

Out Standing Performance and Molecular Profiling of Barley Entry “HUB-113” Across the Location for Yield and Resistance Against Spot Blotch Disease Caused By *Bipolaris sorokiniana*

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Abstract

A new high yielding spot blotch resistant barely variety *viz.*, “HUB-113” derived from Karan 280 / C 138 has been developed by the Department of Genetics and Plant Breeding, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi. Before its release it was tested under all India Coordinated Trial, conducted by ICAR, New Delhi, including molecular profiling with three reference barley varieties namely K-508, RD-2552 and Jyoti. On the basis of its outstanding performance for yield, resistance to spot blotch disease caused by *Bipolaris sorokiniana* fungal pathogen and other desirable traits, Central Varietal Release Committee has approved for its release in 2013 for the cultivation as feed barley in the NEPZ of the country under timely sown irrigated conditions. During three years of field testing/trial at 18 locations HUB-113 exhibited the best performance over all standard checks for yield and resistance against spot blotch disease. In 18 trials conducted at different research station, HUB-113 is was superior to all checks at 10 locations. It had average yield of 4.49 MT ha⁻¹ with yield potential of 5.96 MT ha⁻¹ during trials. It is ideal for days to maturity, plant height, protein content, wax appearance on the plant surface, etc. Further clustering/dendrogram pattern revealed that HUB-113 belongs to single cluster and showed 90 per cent similarity with Jyoti, K 508 followed by RD 508 checks.

Introduction

- Spot blotch disease is the primary disease of barley in eastern Gangetic plains zone of the India Cause by *Bipolaris sorokiniana*.
- Disease not only limits the yield of crop but also impairs the quality of grain, which reduces the price.
- Yield losses range from 16 to 52 per cent however, and can reach 100 per cent on susceptible genotypes when conditions are favorable.
- Application of fungicides is an effective approach to control the disease, yet it is costly and hazardous to the environment.
- In general existing genotypes either low yielding or lack resistance to spot blotch.
- Hence, development of spot blotch resistance genotypes for controlling the disease and enhancing crop yield is the best approach.

Results

Table 1. Analysis of variance table for yield trait

Source	DF	SS	Mean Square	F value
Rep(Year/Location)	2	69.95551	34.97775	1.78
Entry	3	301.76342	100.58780	5.11*
Error	6	117.43421	19.67543	-

