

FROST RESISTANCE OF WINTER WHEAT IN ORGANIC FARMING



ecobreed
IMPROVING CROPS

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Introduction

The frost resistance is one of the desirable traits, which is important for stability of grain yield in many countries. The required level of frost resistance widely differs in different growing conditions. In Central Europe, precisely in Czech Republic, wheat breeders can select genotypes with lower frost hardiness than in Russia or Canada, but cultivation of varieties without any frost resistance is very hazardous.

Cold winters of 2002/03 and 2011/12 showed importance of this trait, since more than 20% of winter wheat fields were completely damaged. Frost resistance is an important factor in yield stability even for organic farming.

In the presented study, the frost survival ability of eighty winter wheats suitable for organic farming was tested by three methods to evaluate the level of risk of winterkilling in Czech winter condition.

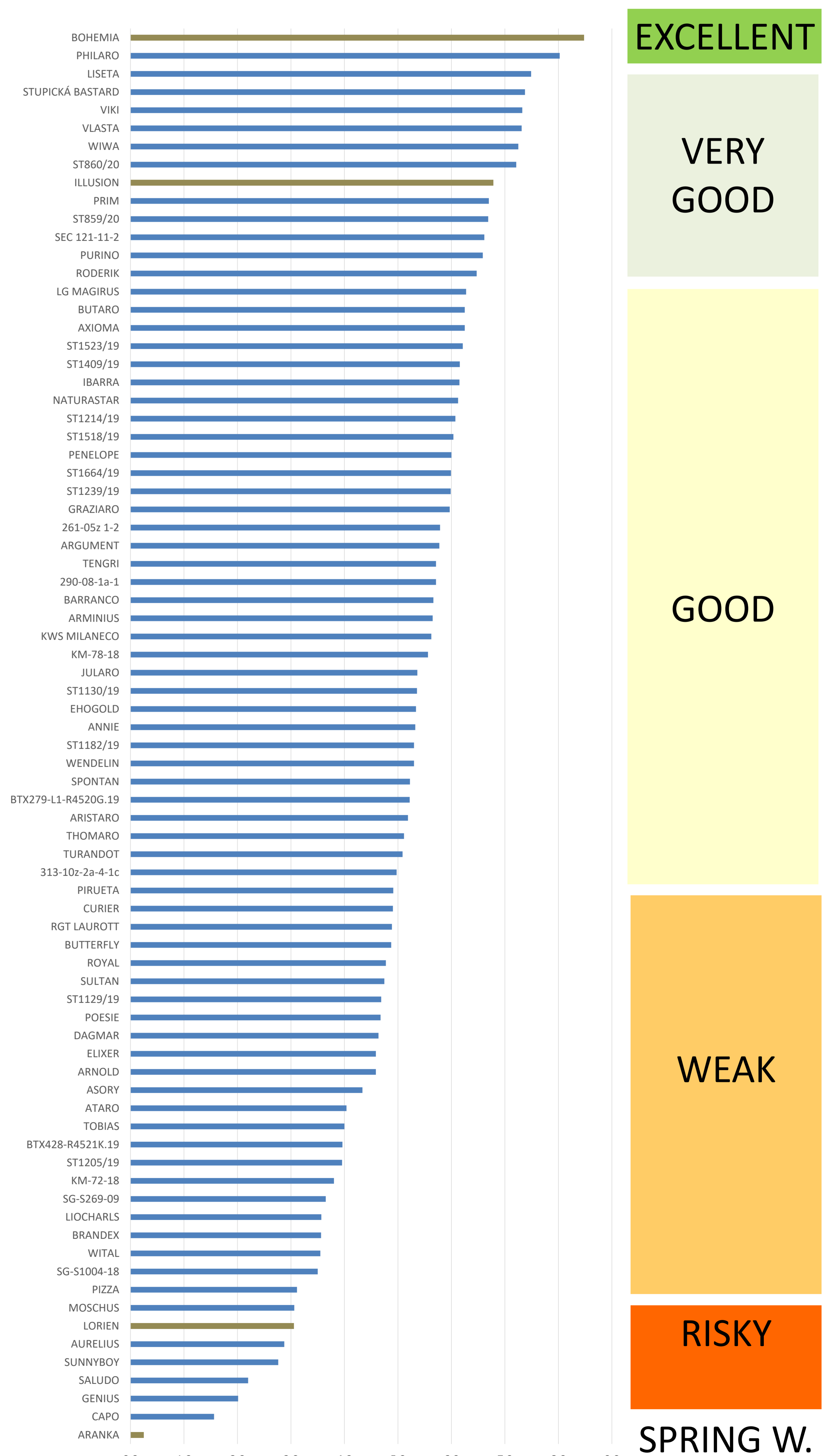
Materials and Methods

Many methods have been designed and are used in winter wheat breeding and testing programs for artificial testing of frost resistance. They differ in the way plants are sown and prepared for testing, in the hardening phase and freezing steps and in the evaluation of frost damage. The range level suitable for winter conditions in the Czech Republic is characterized by four used controls (Bohemia - 9, Illusion - 7, Lorien - 4, Aranka - 0). The plants were grown in seedling tray (quickpot) in peat substrate (2 mm coarseness) under natural conditions during late autumn and early winter in the Czech Republic (2021) in order to obtain natural frost hardening (method KS and KU) or artificial hardening in growing chamber (method L). Each genotype was sown in three repetitions with each repetition affected by different frost stress (-12, -14 and -16 °C). The frost was maintained in controlled conditions of frost chambers. Plant regeneration took place in a tempered greenhouse at a temperature of 15-20 °C. After the restoration of vegetation growth (about 14-21 days), the numbers of surviving plants were evaluated. The result of the evaluation is the survival index defined as portion of surviving seedlings/all planted seedlings (9-0; 9=100% survived). The average value of these three independent tests is shown in the attached graph.

Results

- None of the tested genotypes reached the level of the control variety Bohemia
- Philaro, Liseta, Stupicka Bastard, Viki, Vlasta, Wiwa and ST860/20 varieties achieved very good levels of frost resistance.
- Aurelius, Sunnyboy, Genius and Capo varieties have low frost resistance and their overwintering is risky in the Czech Republic.
- From previous studies of conventional seed tests, we know the Dagmar and Genius varieties as well frost-resistant. Their poor results in this test might be affected by the origin of the seeds from organic farming.

Results – Frost Resistance Level



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