Veredeling

165.3

Poplar breeding in the Netherlands [1]

Veredeling van populier in Nederland

R. Koster

Bosbouwproefstation

Samenvatting

Sedert 1948 wordt op het Bosbouwproefstation "De Dorschkamp" gewerkt aan de veredeling van populieren. Vooral het optreden (sedert ongeveer 1958) van een voordien in Europa onbekende bladziekte, Marssonina brunnea, deed de vraag naar nieuwe, resistente, klonen toenemen.

Dergelijke nieuwe klonen worden voornamelijk gemaakt door kunstmatige kruisingen tussen ouders behorend tot verschillende soorten. De meeste combinaties zijn die van vrouwelijke *P. deltoides* en mannelijke *P. nigra* of mannelijke *P. trichocarpa*.

P. deltoides is een Amerikaanse soort die in het oosten van de V.S. voorkomt tot New Orleans in het zuiden en noordelijk tot in ZO-Canada. Vooral herkomsten uit Michigan waren voor dit kruisingswerk van belang, maar ook vele andere herkomsten zijn met succes gebruikt. Bij P. deltoides klonen wordt vaak weerstand tegen de bladziektenroest (Melampsora larici-populina) en Marssonina aangetroffen. Daarentegen is weerstand tegen bacteriekanker tot nu toe slechts uiterst zelden aangetroffen bij deze soort.

In het westen van Canada (en een deel van de V.S.) komt *P. trichocarpa* voor, een balsempopulier met - vrij algemeen - hoge weerstand tegen Marssonina en (soms) tegen bacteriekanker.

De Europese soort *P. nigra* bezit in het algemeen een hoge weerstand tegen bacteriekanker, doch vrijwel nooit tegen bladziekten. Vooral klonen uit Nederland en Italië werden gebruikt.

Het kruisen wordt gedaan in maart en april met opgeënte bloeitakken van vrouwelijke bomen, waarvan het lange ondereind in een flesje water steekt (foto 4). Voordien is reeds stuifmeel verzameld van bloeihout van mannelijke populieren, door dat te trekken in de kas (in februari). Dit stuifmeel wordt met een penseel aangebracht op het bloeiende vrouwelijke katje binnen een voor vreemd stuifmeel hermetisch gesloten glazen ruimte in de kas. Na ongeveer twee maanden zijn de zaden rijp. Zij worden te kiemen gelegd op natte plakken turf in de kas (foto 3). Later in dezelfde zomer worden de planten opgepot en naar de koude bak overgebracht.

De eerste selectie op bladziekten, die nog dezelfde nazomer wordt uitgevoerd reduceert het aantal planten tot ongeveer 6% (vergelijk foto 6 en 7, d.w.z. de toestand in de bak voor en na deze selectie). Hoewel op deze wijze de zeer grote aantallen zaailingen snel slinken is de hoeveelheid te verwerken administratieve gegevens van dit kruisingswerk zo groot, dat zij alleen nog met de computer kunnen worden gehanteerd (aantal geproduceerde zaailingen in 1967 rond 20.000, in 1968 rond 53.500).

Nadat de planten, geproduceerd in een bepaald jaar tijdens dat jaar en de beide volgende jaren (dus drie jaar achtereen) zijn beoordeeld en geselecteerd op bladziekten, volgt de eerste (voorlopige) selectie op groei en vorm.

De op weerstand tegen bladziekten op groei en vorm geselecteerde planten worden vegetatief vermeerderd door jonge, nog onverhoute scheuteinden met twee à drie blaadjes onder nevel te laten bewortelen. Deze methode heeft het voordeel weinig werk te eisen, terwijl de geselecteerde jonge planten slechts zeer weinig behoeven te worden beschadigd. De verkregen bewortelde stekken worden gebruikt voor een drie jaar durende toetsing op gevoeligheid voor bacteriekanker. Ze worden daartoe (als eenjarige planten) kunstmatig geïnfecteerd met de ziekteverwekker van bacteriekanker, Aplanobacterium, die in reincultuur wordt gekweekt. Zeer gevoelige klonen sterven als gevolg van deze inoculatie geheel of gedeeltelijk in. Geheel resistente klonen vertonen geen enkele schade van de inoculatie. Klonen met voldoende resistentie worden in een serie houtteeltkundige proeven verder bestudeerd op hun waarde voor de praktijk.

