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# Improvement of *Parastagonospora nodorum* blotch resistance in winter triticale by using the *in vitro* somaclonal and androgenic approaches.


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## INTRODUCTION

Leaf and glume blotch caused by *Parastagonospora nodorum* is a widespread triticale disease (Figure 1). It can cause severe losses in grain yield wherever triticale is grown. Plant breeders and pathologists have worked intensively to incorporate resistance to the pathogen in new cultivars. Conventional methods of breeding for resistance can be supported by using the biotechnological ones, i.e. somatic embryogenesis and androgenesis.

**Figure 1. Symptoms of glume and leaf bloth***

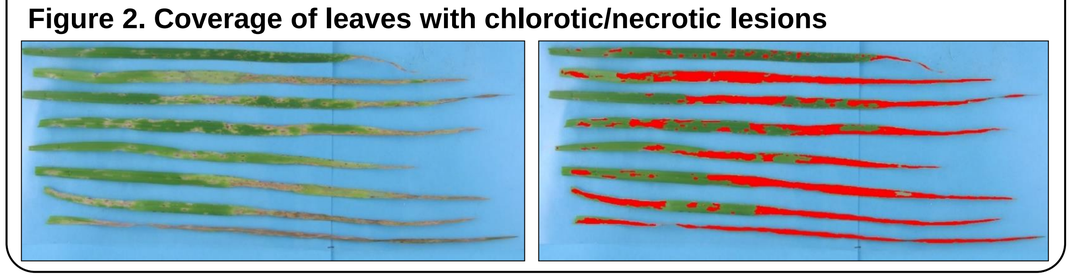

*Photos by S. Bartosik

The study was undertaken to assess and to compare variation of *P. nodorum* resistance among winter triticale somaclones, dihaploids and conventional cultivars.

## PROTOCOL

1. Preparation of inoculum of *P. nodorum* (water spore suspension at concentration 5 x $10^6$ spores/millilitre),
2. Inoculation of seedling leaves with spores suspended in water until run-off,
3. Incubation of inoculated seedlings in the dark for 72h (temp. 22°C, relative air humidity nearly 100% followed by 10 day incubation of seedlings at 20°C, relative air humidity close to saturation).
4. Rating of disease severity on seedling leaves, where 0-10% - resistant, >90% - highly susceptible
5. Analysis in ImageJ (Figure 2.).

