

KORTE MEDEDELING
ELECTRON MICROSCOPICAL INVESTIGATIONS OF
MOSAIC DISEASED WHEAT PLANTS FOUND IN ITALY¹

*Met een samenvatting: Elektronenmicroscopisch onderzoek van in Italië gevonden
mozaïekzieke tarweplanten*

BY

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INTRODUCTION

For some years past a mosaic disease of wheat (*Triticum vulgare* L.) has been constated at several places in the province of Brescia and must probably be attributed to a virus (GRANCINI, 1959). This year the same author has also found the disease in the province of Bergamo. In the field this disease occurs generally in larger or smaller patches.

In recently published papers a mosaic disease is mentioned again from Voghera (CORTE, 1960) and from the provinces Treviso and Bologna (CANOVA & QUAGLIA, 1960) but no decisive answer is given concerning its nature. Probably the disease is spread over the whole of North Italy. It can be assumed that in all the above mentioned cases we have to do with the same disease.

The present authors have investigated diseased wheat material with the aid of the electron microscope in order to ascertain whether virus is involved or not.

MATERIALS AND METHODS

For the first experiment leaves of mosaic diseased wheat plants were sent from Bergamo to Wageningen, where an attempt was made to obtain preparations by applying the "dipping method" (BRANDES, 1957).

Since the material was dried out, it was necessary to moisten it with a few drops of water before treating it according to the method mentioned above. In the second experiment all preparations were made at Bergamo, again using the "dipping method", and afterwards sent to Wageningen. We examined the preparations of both experiments with an electromagnetic electron microscope (Philips EM 100) at an electron optical magnification of 2,000. The measurements were made at a total magnification of 128,000 and the particle lengths divided into classes of 25 m μ .

RESULTS

In all preparations of diseased leaf material rod-shaped particles were found (Fig. 1). These particles were absent from healthy plants. The frequency diagrams of the lengths of the particles show that the main group of particles has a length of 300 m μ (Fig. 2).

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In experiment 1, where 51 % of the counted particles had a length of 300 m μ , the scatter over the whole length scale was greater than in experiment 2 where 62 % belong to the 300 m μ category.