Twee nieuwe klonen 'Dorskamp' en 'Flevo', ontstaan in 1957 door kunstmatige kruising van een ♀ P. deltoides uit Missouri en een ♂ P. nigra uit N. Italië werden in 1966 aan de praktijk ter beproeving gegeven. 'Dorskamp' is de snelste groeier van de twee, 'Flevo' groeit wel duidelijk sneller dan 'Gelrica', maar ontleent zijn waarde verder vooral aan een betere vorm en geringere gevoeligheid voor wind dan 'Dorskamp'.

1 Verschenen als bijdrage 13e zitting Internationale Populieren Commissie 23-28 september 1968 te Montreal.
Foto's: Bosbouwproefstation.

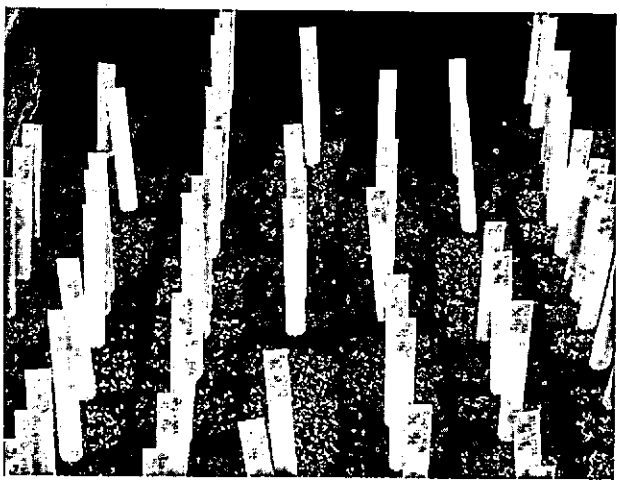
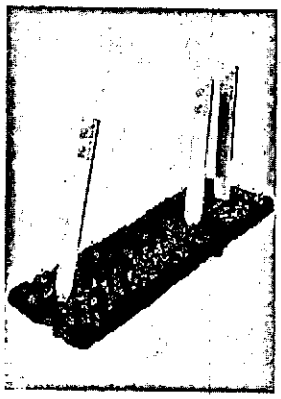


Photo 1 and 2. Poplar seed from crosses, germinating on slices of peat in the greenhouse.
Foto 1 en 2. Kieming van populierenzaad, ontstaan uit kruisingen op turfplakken in de kas.



In een vergelijkende proef in drie herhalingen te Best (N.B.) werd de verhouding van de volumeproduktie van 'Dorskamp', 'Robusta' en 'I 214' onderzocht. In ronde cijfers was deze verhouding na zes jaar (gerekend vanaf stek) als volgt: 'Robusta' : 'I 214' : 'Dorskamp' = 5,8 : 7,9 : 21,2. Dit illustreert de mogelijkheden die selectie op groei en resistentie de populierenteler kan bieden.

Summary

The paper deals with poplar breeding, carried out since 1948 at the Forest Research Station "De Dorschkamp" at Wageningen, Netherlands. New clones are bred by artificial hybridization mainly between parents belonging to the species *Populus deltoides*, *P. trichocarpa* and *P. nigra*. The damage caused by *Marssonina brunnea*, a new leaf disease in the Netherlands since approximately 10 years, has stressed the need for new clones. As a result, breeding work has been intensified during recent years.

