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NATIONAL RESEARCH COUNCIL OF CANADA

PROCEEDINGS

OF THE

TWENTY-FOURTH MEETING

OF THE

SUBCOMMITTEE ON FOREST TREE BREEDING

ASSOCIATE COMMITTEE ON FORESTRY

OTTAWA

5 MARCH 1952

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Initial Distribution.

NATIONAL RESEARCH COUNCIL

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SUBCOMMITTEE ON FOREST TREE BREEDING

ASSOCIATE COMMITTEE ON FORESTRY

Held in Lecture Room, Forest Products Laboratory, Metcalfe and Isabella Streets, Ottawa, 5 March 1952, at 2 p.m.

Attendance

Mr. H.D. Heaney, Chairman
Mr. A. Bickerstaff
Mr. R.S. Carman
Mr. S.J. Cook
Mr. M.B. Davis
Mr. J.L. Farrar
Mr. J.D.B. Harrison
Mr. J.M. Holst
Dr. A.W.S. Hunter
Mr. A.W. McCallum
Dr. C.C. Heimburger, Secretary

269. Minutes

The minutes of the twenty-third meeting were APPROVED.

270. Business arising out of the minutes

The question of a summary report on the progeny of superior trees (see item 253) was again mentioned. Since the Associate Committee on Forestry has become inactive it was decided that the establishment of a working committee for the preparation of such a report was no longer warranted.

271. Dr. Cram's report

Dr. Cram sent his report by mail. It was received after the meeting and could thus not be discussed.

His report is found in Appendix "A"

272. Dr. Heimburger's report

The report of Dr. Heimburger on breeding of white pine and poplar was read. (see Appendix "B") The favourable results in obtaining plant materials from abroad were pointed out. Through the cooperation of the Forestry Branch and the Department of External Affairs it was possible to obtain plant materials in good

condition from Japan and Pakistan and to work out procedures for obtaining further breeding materials from distant localities abroad. Further co-operation with the Forestry Branch is planned in work with white pine for possible resistance to weevil at the Petawawa Forest Experiment Station, and in raising and testing of red pine and related species for possible resistance to the European shoot moth. At the appropriate stages of development further co-operation with the entomologists of the Division of Forest Biology will be enlisted. During the discussion Mr. Holst mentioned the information he had obtained from the New York State Commission of Conservation about the resistance of Japanese black pine (P. Thunbergii) to the European shoot moth. There are now1/0 seedlings of 20 strains of Austrian pine at the Petawawa Forest Experiment Station that could be of possible value in this connection also.

273. Mr. Holst's report

Mr. Holst presented a preliminary report on strain tests with white spruce and Norway spruce at the Petawawa Forest Experiment Station. White spruce of Petawawa origin was found to be more vigorous than several western strains. Norway spruce has vigorous growth but is susceptible to weevil. Seeds of several strains of Norway spruce have been obtained and it is planned to test this material for adaptability to different parts of Canada, also to look for resistance to weevil if this is found. Observation plantations are planned in co-operation with the Ontario Department of Lands and Forests, Division of Reforestation. These should in time result in tree observation plots. Experiments in partial girdling and application of fertilizers to induce flowering in red pine have been started. Materials for strain tests with red pine, Austrian pine, European larch and European white birch have also been assembled. Scaffolds for pollination work have been built around two large red pines. Fifteen thousand white pine transplants have been set out in a strain-test plantation in co-operation with the Ontario Department of Lands and Forests.

In the discussion, Dr. Heimburger recommended tests with white spruce from the interior wet belt of British Columbia and similar regions in western Canada and the United States as being of promise to eastern Canada because of more sustained growth and resulting large sizes as compared with eastern strains of the same species.

Mr. Harrison mentioned that arrangements have been made to obtain microfilm records for various meteorological stations in an effort to assemble weather data for provenance tests. In this connection it was questioned to what extent is Lesser Slave Lake white spruce showing slow growth in eastern Canada also slow growing at its place of origin.

