INFLUENCE OF AGRICULTURAL CROPS ON THE ACTINOMYCETES FLORA IN SOIL

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SUMMARY

The influence of various crops on the actinomycetes flora was studied in different soil types. The influence of soil types on the numbers and species appeared to be more important than that of the crop grown. However, the crop did influence the actinomycetes, especially in the newly reclaimed soil of Oostelijk Flevoland. There it was found that when sugar beets had been grown the number of actinomycetes decreased; this was especially the case with the frequency of *Streptomyces scabies*. The actinomycetes flora of the rhizoplane differs from that of the rhizosphere.

INTRODUCTION

In recent years much research has been carried out on the activity of the microflora of soils, with special attention to bacteria and fungi. At the beginning the research was restricted to the determination of species and their numbers in certain soils. As more information became available, changes in microflora under the influence of physical factors like pH, temperature and humidity were studied, and recently also biological factors, such as crop rotation. The publication of Domsch *et al.* is an example of this for fungi. A more or less forgotten group of the soil microflora is that of the actinomycetes.

During and after the last war interest in the actinomycetes and their antibiotic action on other micro-organisms developed, and the production of antibiotics has drawn still more attention to them. For a long time, however, the difficulties of classification, especially of the important genus *Streptomyces*, has seriously handicapped research on the activity of this aspect of soil microflora and there have been very few detailed analyses of the actinomycetes flora. For the most part these have been restricted to the determination of the
number of actinomycetes; when the analysis went further the streptomycetes were subdivided into larger groups.

Various systems of classification have been proposed but up till now none of them has been generally accepted. Williams therefore says with regret, 'Thus the ecologist is faced with a bewildering choice if he wishes to identify his isolates.'

At the moment an international working group (International Streptomycetes Project) is trying to describe all the species in such a way that others besides taxonomists can also work with the descriptions. Various workers have studied the actinomycetes flora in soil, although only little is known about the influence of any given crop on its composition. Rhem found that seven years of consecutive growth of barley altered the actinomycetes flora. We ourselves have tried to learn more about the alterations and shiftings which occur in the actinomycetes flora under the influence of the growth of a number of agricultural crops; we have paid special attention to the part played by the *Streptomycetes* species. The rhizosphere as well as the rhizoplane of the crops has been analyzed.

**MATERIAL AND METHODS**

In the greenhouse the crops alfalfa and wheat were grown in pots (diameter 26 cm, height 22 cm) on four soil types (two clay soils and two sandy soils). After three months the above-ground parts of the crops were removed and the roots and stubble were mixed with the soil. The clay soils were deposits from the Rhine; those collected at Wageningen had a 65% content of particles < 20 μm, those at Oisterbeek, 18%. The sandy soils came from Wageningen and from an area in the Noord Oost Polder, with a humus content of 3.3% for Wageningen and 1.5% for the Noord Oost Polder. Soil samples for the determination of actinomycetes were taken 6 and 18 weeks after the stubble had been mixed with the soil.

Also investigated were the actinomycetes flora from soil samples taken from Plant Protection Service crop rotation fields on marine clay soils in Oostelijk Flevoland, the Noord Oost Polder and near Uithuizen, in the province of Groningen. Samples were taken only from plots on which the same crops were grown every year, viz. potato, beet, grass and wheat. On these experimental fields grass was always sown in the spring and ploughed under in the autumn. The leaves of the beets were always removed from the filed. The experimental field in Oostelijk Flevoland started immediately after the Polder had been reclaimed. The clay content (particles < 20 μm) of the soils in Oostelijk Flevoland was 8–10%, in Uithuizen 15–18% and in the Noord Oost Polder 30–35%. The crops for these experiments had been grown for six consecutive years before the first soil sampling took place. The soil in Ooste-