The first selection is made at the end of the first summer when the seedlings are still in the cold frames. In 1967, 94 percent of all seedlings were rejected at this stage on account of susceptibility to leaf diseases. After two more years (in the nursery) promising clones are propagated vegetatively outdoors from leaf cuttings under continuous mist. The resulting plants are tried for susceptibility to bacterial canker. Those which prove resistant and have shown other good qualities are tried in comparative field trials on different sites.

Two new clones 'Dorskamp' and 'Flevo', both with a high resistance to leaf diseases, have been released for practical use. Both are *Populus deltoides* x *P. nigra* hybrids made in 1952. 'Dorskamp' grows extremely fast. In a 6-year old comparative field trial with three replications of 30 trees per clone (90 trees in all for each clone), the proportions of the yields of the three clones were (approximately): 'Robusta' : 'I 214' : 'Dorskamp' = 6 : 8 : 21.

Because of the increase in the number of parents and progenies, all information and results of the breeding work are being transferred from a card system to punch cards for electronic data processing.

The paper concludes with a final remark: In hybridizing with imported species a breeder should be careful to use only clones resistant to their native diseases. A sudden invasion of a new pathogen could mean that the work would have to be started all over again.

Introduction

Poplars are common in the Netherlands, both in roadside plantings and in afforestation. Until *Marssonina brunnea* invaded Europe about 10 years ago, less than a dozen clones were in common use. They were *Populus euramericana*, hybrids, with well known properties. Their results were satisfactory. When *Marssonina* attacked these poplars, their growth and vigour were greatly reduced. This had considerable economic consequences. In the areas reclaimed from the former Zuydersea, and in western Holland, many roadside plantings were damaged. They often even died. In the southern parts of the Netherlands, a cultivar like 'Marilandica' that had been used intensively as long as people could remember, suffered considerably. Because it had to be replaced, the need for new clones made itself felt more than ever before.

Artificial hybridization

Since 1948 selection and breeding of poplars has played an important part in the yearly programme of the Forest Research Station "De Dorschkamp" at Wageningen, Netherlands. After the outbreak of *Marssonina* leaf disease this work was intensified.

The main part of the work has been the hybridizing by artificial crosses of pure species, primarily ♀ *P. deltoides* x ♂ *P. nigra* and/or ♂ *P. trichocarpa*. To a smaller extent crosses have been made between ♀

and ♂ P. deltoides. Occasionally other poplar species like *P. maximowiczii* or hybrids were used. In addition to the crossing programme, open pollinated progenies from selected mother trees in pure *P. deltoides* stands or in mixed stands of *P. deltoides* and *P. trichocarpa* have been bred. Combinations between ♀ *P. nigra* and ♂ *P. deltoides* never gave any seed at all. To succeed with crosses of this type, apparently some barrier must be overcome, the nature of which is not yet known. So far recent radiation experiments to eliminate this barrier have not been effective. A short time ago trials with colchicine were started to induce polyploidy.

Species and material used in crosses

P. deltoides

Several series of provenances have been imported since 1950, mostly as seed. Among these, two provenances are remarkable for their growth, of which Michigan is the better one in yield, shape and flower production, whilst Ohio has coarser branches and stem and grows slower. Another provenance doing rather well is Illinois, though it seems to suffer to some extent from late frost. A cross between two *P. deltoides* clones imported from Vermont resulted in a fast-growing progeny also of rather coarse appearance with a high resistance to leaf diseases.

In crosses with male *P. nigra* clones from the Netherlands, female clones of the Michigan provenance gave very good results. These progenies showed a high percentage of resistance to leaf diseases. So far a few crosses between Ohio clones and *P. nigra* clones from the Netherlands gave progenies lacking this resistance. Most of the Illinois clones were more difficult partners in crossing with *P. nigra*. With P. deltoides from other provenances, however, they produced progenies rather easily. In combinations with *P. trichocarpa* they only gave offspring in a few cases. Other provenances used in crosses are Iowa, Wisconsin and Missouri. A few Missouri clones look very promising but on the whole the experience with this material is still too scanty. Only recently have some crosses been made with clones from small lots of other imported provenances (imported as seed in 1950). Of these, Nebraska, N. Dakota, Kansas and Montana have done better than Oklahoma, Louisiana and Mississippi. These last three provenances are extremely poor in growth in the Netherlands.

