amino acid sequence similarities. Comparisons of the peptide sequences within these regions highlight similarities with members of the carmovirus and tombusvirus groups. However, the genome size and predicted strategy seem intermediate between the 2 groups. We propose the name of oat chlorotic stunt for the new virus and suggest that although evolutionarily related to both the tombusviruses and the carmoviruses, it is distinct from both and should therefore not be classified within either group. Epidemiological studies at one of the infected sites have shown that the virus causes mainly root localised infection, and only in a small number of cases does it cause systemic infection. Infection is not limited to oats; although this seems to be the major host, infection is also detected in winter wheat and winter barley.

Some properties of *Lolium* latent virus. W Huth, DE Lesemann, R Götz, HJ Vetten *(Biological Research Center for Agriculture and Forestry, Institute for Biochemistry and Plant Virology, Messeweg 11/12, D-38104 Braunschweig, Germany)*

Lolium latent virus (LLV) was found during investigations on ryegrass mosaic virus (RMV) and hitherto it was only detected on *Lolium perenne* and *L multiflorum* collected in breeding stations in Germany and the Netherlands. From a total of 348 virus-infected plants of *L perenne* 20 (6%) plants were infected exclusively by LLV, 183 (52%) by RMV only whereas 145 (42%) plants were dually infected by both viruses, LLV and RMV.

LLV is mechanically transmissible but with crude plant extract in general a low proportion of inoculated plants becomes infected. *L multiflorum* is more susceptible than *L perenne*. Whereas infected *Lolium* spp remain symptomless, the more susceptible *Bromus* spp, *Briza maxima*, oat, barley, rye and some other Poaceae reacted with mild streaks on their leaves. On leaves of infected *L multiflorum* grown in the greenhouse yellow spots were occasionally observed. Unusually for virus diseases these spots appear on old leaves only and led to an earlier senescense of these. Plants of *Lolium* spp dually infected by LLV and RMV showed reduced growth and intensified RMV symptoms. White streaks on the youngest still rolled leaves are predominant symptoms of dually infected plants.

LLV is also easily transmissible to some dicotyledonous plants. After inoculation on leaves of *Gomphrena globosa* local lesions with red margins appear. *Chenopodium amaranticolor*, *Nicotiana benthamiana* and *Tetragonia expansa* develop systemic infections. The latter is especially useful as propagation host.

A natural vector of LLV has not yet been found although preliminary transmission studies indicate that *Rhopalosiphum padi* might very ineffectively transmit the virus to *L multiflorum* (8 of 508 plants became infected).

The flexible particles of LLV have a normal length of *ca* 640 nm. Their surface structure with cross-banding and longitudinal files resembles that of potexviruses. From foxtail mosaic virus (FMV), the only definite potexvirus of Poaceae, LLV differs in particle length (FMV *ca* 550 nm) and the molecular weights of coat protein (LLV 35 kDa, FMV 32 kDa) and nucleic acid (LLV 2.7×10^6 kDa, FMV 2.1×10^6 kDa).

LLV is not serologically related to FMV or to 25 definite or possible members of the potexivirus group as well as to 25 members of the carlavirus group.

Huth W, Lesemann DE, Vetten HJ, Götz R (1995) A new possible potexvirus isolated from *Lolium* spp. Fourth Int Conf Plant Diseases, Bordeaux 6-8 Dec 1994, vol III/III, 1095-1099

Paulsen AQ, Niblett CL (1977) Purification and properties of foxtail mosaic virus. *Phytopathology* 67, 1346-1351

Interaction of BYDV and *Fusarium culmorum* in winter wheat. N Koch, W Huth *(Federal biological Research Center, Institute for Biochemistry and Plant Virology, Messeweg 11/12, D-38104 Braunschweig, Germany)*

Although BYDV is one of the most common pathogens of cereals in Germany, epidemics of this virus have been very rare. Nevertheless there was a serious outbreak over 3 years from 1988–1990 and it was not barley but mainly wheat which reacted with strong symptom expression upon infection (Huth, 1990). In some regions reddening of flag leaves, the most prominent symptom of BYDV infection of wheat, was found on most of the plants; surprisingly the late-sown wheat was much more affected than the early-sown one.