Dr. Heimburger suggested that photoperiodic response might be a factor causing slow growth of this strain when grown appreciably to the south of its native area.

274. Dr. Hunter's report

Further work in the breeding of elms for resistance to the

Dutch elm disease was reported (see Appendix "C"). One triploid white x Chinese elm seedling was obtained in 1949. Further crosses of Ulmus americana x pumila were successful in 1951. It was possible to propagate elm from softwood cuttings in a greenhouse during June after soaking them for 24 hours in a 50 ppm. solution of indolebutyric acid. The cross black currant x red currant was made for the purpose of obtaining sterile Ribes plants for work with white pine blister rust. Some seeds were obtained and have been sown.

During the discussion Mr. Holst recommended the propagation by cuttings, preferably taken from old trees of known growth form. He also mentioned a variety "Hoersholmii" from Denmark as being promising in work with resistance to Dutch elm disease and having good growth form.

Dr. Heimburger stated that possibilities for work with elm were now at hand at Maple, Ontario, since the disease had reached that area and work in selection and artificial inoculation was planned there by the Division of Forest Biology of the Science Service.

275. Mr. McCallum's report

Mr. McCallum presented a progress report on the distribution of the Dutch elm disease in eastern Canada to date (see Appendix "D"). The disease is now quite widespread in southern Ontario, especially in Essex county.

276. Discussion of the Article "A Tree breeding program for Canada" by I.C.M. Place

Since Mr. Place was not present at this meeting, a discussion of his article was not held. Mr. Holst stated that tree breeding work on a Canada-wide basis is valuable but still somewhat premature. At a later date comments on this article were received from Dr. Cram and Mr. Walker. These are enclosed as appendices "E" and "F" to serve as reference for possible further discussions of this article.

277. Status of the Associate Committee and Subcommittee

Mr. Harrison explained that the status of the Subcommittee still was indefinite but was under consideration. The Associate Committee on Forestry is being disbanded by the National Research Council with the approval of the Forestry Branch. It is expected that the Subcommittee on Forest Fire Research will be reorganized as an Associate Committee. With respect to the present Subcommittee in Forest Tree Breeding, the situation is different, but it is thought that this field of work will be brought under the aegis of the Forestry Branch. Mr. S.J. Cook could not say anything definite about this but hoped this question could be cleared up at the time of meeting of Council on March 21, 1952. It was possible that a small group could be established as an interdepartmental committee on biological research (federal). Mr. Bickerstaff suggested

that if a joint committee on research within the Federal Government were set up, the present Subcommittee could then continue as a subcommittee of this new committee.

It was decided to publish the minutes of the present meeting, and Mr. Cook promised to look after this.

NOTE BY MR. S.J. COOK:- At the meeting of the National Research Council held 21 March 1952 consideration was given to the matter of reorganizing the Forestry Committee. The following resolutions were adopted:-

(a) That the Associate Committee on Forestry be disbanded

(b) That the Dominion Forester be asked to assume responsibility for the activities carried on by the Subcommittee on Forest Tree Breeding (which he subsequently agreed to do - see letter from Mr. D.A. Macdonald to Mr. S.P. Eagleson dated 24 June 1952)

(c) That an Associate Committee on Forest Fire Protection be established under the auspices of the National Research Council to carry on the work previously done by the Subcommittee on Forest Fire Research.

278. Acquisition of plant material

Mr. Holst mentioned that eastern strains of Scotch pine and Norway spruce, not at present available from their native localities, are planted in several strain tests in Germany, Poland and Czechoslovakia. It has been possible to obtain seeds of such strains collected in plantations and further steps are being taken to obtain more materials of this kind. The successful acquisition of white pine materials from Pakistan and Japan has already been mentioned in Dr. Heimburger's report.