**Figure 2. Coverage of leaves with chlorotic/necrotic lesions**



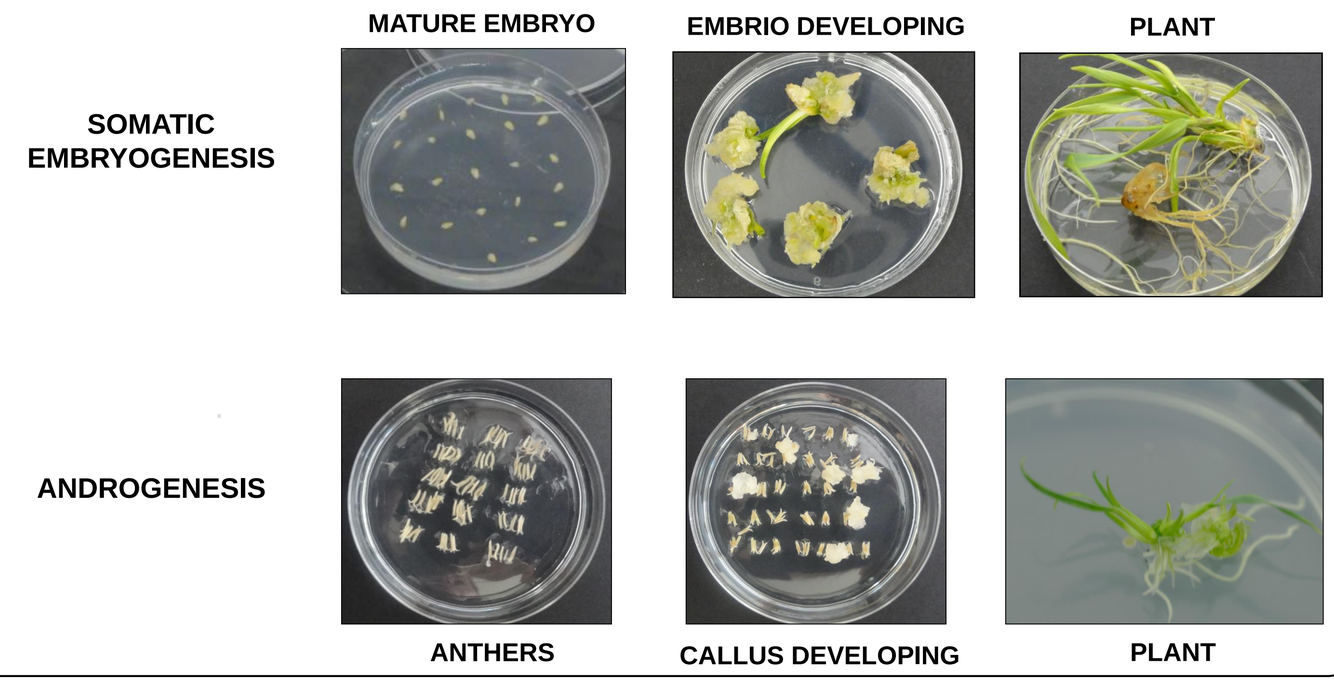
## SUMMARY

In conclusion, it was demonstrated that somaclonal variation might be used as an additional source of triticale resistance to the pathogen and it could be recommended to use in commercial breeding programs. The reported results broaden our knowledge about triticale resistance to *P. nodorum* and brought closer the use of biotechnological methods in breeding for disease resistance of the small grain species of cereals.

## PLANT MATERIAL

Eight triticale commercial cultivars, twenty one double haploids (DH) and seventeen somaclonal lines (SE) produced from cultivars varying in resistance to *P. nodorum* were evaluated under controlled environment conditions. The DH and SE production is presented in Figure 3.

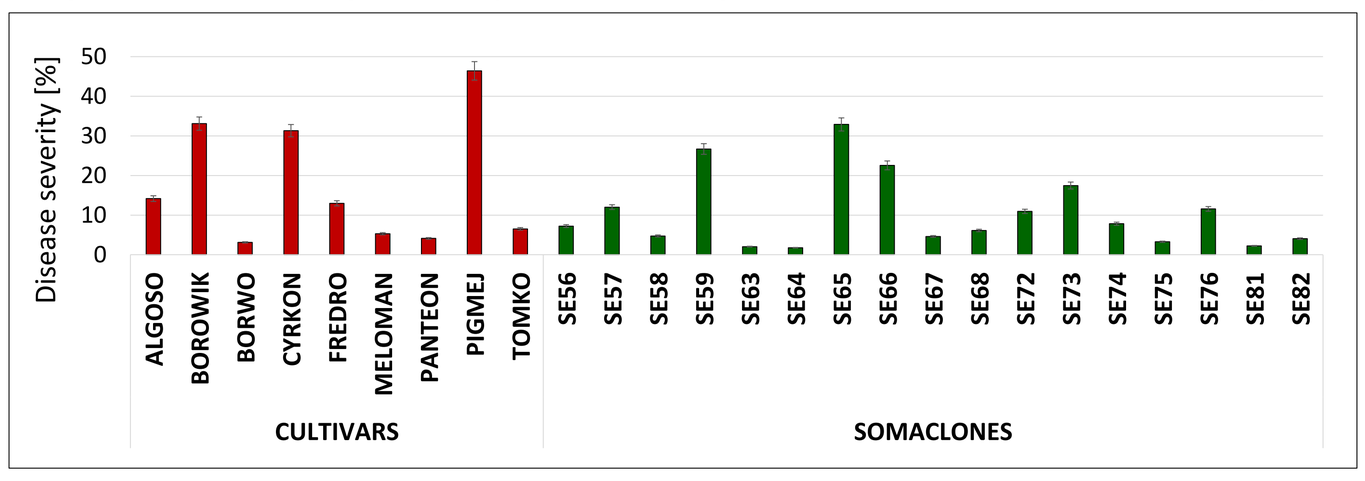
**Figure 3. Somatic embryogenesis and androgenesis scheme**

