COMPARATIVE STUDY OF YIELD AND YIELD CONTRIBUTING TRAITS OF DIFFERENT GENOTYPES IN BREAD WHEAT

MD. Hasnath Karim and M. A. Jahan
Genetic Engineering and Biotechnology Department, Shahjalal University of Science and Technology, Sylhet, Bangladesh
E-Mail: hasnath.karim@gmail.com

ABSTRACT
Ten different genotypes of bread wheat were evaluated for analysis the yield and yield related traits. The objectives of the study was to study the performances of some wheat varieties for grain yield and its contributing characters and study the heritability for grain yield and its contributing characters. The study revealed that there have significant differences among the different genotypes of bread wheat. From the observation it is clear that Akbar and Shourav have highest height and they were 69.3cm. Sufi was the smallest variety (54.3cm). Shatabdi and Barkat had highest number of tillers (3.67). Pradiv had the highest spike length (16.20cm), relatively high number of spikelets/spike and grains weight in per spike was highest (2.33gm). Some characters of bread wheat are highly heritable such as length of spike, 100-grain weight, yield etc. So these characters would be effective for selection in breeding programme. Sufi and Gourav varieties are semi dwarf. Pradiv, Shatabdi and Prativa have the higher yield than other varieties are semi dwarf in nature. The degree of relationship varied from genotype to genotype.

Keywords: bread wheat (Triticum aestivum), yields, traits, genotypes.

INTRODUCTION
The priority of wheat improvement programme is to increase grain yield. Any improvement programme for increasing yield requires sufficient information on their parental materials in respect of variation for yield and yield contributing character. It helps the breeder for improving the selection efficiency. For this many researchers studied variation for yield and yield contributing characters in wheat.

Manal. H. Eid (2009) estimated heritability and genetic advance of yield traits in wheat (Triticum aestivum L.) under drought condition. The mean average for plant height, spike length, number of spikes per plant, number of grains per spike, 50% heading date and 1000 grain-weight revealed highly significant differences among genotypes and crosses under both sowing conditions. Low, medium and high heritability was found in different yield traits under study. High heritability accompanied by high genetic advance was observed for spike length and 1000 grain-weight. Low heritability coupled with low genetic advance was for plant height and number of grains per spike.

Yadav, R. K., Parvez Khan and Singh, P. (2006) worked on heritability and genetic advance in common wheat (Triticum aestivum L.). In general, heritability estimates were high for all the characters studied except for peduncle length, grain filling period and grain yield per running metre. High heritability coupled with high genetic advance was recorded for number of tillers.

Khalil Ahmed Laghari (2009) studied on comparative performance of wheat advance lines for yield and its associated traits. Some morphological (grain yield, plant height, 1000-grain weight, spike length, number of spike let/spike, number of grains/spike, main spike yield and phenological data (days to ear emergence, maturity period and grain filling period) were studied. Number of tillers per plant, flag leaf area, peduncle length and grain yield per plant ranged from 6.30 to 19.88, 1.87 to 4.42, 4.78 to 10.10, 2.68 to 10.38 and 4.95 to 11.61, respectively.

Spikes per plant is one of the primary yield components of wheat and sometimes studied as number of effective tillers per plant. Srivastava et al., (1988) studied variation and reported significant differences among the genotype for spike per plant in spring wheat. In their studies both genotypic and phenotypic coefficient of variation were found high.

Spikelet per plant is an important character related to grain yield in wheat. Singh and Tiwari (1990) reported high genotypic and phenotypic coefficient of variation for this character. Pathak and Nema (1985) recorded 6.51% genotypic coefficient of variation and 10.25% phenotypic coefficient of variation for spikelet per spike.

In wheat, grains per spike are one of the important primary yields contributing character. In study with 25 spring wheat varieties Mondal and Sarker (1996) found significant differences among the yield components. They observed wide range of variation for number of grains per spike. Similar result were obtained by Shoran (1995), Amin et al., (1992), Pratik et al., (2003) But genotypic and phenotypic coefficient of variation was moderate for number of grains per spike as reported by Singh and Tiwary (1990).

