

Resistance in pea germplasm / lines to powdery mildew under natural conditions

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Abstract

The studies were conducted at Agricultural Research Institute Tarnab, Peshawar to evaluate eight pea lines (nearly isogenic) against powdery mildew and some quantitative traits during cropping season 2009-10. Out of eight, four test entries were found resistant, one moderately resistant and three were susceptible. The lines, 26713 and 27315 showed maximum resistance to the disease while the line 27313 was the most susceptible. The lines 27310 and 26719, excelled in pods plant⁻¹ and Grains pod⁻¹ respectively. Maximum vegetative growth of tendrils was exhibited by the lines 27313 and 26713.

Key words: Lines, pea, powdery mildew, resistance.

Introduction

Pea (*Pisum sativum* L.) belongs to family Papilionaceae and is cultivated both as winter and summer crop in Khyber Pukhtoonkhwa where its yield is higher than that in other provinces such as Sindh and Balochistan. However, its successful production in this province is constrained by several factors which include the non-availability of quality seed, high plant density in the farmer fields and above all the attack of several serious diseases (Zaman *et al.*, 1987). Among pea diseases, powdery mildew, root rot and blight are worth mentioning (Iqbal *et al.*, 2000).

Powdery mildew, causing serious losses, is characterized by a white powdery coating on the surface of leaves, stems and pods by the mycelium of the fungus (*Erysiphe polygoni*) DC. (Singh, 1978; Bilgrami and Dube, 1982; Agrios, 1988; Kazmi *et al.* 2002). The disease is more prevalent in late planted or late maturing peas, reducing the yield up to 50% or more (Gritton and Ebert, 1975; Mahmood *et al.*, 1983). A drastic reduction in number of pickings from seven in the healthy to one in a diseased crop has been reported (Dixon, 1987). However, late planted crop or late maturing varieties, if escape from the disease, can fetch higher returns. The local farmers try to overcome the disease by using fungicides but these fungicides are expensive and often beyond the reach of small farmers. In view of the economic importance of the problem, there is a need to search for varietal resistance (Jan, 1999). The present study was, therefore, carried out to evaluate a number of pea lines against powdery mildew resistance and some quantitative traits.

Materials and Methods

The germplasm / lines were collected from EFUPVS and NPP (Establishment of Facilitation Unit for Participatory Vegetable Seed and Nursery Production Program), MINFA Islamabad for the present study. A total of 8 pea lines (nearly isogenic) were used in the study (Table.1). The experiment was conducted at ARI, Tarnab in the last week of Nov 2009, laid out in randomized complete block design and replicated thrice. The plot size was kept 2x1 m for each treatment in each replication with one row per treatment. Disease severity in different lines was quantified by using the disease severity scale described by Ghufuranulhaq, *et al.* 2000 (Table. 2). Number of pods plant⁻¹ were counted on five plants for each treatment in each replication at the maximum production stage of the plants and were averaged. Similarly, number of grains pod⁻¹ were counted in five randomly selected pods for each treatment in each replication and then averaged. The vegetative growth of tendrils was assessed visually as Less (+), Normal (+ +) or Abundant (+ + +). The data recorded was statistically analyzed using Statistix v.8.0, statistical package.

Results and Discussion

Our results showed a significant difference among germplasm / lines in terms of disease severity, number of pods per plant, number of grains per pod and tendrils formation (Table-4)

Disease severity

The symptoms of the disease started to appear in the last week of February and reached its peak by the end of March. The appearance of the disease in the last week of February and its peak incidence by the end of March has also been reported by Iqbal *et al* (1998). Significant ($p \leq 0.05$) differences in severity of powdery mildew among the lines were observed. Disease severity ranged from 8 to 79 percent. The lines 26713, 27315, 26719 and 27311 showed resistance to powdery mildew with disease severity of 8, 8, 8.67 and 9 percent. The line 27310 showed moderate resistance with disease severity of 27 percent and the lines 27314, 27312 and 27313 showed susceptibility with disease severity of 75, 78 and 79 percent respectively (Table 3). These results are in conformity with those reported earlier (Jan 1999; Jan *et al.*, 2007.)

Number of pods/ plant

Statistical analysis of the data indicated a significant difference in number of pods per plant among these lines. The highest number of pods plant⁻¹ (22.22), was recorded in plants of the line, 27310, followed by the lines 27312, 27314 and 26713, where as lowest number of pods plant⁻¹ (16.22), was exhibited by line, 27311, however, it was statistically at same level with 27313, 27315 and 26719 (Table 4). The higher pod number can

be attributed to the high seed of green pod yield. These results are compatible with the findings of Jan *et al.* (2007).

Number of grains/pod

The data on the number of grains per pod were significantly different ($p \leq 0.001$). It was revealed that maximum number of grains per pod (5.66) was recorded for the line 26719, which was statistically at the same level with 27311, 27310 and 27315, where as minimum number of grains per pod (3.99) was recorded in plants of the line, 27312 which is statistically at the same level with the lines, 27313, 27314, 27315 and 26713 (Table 4). These results are in conformity with the findings of Hussain *et al* (2002).

Tendrils

Fewer tendrils were observed in plants of the lines, 27314, 26719 and 27311 while tendrils were abundant in plants of the lines, 26713 and 27313. Normal tendrils were present in plants of the lines, 27312, 27310 and 27315 (Table 4).

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Table 1: List of pea lines used in the study.

S.No	Line codes	Source
1	26713	EFUPVS and NPP
2	27315	EFUPVS and NPP
3	26719	EFUPVS and NPP
4	27311	EFUPVS and NPP
5	27310	EFUPVS and NPP
6	27314	EFUPVS and NPP
7	27312	EFUPVS and NPP
8	27313	EFUPVS and NPP

Table 2: Disease severity scale.

Score	Description(% plant area covered by mildew)	Reaction category
0	0%	Immune
1	1-10%	Resistant
2	11-30 %	Moderately Resistant
3	31-70%	Moderately Susceptible
4	71-80%	Susceptible
5	81-100%	Highly Susceptible

Table 3: Resistance level of pea lines to powdery mildew.

Lines	Disease severity (%)	Score	Response
26713	8.00 d	1	Resistant
27315	8.00 d	1	Resistant
26719	8.67 d	1	Resistant
27311	9.00 d	1	Resistant
27310	27.00 c	2	Moderately Resistant
27314	75.00 b	4	Susceptible
27312	78.00 a	4	Susceptible
27313	79.00 a	4	Susceptible

Means not followed by similar letters are significantly different at $p \leq 0.05$.

Table 4: Means for Disease severity, Pods Plant⁻¹, Grains Pod⁻¹ and Tendrils.

Lines	Disease severity%	Pods Plant ⁻¹	Grains Pod ⁻¹	Tendrils*
27312	78.00 a	19.77 ab	3.99 b	++
26719	8.67 d	17.33 bc	5.66 a	+
27311	9.00 d	16.22 c	5.55 a	+
27313	79.00 a	16.44 c	4.22 b	+++
27310	27.00 c	22.22 a	5.33 a	++
27314	75.00 b	19.66 ab	4.00 b	+
27315	8.00 d	17.22 bc	4.88 ab	++
26713	8.00 d	19.66 ab	4.11 b	+++

*Tendrils: + (less), ++ (normal), +++ (abundant)

Means not followed by similar letters are significantly different at $p \leq 0.05$.

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