Dr. Hartmann, PZ 4b Crop management and breeding: forage plants;
Bavarian State Research Center of Agronomy; Am Gereuth 4; D-85354 Freising / Stephan.Hartmann@lfl.bayern.de
Gerstle University of Applied Sciences Weihenstephan; Fachbereich Land- und Ernährungswirtschaft;
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# Natural selection for persistence in rough regions of Bavaria in perennial ryegrass (*Lolium perenne* L.) and its impact on other characteristics

Stephan Hartmann and Christian Gerstle, Bavarian Research Center for Agronomy, Freising

## Abstract

In this study the impact of natural selection for persistence in rough regions of Bavaria in perennial ryegrass (*Lolium perenne* L.) on morphological characteristics was evaluated by a comparison of 15 varieties with different levels of persistence, each variety divided in unselected and selected subpopulations was carried out at two locations.

## Introduction

Perennial ryegrass (*Lolium perenne* L.) is one of most important forage grasses in the temperate zone [RIEDER 1983, HOFFMANN, 1985]. Never the less every severe winter in Bavaria there are damages in intensive grassland depending on the loss of ryegrass [SCHELLER 1993]. Therefore well adapted varieties are of great importance for a sustainable and economically efficient management in major parts of grassland of Bavaria [SCHELLER 1995, RIEDER 1999]. To increase the efficiency of breeding for this region means to improve breeding for the key-feature "persistence". So the methods of selection for this complex feature [BREESE and FOSTER 1971] have to be enhanced. The correlation of persistence with other characteristics, which are easier to handle and can be detected in a shorter range of time, are of high interest to get a step forward on this journey.

## Material and Methods

In autumn 1998 72 individual plants per variety were taken from variety persistence trials seven winters after seeding. Plants from seeds of these varieties were also grown for comparison. Both groups were cloned to plant identical arrangements in Pulling/FS and Kempten/Spitalhof (figure 1).
So for each variety two populations could be compared in the trials: one grown from seeds further named „before selection" (= BS) and one reselected from persistence trials further named „after selection" (= AS)
1999 plants at both sites were visually scored for several features.
This means that each point for a variety in the graphs below results from a data set of 288 records: 72 (individuals)
x 2 (selected/non selected)
x 2 (sites)
"Persistence" in the following context is scored as number of surviving individuals in a population. The results are represented in figure 2.