100 grains weight has direct effect on grain yield. If 100 grain weight increase, the ultimate total yield increases. A wide range of variation for grain weight was observed by Nessa et al., (1994). Pathak and Nema (1985) found genotypic and phenotypic coefficient of variation for 100 grains weight is up to 30.93%. Yadav and Mishra (1993) studied 10 varieties under rainfed condition and they found maximum coefficient of variation for grain weight.
Heritability for spikes per plant of wheat was extensively studied. Narwal et al., (1999) reported high heritability for spike per plant in bread wheat. But Kamboj et al., (2000) indicated that spike per plant was poorly heritable character.

Plant height was highly heritable as reported as Afiah et al., (2000). Camargo and Ferreira (1999) estimated moderate to high narrow sense heritability for plant height in bread wheat.


Chaturvedi and Gupta (1995) reported poor heritability for 100-grain weight suggesting that the character would not give good response to selection.

**MATERIALS AND METHODS**

Ten wheat genotypes (*Triticum aestivum*) namely Bijoy, Akbar, Balaka, Shatabdi, Prativa, Shourav, Barkat, Sufi, Gourav and Pradiv were studied in this experiment. Seeds were collected from Regional Wheat Research Centre (RWRC), BARI, Rajshahi Bangladesh and were seeded at an experimental plot of Shahjalal University of Science and Technology, Sylhet in the Rabi season of 2009. The genotypes were grown in single row plot of significance it was highly significant. Tiwari (1993) and Amin (1992) et al., also reported same observation.

In the case of grains weight in per spike, there also show some variation. The weight of grains in a spike was relatively higher in Pradiv. In Pradiv the grain weight was 2.33gm. The weight of grains in Shatabdi and Prativa also higher and they were 2.13gm and 1.91gm, respectively. Akbar and Balaka had lower grains weight but the grains weight of Gourav was much lower than all other varieties and its weight was 0.97gm. At the 5% level of significance it was showed great variation.

For Pradiv and Akbar the weight for 100 grains weight were more than others. The weights were 5.78gm and 5.72gm respectively. Shatabdi and Gourav also had similar nature. But for Barkat, Sufi, and Prativa the 100-gains weight was lower and for Barkat it was 4.12gm. From the analysis of variation there observed a significant variation at 5% level of significant.

Data were statistically analyzed and to distinguish the significant differences between two different means, least significant differences (LSD) were estimated. Mean squares of analysis of variances were worked out to test the significance. The heritability, genotypic variance and phenotypic variance were also estimated.

**RESULTS AND DISCUSSIONS**

The yield relating traits expressed different variation. Among this yield relating traits length of spike, spikelet number, grains weight show highly differences.

The length of spike was larger in Pradiv and its length was 16.20cm. The spike length in Shatabdi and Prativa also larger and they were 15.70cm and 15.43cm, respectively. On the other hand, the length of spike was smaller in Akbar and Bijoy. Their estimated length was 12.83cm and 12.87cm, respectively. All the other varieties had almost similar length of spike. At 5% level of significance there observed a significant variation.

Total number of tillers per plant was highest in Shatabdi and Barkat (3.67) and it was relatively lower in Pradiv (2.6).

Spikelet number also varies from variety to variety. Prativa composed high number of spikelet and it was estimated 15 spikelet’s in per spike. Pradiv, Barkat, Shourav, Shatabdi and Bijoy also had well number of spikelet. Akbar, Balaka and Sufi had also around 12 to 13 spikelets. But Gourav produced only 9.67 spikelets which were smaller in compared to other varieties. At 5% level of significance it was highly significant.

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Table-1. Mean differences in six agronomic traits of ten wheat genotypes.

