T. Pl.-ziekten 68 (1962): 289–291

APLANOBACTERIUM POPULI, THE CAUSE OF BACTERIAL CANKER OF POPLAR[1]

Met een samenvatting:
De bacteriekanker van de populier, veroorzaakt door Aplanobacterium populi

BY

A. DE LANGE and L. C. P. KERLING
Phytopathologisch Laboratorium "Willie Commelin Scholten", Baarn

INTRODUCTION

A typical symptom of the bacterial canker of poplars is the viscous exudate oozing out of cracks present in cankers and branches of diseased trees. It has been shown by KONING (1937) that the exudate is highly virulent. Susceptible trees developed true cankers after inoculation with the slimy substance, from which *Pseudomonas rimaefaciens* Koning could be isolated. This bacterium was considered to be the causal organism, though the symptoms which it provoked in the trees were different from those occurring after inoculation with the natural exudate. Later, among others, SABET & DOWSON (1952) tried to discover the real pathogen. They isolated a bacterium which they called a forma specialis of *Pseudomonas syringae* v. Hall. It induced canker formation, though only when inoculations were performed with bacteria suspended in sterile filtrate of the exudate. When repeating these experiments VAN DEN ENDE (1957) could not confirm these results, as in only a few cases did cankers appear. Most wounds made by inoculation healed.

It is the merit of RIDÉ (1958) to have finally succeeded in isolating a bacterium which causes cankers wholly similar to those found in the field or obtained after inoculation with exudate. The pathogen, *Aplanobacterium populi* Ridé, could be isolated from cankers in different seasons. Inoculation of fresh leaf scars in summer or autumn resulted in canker formation simultaneously with bud development in the following spring.

EXPERIMENTS

By the courteous help of Mr. RIDÉ we were able to isolate bacteria from the translucent centres present in a canker at the border of diseased and healthy tissue. In a first attempt three isolates were obtained from a canker of *Populus candicans* Ait. in spring 1961. Four months old cuttings of the same species showed canker development six weeks after bacteria had been introduced into a wound. The cankers increased in size during the following summer and they resumed growth in spring 1962. Unfortunately the bacteria kept *in vitro* on agar died after they were left without subculturing for six weeks. Later on subculturing was done weekly, and moreover cultures were preserved in lyophilized condition. Renewed isolation resulted in 12 strains from which two originated from the cankers described above. Twelve small root-cuttings of *P. candicans*,

[1] Accepted for publication 28 August, 1962.

seven months old, were inoculated with four of these strains on October 18th 1961. The strains had been isolated one week before. With a sterile scalpel bacteria were scraped from an agar culture and put onto newly made leaf scars. For this purpose one, two or three leaves of each plant had been removed; the petioles loosened easily. After inoculation the scars were left uncovered. Control plants were treated with water in a similar way. All plants were left in the open during autumn and winter. A first set of six inoculated and six control plants were brought into the glasshouse on March 1st 1962; a second set of six inoculated and four control plants followed on March 28th. At a temperature of 18 °C bud development started quickly. In the first set swellings of the inoculated nodes became visible after about two weeks. Cracks appeared in the cortex. Typical small cankers developed only 23 days after exposure of the plants to the higher temperature (fig. 1). The inoculated plants of the second set showed symptoms only seven days after the plants were brought into the glasshouse. After about 15 days cracks became visible in the swollen nodes. Bacteria could be isolated from these cankers. Control plants did not show any symptom of disease.

IDENTIFICATION

The strains originally isolated from cankers and used for inoculation seemed identical with those re-isolated. According to KOCH's postulates it has been proved that the isolated bacterium is the causal pathogen of bacterial canker of poplars.

No difference in properties could be detected between a strain isolated by RIDÉ in France and strains isolated in the Netherlands, so the latter must be considered identical with *Aplanobacterium populi* Ridé.

TESTING OF POPLAR HYBRIDS IN THE FIELD

The possibility of growing the causal pathogen of the bacterial canker of poplar *in vitro* opens new prospects for testing the resistance of poplar hybrids to the disease. Up till now exudate has been gathered from diseased trees of *P. trichocarpa* Torrey et Gray. In some years, depending on the weather conditions in spring, exudate was scarce and the quantity collected insufficient for testing. In spring 1962 some 300 trees were inoculated with exudate and also with bacteria grown *in vitro*. The results obtained from both treatments will be compared. Availability of bacteria grown *in vitro* would allow great improvement of the inoculation method used in the field.

SUMMARY

From cankers of *Populus candicans* Ait. in the Netherlands a bacterium was isolated which was identical with *Aplanobacterium populi* Ridé, the causal pathogen of bacterial canker of poplars. Cuttings of *P. candicans* inoculated with bacteria through freshly made leaf scars showed typical symptoms of the disease.

SAMENVATTING

Hoewel reeds door KONING (1937) bacteriestammen verkregen werden uit

kankers van populieren, kon pas in 1958 RIDÉ met zekerheid de verwekker van de ziekte isoleren. Hij beschreef deze bacterie als *Aplanobacterium populi.*

Identieke bacteriestammen werden in Nederland uit populierekankers verkregen. Met een viertal isolaties werden inoculaties verricht. Daartoe werden in oktober 1961 bladeren afgetrokken van zeven maanden oude stekken van *Populus candicans* Ait. Bacteriën werden op de verse littekens gebracht. De planten bleven gedurende de winter buiten; in het volgende voorjaar werden zij in een kas bij ongeveer 18 °C geplaatst. Reeds na zeven dagen traden de eerste symptomen van de bacteriekanker op, gelijktijdig met het uitlopen van de knoppen (zie fig. 1). Bacteriestammen uit deze kankers geïsoleerd bleken identiek met de oorspronkelijke.

Tot dusver wordt voor het toetsen van populieresoorten en -hybriden op resistentie tegen de bacteriekanker het infectieuze exudaat gebruikt, dat niet steeds gemakkelijk te vinden is. De mogelijkheid de ziekteverwekker in reincultuur te kweken biedt goede vooruitzichten voor het toetsen.

ACKNOWLEDGEMENTS

The authors are greatly indebted to Mr. M. RIDÉ for his kind help and advice and to Dr. J. RISHBETH for correcting the English text.

REFERENCES

ENDE, G. VAN DEN, – 1957. Het onderzoek over de populierenkanker, veroorzaakt door Pseudomonas syringae v. Hall f. sp. populae Sabet. Meded. Landb. Hogesch. Gent 22: 527–533.

KONING, H. C., – 1937. The bacterial canker of poplars. Meded. Phytopath. Lab. W. C. Scholten 14: 3–42.

RIDÉ, M., – 1958. Sur l'étiologie du chancre suintant du peuplier. C. R. Acad. Sciences 246: 2795–2798.

SABET, K. A. & W. J. DOWSON, – 1952. Studies in the bacterial die-back and canker disease of poplar I. The disease and its cause. Ann. appl. Biol. 39: 609–616.