NECOCHENSE MOSAIC OF SUNFLOWER IN THE SOUTHEAST OF THE PROVINCE OF BUENOS AIRES, ARGENTINA.

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Summary

A sap-transmissible virus is the cause of necochense mosaic on sunflower in the southeast of the Province of Buenos Aires, Argentina. The experimental host range includes several species of Asteraceae and Solanaceae. Flexuous particles of about 750 nm length and cytoplasmic pinwheel inclusions are associated with the disease. The virus has been transmitted experimentally by the aphid Macrosiphum euphorbiae, but not by sunflower seed or soil. Comparing healthy and diseased plants in the field, the latter yielded 65 per cent less in weight of achenes per plant than the former. Plant height, head diameter, dry weight of vegetative plant parts, total dry weight, number of achenes per plants, weight of 1,000 achenes and Harvest Index were also reduced significantly. The disease incidence has been systematically evaluated in the last three years. Normally, the number of diseased plants is very low. However, in late plantings of the season 1983/84, rather high percentages of infection have been encountered, with up to 28 per cent diseased plants. Necochense mosaic is a new, potentially dangerous sunflower disease.

Resumen

EL MOSAICO NECOCHENSE DEL GIRASOL EN EL SUDESTE DE LA PROVINCIA DE BUENOS AIRES, ARGENTINA.

Un virus que se transmite por la savia es el agente causal del mosaico necochense del girasol en el sudeste de la provincia de Buenos Aires, Argentina. El rango de hospedantes incluye a varias especies de Asteraceae y Solanaceae. En plantas infectadas se encontraron partículas flexuosas de aproximadamente 750 nm de largo. También se observaron inclusiones citoplasmáticas del tipo "molinete". El virus ha sido transmitido en forma experimental por el áfido Macrosiphum euphorbiae. Los intentos de transmisión a partir de semilla de girasol y del suelo dieron resultados negativos. En un ensayo comparativo en el campo entre plantas sanas y enfermas estas últimas sufrieron una reducción del 65% en el rendimiento de aquenios por planta. Hubo también una disminución altamente significativa en la altura de las plantas, materia seca total y del aparato vegetativo, Indice de Cosecha, diámetro del capítulo, número de aquenios por planta y peso de 1.000 aquenios. Durante los últimos tres años se evaluó la incidencia de la enfermedad en el sudeste de Buenos Aires, siendo el número de plantas infectadas muy bajo. La situación cambió en la campaña 1983/84, en campos de siembra tardía, donde el porcentaje de plantas enfermas fue más alto llegando a un 28%. Se concluye que el mosaico necochense es una enfermedad con un gran potencial destructivo.

Introduction

Necochense mosaic on sunflower was observed for the first time in December 1973 on the cultivar Norkinsol in the proximity of Necochea, in the southeast of the Province of Buenos Aires. A sap-transmissible virus was isolated from diseased

plants and studied at the INTA Experimental Station Balcarce and the BBA, Braunschweig, Germany. Preliminary results on the characteristics of the virus (symptoms, host range, transmissibility, vectors, ultrastructure) have been reported already (Delhey and Kiehr-Delhey, 1974; Delhey et al., 1981) and will only be summarized here. The main objective of the present communication is to report on the incidence of the disease and its effects on the growth and yield of sunflower plants.

Material and Methods

Naturally infected sunflower plants cv. Negro Bellocq were compared with healthy ones in the 1982/83 season. Each diseased plant was paired with the second nearest neighbour plant in the same row in order to avoid biassing of the data by a possible compensation effect of the nearest neighbour plant (Blodgett, 1941). Twenty pairs of healthy and diseased plants were identified in this manner. At the end of the flowering period the heads were covered with nylon nets to prevent depredation by birds. At maturity, the whole plants (without roots) were harvested and growth and yield components were determined as specified in table 1. The data obtained were elaborated statistically as paired samples.

In the seasons 1981/82, 1982/83 and 1983/84, the disease incidence in the southeast of Buenos Aires was surveyed systematically. Sunflower crops of the main growing period (planting in November/beginning December) were visited from the end of December to the middle of January (vegetative stage to beginning of anthesis). Foci of infection and number of diseased plants per focus were determined while driving along sunflower fields by car, the observer sitting on the top of the car. This procedure does not permit the determination of infection percentages, but it does allow to compare the relative disease incidence from season to season and from region to region.

Results

Characterization of the virus: The virus causing necochense mosaic was transmitted by mechanical inoculation to a number of host plants belonging to the families of compositae (Centaurea solstitialis, Cichorium intybus, Gaillardia sp., Helianthus annuus, Helichrysum bracteatum, Lactuca sativa, Madia sativa, Tagetes erecta, Xanthium spinosum, Zinnia elegans) and solanaceae (Datura metel, Nicotiana glutinosa, N. rustica, N. tabacum, Petunia hybrida, Solanum gracilius). The symptoms consist mainly of mosaic, necrosis, and leaf deformation. In Z. elegans colour breaking in ligulate flowers has been observed. Extreme dwarfing and deformation occurs in C. solstitialis.

Natural infection with the same virus has been encountered in X. spinosum, growing as a weed in a diseased sunflower field, and in lettuce plants, about 100 m distant from this field.

In aphid transmission trials carried out by H.L. Weidemann, Braunschweig, the virus was transmitted from D. metel to D. metel by a green form of Macrosiphum euphorbiae but no by a pink form of this species nor by Myzus persicae. The acquisition feeding time in these experiments was 15 min, the inoculation feeding time 24 hs.

In two experiments demonstrating soil transmissibility, a total of 108 sunflower plants were grown in soil taken from heavily infected fields; none of these plants developed symptoms of infection. Achenes were harvested from infected

a virus from C. cardunculus have failed. The above mentioned species have a life cycle lasting from autumn to the beginning of summer, and would thus bridge the gap from the time of harvesting to emergence of the sunflower crop.

Necochense mosaic-infected plants have smaller leaves than healthy ones; in addition, chloroplasts are damaged in the yellow portions of the lamina. The primary productivity of infected plants is thus affected by reductions in both the photosynthesizing leaf area and the phtosynthetic efficiency per unit area. This is reflected in the poor vegetative growth of diseased plants (plant height, dry matter of vegetative plant parts, see table 1). As a consequence, the reproductive behaviour is also severely affected (head diameter, number of achenes per head, 1,000 achenes' weight). The final result is a 65 per cent yield reduction per plant.

These figures refer to plants which became infected in the early vegetative stage, and which later flowered and set fruit. Earlier infections occur and lead to total losses, the plants dying before or during anthesis. The actual destructive potential of necochense mosaic to sunflower is thus higher than might be inferred from the results of table 1.

In the area studied, the infection rates are normally too low to produce considerable yield losses. However, up to 28 per cent diseased plants have been encountered in late-seeded crops in 1984. It is not clear if this severe attack is the consequence of a unique constellation of disease-conditioning factors or if it indicates a general trend in late-seeded crops. In any case, necochense mosaic is a serious menace to sunflower production in the southeast of the Province of Buenos Aires and other regions, and should be watched carefully in the future.

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