilization in Ulmus with special reference to hybridization procedure" will appear in the February, 1946, issue of the same journal.

I-Z-4 Chemical stimulation of seed germination

Two papers have been prepared on this subject, each having the title, "Effect of chemical treatments on the germination of forest tree seeds". The first appeared in Journal of Forestry, 43: 825. 1945; the second will appear in Forestry Chronicle early in 1946.

I-Z-5 Acid extraction and scarification of bass-wood seeds

A paper giving the final results of this work has been prepared under the following title, "A practical method of overcoming seed dormancy in Tilia americana L.". It is expected that the paper will be published shortly.

II-A-1 Studies on genetic variability for sugar production in the sugar maple

Analyses of data from these studies indicate difficulties in separating generic effects from environmental effects. Consequently, results have not been reported.

II-A-2 Inheritance studies

An experiment has been started with the object of obtaining further information on the inheritance of rooting capac-

ity in Populus. It involves rooting tests of cuttings of P. alba 36, P. grandidentata, P. tremuloides, and a number of hybrids between the former (good rooting capacity) and each of the two latter species (poor rooting capacities).

In another experiment the inheritance of growth vigour, form, and of leaf, bark, twig and bud characters is being studied in parental, F_1 and F_2 material of a P. alba x P. grandidentata cross. The F_2 population comprises 170 5-year-old trees.

II-B-1 Cytology of colchicine-treated materials

There is little new to report in this work except the publication of a report on the cytological technique, developed in the course of the investigation, as follows: A rapid squash technique for stem and root tips. Can. J. Research, C, 23: 127-130. 1945.

V-A-2 Testing hybrid poplars for Septoria canker reaction by artificial inoculation at the N.R.C. Annex nursery

A detailed report on this work has already been made in Progress Report 19-20/45.

This report, involving data from nine crosses comprising 256 trees, indicated that materials belonging to the balsam-cottonwood-black poplar taxonomic group were susceptible, while materials belonging to the aspen-white poplar group were relatively resistant. Obviously, intercrossing between materials in these groups should provide valuable new forms.

G-1 Physiological studies on the sugar maple

This work has been completed and the results have been published as follows: Physiological studies on sap flow in the sugar maple, Acer saccharum Marsh. Can. J. Research, C, 23: 192-197. 1945.

Note: It has been customary to include in the Annual Report outlines of new experiments and of proposed activities for the coming outdoor season. These outlines are omitted from the present report because of the indefinite future of the work concerned.

APPENDIX B

Report on Work in Nurseries and Test Plantations, Petawawa Forest Experiment Station, 1945

By C. Heimburger

Introduction

The working conditions at this Station were about the same in 1945 as in 1944. No regular labour was again available for nursery work and conscientious objectors were used for this. One worker had been employed since 1943 and was promoted to straw-boss, while two other workers were inexperienced to begin with but later proved quite satisfactory. As in 1944, it was easier to obtain support for physical improvement of the nursery than for research work. A student assistant was employed for seasonal work during the summer and his time was largely allotted to vegetative propagation, assistance in surveying of test plantations and, later in the summer, to seed collection, extraction and cleaning.

The summer of 1945 was abnormal in several respects. An extremely early spring was followed by very cool and wet weather in May which was favourable for planting. June and early July were also abnormally cool and moist. An extremely dry period in early August caused some abnormal mortality in new test plantations and necessitated heavy watering of the nurseries. The fall was rather late and favourable for poplar propagation and other nursery work.

General Nursery Work

The existing working conditions were utilized in setting up a small greenhouse, in excavating all remaining propagation beds and supplying them with a sawdust sponge, and in thorough removal of stones from a new compartment in nursery No. 1 which was levelled with a bulldozer and received a heavy application of sawdust.