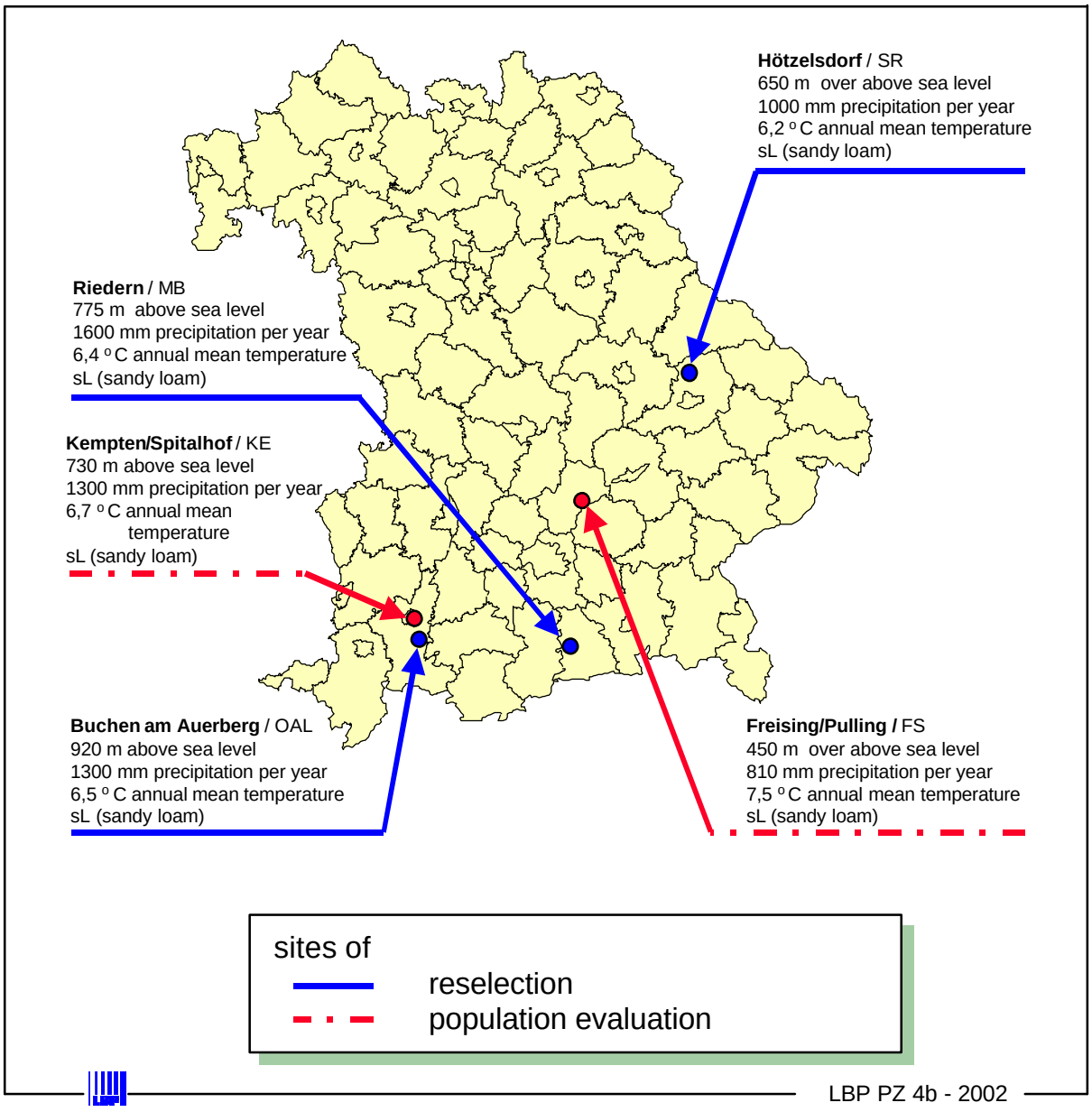
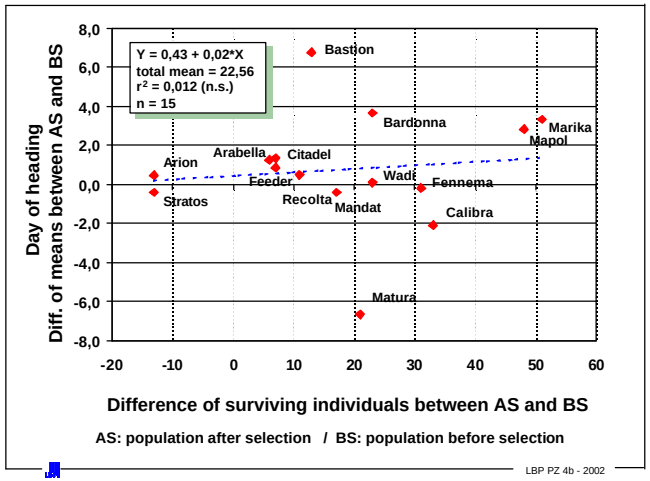
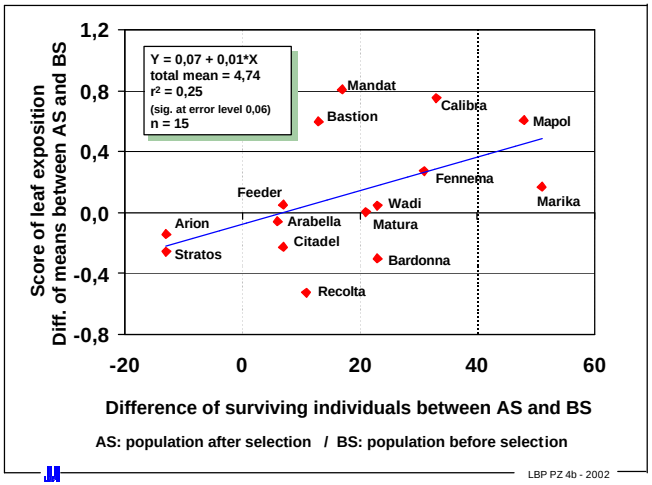