Some clones of *P. deltoides*, partly provenance hybrids within the species *P. deltoides*, show fast growth and good rooting capacity on fertile soils where they may outgrow good hybrids, at least during the first years. On soils of poorer quality, however, the situation is reversed.

Many clones of *P. deltoides* show a high level of resistance to leaf diseases but they seldom show a high level of resistance to bacterial canker.

Populus trichocarpa

A limited number of clones has been imported from various areas such as Canada (British Columbia) and USA (Washington, Oregon, Idaho, Montana). Some of the Oregon clones proved to be less sensitive to rust (*Melampsora larici-populina*) than the other provenances. Most clones show high resistance to *Marssonina*, however, while a few clones are even highly resistant to bacterial canker (as demonstrated in artificial inoculations with *Aplanobacterium*).

All clones so far have demonstrated very good rooting capacity from ripened wood cuttings and medium to very fast growth. Most clones showed early flushing. Progenies from crosses of ♀ *P. deltoides* x ♂ *P. trichocarpa* often have a high percentage of plants resistant to leaf diseases.

Populus nigra

Though the species occurs naturally in the Netherlands, it has become scarce because for a long time the farmers have methodically replaced *nigra* poplars with the faster-growing *P. euramericana* hybrids. However, a few hundred *P. nigra* clones have been collected, some of them of remarkable form. Several clones have been imported from other countries, of which Italy is the most important one. In most cases they grow slightly faster than the Dutch *P. nigra* and are somewhat less sensitive to rust.

New *P. nigra* clones have originated from crosses, some of them between pure Dutch *P. nigra* clones, other between Dutch and Italian *P. nigra* clones. These provenance hybrids often show faster growth than their parents. They are on the whole less sensitive to leaf diseases than their Dutch parents though by no means immune. Most Dutch *P. nigra* clones seem to be resistant to bacterial canker. All *P. nigra* clones found so far root very easily and many clones grow well on exposed sites.

As part of the effort to save the indigenous population of the Netherlands from extinction, selected clones have been planted in areas reserved for nature protection and along roads as windbreaks. These will provide breeding material for future poplar breeders.

Method of crossing and breeding

Flower branches with cut ends placed in water are forced in the greenhouse in February and early March. The pollen is collected in glass tubes and stored dry in the refrigerator at about 0° C. The next step is to graft branches with female flowerbuds. Normally bottle grafts are made on one-year old stocks of *P. 'Heidemij'* or *'Robusta'*. These stocks are rooted cuttings potted in November or December (after the

Photo 3. Transplanting newly germinated seedlings with tweezers.
Foto 3. Verspenen van op turfplakken gekiemde zaailingen met de pincet.

