Evaluation of Common Beans *Phaseolus vulgaris* L. for agronomic traits and resistance to bacterial diseases

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**Abstract**

An agronomic evaluation of the *Phaseolus* germplasm helps to identify the lines to improve its use in our region. The phenotypic variation of introduced accessions is high for traits important for breeding objectives. The results showed a potential for improving these traits in *Phaseolus*.

**Introduction**

Field beans (*P. vulgaris* L.) are one of the most important pulse crop in world production and consumption. In our country dry bean appears to be one of the most important grain legume crop.

The traditions of growing dry bean seem to be the most valuable in the North-Eastern Bulgaria where 80-90% of the bean production were concentrated (Georgiev D., 1998). After changing policy the owners are interested in many different crops for different regions.

High temperature during flowering and pod filling is a factor that limits *Phaseolus* production. It may become an important factor in inducing crop maturity.

The objective of the present work is to evaluate 25 accessions received from CIAT-Colombia in the Southern part of the country, where the agrobiological conditions are characterized by rapidly rising temperature in the spring and hot dry summer.

**Material and Methods**

The field experiment was conducted in 1997-1998 at the IPGR-Sadovo. The accessions were sown and evaluated according to the *Phaseolus* Descriptors (Rome, 1982; Genchev and Kiryakov, 1994). Reaction of the leaves to *P.s. pv. phaseolicola* and to *X. a. pv. phaseoli* was tested in flowering stage. Each leaflet of the respective trifoliate leaves was inoculated by multiple needle (MN) with bacterial suspension /10⁶ cfu/ml/ from the PBS1(race 1) and PBS2 (race 2) isolates of P.s. pv. phaseolicola and isolates XBS and XBFS of *X.a. pv. phaseoli*. The inoculation in pods at pod filling stage was made by dissecting needle (Genchev and Kiryakov, 1994). The results were recorded 14 days after inoculation.

**Results and Discussions**

One of the most important characters is duration of vegetative cycle (VP). The accessions had mean value of that character 76 days with comparatively low variation CV% - 5.6% (Table 1). The mean period to initial flowering was 32 days (range 27-37) with low variability (CV%) 7.1%. Most accessions flowered in 28 - 30 days after emergence.

The number of seeds per plant is a result of the number of pods per plant and the number of seeds per pod, with high seeds-weight (100 seeds-weight). These characters ensure good productivity. The range in 100seed-weight was 17.9 to 33.3g, with a mean value of 24.9g and CV% - 19.4%. Almost all accessions were with not so...
high number of seeds per one plant with mean 21.7 seeds and comparatively high variation CV% - 31.2%. These characters are some of the most important for breeders and breeding programs.

Protein content expressed as a percentage of seed dry weight ranged from 23.5% to 28.82% with a mean of 26.17%. The level of variability was low (CV% 6.7).

The evaluated accessions were tested to *X. a. pv. phaseoli* and to *P. s. pv. phaseolicola*. Almost all accessions had high or moderate susceptibility to the first pathogen and moderate or low susceptibility to the second one. Among the two genotypes (cat. 91-50 and cat.92-10) showed resistance to both pathogens (Table 2).

**Conclusions**

The studied accessions showed high coefficients of variation of number of seeds/plant, total seeds weight/plant seed yield and 100-seeds weight.

This indicates the potential of *Phaseolus* genetic resources for improving these traits in a future breeding program.

Two genotypes showed resistance to strains of *X. a. pv. phaseoli* and both races of *P. s. pv. phaseoli*. They can be used as sources of resistance to these pathogens.

**Table 1.** Mean, min. and max. values with coefficients of variation of 7 morphological and phenological characters.

<table>
<thead>
<tr>
<th>Characters</th>
<th>mean</th>
<th>min.</th>
<th>max.</th>
<th>CV%</th>
</tr>
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<tbody>
<tr>
<td>Days to 50% flowering</td>
<td>32</td>
<td>27</td>
<td>37</td>
<td>7.1</td>
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<tr>
<td>Days to maturity (VP)</td>
<td>76</td>
<td>68</td>
<td>84</td>
<td>5.6</td>
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<tr>
<td>Number of pods/plant</td>
<td>14.6</td>
<td>10.7</td>
<td>18.4</td>
<td>23.2</td>
</tr>
<tr>
<td>Number of seeds/plant</td>
<td>21.7</td>
<td>12.2</td>
<td>40</td>
<td>31.2</td>
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<tr>
<td>Total seeds weight/plant</td>
<td>5.7</td>
<td>2.5</td>
<td>9.5</td>
<td>37.8</td>
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<tr>
<td>100-seeds weight (g)</td>
<td>24.9</td>
<td>17.9</td>
<td>33.3</td>
<td>19.4</td>
</tr>
<tr>
<td>protein content (%)</td>
<td>26.17</td>
<td>23.5</td>
<td>28.82</td>
<td>6.7</td>
</tr>
</tbody>
</table>

**Table 2.** Response selected *Phaseolus* genotypes to *X.a.pv.phaseoli* and to *P.s.pv.phaseolicola*

<table>
<thead>
<tr>
<th>Accessions</th>
<th>X.a.pv.phaseoli</th>
<th>P.s.pv.phaseolicola</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>leaves pods</td>
<td>leaves pods</td>
</tr>
<tr>
<td>91-50</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>92-10</td>
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<td>91-48</td>
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<td>91-60</td>
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<td>6.0</td>
</tr>
<tr>
<td>91-113</td>
<td>6.0</td>
<td>6.0</td>
</tr>
</tbody>
</table>

* Score of resistance (from 1to 9): 3 high; 5 medium; 7 low

**References**