*Significant at p 0.05, CV=9.69 %

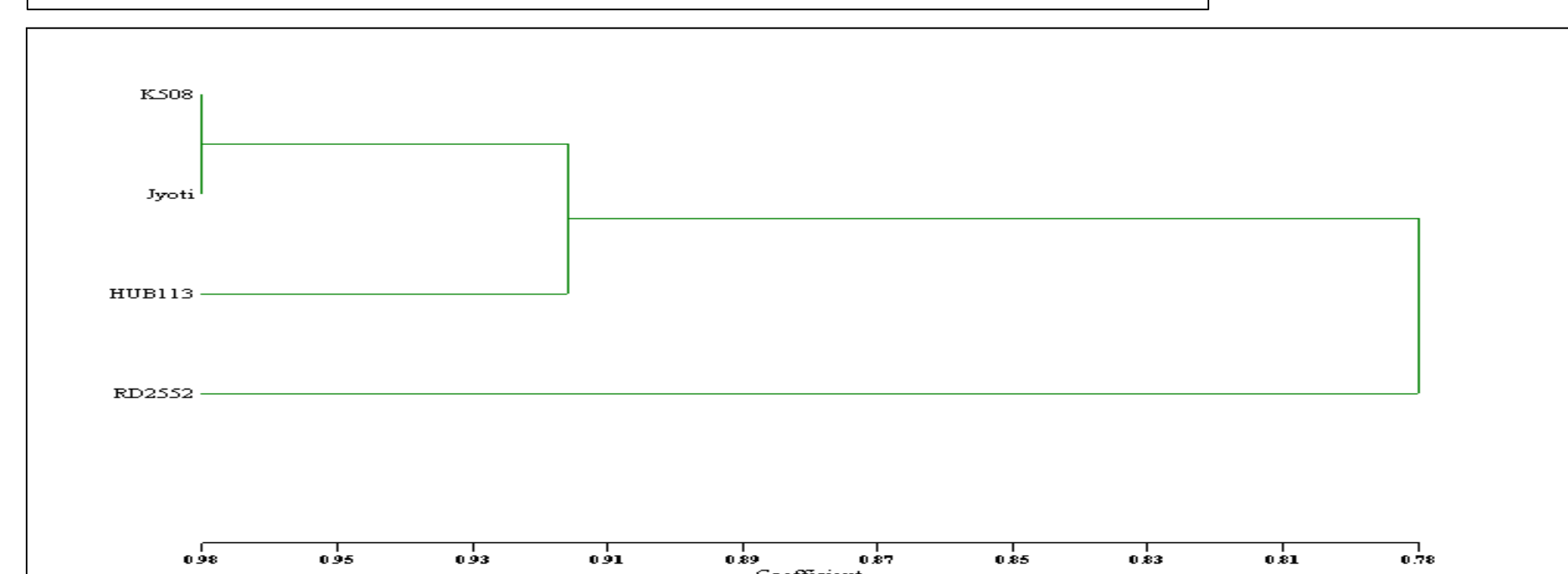


Fig. 1. GS among the entries based on SSR markers

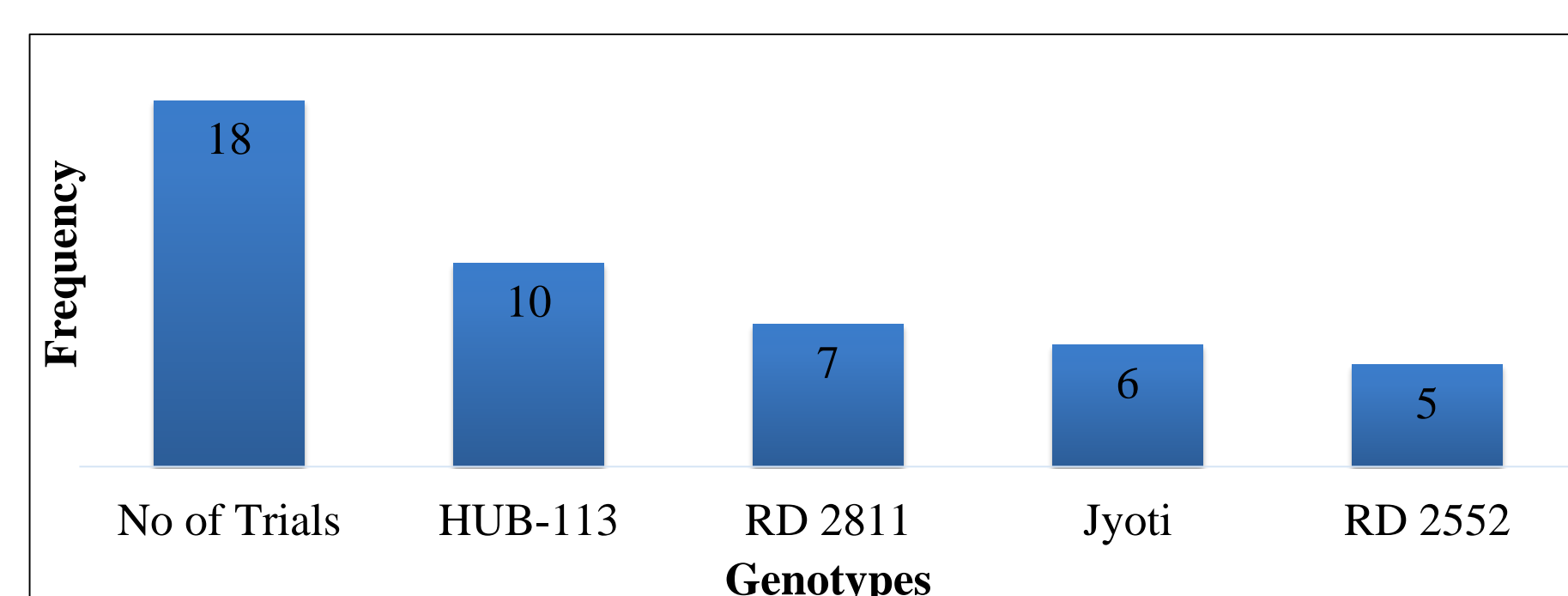


Fig. 2. Better yield performance of HUB-113 vs checks

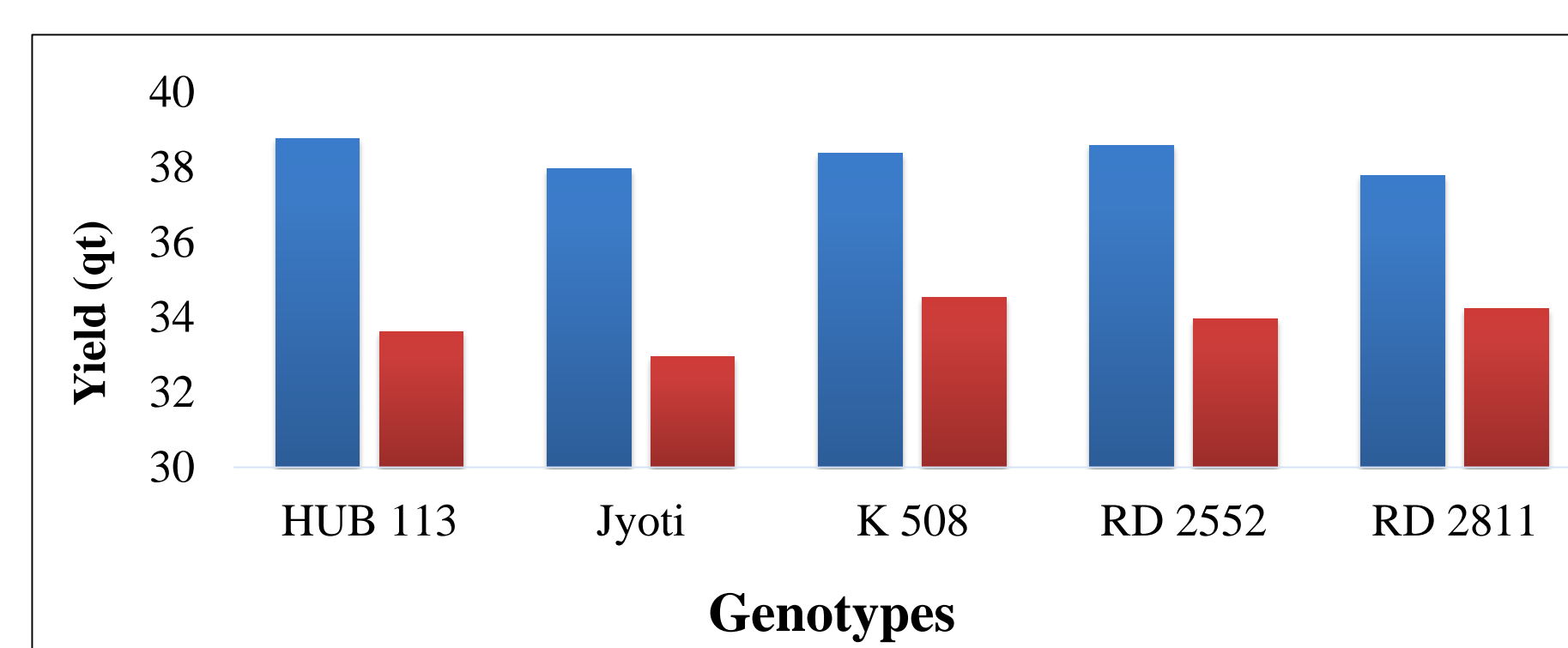


Fig. 3. Yield under timely and late sown conditions



Fig. 4. Phenotypic expression of HUB-113 (A) and Sus. variety against SB disease in field condition

- Trials data over three years proved that HUB-113 is high yielding and highly resistant against spot blotch disease, aphids and rusts.
- HUB-113 performed yielded higher than all the standard checks (Jyoti, RD 2552 and RD 2811) during trials.
- It had the highest yield compared with all checks over the mean of three years (2010-11 to 2012-13) in NEPZ.
- The yield potential of HUB-113 was 4.75 MT/ha in 2010-11, 5.96 MT/ha in 2011-12 and 5.64 MT/ha in 2012-13 during testing.
- HUB-113 surpassed all the checks for grain yield and grain number/head in Agronomic Trial (2012-13) under timely sown condition in NEPZ.
- Yield potential of HUB 113 and checks were significantly higher under irrigated conditions followed by rain fed conditions.
- ANOVA table revealed significance difference among entries for yield.
- The identified Zone for HUB-113 is North Eastern Plains Zone (NEPZ)
- Its yielding ability range is 4.7-5.7 MT/ ha.
- Its yield production (7.46 to 8.54 %) was higher than the check varieties
- Its maturity duration range is from 16-119 days.
- DNA finger printing profile indicate that HUB-113 has greater genetic diversity compared to standard checks.

Conclusion