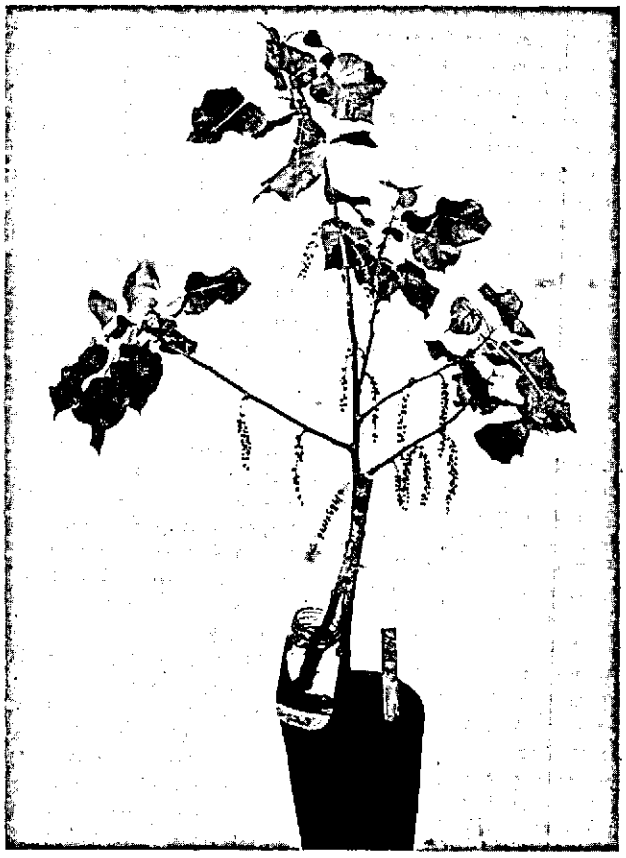


Photo 4. Poplar bottle-graft with fruits.
Foto 4. Vruchtdragende zuigent van populier.

end of the first growing season) and then immediately brought into the greenhouse. Each artificial cross of one male and one female clone is made on three separate female scions (belonging to the same clone) grafted on three different stocks to ensure a reasonable number of seed per cross.

The pollinations are made with a small brush. The greenhouse contains a series of small glass-panelled rooms. Each room is reserved exclusively for the application of the pollen of one male clone. These rooms are cooled by sucking air through them. The entering air passes through filters which prevent the passage of pollen. Flowering female clones are pollinated 3-4 times, a few hours to half a day apart, because different parts of the catkin flower successively.

Fruits ripen about six weeks to four months after pollination, depending upon the clone. The usual time is eight weeks. The seed is extracted from the embedding cotton mass with tweezers and put on wet slides of peat to germinate under cover of a glass plate or plastic sheet in the greenhouse. A few days later when the plants are about half an inch high they are transplanted into big, square pots filled with garden soil. About six weeks later each plant is potted separately and transferred to cold frames, where they stay during the remaining part of the summer.

Selection in the cold frames

At the end of their first season, the plants are still in the cold frames. Those which show more than the lightest degree of leaf diseases are rejected. This selection should be timed as late as possible because within the last 2-3 weeks before leaf fall, rust and *Marssonina* may develop on hitherto disease-free plants. The selected plants at the end of the vegetation period of 1967 amounted to six percent of the whole lot produced by artificial pollination.

Results of selection on the basis of leaf diseases in the cold frames do not diverge much from those of selection of the same plants under nursery conditions, one year later as the following experiment may show.

In 1966, at the end of the summer out of 1,273 seedlings in one of the cold frames, 318 were selected and marked as belonging to the following categories:

1	plants not showing any leaf disease	75
2	plants with an extremely light infection	26
3	plants somewhat more affected by leaf diseases	217
	Total	318

The remainder were more heavily infested with leaf diseases and not marked. About one year later in October 1967, after their first summer in the nursery, these plants were re-examined. The results can be summarized as follows:

1966 Selection on resistance to leaf diseases in cold frames at the end of first season	1966	1967		*1967* Selection on resistance to leaf diseases in the nursery at the end of second season
categories	number of plants	number of plants still living	number of plants classified without change	remaining
I Plants not showing any leaf disease	75	70	68	2 (classified as cat. III)
II Plants showing extremely light infections with leaf diseases	26	25	17	7 (classified as cat. I; these may show diseases again in coming years!)
				1 (classified as cat. III)
III Plants slightly more affected by leaf diseases	217	215	215*	0 * all were classified as cat. III or IV
Total selected	318	310	300	10
IV Plants more heavily infested with leaf diseases	955	not considered		
Total number of plants	1273			

class	percentage of resistant plants in a progeny ranging between	average percentage of each class	relative proportions of these averages
1	(>0) — 5 percent	2.5 percent	1
2	5 — 15 „	10 „	4
3	15 — 50 „	32.5 „	13
4	50 — 100 „	75 „	30

