Characterization of Resistance of Wheat Varieties and Breeding Lines Against Common Bunt (*Tilletia tritici*) and Dwarf Bunt (*T. controversa*)

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Abstract: In organic farming, infestation of cereals with bunt and smut fungi has increased in recent years. In Germany, the economically most important bunt pathogen is *Tilletia tritici*. *Tilletia controversa* can be similarly damaging, but its occurrence is limited to some elevated areas in Southern Germany. Unlike with many other diseases, evaluation of the susceptibility or resistance to bunt is not part of the official registration procedure for new varieties in Germany, because highly effective chemical seed treatments are available. As a consequence, bunt resistance was and still is not considered an important trait by most breeding companies. Cultivation of resistant varieties, combined with treatment of seeds with accepted methods, should avoid or at least significantly reduce the losses to bunt in organic farming. However, the targeted use of resistant varieties requires knowledge both about the resistance status of the commonly grown varieties as well as of the pathogenic variability among bunt populations in different parts of the country. At the biodynamic farm Dottenfelderhof, studies on the resistance of cereals to bunts and smuts where started about 10 years ago. In 2001 and 2002, altogether 52 spring wheat varieties were evaluated in field experiments with artificial inoculation with spores of *T. tritici*. Only 10 of them had > 5% (max. 36%) bunted heads, and more than half had < 1%. The results indicated that a number of wheat varieties are available, that under the conditions of sowing in spring remain free of common bunt. In the period 1995–2005 more than 160 winter wheat varieties were evaluated for bunt resistance at Dottenfelderhof. In these experiments the degree of infection ranged from 0 to 95% bunted heads and was largely affected by the conditions in the different years. However, repeated testing showed that certain varieties had always a lower or higher degree of infection irrespective of the conditions in the different years. In the framework of a national project, field experiments were performed at five locations in Germany in the growing period 2002/03 to determine the susceptibility against common bunt of 30 winter wheat varieties and breeding lines. In four of the five experiments the spores used for seed inoculation were of local origin, *i.e.* derived from the respective location. The maximum percentage of infected heads recorded at the five locations varied between 35 and 87%. Depending on the location, one to two thirds of the varieties had below 20% infection. Among the varieties with low infection were Magnifik, Stava, Tambor, Tommi, Tarso and *SW 51136*. In the following year the experiments were repeated with the varieties Altos, Ataro, Korund, Tataros and Tommi. Under the generally higher disease pressure of the second year the cultivar Tommi was the only one with a similarly low percent infection as in the first year. In the field experiment for determination of susceptibility of the 30 varieties against dwarf bunt (tested at one location in 2002/03), one fourth of the varieties had below 2% infection, with a maximum infection of 16% in the susceptible reference variety Jubilar. The majority of these varieties were the same as those that had already shown reduced susceptibility towards common bunt. However, when the experiment was repeated in 2003/04, the selected varieties Ataro, Toronto, Tommi, Pegassos and Tarso had between 5 and 12% infection (Jubilar 30%). Further, the virulence of five spore samples (isolates) of different geographical origin of *T. tritici* was analysed at one location using a standard set of differential cultivars. All isolates were virulent for the resistance genes *Bt2* and *Bt7*, but avirulent towards *Bt5*, *Bt8*, *Bt10*, *Bt11*, *Bt12* and *Bt14*. The isolates could be differentiated by the plants carrying *Bt1*, *Bt3*, *Bt4*, *Bt6*, *Bt9*, *Bt13* and *Bt15* as well as by PI 173437. All five isolates had different virulence pattern.

Keywords: organic farming; bunt resistance; field experiments; varieties