279. Equipment

Mr. Davis stated that the new truck-mounted extension ladder is now at Indian Head. In a letter received after the meeting by the Secretary, Dr. Hunter stated that Mr. Walker had nothing to report. The ladder was not received until late in the season and the weather conditions experienced last fall allowed no time or opportunity to use the ladder. However, the ladder will be put to use this year.

Mr. Heaney mentioned the tree-scaling ladder made of magnesium metal, now in use by Mr. Holst.

280. Membership and officers

Mr. Heaney stated the membership will depend on the status of the Associate Committee and Subcommittee if and when this will be clarified. Entomologists are at present very desirable as members because

several members are working actively on resistance to insects in their breeding materials and nearly all are faced with damages caused by insects in one way or another.

Mr. Heaney suggested that Mr. Farrar be reinstated as member of this Subcommittee.

Dr. Heimburger found it desirable to have a longer meeting once a year, rather than several short meetings, in case the agenda became too lengthy to handle during one afternoon.

Mr. Davis suggested that reports by active members on their work be distributed prior to the meetings, to allow fuller discussion at the meetings.

281. Disease Garden at Connaught Ranges

Dr. Hunter did not weed the white pine plantation in 1951 (see minute 264), but agreed to arrange for weeding during this year. Mr. McCallum agreed to ask Dr. Riley for any available data on resistance to blister rust of the white pine materials planted there, which had been obtained while the plants were growing at the N.R.C. Annex nursery. Mr. Holst agreed to prepare a report on the present status of the Disease Garden.

282. Adjournment

The meeting adjourned at about 5 p.m.

APPENDIX "A"

SUMMARY REPORT FOR 1951

Forest Nursery Station,
INDIAN HEAD, Sask.

(TREE BREEDING SECTION - by W.H. CRAM)

INTRODUCTION:

Gratifying progress in 1951 is reported for all authorized projects in plant breeding. This progress has resulted in the submission of two articles for publication in 1952, i.e. "Spruce Seed Viability" and "Parent-Seedling Characteristics and Relationships in Caragana".

Progress to date has been facilitated by the excellent services of Mr. Brack (Plotman) and by the whole-hearted co-operation of Mr. Walker (Superintendent).

With the natural expansion which follows as selections and progenies are obtained, present facilities are proving inadequate. Additional technical assistance, labour, and some stenographic help are urgently requested, in order to ensure economic use of existing plant material and more rapid progress with projects.

Loss of plant material and distortion of results, due to insects and diseases, continues to be serious. The assistance rendered by the staff of the Forest Biology Laboratory at Indian Head is greatly appreciated.

Caragana Breeding

Self-and open-fertility determinations which were made in the field for 39 selections exhibiting exceptional vigour, were seriously handicapped by a severe infestation of aphids in 1951. Interannual correlations, for the 1948 to 1951 data, suggest that 'seeds-harvested-per-flower-tripped' is a more reliable and consistent measure of self-fertility for caragana selections than that of 'pods-harvested-per-flower-tripped'! Due to the year to year variations obtained in fertility evaluations it would appear that field results must be verified under greenhouse conditions. To date, 12 selections have been identified as being self-sterile, or nearly so, and in addition

exhibit a high degree of open-fruitfulness. These selections constitute ideal material whereby combining ability may be determined in polycross plots, provided they are capable of being propagated vegetatively.

High interannual associations were evident between 'seeds-per-pod' values following self-pollination. This relationship suggests that the number of viable ovules per pod is an inherent character. Size (weight) of seed was found to bear no relationship to seed yield (seeds per pod), which indicates that size of seed may also be an inherent character of caragana selections rather than a factor conditioned by yield.

Circumstances of season and help forced postponement of the propagation of selections by softwood cuttings until July 17. Rooted cuttings were obtained for six of the twelve selections when collected on July 17th and on August 8th. Forty-two percent of those taken at the earlier date rooted as compared to 37% for the later date, while cuttings with 'heels' (of the older wood) demonstrated superior rooting (both dates). Some desirable selections failed to produce rooted cuttings. The need for an earlier start in this work is indicated. It is thought that the dry, hot weather prevailing in 1951 may have hastened maturity of the wood for some selections. Hardwood cuttings, which were collected in 1950 and planted in the field in 1951, gave unsatisfactory results, no doubt due to climatic conditions prevailing. The use of greenhouse facilities during the winter months is contemplated for the rooting of hardwood cuttings.