♀ clones \ ♂ clones	22 *P. nigra* clones found in the Netherlands	11 *P. nigra* clones received from Italy	6 *P. nigra* provenance hybrids the Netherlands x Italy	1 clone *P. nigra* *'Italica'*	2 *P. trichocarpa* clones
a 15 ♀ *P. delt.* clones (provenance Michigan)	31 crosses 18 percent	6 crosses 6 percent		7 crosses 14 percent	
b 24 ♀ *P. delt.* clones (originating from one cross of *P. delt.* Iowa x *P. delt.* Ontario)	11 crosses 22 percent	9 crosses 53 percent	3 crosses 4 percent	6 crosses 28 percent	6 crosses 50 percent
c 12 ♀ *P. delt.* clones (second generation of clones out of the cross mentioned under b	8 crosses 8 percent	5 crosses 15 percent		5 crosses 11 percent	3 crosses 60 percent

Conclusion

A first selection on leaf diseases in the cold frames just before leaf fall is an effective, acceptable and practical way of rejecting the majority of the plants with high susceptibility to these diseases.

Production of seedlings; administration

In 1967, 90 combinations were made on 270 female scions. Of these, 63 combinations were successful. They resulted in 19,747 plants which were transplanted into the cold frames. The average result of these 90 combinations amounted to 219 plants per combination.

In 1968, 125 combinations were made on 375 female scions. Of these, 115 were successful. They yielded 53.500 plants. This means an average of 428 plants per combination, the highest number ever attained so far.

In previous years, the normal averages ranged between 100 and 150 plants per combination, sometimes even lower. The higher averages in the last two years can be ascribed to such circumstances as:

1 In earlier crosses a great number of clones had to be tried as parents for the first time. Those which showed bad results were eliminated for use in the 1967 and 1968 crossing programmes.

2 From the results of crosses from previous years exceptionally well-combining parents were singled out and given preference for the crossing programmes of 1967 and 1968.

3 With young trees, flowering for the first time, the proportion of failures in crosses is higher than in crosses with older trees.

4 Probably on account of the unusually warm summer of 1967, the seed production of poplars in the Netherlands in 1968 was unusually high.

The administration of the clones used in the crosses and their results made these data easily available, for the first time in 1967. In 1966 a card system containing two cards for every clone was started; one for observations on its vegetative propagation, one for the results of crosses. The number of cards grew so fast, however, that by summer 1968 it could not be handled easily enough. Therefore, the system is being transformed into a punch card system for the computer.

Results in resistance to leaf diseases

Crosses can be evaluated on a basis of the percentage of resistant plants produced in the progeny. (For practical reasons no difference is made between absolute resistance, immunity, and the lightest degree of susceptibility, as shown by plants where only one or very few scattered spots of leaf diseases can be found just before leaf fall). To represent a more general picture, the parents can be gathered into groups according to, e.g. provenance or origin. The total result, in terms of percentages of resistant plants in the progenies of all crosses made between members of these groups, can be considered a measure of the success obtained in combining these groups. To this end, percentages of resistant plants found in each progeny were classified as follows:

Comparative trial at Best, Netherlands, planted 1961 with 1-year old plants

Clone	'Robusta'			'I 214'			'Dorskamp'		
Winter of measurement	1966/67		67/68	1966/67		67/68	1966/67		67/68
Means per plot (of 30 trees)	height (m)	basal area (cm^2)	basal area (cm^2)	height (m)	basal area (cm^2)	basal area (cm^2)	height (m)	basal area (cm^2)	basal area (cm^2)
first plot	7.9	74	102	9.2	93	122	10.3	167	230
second plot	8.2	72	101	8.5	65	86	10.8	181	245
third plot	7.9	72	105	9.7	99	130	11.9	230	308
total mean	8.0	73	103	9.2	86	113	11.0	193	261
Product: total mean basal area x total mean height (for 1966/67)	584.0			791.2			2123.0		

