

## Top wilting in asparagus.

J. M. M. VAN BAKEL<sup>1</sup> AND JOSEPHINA J. A. KERSTENS

Institute of Phytopathological Research (I.P.O.), Wageningen and Research Station for Vegetable growing in the open, Alkmaar, the Netherlands

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### Abstract

Wilting and dying off of young shoots of the 'second flush' of asparagus are typical symptoms of one of the soil-borne diseases of this crop. Fungi could not be isolated from these shoots. A positive correlation was found between an increase of the pH-value of the soil and the occurrence of 'top-wilting'.

### Introduction

One of the soil-borne diseases in asparagus (*Asparagus officinalis* L.) is characterized by wilting and dying off of young shoots. This disorder was earlier described as top wilting (van Bakel and Kerstens, 1970). Symptoms can be observed in young shoots which appear in July and August, the so-called 'second flush'. The first symptoms are wilting of the tips of the spear and the young laterals, followed in a few hours by dying off of these tips, which then turn black, while the stem tissue shrivels (Fig. 1). Sometimes a shoot recovers but the presence of a typical S curve in the mature stem indicates that wilting had occurred earlier (Fig. 2). It also can happen that only a few laterals grow out. However, usually the shoots die off and remain as skeletons on the field. This top wilting is most serious in young, vigorous growing asparagus crops, especially in the first three years after planting. Very often the dead stems are later on infected by *Botrytis cinerea*, by *Fusarium culmorum* or by both.

In the literature little is known about the cause of this disease. Van de Vliet (1955) and Kempenaers (1961) ascribe it to infection by a form of *Fusarium oxysporum*. De Leeuw (1965) considers shortage of boron the cause of the disorder. Experiments to test this possibility were carried out in co-operation with Dr. Ir. K. W. Smilde of the Institute for Soil Fertility at Groningen. No correlation between Boron and top wilting could be observed (in press). From glasshouse irrigation experiments, Ellison (1956) concludes that top wilting ('dieback') is caused by a lack of water in a critical period in the development of the plants. The purpose of our investigations was to get a better understanding of this phenomenon and of its significance in the whole complex of soil-borne diseases of asparagus.

### Material and methods

In summer, samples of stems showing top wilting symptoms were taken from 20

<sup>1</sup> Stationed at the Research Station for Vegetable growing in the open, Alkmaar.



Fig. 1. Top wilting  
Fig. 1. Topverwelking

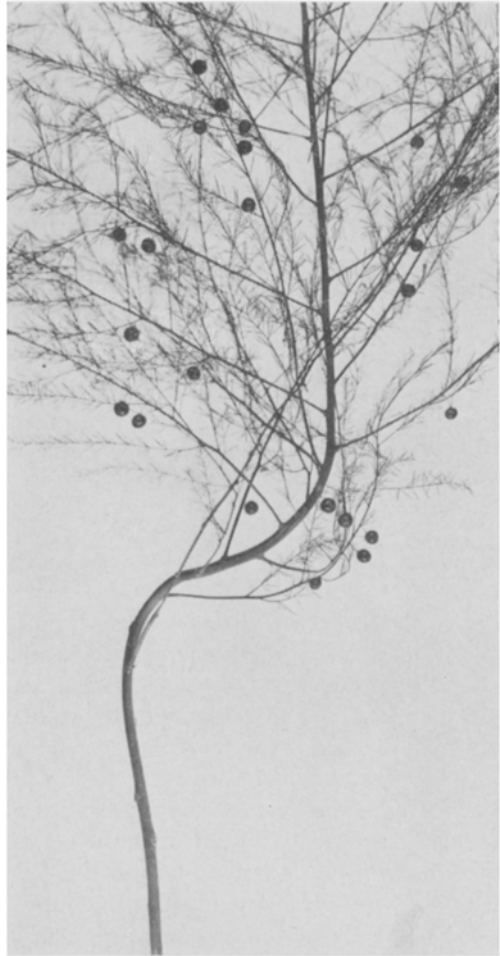


Fig. 2. Mature stem recovered from topwilting  
Fig. 2. Uitgegroeide aspergestengel, die zich hersteld heeft van topverwelking

different fields. Although the stems did not show any visible signs of infection by fungi, isolations were made as described earlier (van Bakel and Kerstens, 1970). Special attention was paid to the occurrence of *Fusarium oxysporum* f. sp. *asparagi* Cohen, the causal organism of foot rot in asparagus. Since asparagus is grown in sandy soils, it could very well be, as suggested by Ellison (1956), that shortage of water plays an important role in top wilting. Therefore, during the growing period soil samples were taken from four asparagus fields in 1967, 1968 and 1969. These samples were taken at intervals of 14 days at various depths between 25 and 60 cm below soil level, as this is the region where most of the roots are present (Franken and Roorda van Eysinga, 1958). At a given depth, four identical cylinders of soil per sample were taken. Soil samples were dried at 105°C for two days, the water content was deter-

