been prevalently carried out by seed dressing with chemicals. A better knowledge of mechanisms involved in pathogenesis could contribute to the establishment of suitable breeding programmes for disease resistance. Toxins produced by the fungus could be involved in pathogenicity and/or virulence, as it is known for other species related to *P. graminea*.

As a first approach to the study of plant-pathogen interactions, toxin(s) production by isolates of *P. graminea* differing in virulence was investigated. Filtrates from static cultures in modified Fries' medium were tested for toxic activity by a leaf infiltration assay on resistant and susceptible host varieties. The results indicated the presence of a toxic compound(s) in the culture filtrates, which is able to cause leaf-stripe symptoms within three days after infiltration. Susceptible and resistant cultivars showed differences both in the timing and intensity of symptom expression. Moreover, electrophoresis performed on protein extracts from leaves of two barley cultivars showed that both mycelial infection and culture filtrates of *P. graminea* induced an identical protein set, lacking in the leaves treated with Fries' medium and in the untreated tests.

Toxin is thermostable, culture filtrate remains active after a treatment at 121 °C for 15 minutes. Probably toxin has at least a component of high molecular weight, since filtrate toxicity is unaffected by dialysis when it is tested on barley leaves.

Culture filtrate has been tested also on non-host species. In this case toxicity was shown by the whole filtrate and by the water used for dialysis, but not by the dialyzed fluid. This suggests the presence of another compound of a lower molecular weight.

When culture filtrates were submitted to extraction by various solvents with different polarity, toxic activity was found always in the most polar phase. Ion exchange chromatography is now in progress in order to purify the toxin(s).

RECENT RESULTS ON PERYLENEQUINONES FROM PHYTOPATHOGENIC STRAINS: THE CLADOCHROMES

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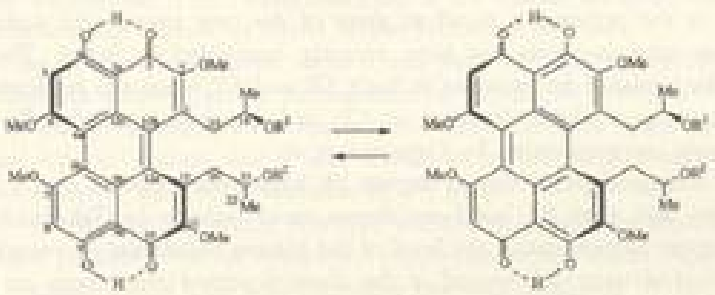
Some fungal strains of the genus *Cladosporium* produce red perylenequinone pigments (1), natural compounds of growing interest, due to their photodynamic and phytotoxic activity. These compounds show intriguing stereochemical features, i.e. axial chirality due to the helical shape of the constrained pentacyclic ring, combined with asymmetric carbons in the side chains. *Cladosporium phlei* produces only phleichrome (with *P* axial chirality and S configuration of the side chain carbons), which can be converted thermally into the unnatural diastereoisomer isophleichrome with opposite helicity and different conformations of the side chains.

The structure of the cladochrome A *1* and B *2*, isolated from etiolated cucumber seedlings infected with fungal spores of *C. cucumerinum* have been revised recently (*) and established as that of a diester of 3-hydroxybutyric acid, and a mono-3-hydroxybutyrate monobenzoate with *ent*-isophleichrome *3* respectively. An *in vitro* culture of *C. cladosporioides* produces *3*, and cladochrome C *4*, D *5*, and E *6*; compounds *5* and *6* are novel carbonic acid ester derivatives of *3*. Their structure and stereochemistry were assigned on the basis of spectroscopic measurements and CD spectra.

Some cladochromes present an interesting inhibition of protein kinase C.



1 R^1=R^2= CO-CH_2-CHOH-Me
3 R^1=R^2= H
5 R^1= CO-p-PhOH; R^2= COO-p-PhOH

2 R^1= CO-CH_2-CHOH-Me; R^2= CO-Ph
4 R^1= CO-Ph ; R^2=CO-p-PhOH
6 R^1= CO-Ph ; R^2= COO-p-PhOH

(*) U. Weiss, L. Merlini and G. Nasini, *Fortschr. Chem. Org. Naturstoffe*, *52*, 1 (1987).
(*) A. Amone, G. Assante, L. Merlini and G. Nasini, *Phytochemistry*, *27*, 1675 (1988).

METABOLITES OF THE PLANT PATHOGEN *PSEUDOMONAS SYRINGAE* PV. *SYRINGAE*

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Some years ago a multidisciplinary study directed to define the structure and investigate the biological and physicochemical properties of substances produced by *Pseudomonas syringae* pv. *syringae*, a bacterial pathogen of numerous monocot and dicot plants, was started in Italy. At present the groups participating into this joint venture belong to the two Universities of Rome, to those of Florence and Naples, to CNR laboratories in Rome, Montelibretti-Rome, and Bari, and to the ETH of Zürich.

The first metabolite studied has been syringomycin (SR), a substance produced by pathogenic isolates from stone fruits, pears and grass hosts (De Vay *et al.*, 1968). We have shown that SR preparations obtained according to Gross *et al.* are in fact mixtures of several structurally similar lipopeptides together with some unrelated peptides; in collaboration with a group of Utah State University we have determi-