To evaluate combinations of groups, a scoring system is used which can be best explained by giving an example. In a number of crosses the best result that could be obtained would be that all (e.g. 10) crosses gave progenies of class 4 (with the highest percentage of resistant plants). Then these 10 crosses would score (using the relative proportions in the last column): 10 x 30 = 300 points. Now if the actual results will be that out of these 10 crosses, two progenies are without resistant plants and the other eight

Photo 5. Inside view of one of the greenhouses. Left: bottlegrafts of poplar. Right: young transplants in square pots.
Foto 5. In de kas: links zuigenten, rechts vierkante bakken met verspeende zaailingen.

progenies are divided equally throughout the four classes, the score of these 10 crosses will be: 0 + 2 + 8 + 26 + 60 = 96, or, in relation to the highest possible score,

$$\frac{96}{300} = 32 \text{ percent.}$$

In accordance with this method, the results of the crosses made between clones belonging to the different groups are represented by their scores as follows: (only combinations represented by more than two crosses are considered; crosses not giving any progeny are not taken into account).

High scores are obtained by combinations with *P. trichocarpa*. Also the combinations of the clones mentioned under b) and Italian *P. nigra* gave a high score. Of course, this evaluation of results of crosses is not meant as a genetical interpretation. It does not pretend to be more than an example of differences in resistance as they have been found.

Subsequent selection; vegetative propagation

During the first three years of their life, selected seedlings are examined yearly, especially shortly before leaf fall, for symptoms of leaf diseases. If their resistance is considered sufficient and other properties (growth, form etc.) are satisfactory, they are propagated vegetatively.

For the usual methods of vegetative propagation (especially with ripened wood cuttings and to a lesser extent with grafts) these 3-year old trees have to be cut back severely. This damages them seriously, making them unfit for a few years for further observations of growth and form. Also, grafting has the disadvantage of being a time and labour consuming method in early spring, a period of distinct shortness of labour with tree breeders.

For these reasons young trees are propagated by taking the tops of the current year's growth of young shoots. These tops with two or three leaves are placed in open frames in a mixture of sand and peat. The frames are kept under continuous mist during the day. At night they are covered with a lattice. The method was developed and described[1] for *P. nigra* and different species of white poplars especially for *P. canescens*, a species that cannot be grown from ripened wood cuttings.

A publication dealing with this method and its results if applied to *Aigeiros* and *Tacamahaca* poplars, is offered to the Session in Montreal under the title: "Outdoor propagation of *P. deltoides*, balsam poplars and hybrids from leaf cuttings" by R. Koster.

Plants, thus obtained from a new clone, serve two purposes: 1 tests for susceptibility to bacterial canker; 2 further observations concerning leaf diseases, growth, form and other characteristics, e.g. time of flushing and leaf fall, resistance to drought, wind, insects, etc.

Clones which have successfully passed the canker test are grown in comparative trials on different sites. One should bear in mind that these clones were selected in their seedling stage. Their capacity to grow from ripened wood cuttings might be different

1 Koster R. and A. van Wijk: 1963. Propagation of poplars by softwood cuttings out of doors. Ned. Bosb. Tijdschr. 35 (12): 464-469; Korte Mededeling Bosbouwproefstation Wageningen, nr. 60. (The words "softwood" and "leaf cuttings" are used for the same kind of cuttings).

Photo 6 and 7. Cold frame with young plants before (6) and after (7) selection (at the end of the first summer).

Foto 6 en 7. Koude bak met populieren aan het einde van de eerste zomer: vóór selectie (6), na selectie (7).

in comparison to their seedling growth. This capacity should be tried as soon as material for these cuttings can be obtained without harm to the selection programme.

Bacterial canker

Susceptibility to bacterial canker is tested by the phytopathological section of the Forest Research Station "De Dorschkamp". New clones are inoculated with a suspension of *Aplanobacterium sp.* In these tests, 10 one-year old plants are inoculated, each one in two different places about 5 to 10 inches apart. The reactions of clones of different susceptibility observed one year later vary between 1 dieback a large part of the plant (in casses of high susceptibility) 2 a wound that may, or may not, be overgrown by surrounding callus (in intermediate cases) and 3 no reaction whatsoever (in cases of extreme resistance to the disease). So far, the interpretation of intermediate susceptibility poses problems. Clones which show comparable levels of intermediate susceptibility when inoculated may vary strongly in resistance under natural conditions.

