**Scientific Training Center in Plant Biotechnology**

*Modern Plant Breeding. Beginner Level. 4th Edition. February, 6-17, 2023*

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Session. ‘Varietal selection for quantitative disease resistance

Determination of the genetic value of genotypes by early progenies testing'

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**Case study – Genetic value of genotypes for resistance to helminthosporiosis in barley.**

The helminthosporiosis barley disease caused by the pathogenic fungus *Drechslera teres*can cause yield losses of up to 40% in Bavaria the years with heavy rainfall. It manifests itself as well on winter barley as on spring barley. The fungus occurs mainly on the leaves, but sometimes also on the leaf sheaths, ears and seeds. The typical symptoms are 'dark spots' or 'network'-like necrosis leaves. The destruction of the assimilating capacities of the leaves (but also the direct action of mycotoxins) is at the origin of the drop in yield by reducing the weight of a thousand grains.

In order to assess the value of using the Bateng and Pirate barley varieties as parental lines in a breeding program aimed at improving resistance to *Drechslera teres,*resistance to this pathogenic fungus was evaluated for the two parental inbred lines and the F2 segregating population. For this, the number and size of necrosis (small, medium, large) present on the leaves of the plants were recorded (BarleyQDRhelminthosporiosis.xls). The experiments were carried out under the same environmental conditions for all evaluated generations.

**1) For each individual, calculate the level of susceptibility to the disease.**

The level of susceptibility to disease for an individual corresponds to the total number of spots adjusted by coefficients according to their size.

**2) What experimental plan could be implemented to obtain these data?**      

**3) Is it useful to cross the Bateng and Pirate varieties in a breeding program aimed at improving resistance to helminthosporiosis in barley?**

*i.e. Are the two parental varieties genetically different for the trait of interest?*

**4) How to make the selection?**

- *What is the degree of dominance?*

- *Calculate the broad-sense and narrow sense heritabilities of leaf blight resistance quantitative traits.*

- *Conclude on the strategy for selecting the resistance trait.*

**5) Can the quantitative resistance to leaf blight be explained by the expression of a major gene resistance ?**      

**6) Propose a scheme for breeding a variety of barley improved for resistance to helminthosporiosis under the hypothesis**

**(i) That Bateng and Pirate are of equivalent agronomic interest,**

**(ii) That Pirate is an elite variety and Bateng a low productivity mutant.**

**7) What would you suggest to speed up the breeding program?**      

