known to exist in plants against viruses and to determine whether they are associated with natural antiviral substances that inhibit virus replication without detrimental effects to the plant tissue.

In this work the inhibitor of virus replication (IVR) released from resistant protoplasts was found to inhibit the replication of tobacco mosaic (TMV), cucumber mosaic (CMV) and potato virus X (PVX) in leaf discs. The inhibition rates ranged between 60% and 80% when the virus concentration was determined by infectivity or by ELISA.

IVR also inhibited replication of TMV applied through cut stems or by spray before or after inoculation. The inhibition rates ranged between 60% and 90%.

The effect of the two antimetabolites actinomycin D and chloramphenicol on IVR production and TMV replication was studied. Both materials markedly increased TMV replication in protoplasts of Samsun NN, a cultivar in which the infection in the intact plant is localized, when added up to 24 h after inoculation. No increase was observed when TMV-infected protoplasts of Samsun – a systemic responding cultivar, were incubated in the presence of these antimetabolites. On the other hand, cycloheximide depressed virus replication in the protoplasts from the two cultivars. *(L)*

ULTRASTRUCTURAL EVIDENCE FOR RECOGNITION BETWEEN PLANT AND BACTERIAL CELLS

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Historically, the study of pathogenesis during the last 35 years followed a pattern of tissue examination *(a)* just prior to symptom development, *(b)* 6-24 hours after inoculation, and most recently *(c)* moments after inoculation.

The recent trend has been to presume that the development of pathogenesis is determined moments or within minutes after contact or "recognition" between host cell and pathogen.

Terminology for the phenomenon includes *receptor* and *ligand* and more recently *cognor* (active partner) and *cognon* (passive partner, the entity that is recognized). In addition there is *molecular recognition* – which is instantaneous, probably controlled by *diffusion*, and by *cellular recognition*, which is metabolic. Cellular recognition may become evident only in hours and presupposes a second and/or a succession of reactions before becoming evident.

This presentation describes briefly the reacting surfaces of plant cell and bacterial cell in ultrastructure. In addition, we allude to the rate of reaction and precision of recognition. Finally, a series of electron micrographs are presented that portray recognition and reactions that are preludes to either pathogenesis or resistance. *(L)*

PATHOGEN PENETRATION AND BACTERIAL-PLANT PHYSIOLOGICAL PROCESSES IN BACTERIAL SPECK OF TOMATO

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Pseudomonas syringae pv. *tomato*, the causal agent of bacterial speck of tomato, possesses several mechanisms for penetration and pathogenesis in the tomato plant. In addition to its ability to penetrate through the natural openings of the leaf and through wounds, the pathogen has a limited active penetration ability. Cell-free extracts of the infected plant showed moderate cutinase and endo-polygalacturonase activities during the first 48 h of invasion both in susceptible and in resistant plants. Cutinase was found to be of bacterial origin, whereas endo-polygalacturonase

stemmed from both the bacterium and the pathogen-host interaction. Phenols extracted from resistant inoculated tomato plants inhibited endo-polygalacturonase activity.

The tomato plant's surface morphology (number of stomata, trichomes, cuticle and wax thickness) was not an important factor in enhancing or inhibiting the invasion. It was demonstrated that ammonia causes necrosis in bacterial speck of tomato. Enzyme activities responsible for ammonia production in diseased plants, such as protease and deaminative enzymes, were tested. Protease, which is a constitutive enzyme, participates in the disease syndrome at later infection stages. Activity was higher in inoculated susceptible plants than in resistant plants and isozymes originating from the host, the pathogen and the pathogenic interaction were found in extracts of diseased plants. A good regression coefficient was found between proteolytic activity and degree of disease severity in susceptible and resistant cultivars and in 21 tomato cultivars, lines and species, with a wide range of susceptibility and resistance to bacterial speck of tomato. Protease activity was located mainly near the still forming necrotic spot. As a result of proteolytic activity, free amino acids accumulated and soluble proteins decreased in the leaf. These newly formed amino acids were converted into ammonia *in vivo* by bacterial asparaginase and glutaminase. Disease severity could be enhanced by applying asparagine and glutamine to the leaves prior to inoculation. There was a decrease in the nitrogen content of diseased plants. *(L)*

CO_2 FIXATION IN CORN PLANTS INFECTED BY *EXSEROHILUM TURCICUM*

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Corn plants (cv. 'Jubilee') locally infected by *Exserohilum turcicum* were exposed to labeled carbon dioxide at 250 μEinstein $.m^{-2}$ $.sec^{-1}$ and 25°C for 1 min. Carbon fixation in the leaf tissue surrounding the infected sites was measured and compared with that in uninfected plants and in the surrounding leaf tissue of artificial lesions. Results show that carbon fixation by leaf tissue surrounding an infection site, expressed in chlorophyll units, is dependent on time lapsed from inoculation, and on the distance from the infection site. Carbon fixation in the leaf tissue surrounding the infection site was significantly higher than that in the control plants during the first 6 days after inoculation, equal during 7-10 days and declined to 56% as compared with the control plants after 13 days. The higher amount of incorporation was found at a distance of 1 cm from the infection site. No differences between the infected and the control plants were found at a distance greater than 5 cm from the infection site. The amount of chlorophyll in the leaf tissue surrounding the infection sites was 29% lower than in the control plants.

Results show that *E. turcicum* induces photosynthesis in the leaf tissue surrounding the infected sites. *(P)*

THE ROLE OF MYCORRHIZA IN PHOSPHORUS UPTAKE AND PLANT GROWTH

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During the last decade the role of mycorrhizal fungi in phosphorus uptake by higher plants has been elucidated in some detail.

In Israel, where fumigation eliminates these beneficial fungi, or where due to sparse desert vegetation little inoculum is present, the lack of these organisms has been noted frequently. Symptoms are expressed as severe stunting and a much lower phosphorus concentration in the