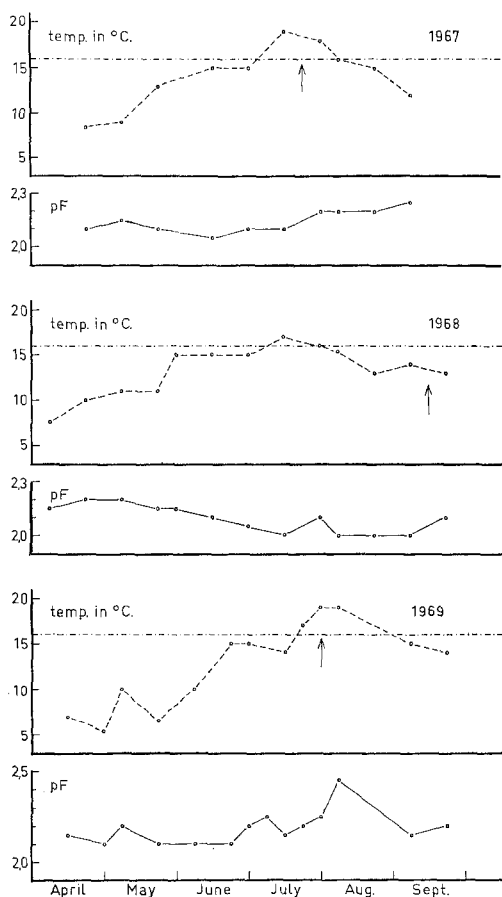


Fig. 3. Various data about measurement of temperature and determination of pF value. In the area above the broken line shoots of the second flush start growing. The occurrence of top wilting is indicated by an arrow.

*Fig. 3. Gegevens omtrent de temperatuurmetingen en pF-bepalingen. In het gedeelte boven de streeplijn beginnen de stengels van het tweede schot te groeien. Het optreden van top-verwelking is aangegeven met een pijl.*

mined by weighing the samples before and after drying. With a standard pF curve of this soil, obtained from the Soil Survey Institute at Wageningen, the figures for the water contents were converted into pF values. Besides the water content of the soil, the temperature plays an important role in the growth of the spears (Keuls and Post, 1956). So soil temperatures were measured 25 cm below soil level, at the position of the rootstocks.

## Results

The various figures for soil temperatures and pF values of the soil are given in Fig. 3.

From field observations it appeared, that young shoots from the second flush start growing at a soil temperature of about 16°C. Subsequently, in 1967 and 1969 young shoots appeared in the first and in the third week of July, respectively. Top wilting occurred 10 to 14 days later, as indicated by arrows in Fig. 3. In these two years top wilting symptoms developed at a time of increasing pF values. In 1968 soil temperatures remained low, due to very unfavourable wheather conditions. Young shoots of the second flush were present in the second week of September. Although top wilting

was much less than in 1967 and 1969, some symptoms developed in the second and third weeks of September. At that time a slight increase in the pF value was measured.

No fungi were isolated from stems showing symptoms of top wilting, neither from the top-wilted parts, nor from the basal portion.

## Discussion

As no fungi were isolated from stems showing symptoms of top wilting and in view of the results shown in Fig. 3, it is evident that a strong correlation exists between the water content of the soil and the appearance of top wilting in young shoots in summer. This might mean, that this dying off of young shoots is due to water shortage at the time of full growth of these parts of the plant as was suggested by Ellison (1956). At that time weather conditions can be such that the plants are losing much water by transpiration. Such weather conditions existed in 1967 and 1969 and to a smaller extent in 1968. When the soil is comparatively dry, the water uptake cannot be sufficient, resulting in a wilting of the weaker parts of the plant i.e. the young, fast growing shoots. In the whole complex of soil-borne diseases, top wilting seems to be the only recognised so far that is not caused by fungi, but might be due to shortage of water at a critical period of plant growth.

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## Samenvatting

### *Topverwelking in asperge*

Een van de ziekten van asperge is topverwelking, waarbij de stengeltoppen van jonge scheuten vrij plotseling verwelken, en vervolgens de gehele stengel afsterft. Dit komt vooral voor in jonge stengels van het zogenoemde tweede schot in juli en augustus. Er werd een positieve correlatie gevonden tussen het optreden van dit verschijnsel en het oplopen van de pF curve (Fig. 3). Schimmels konden uit juist verwelkte stengels niet geïsoleerd worden.

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### **Address**

Proefstation voor de groenteteelt in de volle grond in Nederland, Postbus 266, Alkmaar, Nederland.