Field germination tests, with open-pollination seed of 12 sizes from 14 trees, demonstrated significant differences between seed-tree sources both for germination capacity and speed. The presence of a mild form of dormancy for seed from some seedtrees was suggested by differences obtained in germination speed. Seed sizes, ranging from 16 to 40 milligrams, appeared to have little, if any, influence upon germination. Greenhouse germination of seed harvested 23, 20, 16, 8 and 0 days prior to natural dehiscence of pods (i.e. maturity), was 36, 43, 68, 66, and 56% respectively. In addition, size (diameter) and weight of seed harvested at the above intervals increased significantly up to, but not beyond, 16 days prior to pod dehiscence. It would appear that viability of seed does not materially change in the last 16 days prior to dehiscence.

Vigor of 80-day open-pollination seedlings differed significantly for 16 seedtree sources. Average height of these progenies ranged from 9.7 to 13.7 cm. No relationship was evident between vigor of these seedlings and self-fertility of parental trees. Nevertheless, the most vigorous progenies were produced by two seed-trees, one being self-sterile and the other moderately self-fertile; while the least vigorous progenies were produced by seedtrees exhibiting a high degree of self-fertility as well as a moderate degree of self-tripping. It would appear that selections of the latter type should be

eliminated from a breeding program having vigor as its objective.

Viability of Spruce Seed

Large progenies are essential in order to evaluate spruce seedtrees as to their potential breeding value, especially when the economy of utilizing open-pollination seedlings is followed. It is evident from the following table why investigations into 'Spruce-Seed-Viability' have taken precedence over progeny tests.

Seedbed Performance of Non-Stratified Seed from Four Species of Spruce

(based on progeny tests initiated in 1949 with 1948 seed)

Spruce Species	Seedtrees Involved	Mean 1949 Germination	Transplants Produced (on basis of seed sown) Mean	Range
	(No.)	(%)	(%)	(%)
White	24	14.6	11.4	6-22
Black Hills	21	16.5	12.1	5-29
Norway	14	50.9	22.7	13-32
Colorado	36	57.9	45.3	18-69

Stratification of spruce seed for a period of two months in 1950 resulted in an average germination of 68% for the four species, as compared to 23% for non-stratified seed. From these results, it was evident that low seedbed germination was essentially due to seed dormancy. Work was continued in 1951 to determine the most congenial seed treatment necessary to ensure germination of spruce seed. The following results are reported:-

1. Colorado seed, harvested on August 15, 21, 26 and September 6 and stratified for 40 days, exhibited germination of 68, 95, 97 and 96% respectively, within 27 days. This suggests that Colorado seed may be harvested over a 16-day period, prior to natural opening of the cones on the trees, without loss in viability.

2. Stratification of seed from White and Black Hills spruce for 0, 30 and 60 days resulted in germination of 12, 64, and 78%, respectively,

within 19 days. These results indicate that stratification beyond 60-days may be necessary for such seed, for maximum germination.

3. Stratification of seed for 30 days resulted in a mean germination of 91% compared to 75% for non-stratified seed of Norway spruce, and 86% compared to 68% for seed of Colorado spruce. It would appear that such pre-sowing treatment ensures adequate seed germination for progeny tests of these two species.

