19th Century (Canova, 1962). SBWMV and WYMV were observed in Europe only in the 1960s.

Studies on the susceptibility of old French cvs were undertaken for understanding the presence of these viruses before the 1960s and to search for new sources of resistance.

In the 1930s in the west of France about a dozen cvs were characterized based on their susceptibility to a soil-borne fungi *(Lagena radicicola)* (Ponchet J, unpublished results) but the symptoms recorded resembled those of soil-borne mosaic viruses. We have shown that these cvs have similar characteristics to cvs susceptible or resistant to SBWMV. Moreover, in the plots observed earlier to be infested by *L radicicola*, *Polymyxa graminis* and SBWMV were also present. Owing to the large-scale incidence recorded in the 1930s, it may be considered that SBWMV was probably present in that zone at least from the beginning of the century.

The characteristics of 158 sources of bread wheat growing in a plot having the SBWMV-WYMV complex were analysed. These sources consisted of landraces and the first wheat cvs registered in the French catalogue.

Two thirds of the sources showing mosaic symptoms contained SBWMV and WYMV. Like the modern wheat cvs grown in France, cvs showing a specific susceptibility to SBWMV (30%) were much more frequent than those showing specific susceptibility to WYMV (1%). The cv Noe, which was widely used for wheat breeding programmes at the beginning of the century, is included in the category of cvs uniquely susceptible to SBWMV.

Studies are in progress to define the mechanism of resistance against these 2 viruses, which represented one third of the sources tested.

McKinney H (1923) *J Agric Res* 23, 771

Canova A (1962) *Annali Acc Agric Bologna* 73, 291-299

Genomic variability of bymoviruses. HH Steinbiß *(Max-Planck Institut für Züchtungsforschung, Carl-von-Linné-Weg 10, D-50829 Cologne, Germany)*

Barley yellow mosaic (BaYMV), barley mild mosaic (BaMMV), oat mosaic (OMV), rice necrosis mosaic (RNMV), wheat spindle streak mosaic (WSSMV) and wheat yellow mosaic viruses (WYMV; possibly a strain of WSSMV) all have 2 positive-sense, single stranded, 3'-polyadenylated RNAs, separately encapsidated in 2 filamentous particles. These viruses were all recognized as members of a genus of the family *Potyviridae* named bymoviruses, and they are transmitted by *Polymyxa graminis* Ledingham, a soil-borne plasmodiophorous fungus with worldwide distribution.

Due to the mode of transmission, the cultivation of resistant cultivars is probably the only means of controlling bymoviruses. Genetically engineered resistance has failed to date. In 1988, symptoms of BaYMV were detected on resistant cultivars simultaneously in England and Germany. Restriction mapping of BaYMV-2 and sequence comparison with BaYMV-G revealed several minor variations, but no resistance-breaking mechanism has been identified. Interestingly, the similarity between BaYMV and BaYMV-2 seemed to be more pronounced for RNA1 than for RNA2. This likely indicates that RNA2 molecules of bymoviruses are particularly unstable and prone to deletions as shown for RNA2 of mechanically transmitted isolates of BaMMV and BaYMV. These deletions affect domains of the putative 73 and 70 kDa proteins, which are obviously not essential for replication but may the important for the transmission of BaMMV/BaYMV by *Polymyxa graminis*. Additionally, RNA viruses generally show high mutation frequencies because of a lack of the proofreading enzymes that assure fidelity of DNA replication. Therefore, population of RNA viruses do not consist of a single genome species of defined sequence, but rather of heterogeneous mixtures of related genomes (quasispecies).

Molecular basis of the interactions between luteoviruses and aphids. JFJM van den Heuvel *(DLO Research Institute for Plant Protection (IPO-DLO), PO Box 9060, NL-6700 GW Wageningen, The Netherlands)*

Luteovirus are single-stranded RNA viruses which infect a wide range of mono- and dicotyledonous plants in which they replicate almost exclusively in the phloem tissue. They are transmitted by aphids in a circulative manner. Briefly, this implies that virus particles are ingested along with phloem sap from infected host plants and transcellularly transported through the hindgut into the haemocoel. The virus particles acquired are retained in an infective form in the haemolymph for the aphids' lifespan, apparently without replication. Upon contacting the accessory salivary glands, they may be transported