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Conference Report

51st German Plant Protection Conference, October 5- 8, 1998, in Halle/Saale, Germany

Hans-Jochen Eberhardt,

Verband der Cigarettenindustrie,
Königswinterer Str. 550,
D-53227 Bonn

The 51st German Plant Protection Conference was held by the Federal Biological Institute of Agriculture and Forestry [Biologische Bundesanstalt für Land- und Forstwirtschaft] in Halle/Saale from 5th to 8th October 1998. The attendance of over 1,000 registered participants reflected the continued lively interest shown in the conference. Some 330 oral contributions, assigned to the various sections, were presented in five parallel sessions.

The extensive programme was complemented by a poster session on Thursday, 8th October 1998, during which research findings were presented on more than 250 posters, allowing interested parties to discuss the results personally with the authors. Although tobacco as a cultivated plant played only a minor role in the discussion of issues such as the use of agrochemicals, introduction of new biotechnological methods or issues related to legal regulations, a number of the papers presented were still of direct or indirect relevance to the tobacco industry.

At the beginning of the sessions of the various sections, J. LANDSMANN (Institute of Biochemistry and Plant Virology [Institut für Biochemie und Pflanzenvirologie] in Braunschweig) presented an interesting survey of the work of the Federal Biological Institute of Agriculture and Forestry in the release of genetically modified organisms (GMOs) in Germany and the European Union.

According to the Gene Technology Law [Gentechnikgesetz] the Federal Biological Institute is the agency of agreement for the release of GMOs, while the supreme agency responsible for deciding on the release of GMOs is the Robert-Koch-Institute in Berlin. The Federal Biological Institute in Braunschweig maintains a comprehensive database on the release and the introduction into the market of genetically modified plants and other organisms within the EU.

Thus, during the period 1988–1998, 1280 applications for the release of genetically modified plants were submitted in the European Union. Of these, 49 referred to tobacco; the majority of the applications for field tests with transgenic tobaccoes were filed in France (36), whereas applications for the release of recombinant tobacco plants were also submitted in Italy (1), Spain (5), United Kingdom (6), and in Germany (1). Among the 49 tobacco-relevant applications for release in the EU, 11 dealt with transformations with the aim of achieving tolerance to herbicides. Applications were made for field tests using four transgenic tobacco breeding lines in each case to demonstrate resistance to viruses and to pathogenic fungi. Further applications for the release of genetically modified tobacco plants dealt with studies of resistance to infestation by nematodes (1), introduction of marker genes (2) and the modification of metabolic pathways (28 in total).

The number of genetically modified plants in Germany has dramatically increased from 1 to 255 during the period 1990 to 1998. The applications for two field tests with transgenic tobacco in Germany were submitted in 1996 and 1997. The Institute of Plant Genetic and Research into Cultivated Plants [Institut für Pflanzengenetik und

Kulturpflanzenforschung] in Gatersleben is responsible for carrying out these tests.
A number of 26 applications for introducing GMOs into the market have been filed EU-wide by September 1998. Approval for introducing herbicide-tolerant tobaccoes (bromoxynil tolerance) was granted to Seita.
According to the Novel Food Ordinance, genetic modification of foodstuff is subject to labelling requirements if the new protein or the foreign DNA can be identified.

The cucumber mosaic virus (CMV) which is pathogenic to tobacco infects over 800 plants. It is possible to produce CMV-resistant tobaccos by the expression of virus-specific genes. K.-H. HELLWALD (Institute of Phytomedicine, University of Hohenheim) presented the results of replicase-mediated resistance to the Fny-strain of CMV. The effectivity of the resistance depends primarily on the fact that the nucleic acid sequence of the transgene corresponds to the sequence of the infecting virus. Thus, a number of CMV isolates have been identified whose genetic primary structure reveals deviations from the Fny-strain and by which the Fny-CMV-specific resistance can be broken.
In the studies of K.-H. HELLWALD and D. GLENEWINKEL, three resistance-breaking RNAs of different CMV isolates were cloned and the respective genes were transmitted as infectious in vitro transcripts in mixed infections with Fny-CMV onto transgenic Fny-CMV-resistant tobacco plants. It was the aim of the studies to find out how these mixed infections affect the interaction of Fny-CMV with the transgenic plants. As was shown by the authors, mixed infection of transgenic plants may lead to a recombination of viral genes and these pseudorecombinants may be able to break the plant's resistance. HELLWALD and GLENEWINKEL conclude that while in laboratory tests mixed infections of this kind may easily promote pseudorecombination, this is only rarely to be expected under natural conditions.
Apart from the already known effects of salicylic acid and of "Bion" (manufactured by Novartis) on the induction of resistance in a large number of cultivated plants, bacterial lipopolysaccharides (LPS) occurring in the outer membrane of gram-negative bacteria seem to exhibit similar effects. K. RUDOLPH (Institute of Plant Pathology and Plant Protection, University of Göttingen found that during treatment and infiltration of tobacco leaves with LPS, defence reactions of the plant are activated against bacterial colonisation in the case of an incompatible combination. The effective mechanism of the LPS-activated signal transduction is, for the most part, still unknown. According to K. RUDOLPH, the monomer LPS-component lipid A from *Pseudomonas aeruginosa* and *Pseudomonas syringae* is primarily responsible for induction of resistance in both compatible and incompatible systems.
In K. RUDOLPH's view, however, the use of LPS in plant protection is not advisable, particularly since the substances may have a toxic effect on humans. In addition, they do not appear to be suitable for application as a spray.
J. CHAMSAI (Institute of Phytomedicine, University of Hohenheim) presented another resistance-inducing compound, i.e. 3-aminobutyric acid (3-ABS). Thus, for instance, tobacco plants can be protected from infection by the fungus *Peronospora tabacina* if pretreated with 3-ABS. Findings on the mode of action of 3-ABS which have been obtained on young tomato plants reveal the occurrence of tissue necroses at the main roots as primary effect. Closely correlated with this an increase in salicylic acid concentration in the plant occurs. This substance is supposed to play a decisive role in the development of resistance. In addition, accumulation of cell-wall-bound phenols was observed as well as an increased activity of the enzymes peroxidase and phenol oxidase. The formation of various pathogenesis-related proteins (PRPs) within a period of 3 days was also demonstrated. Further studies are necessary to obtain a better insight into the effective mechanism of 3-ABS during the induction of resistance in tomato plants, tobacco and other plants.
A general overview of the legal regulations for the use of plant activators, which also include activators of systemic resistance, was presented by M. JAHN (Federal Biological Institute of Agriculture and Forestry, Kleinmachnow). Plant activators have been included in the Plant Protection Law [Pflanzenschutzgesetz] since 1986. Up to now no stringent requirements for registration have been envisaged for these substances comparable with those which exist for plant protective agents.
When the revised version of the Plant Protection Law came into force on 1st July 1998, it was accompanied by substantial modifications with respect to the definition of plant activators and their introduction into the market. According to the definition, plant activators are substances
(i) which are exclusively intended to enhance plant resistance against pests;
(ii) which are intended to protect plants from non-parasitic impairment;
(iii) which are intended for use on cut ornamental plants.
Introducing plant activators into the market is subject to inclusion in a list authorized by the Federal Biological Institute [Biologische Bundesanstalt (BBA)]. For this purpose, the former registration procedure was altered to an application for listing. The application must include a declaration that the plant activator, when used for the intended purpose and in the stipulated way, has no negative effects on