Number of particles
Aantal deeltjes

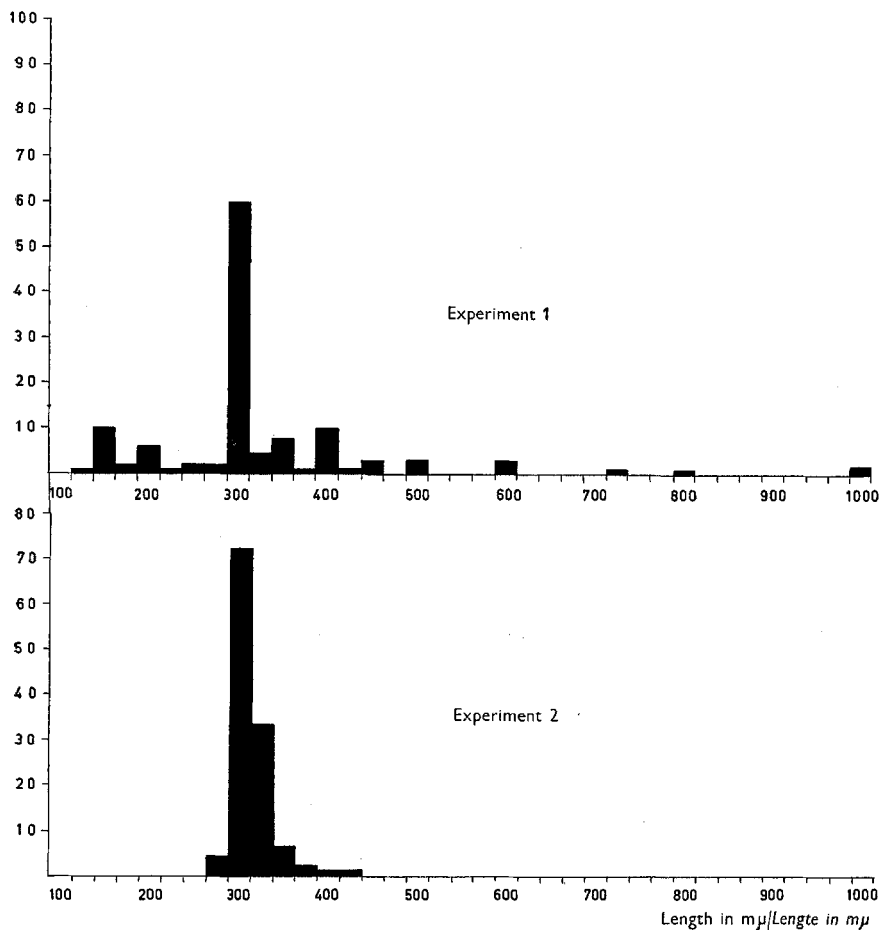


Fig. 2. Frequency diagrams of particle lengths.
Frequentie-diagrammen van de lengten der deeltjes.

DISCUSSION

It is evident from the electron microscopical investigations that there is a virus in the diseased wheat plants. A relation between this virus and the well-known cereal viruses, as described in the survey by KLINKOWSKY & KREUTZBERG (1958), could not be established since particle sizes have not yet been determined for all these cereal viruses.

The cereal viruses with known dimensions have lengths which differ from that observed in our experiments with the unidentified mosaic disease of wheat. In the literature the length of Barley stripe mosaic virus is given as 150–180 m μ .



FIG. 1. Virus particles in preparations from diseased wheat plants.
Magnification: $\times 10,000$; palladium-shadowed.
Photograph Physico-Technical Service for Agriculture, Wageningen.
Virusdeeltjes in preparaten afkomstig van zieke tarweplanten.
Vergroting $10.000 \times$; geschaduwd met palladium.
Foto Stichting Landbouw Fysisch-Technische Dienst, Wageningen.

(SHALLA, 1959) and 126 m μ (BRANDES, 1959), of Barley false-stripe virus 130 m μ (GOLD, SUNESON, HOUSTON & OSWALD, 1954), of wheat streak mosaic virus 670 m μ (GOLD, HOUSTON & OSWALD, 1953), 650 m μ (BRAKKE & STAPLES, 1958) and 702 m μ (BRANDES, 1959) and of oat red leaf virus 150 m μ (THORNBERRY, VATTER & HICKMAN, 1953).

For the wheat mosaic virus found in the U.S.A., SMITH (1957) reports a length of 400-700 m μ , in contrast to THORNBERRY et al. (1957) who found a length of 280 m μ for a virus from mosaic diseased wheat plants.

Consequently it might be possible that there exists a resemblance between this wheat mosaic virus from the U.S.A. and the unidentified wheat virus from Italy. However, THORNBERRY et al. also detected in the same object particles that appeared to be spherical with a diameter of 40 m μ .

It must be taken into account that these authors obtained their preparations by purification by means of ultra centrifugation, whereas ours were prepared according to the "dipping method".

Up to the present we have not succeeded in infecting healthy wheat plants by mechanical inoculation with carborundum powder and we have not yet been able to decide whether the virus is soil-transmissible or not.

SUMMARY

For some years past at several places in the province of Brescia a mosaic disease of wheat has been detected which probably must be attributed to a virus (GRANCINI, 1959). Presumably the same disease has recently been constatated in other provinces of North Italy.

Electron microscopical study of diseased wheat leaves showed that the preparations which were obtained with the "dipping method" of BRANDES (1957) all contained rod-shaped virus particles with a length of 300 m μ . These particles were absent from healthy plants. Whether or not this virus is directly responsible for the mosaic disease could not be established, since we did not succeed in transmitting the virus artificially.

SAMENVATTING

Sedert enige jaren wordt op verschillende plaatsen in de provincie Brescia een mozaïekziekte bij de tarwe gevonden, waarvan de oorzaak waarschijnlijk aan een virus moet worden toegeschreven (GRANCINI, 1959).

Bij elektronenmicroscopisch onderzoek van zieke bladeren is gevonden, dat de preparaten, welke met de „doop-methode” van BRANDES (1957) verkregen waren, alle staafvormige virusdeeltjes ter lengte van 300 m μ bevatten (fig. 1). In preparaten van gezond bladmateriaal kwamen deze deeltjes niet voor. Of dit virus direct aansprakelijk is voor de mozaïekziekte kon nog niet aangetoond worden, aangezien het tot nu toe niet gelukt is het virus langs kunstmatige weg over te brengen.

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