Figure 1: Environments of natural selection and following evaluation

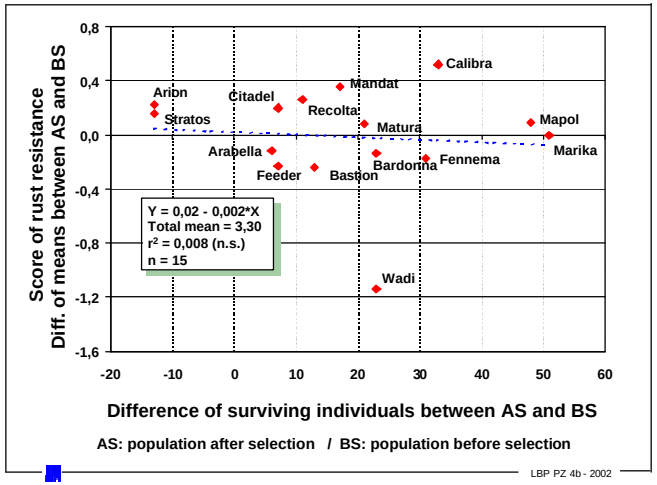
Figure 2: Correlation between the shift of day of heading (A), rust resistance (B), leaf exposition (C), growth rate after the first cut (D) and the number of surviving individuals from 15 varieties after 7 years of natural selection in rough regions of Bavaria



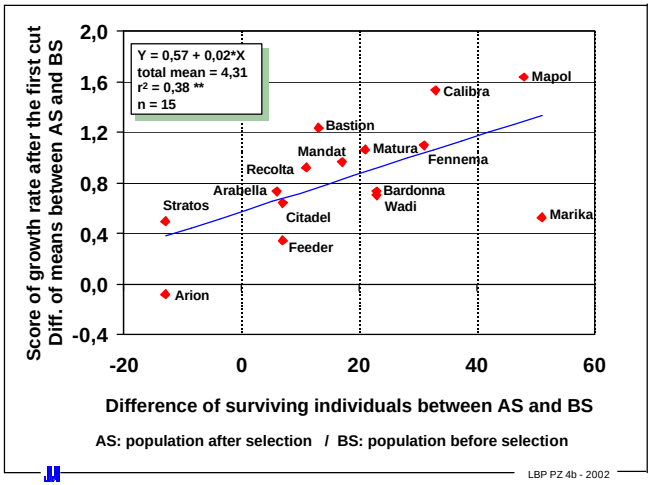

A: Correlation to the shift of day of heading




C: Correlation to the shift of leaf exposition




B: Correlation to the shift of rust resistance




D: Correlation to the shift of growth rate after the first cut

**Results and Discussion**

4.320 plants were scored for day of heading, plant height, growth habit, colour of leaves, flag leaf length, flag leaf width, inflorescence length, growth rate after the first cut and rust resistance.

Plant height, colour of leaves, flag leaf length, flag leaf width, inflorescence length showed no shift caused by co-selection with persistence. Likewise, rust resistance and a later date of heading did not show any influence caused by natural selection. Other authors reported that there are effects on persistence by rust resistance [BIRKENSTAEDT 1990, LELLBACH and RUGE 1996, PFEFFER and PFEFFER 1991] and later day of heading [HUMPHREYS and EAGLES 1988]. This difference can be explained by the environmental conditions [REHEUL and GHESQUIERE 19969 of the trails representing the situation in the rough regions of Bavaria:

- in these rough regions of Bavaria only little infections are caused by rust. Therefore there exists no selection pressure
- the trials have 4 to 5 cuts per year, so that no variety can multiply itself by seed. Hence there is no selection advantage in any direction on the scale of heading date

The growth rate after the first cut as well as leaf exposition were altered by natural selection for persistence. This complies with the results of BUGGE (1991) and HUMPHREYS (1989).
In grass populations both features are advantageous for the individual plant in the struggle for living space.

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