- Based on outstanding performance of HUB-113 for yield and resistance against spot blotch disease and also superiority for other desirable traits, it could be used as parent and standard check for crop improvement under breeding program.
- It is also an ideal candidate for molecular dissection of resistance loci to spot blotch.

Further Goals

- Mapping of resistance genes/QTLs responsible for spot blotch disease using SSR/GBS approach.
- Identification of tightly linked molecular marker associated with resistance to spot blotch disease.
- Pyramiding of other SB disease resistance genes/QTLs into single desirable cultivar.

Materials and Methods

- “HUB-113” was derived from cross of Karan 280 / C 138 using pedigree method.
- Based on performance in response to yield and disease reaction in station trials it was selected for Initial Varietal Trial (IVT) and Advance Varietal Trial (AVT) conducted by Indian Council of Agricultural Research (ICAR), New Delhi at various research stations along with checks for three years (2010-11/Varanasi, 2011-12/Faizabad and 2012-13/Ranchi) India.
- Disease severity (%) was recorded at different growth stages (Zadoks et al. (1974).
- Based on DS, Area Under Disease Progress Curve (AUDPC) was also calculated (Roelfs et al. (1992).
- For DNA finger printing-, a set of 120 Simple Sequence Repeat (SSR) molecular markers covering whole genome of barley was used.
- A set of 45 SSR markers used to construct dendrogram.
- Statistical analyses was performed by using SAS version 9.1 (SAS Institute, Cary, NC).

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