

# Occurrence of hetero-branching of spike in bread wheat (*T. aestivum* L.)

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## ABSTRACT

Direct and reciprocal crosses were made between two bread wheat varieties (WH 147 and PBN 51) bearing normal spikes. The F<sub>1</sub>, BC<sub>1</sub> and BC<sub>2</sub> generations of straight and reciprocal crosses were showed normal spikes. However, the F<sub>2</sub> generations of direct and reciprocal crosses showed segregation for various spike morphotypes. The most striking morphotype was characterized by two fully developed spikes on a single tiller/culm. Interestingly, the segregation of spike morphotypes was seen to be associated with the sowing time of the experimental material because different morphotypes expressed only under early sown F<sub>2</sub> material (16<sup>th</sup> November 2005), while there was no such type of segregation in F<sub>2</sub> material planted on 21<sup>st</sup> December 2005. The corresponding mean minimum and maximum temperatures at flowering stage during early and late planting were 6.90°C/ 8.39°C and 22.79°C/24.09°C.

## INTRODUCTION

Spike-branching is hitherto seen in the case of bread wheat (*T. aestivum*); however, this trait is not an unusual phenomenon in *Triticum turgidum*, tetraploid wheat. Introduction of this trait into the background of commercial cultivars can be seen as one of the ways to increase the effective spikes per plant/per unit area for the purpose of further enhancing the yield potential of common wheat. The earlier efforts made to cross common wheat with branching forms of *T. turgidum* L. (Koric, 1980 and Dencic, 1988) resulted into variable expression of the trait in the background of hexaploid wheat.

## MATERIAL AND MATHOD

The present investigation was initiated during *Rabi* 2004-05 with the planting of parents and making of F<sub>1</sub> at Crop Research Centre, GBPUAT, Pantnagar. Later on the F<sub>2</sub>, BC<sub>1</sub> and BC<sub>2</sub> of the respective crosses were developed in summer nursery at Dalang Maidan, District Lahaul & Spiti (H.P.) a regional station of Directorate of Wheat Research (ICAR) Karnal (Haryana) in the same year 2004-05. The final trial was conducted during *Rabi* 2005-06 using P<sub>1</sub>, P<sub>2</sub>, F<sub>1</sub>, F<sub>2</sub>, BC<sub>1</sub> and BC<sub>2</sub> generations resulting from normal (WH147 × PBN51) and reciprocal (PBN51 × WH147) crosses in a compact family block design with three replications in 1m long rows spaced 23 cm apart with plant to plant distance of 10 cm for timely sown 18 cm in late sown condition at the Crop Research Centre of G.B. Pant University of Agriculture and Technology, Pantnagar, District. Udham Singh Nagar,

Uttarakhand, India. Geographically, Pantnagar is located at 29° N latitude, 79.30° E longitudes at an altitude of 243.84 meters above the mean sea level, under humid sub-tropical zone at the foot hills of Shivalik range of the Himalayas, popularly known as *Tarai*.

## RESULTS

In the present report, the spike-branching was observed in F<sub>2</sub> generation of normal and reciprocal crosses performed between two bread wheat varieties namely, WH 147 and PBN51 bearing normal spikes. The F<sub>1</sub>, BC<sub>1</sub> and BC<sub>2</sub> plants were raised from both the normal and reciprocal crosses.

Among the various spike morphotypes observed in F<sub>2</sub> generation, the most desirable and useful type is DSST which is characterized by two fully developed spikes on a single tiller /culm or collar (Fig.1). However, three spikes on a single tiller, TSST (Fig. 2) and other different morphotypes variability were observed for spike in bread wheat (Fig.3).

## CONCLUSION

Incidentally the experimental material comprising the P<sub>1</sub>, P<sub>2</sub>, F<sub>1</sub> F<sub>2</sub>, BC<sub>1</sub> and BC<sub>2</sub> populations were grown under early and late plantings exposing the plants to variable temperature regimes. The expression of different morphotypes was found to be highly temperature dependent in a way that the reported morphotypes were recorded only in early or timely planted material, while there was no expression of any of the morphotypes in late sown material. It is assumed that the character may have low heritability and the threshold controlled by one or more recessive genes at various temperatures. The minimum and maximum mean temperatures during early or timely sown crop at heading stage were 6.90°C and 22.79°C, while the corresponding figures of mean minimum and maximum temperatures were 8.39°C and 24.09°C, respectively under late sown conditions. Further studies are underway to establish pure-breeding lines of morphotypes and also to work out the genetics of this trait.

## REFERENCES

- Koric, S. 1980. *J. Sci.Agric.Res.* Zagreb (41) 271-282  
Dencic, S.1988. *Proc. 7<sup>th</sup> IWGS*, Cambridge 499-502

**Table1: Segregation pattern of spike morphotypes in F<sub>2</sub> population**

Crosses	Total F <sub>2</sub> plants observed	F <sub>2</sub> plants with normal spike	No. of F <sub>2</sub> plants showing various spike morphotypes							
			MVSW1	MVSW2	MVSW3	MVSW4	MVSW5	MVSW6	DSST	TSST
WH 147×PBN51 (Normal cross)	294	227	18	15	10	9	3	3	6	3
PBN51×WH147 (Reciprocal cross)	285	210	15	21	12	9	3	6	7	2
Total	579	437	33	36	22	18	6	9	13	5

**\* MVSW: Morphotype variability for spike in wheat**

**MVSW 1**=Hetero branching from first spikelet;

**MVSW3**=Hetero branching from third spikelet;

**MVSW5**=Hetero branching from 5<sup>th</sup> or 6<sup>th</sup> spikelet;

**DSST**=Double spikes on single tiller;

**MVSW2** = Hetero branching from second spikelet;

**MVSW4**=Hetero branching from fourth spikelet;

**MVSW6**=Hetero branching from upper second/third pikelet;

**TSST**=Three spikes on single tiller



Figure: 1 Double spike on single tiller



Figure: 2 TSST: Three spike on a single tiller



Figure: 3 Different Morphotypes variability observed for spike in bread wheat