the health of humans and animals and on the environment.
If there are any doubts in this respect, the Federal Biological Institute is entitled to require the plant activator to be tested. This can cause considerable costs to the applicant.
The Federal Biological Institute decides on whether to include the agent in the list within 4 months. Inclusion in or deletion from the list of plant activators is published by the Federal Biological Institute in the Federal Gazette [Bundesanzeiger].
A newly developed agent for combatting *Botrytis* and *Sclerotinia sclerotiorum,* two fungal pathogens which may also attack tobacco plants, was presented by K. STENZEL (Bayer AG, Centre of Agriculture, Monheim).
The fungicide fenhexamide belongs to the new class of chemical agents known as hydroxyanilides and was developed by Bayer AG for use in viniculture, as well as in the growing of fruit, vegetables or ornamental plants.
Fenhexamide is distinguished by favourable toxicological properties (LD_{50} > 5,000mg/kg bodyweight, dermal toxicity) and has no mutagenic, teratogenic or sensitizing effects on vertebrates. The fungicide is commercially available under the brand name Teldor®. In the USA, fenhexamide was classified by the Environmental Protection Agency (EPA) as a 'Reduced Risk Pesticide', whereas the fungicide has already been provisionally registered in UK and is expected to be registered in Germany for 1999. Application of 100 ppm fenhexamide on the leaf is already sufficient to make the fungus die by inhibiting the growth of the germ tube and the mycelium. The exact biochemical effective mechanisms still need to be clarified. Fenhexamide has a protective effect, i.e. penetration into the plant is only minimal, and it is very well tolerated by the plants. Future studies should demonstrate whether the substance is suitable for protecting tobacco plants from infestation by *Botrytis* or *Sclerotinia sclerotiorum*.
A.H. SZIDERICS (Novartis Agro GmbH, Frankfurt) presented new Ridomil products based on the biologically active metalaxyl-*M* isomer. The fungicide metalaxyl contains an asymmetric C-atom and therefore occurs as a racemic mixture of two isomers, metalaxyl-*M* and metalaxyl-*P*, at a ratio of 50:50. Studies have shown that the fungicidal activity of metalaxyl is almost exclusively attributable to the *M*-isomer. Thus, growth of fungi can be stopped by applying only 1 ppm of metalaxyl-*M*, whereas metalaxyl-*P* merely causes a slight growth retardation. By using pure metalaxyl-*M*, the amounts applied up to now can thus be reduced by 50% (i.e. 100 g a.i./ha. instead of 200 g a.i./ha). One of the new products containing metalaxyl-*M* is Ridomil Gold Combi®, which has also been formulated for use in tobacco growing and which has exhibited excellent activity against oomycetes. The fully systemic effect of metalaxyl-*M* is reinforced in this formulation by the contact action of folpet, a phthalimide compound.

E. BODE (Federal Biological Institute of Agriculture and Forestry, Braunschweig), drew attention to developments which give rise to serious concern for storage protection in Germany. As he expounded, the possibilities of effective storage protection are subject to increasing restrictions. The fumigants hydrogen cyanide and methyl bromide, for instance, are only approved for the treatment of empty storage rooms; indeed, an almost total ban on the use of methyl bromide is to be expected within the foreseeable future. In view of the reassessment of the effective properties of the agents concerned, it is also uncertain whether storage protection will be left with all the other important effective agents. The only fumigant in widespread use is phosphine, although recent years have also seen increasing use of inert gases such as CO_2 and nitrogen. If storage pests should develop resistance against phosphine or other storage protectants, Germany will be faced with great problems, in BODE's opinion. In addition, the high standards which are already applied to the effective agents make it harder than ever to find suitable substances. According to BODE, research and development costs and the high fees charged on the testing procedures for agents and formulations also have the effect of discouraging innovation.