<table>
<thead>
<tr>
<th>Genotypes</th>
<th>Plant height (cm)</th>
<th>Total number of tillers/plant</th>
<th>Length of spike</th>
<th>No. of spikelet</th>
<th>Grains weight in per spike (gm)</th>
<th>100 grains weight (gm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bijoy</td>
<td>67.00</td>
<td>3.00</td>
<td>12.87</td>
<td>14.00</td>
<td>1.64</td>
<td>4.41</td>
</tr>
<tr>
<td>Akbar</td>
<td>69.30</td>
<td>2.53</td>
<td>12.83</td>
<td>13.00</td>
<td>1.52</td>
<td>5.72</td>
</tr>
<tr>
<td>Barkat</td>
<td>58.00</td>
<td>2.67</td>
<td>13.10</td>
<td>12.00</td>
<td>1.53</td>
<td>4.63</td>
</tr>
<tr>
<td>Shatabdi</td>
<td>63.67</td>
<td>3.67</td>
<td>15.70</td>
<td>14.67</td>
<td>2.13</td>
<td>5.08</td>
</tr>
<tr>
<td>Prativa</td>
<td>66.67</td>
<td>3.30</td>
<td>15.43</td>
<td>15.00</td>
<td>1.91</td>
<td>4.23</td>
</tr>
<tr>
<td>Shourav</td>
<td>69.33</td>
<td>3.00</td>
<td>13.70</td>
<td>14.33</td>
<td>1.79</td>
<td>4.57</td>
</tr>
<tr>
<td>Barkat</td>
<td>61.32</td>
<td>3.67</td>
<td>13.87</td>
<td>14.67</td>
<td>1.66</td>
<td>4.12</td>
</tr>
<tr>
<td>Sufi</td>
<td>54.30</td>
<td>3.00</td>
<td>13.20</td>
<td>13.00</td>
<td>1.18</td>
<td>4.23</td>
</tr>
<tr>
<td>Gourav</td>
<td>56.32</td>
<td>3.00</td>
<td>13.53</td>
<td>9.67</td>
<td>0.97</td>
<td>5.36</td>
</tr>
<tr>
<td>Pradiv</td>
<td>57.33</td>
<td>2.60</td>
<td>16.20</td>
<td>14.67</td>
<td>2.33</td>
<td>5.78</td>
</tr>
<tr>
<td>LSD (5%)</td>
<td>5.95</td>
<td>1.81</td>
<td>0.90</td>
<td>1.97</td>
<td>0.44</td>
<td>0.45</td>
</tr>
<tr>
<td>LSD (1%)</td>
<td>8.15</td>
<td>2.48</td>
<td>1.24</td>
<td>2.70</td>
<td>0.60</td>
<td>0.62</td>
</tr>
<tr>
<td>CV (%)</td>
<td>5.56</td>
<td>11.48</td>
<td>3.76</td>
<td>8.51</td>
<td>15.43</td>
<td>5.47</td>
</tr>
</tbody>
</table>

LSD indicates the least significant differences at 5% and 1% level, respectively

Table-2. Mean square of analysis of variance of six agronomic traits of ten wheat genotypes.

<table>
<thead>
<tr>
<th>Source of No. of variation</th>
<th>d.f</th>
<th>Plant Height</th>
<th>No. of Tillers/Plant</th>
<th>Length of spike</th>
<th>No. of Spikelet</th>
<th>Grains weight/spike</th>
<th>100 Grains weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replication</td>
<td>2</td>
<td>11.44</td>
<td>.035</td>
<td>0.24</td>
<td>2.08</td>
<td>.16</td>
<td>0.06</td>
</tr>
<tr>
<td>Genotype</td>
<td>9</td>
<td>95.04**</td>
<td>.55</td>
<td>4.73**</td>
<td>8.24**</td>
<td>.50**</td>
<td>1.18**</td>
</tr>
<tr>
<td>Error</td>
<td>18</td>
<td>12.03</td>
<td>1.11</td>
<td>0.28</td>
<td>1.32</td>
<td>.07</td>
<td>0.07</td>
</tr>
</tbody>
</table>

*, ** indicate significant at 5% and 1%, respectively

From Table-3, it was observed that length of spike was highly heritable and it was estimated 84%. The genotypic and phenotypic variances were observed 1.48 and 1.76, respectively. Number of spikelet also a heritable character and 64% of variation in it occur due to genetic constituents. Its genotypic and phenotypic variance estimated 2.31 and 3.63, respectively.