During these epidemic wheat was infected at late growth stages from May to July. Nevertheless in some fields yield reductions over

50% were observed. Therefore it was assumed that these reductions were not only caused by BYDV but also by other pathogens. The high percentage of dead heads indicated that *Fusarium* could be one of these additional pathogens.

Hence, the winter wheat cvs 'Oretis' and 'Kraka', differing in susceptibility to *F culmorum* were used for investigations. The plants were sown at 2 different dates, in September and November, and were inoculated with BYDV in field trials at EC 25/23 and EC 55/65, but only once with *F culmorum* in EC 65. Virus strains used for this trials were PAV and MAV. Yield and growth of both cultivars after various inoculations with BYDV and *F culmorum* were compared with the untreated control.

When plants were inoculated with virus (PAV and MAV) at EC 25-35 yields were partly reduced to less than 50% whereas late inoculations at EC 55/65 reduced yield by only 30%. Inoculation with *F culmorum* caused a yield reduction to approximately 50%.

Combined inoculations of virus and fungus had a significantly more severe effect on wheat plants than only one of these pathogens. The yield was decreased to less than 20% of the healthy control. The synergistic effect of dual infection was clearly pronounced in wheat plants infected with both pathogens at nearly the same time. However, the early virus-inoculated plants (EC 25/35) did not show this synergistic effect to the same extent.

Concerning the various drill terms there was no remarkable distinct reaction to virus or combined inoculations. Only the inoculation with *F culmorum* was more effective in late-sown plants than in the early-sown ones.

In order to deduce the growth reduction of wheat after the various inoculations with BYDV and *F culmorum* the heights of the plants were measured. The results revealed the considerable effect of the early inoculations of BYDV at EC 25/35 with height reductions up to 20% in comparison to the untreated control whereas the height of plants which were inoculated at EC 55/65 was only reduced by 10% maximum. As there were no significant differences after the additional inoculation with *F culmorum* in comparison with plants which were only inoculated with virus the fungus had obviously no or a minor influence on growth reduction.

The results of these investigations confirmed the assumption that *F culmorum* was the most important contributing factor to the decreased yield of wheat during the serious epidemic of BYDV 1988 to 1990. Furthermore, from the results it can be concluded that BYDV infections obviously enhance the susceptibility of wheat plants to other pathogens.

There were significant differences in the behaviour of both cultivars tested.

Huth W (1990) Barley yellow dwarf – ein permanentes Problem für den Getreideanbau in Deutschland? *Nachrichtenbl Dtsch Pflanzenschutzdienst* 42, 33-39

Effect of successive BYDV inoculation times from October to April on the yield of some barley cultivars. S Steyer [1], F Froidmont [2] *([1] Station de phytopathologie, CRA, Gembloux; [2] Station d'amélioration des plantes, CRA, Gembloux, Belgium)*

In Belgium, barley yellow dwarf virus (BYDV) is present in some years in early-sown winter barley. Different strategies, such as the modification of sowing date or partial insecticide control, are used to avoid BYDV infection. However, none of these methods is completely satisfactory and the most effective control is probably plant tolerance or resistance. High levels of tolerance to BYDV in barley are conferred by the *yd2* gene, transferred from an Ethiopian landrace. This single, incompletely dominant, resistance gene is rather strong: it has been used commercially since 1967 without adaptation of isolates that could infect the resistant cultivars.

Artificial inoculation using viruliferous aphids is the only way to evaluate BYDV resistance or tolerance in cereals. As the PAV-strain is known to cause severe disease and to be efficiently transmitted by *Rhopalosiphum padi*, viruliferous aphids were transferred in the glasshouse to healthy seedlings of cv Clédor. In collaboration with the Plant Breeding Station, 9 cvs winter barley were studied (table I). Field plots were established in Gembloux, Belgium. The plots were 6 m long and 8 rows wide. Plants in a 1.5 m row section of each plot were infested at the 2-leaf stage on the 15 October and covered with a cage for 15 d. The cages were then shifted for 0.75 m, allowing the aphids to move under the cages to infect other plants, and the unprotected rows were treated with an insecticide. During the winter, the cages were removed and were then replaced at the beginning of March. The controls consisted of plants covered with cages without aphids and with healthy aphids for the cultivar Express. At the end of June, the rows were har-