The ditch separating the east side of the nursery No. 1 from the road leading to the lake was completed, as was the tool shed near nursery No. 1. A lane was cut through the alder thicket separating nursery No. 2 from the lake, and a platform for setting up a fire pump was erected on the shore at the end of the lane. Watering of nursery No. 2 by means of a fire pump and hose is now greatly facilitated during periods of dry weather when this is necessary.

Maintenance of Plantations

The good results with an electric fence around plantation No. 52 were repeated in 1945. Some of the posts in the fence were replaced and a new electric battery was installed for the summer of 1945.

Plantations: 52-poplar test plantation on Thomas Field, 55-poplar plantation in arboretum, 56-pine plantation in arboretum, 57-black spruce plantation in arboretum, and 59-Norway spruce test plantation in Thomas Field were cleaned by cutting tall grass and shrubs competing with the planted stock.

Plantations: 51-poplar disease garden on Woermke Field, 52-poplar test plantation on Thomas Field, 53-white pine test plantation east of nursery No. 2, 55-poplar plantation in arboretum, 58-poplar arboretum plantation east of nursery No. 2, and 59-Norway spruce test plantation on Thomas Field, were extended by planting of additional stock in the spring of 1945.

Two new plantations:- 60-hard pine plantation near Montgomery Lake and 61-poplar test plantation on Thomas Field, were established on sites prepared in 1944.

Project 50 Vegetative Propagation

The following experiments are active at present:

54:2, 1937 - Development of plants from stem cuttings of Norway spruce, Black spruce and Colorado spruce.

Material is in the nursery and Norway spruce has been used for cutting production and trimmed back this year. Colorado spruce are now straightening up very well and promise to grow into more or less normal trees.

50:4-41, 1941 - Development of plants from stem cutting of white pine.

The rooted cuttings have been set out in test plantation No. 53 in the spring of 1945. During planting it was observed that the root system of the cuttings is somewhat abnormal in that a regular tap root is lacking. The plants were set deeper in the ground than ordinary seedling stock of the same size, as they tended to be somewhat top-heavy. Apart from some mortality caused by the severe drought in the summer of 1945, development of this material does not differ from that of ordinary seedling stock.

50:5-41, 1941 - Development of plants from stem cuttings of white spruce.

The plants are still in the nursery, in all respects yielding results similar to 54:2, 1937.

50:4-42, 1942 - Physical and biological properties of various propagation media.

No new analyses have been made in 1945.

The following older experiments were terminated in 1945:

50:4-43 - Rooting of semi-lignified, hormone treated cuttings of several softwood species in hot bed and cold frame in sand and peat mixtures.

White spruce, Lodgepole pine and Douglas fir showed slight response to hormone treatment of cuttings; Colorado spruce and Norway spruce rooted fairly well without hormone treatment; Picea asperata, black spruce and red spruce gave inconclusive results, while white pine, Scotch pine and red pine did not root.

50:1-44 - Vernalization of cuttings of Populus alba x grandidentata in the laboratory with subsequent treatment with hormone solutions.

Vernalization and vacuum application proved harmful to the cuttings. Hormone application counteracts the harmful effects of vernalization and application of vacuum in increasing the rooting capacity of cuttings so treated. Cuttings collected in early spring with buds swelling showed poorer rooting than winter-collected cuttings in the laboratory.

The following experiments were started and terminated during 1945:

50:1-45 - Rooting of early semi-lignified cuttings of hardwoods in beds covered with cellophane and lath-cloth screens and surrounded with lath screens, treated with hormones.

White birch, yellow birch, white ash, trembling aspen and largetooth aspen did not root. Basswood responded to IB in talc in sand and in sand-peat. Caragana arborescens responded to applications of IB in talc when planted in coarse sand but not in sand-peat. Populus alba x grandidentata (bulk collection) responded moderately to applications of Na-phenyl stearate and Na-xylyl stearate in talc but not to IB in talc when planted in coarse sand.

50:2-45 - Rooting of early semi-lignified cuttings of softwoods in beds covered with cellophane and lath-cloth screens and surrounded with lath screens, treated with hormones.