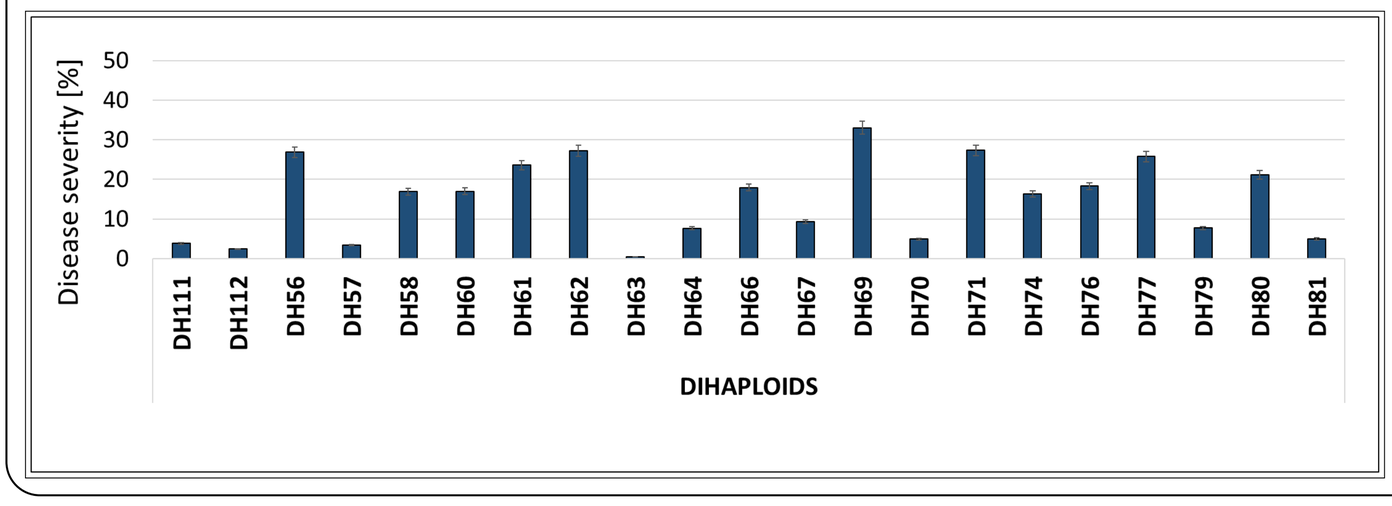



## RESULTS

The differences between seedling leaves for all variance components were statistically significant. Most of the somaclonal and dihaploid lines produced from commercial triticale cultivars showed significantly improved resistance to the pathogen in question (Graph 1.). However, from resistant parental cultivars were obtained primarily more resistant somaclones and dihaploids. Higher resistance to *P. nodorum* was observed more often on leaves of somaclonal lines then on leaves of dihaploids. On average, disease severity reached 10% on leaves of somaclones and 12% on leaves of dihaploids. Some of genotypes were showing low leaf infection, e.g. dihaploid DH63 obtained from F1 plants of Borwo x Tomko. Similarly, lower disease severity was observed on a somaclone SE64 produced from F1 plant of Borwo x Cyrkon.

**Graph 1. Disease severity caused by *P. nodorum* on parental cultivars, somaclones and dihaploids.**





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