Evaluation of Scotch Pine Seedtrees

Vigor data, for three-year-old (2/1) seedlings of Scotch pine, clearly demonstrate that differences existed between the progenies of 45 seedtrees. The average height of these progenies ranged from 17.1 ± 0.8 to 30.8 ± 0.7 cm. Seedling progenies from seedtrees within each geographic race of Scotch pine exhibited the following ranges in vigor:- for the Aberdeen race from 21.7 to 30.8 cm., for Finnish, 19.2 to 27.0 cm.; and for Russian from 17.2 to 24.6 cm. It would appear that all three races contain seedtrees capable of producing moderately vigorous progenies, while some seedtrees of the Aberdeen race produce the most vigorous seedlings. However, the relationship of vigor for seedlings to that of mature progenies remains to be determined. Thus, the final selection of the most desirable seedtrees must be postponed until mature progenies can be studied for vigor.

Rooting Capacity of Poplar Clones - (Exploratory)

The exploratory study involving rooting capacity determinations of poplar clones was continued in 1951 to verify the incomplete results obtained in 1950. However, no association was evident between the rooting capacity exhibited by 12 clones in 1950 and 1951. There appears to be evidence that differences between seasons resulted in a differential response for some clones in the two years. For instance, Northwest poplar demonstrated a rooting capacity of 79% in 1950 but only 65% in 1951, while the opposite trend was evident for the Dunlop poplar with 75% rooting in 1950 and 92% in 1951. It would appear that an accurate determination of rooting capacity should involve consideration of such factors as, maturity of the wood, compatibility of cuttings to storage, climatic and soil conditions at the time of planting, etc. Nevertheless, the data for two years suggest that the Volunteer clone is vastly superior to the Northwest clone in rooting capacity.

The relative vigor of shoots produced in the two consecutive years by cuttings from 12 clones was consistent, as indicated by a correlation value of .934. As a result it is clearly evident that two clones, Volunteer and FNS 44-52, are capable of producing growth in the first year, which is superior to that of Northwest poplar.

APPENDIX "B"

Report on Forest Tree Breeding

in 1951

C. Heimburger

As formerly, the work has been divided into 3 main projects: 1) white pine, 2)poplars and 3) arboretum. In addition work with red pine has been carried out on a small scale and additional results with induction of flowering by means of girdling in a young plantation have been obtained.

White pine. The assembling of breeding materials indicated in former reports has been continued in 1951 and the number of grafts was about the same as in 1950, namely 1979 successful grafts in the greenhouse, comprising 121 clones, besides some 200 grafts of 3 populations made on established plants outside. The bulk of the materials comprised scions collected from some plus-trees at the Petawawa Forest Experimental Station and from a plantation of Pinus Peuce in Finland. Additional scions of Pinus Peuce were collected in Rochester, N.Y., and obtained from several other places in Europe. This species is usually highly resistant to blister rust and it was considered important to establish a good collection of different biotypes for future evaluation and breeding work. Scions of several artificial species hybrids were obtained from the Institute of Forest Genetics at Placerville, Calif. Co-operation with the Northwestern Blister rust Control Project of the U.S.D.A. in Spokane was initiated and scions as well as grafts of apparently resistant western white pine from Idaho were received for testing under our conditions. A small test plot with these materials was established in the nursery. Through a contact established by Eric Gage, of our Department, during a trip to Europe in 1950, seeds of white pine free from blister rust under conditions of heavy infection in Germany were obtained in exchange for seeds of some of our resistant white pine. Through the co-operation of the Federal Department of Resources and Development and the Department of External Affairs, scions and seeds of the wild form of Pinus parvifloraz were received from the Japanese Ministry of Agriculture and Forestry. Portions of the seeds were distributed to the Institute of Forest Genetics in Placerville and to the Arnold Arboretum. The scions were grafted on natural white pine seedlings. This was done in late June when new growth already had started and would have been complete a failure under ordinary circumstances. Because of new techniques developed recently about half of the grafts took and we now have about 80 successful grafts of this promising strain. In the fall, scions were received of Pinus Griffithii (excelsa), collected from natural seedlings at an elevation of over 11,000 feet in the Himalayas, through the courtesy of the Pakistan Forest Research Institute, ✓cooperation of the Department of External Affairs and the Department of Resources and