With a well known cultivar like 'Robusta', bacterial canker under natural conditions is extremely rare. Still, according to its reaction upon inoculation, it should be classified as rather susceptible. On the other hand, the two opposite extremes in reaction after inoculation, high resistance versus high susceptibility, so far tally with observations made under natural conditions.

New clones: 'Dorskamp' and 'Flevo'

Of course, new resistant clones should be tested for a long time before they can be released for use in forestry practice. This, the breeder's point of view, clashes to some extent with the ideas of foresters, whose choice of existing cultivars is restricted to material all highly susceptible to a disease such as *Marssonina* which suddenly became common.

As a result of this difference of opinion, two new clones were released by the Forest Research Station "De Dorschkamp" in 1966. Both were hybrids made by an artificial cross in 1952 between a ♀ *P. deltoides* from Missouri and a ♂ *P. nigra* from N. Italy. One, named 'Dorskamp', is an extremely fast-growing clone, outgrowing a clone renowned for its growth, such as 'I 214' in the Netherlands. It has a slightly undulating stem and is less wind-resistant than the other, 'Flevo', a clone with a very straight stem. 'Flevo' can be used on more exposed sites. It grows more slowly than 'Dorskamp' but is faster than the best growing older cultivar 'Gelrica'.

Both new clones are highly resistant to leaf diseases bur their resistance to bacterial canker after inoculation is of an intermediate level, comparable to that of 'Robusta'. The future will show whether they will play an important role in forestry in the Netherlands.

Yield of 'Dorskamp'

One of the trials in a poplar-growing area at Best in the southern part of the Netherlands, shows the yield of the new clone 'Dorskamp' in comparison to 'Robusta' and 'I 214'. The trial was planted in 1961 with one-year old plants. Each of these three clones is represented in 3 replications of a plot of 30 trees, in all 90 trees for each clone. Planting distance was 4 m. The trees were measured yearly. Heights and diameters were measured for the last time in winter 1966/67. Because the increase in height made such measurements very time-consuming, only diameters were measured after that time. From the diameters the basal area at breast height was calculated. The results are given below. As a measure for comparison of yields the product of basal area x height is calculated for each of the three clones.

Hopes and anxieties

Though an experienced breeder's philosophy may be reflected in the expression: "a breeder hopes much but he expects nothing", this should only apply to the positive side of his profession. As to an aspect of the negative side, a possible introduction of a new disease, he should hope for the best, yet be prepared for the worst.

As happened with *Marssonina brunnea*, other diseases might be imported into or arise in Europe in the future, dealing a fatal blow to existing plantations and rendering valueless the results of prior plant breeding. It is a measure of common-sense that breeders should try to start from material showing the highest possible resistance to those diseases that occur in their natural habitat. For example, when *P. deltoides* is used as one of the parents for hybridizing, the choice of *P. deltoides* should be confined to clones with the lowest possible susceptibility to their native diseases. To this end much international cooperation will be necessary.

Koninklijke Nederlandse Bosbouw Vereniging

De 43ste voorjaarsbijeenkomst

De voorjaarsbijeenkomst zal dit keer worden gehouden op donderdag en vrijdag 8 en 9 mei 1969. Noteert u dit alvast in uw agenda: De bijeenkomst zal plaats vinden in Zeeland waar de Braakman, het Veerse Meer en Walcheren bezocht zullen worden. Speciale aandacht zal worden besteed aan de houtteeltkundige aspecten van de bebossing van jonge mariene gronden, terwijl daarnaast de recreatieve en landschappelijke functie van de bebossingen in Zeeland zal worden beschouwd.