Variable survival of cuttings depending on position in bed, media and time of planting. No rooting in red spruce, white pine, Scotch pine, red pine, tamarack. Good response of early plantings of black spruce in sand to

sebacic acid in charcoal; moderate response to sebacic and traumatic acids in talc. Moderate response of early planted white spruce and Norway spruce to sebacic and traumatic acids in talc and charcoal. Results as a whole inferior to those of experiment 50:4-43 probably because bottom heat was lacking.

50:3-45 - Greenhouse propagation of semi-lignified cuttings of white pine and Populus alba x grandidentata planted in sand and treated with hormones.

The poplars showed moderate response to all soaps in doubling rooting as compared with controls. White pine showed moderate response of early collection to sebacic acid in charcoal - the only rooted cutting was so treated.

Project 51 - Methods of Raising Nursery Stock

(1) Poplars - Material of the cottonwood and balsam poplar group was propagated according to methods worked out previously and with good results. As stump planting of poplars in the spring of 1945 gave good results, all poplar material for setting out in 1946 was lifted in the fall of 1945 and the tops cut off and used for cutting production of desirable clones while the roots were buried for the winter.

The results of spring planting of aspen hybrid cuttings stored upside down during last winter were inferior to those obtained in 1944, probably because the planting was done too late and the spring was abnormal.

The cuttings of aspen hybrids were again prepared in the fall of 1945 and stored upside down in a shaded place in nursery No. 2 to avoid too early sprouting in the spring of 1946, if possible, and thus to ensure better results in spring planting.

(2) Conifers - The results of fall transplanting of larch and of transplanting of stored seedlings and rooted cuttings in the spring were quite promising.

Fall transplanting of spruce again resulted in heavy frost heaving during the following winter in spite of protection by sowing oats between the rows in the fall. Frost heaving was especially severe in Nursery No. 1 with its moister soil.

In the fall of 1945 all stock for transplanting and setting out was lifted and heeled in, either in seed beds under protection of lath screens or in a shaded place in nursery No. 2 and covered with balsam fir branches for protection.

An experiment in early fall transplanting of larch seedlings was started. The seedlings were transplanted in early September when they were in full leaf so as to make the use of the Yale transplant board possible. Later, in October, they lost their leaves and were hilled for the winter.

(3) Other Hardwoods - The results of fall transplanting of white birch and related species were not as good as those with white ash and basswood species.

Fall-lifted Caragana survived the winter very well and was suitable for spring planting.

In the fall of 1945 all seedlings of white birch and related species were lifted and heeled-in for the winter, for spring transplanting.

All yellow birch and related species were left in the nurseries for spring lifting and transplanting.

Caragana was again lifted and heeled-in for the winter in the fall of 1945, following the good results with this method of last year.

(4) Soil Treatment - No new methods were tried in 1945.

Spring-sown hairy vetch in the seed beds of nursery No. 1 was inferior to fall-sown hairy vetch.

Sand and soil were applied to some older seed beds when vacated by fall-lifting of seedlings, to improve their drainage.

Sawdust application, together with treatment with superphosphate and potash in the fall, followed by fall sowing of hairy vetch is now the standard procedure in most of the empty compartments and seed beds.

Project 52 - Strain Testing of Spruce

The following lots were set out in test plantations in the spring of 1945:

Lot	192	Picea Excelsa, Vilppula, Finland,	30	to plantation	59
"	195	Picea excelsa, France,	237	" "	"
"	196	Picea excelsa, Poland,	164	" "	"
"	199	Picea excelsa, Smaland, Sweden,	152	" "	"
"	204	Picea excelsa, Inntrondelag, Norway	150	" "	"
"	205	Picea excelsa, No. 1, Roumania,	452	" "	"
"	207	Picea excelsa, U.S.S.R.,	255	" "	"
"	209	Picea glauca, Notakim depot P. Q.	98	" "	53
"	228	Picea rubra, Berthierville, P. Q.	1358	" "	59