Table-3. Genotypic variance, phenotypic variance and heritability.

<table>
<thead>
<tr>
<th>Character</th>
<th>Length of spike</th>
<th>No. of spikelet</th>
<th>Weight of grains/spike</th>
<th>100 grains weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genotypic variance</td>
<td>1.48</td>
<td>2.31</td>
<td>0.14</td>
<td>0.37</td>
</tr>
<tr>
<td>Phenotypic variance</td>
<td>1.76</td>
<td>3.63</td>
<td>0.21</td>
<td>0.44</td>
</tr>
<tr>
<td>Heritability</td>
<td>0.84</td>
<td>0.63</td>
<td>0.68</td>
<td>0.84</td>
</tr>
</tbody>
</table>

Grains weight in per spike was also estimated. Its genotypic variance is 0.14 while phenotypic variance is 0.21. Its 68% variation was occurred due to genetic constituents. From the observation of 100 grains weight it was found that, genotypic and phenotypic variances in these varieties were 0.37 and 0.44, respectively. It was highly heritable character and its heritability was estimated as 84%.
The investigation was carried out to find genetic variation among the varieties and their lodging resistance activity in relation to different characteristics. From the morphological view, Akbar and Shourav two plants height are comparatively higher than other genotypes. Bijoy also have higher height. Ten varieties also show genetic variation among them. The variety Akbar also produces higher weight in its 100 grains though its length of spike and number of spikelet not so higher than other varieties. Spike length of Pradiv is the highest and its spikelet number also more than other genotypes. Its grains weight in per spike is also more than other varieties. 100 grains weight of this genotype also so high but its height is lower than Akbar. Among the observation it is found that different genotypes show variation among them. So the grain yield and yield relating characters in wheat show variation in different degrees and this difference are accompanied by their genetic materials and effects of environmental factors.

The heritability of different character was also estimated. The heritability for length of spike, number of spikelet, weight of grains per spike, 100-grain weight are 84%, 63%, 68% and 84%. It’s indicated that those characters were highly heritable.

Afia (2000) found high heritability for plant height and weight of grains per spike. Kamboj et al. (2000) reported that spikes per plant were poorly heritable character.

In this experiment different morphological and anatomical characteristics were observed and found significant phenotypic and genotypic variation due to their genetic constituent and environmental effect. Variety Akbar and Shourav had higher height than other variety. On the other hand Sufi and Gourav were two shortest varieties among the all varieties. Spike length of Pradiv was higher than all other varieties. Shatabdi and Prativa had similar length of spike. Pradiv, Akbar, Gourav, and Shatabdi respectively.

For weight of grains in per spike there shown 14% genotypic variations and 21% phenotypic variation. There shown 37% genotypic variation and 44% phenotypic variation for 100-grains weight in all genotype. Pawar et al. (2002) reported high phenotypic and genotypic coefficient of variation for the characters spike length, 100-grain weight and yield per plant. Islam (1988) reported high genotypic and phenotypic coefficient of variation for 100-grain weight and grain yield per spike. Amin et al., (1992) observed that spikes per plant had high phenotypic coefficient of variation but its genotypic coefficient of variation was much low suggesting that the character was influenced by environmental factor.

Among the observation it is found that different genotypes show variation among them. So the grain yield and yield relating characters in wheat show variation in different degrees and this difference are accompanied by their genetic materials and effects of environmental factors.


Yadav R. K., Parvez Khan and Singh P. 2006. Heritability in wheat. Springerlink, India. 24: 06.