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SCREENING OF ADVANCED PEA LINES FOR YIELD AND RESISTANCE AGAINST POWDERY MILDEW IN KAGHAN VALLEY (NWFP), PAKISTAN

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ABSTRACT

Field studies were conducted at Potato Research Farm, Battakundi (Kaghan Valley) to evaluate ten advanced pea lines along with two commercial cultivars for yield potential against powdery mildew during summer, 1997. The disease severely infected the locally grown check cultivars "Mingo-Mark and Meteor" up to the maximum at each site. Five test entries were found resistant, one tolerant and four susceptible to the disease. Among the resistant accessions, the test line PS-310539 out yielded with the dry seed yield of 1406 kg ha^{-1} followed by entries PS-810106, PS-210377 and PS-310396 giving seed yield of 1274, 1203, and 1164 kg ha^{-1}, respectively.

INTRODUCTION

Pea (*Pisum sativum* L.), an important leguminous vegetable of Pakistan, is grown over 10,478 ha with a total production of 71,792 tons and an average yield of 6.9 t/ha (Anonymous, 2000). It was introduced in 1989 as a rotational crop for potato in Kaghan Valley of North West Frontier Province (NWFP), Pakistan, and proved to be highly economical since then. The crop is now cultivated on a large scale by the farmers of the area and approximately 50% of the valley is occupied by pea each summer. Due to increased acreage under susceptible pea cultivars and conducive weather conditions, the crop is severely damaged by powdery mildew in the valley especially in areas around and above Battakundi each year (Jan, 1996; 1999).

The disease, 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, and can reduce 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 varieties, if escape from the disease, can fetch higher cash returns in the area.

The local farmers are not aware of use of any fungicides. Moreover, these chemicals are not easily available in the area (Jan, 1996). 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 undertaken to evaluate a number of advanced pea lines against powdery mildew for yield potential and other economic characters.

MATERIALS AND METHODS

Ten test entries along with two commercial check cultivars (Table 1) were planted in the first week of June, 1997 at Government Seed and Research Farm, Battakundi in Upper Kaghan Valley of Pakistan. Four rows of each entry, each 4 m long and spaced 60 cm with plant-to-plant distance of 8 cm, were placed with four replications in randomized complete block design. The material was screened for powdery mildew under field conditions.

Disease intensity was recorded in the first week of September using 1-9 rating scale where 1= No lesions on plant parts/pods, and 9= Plant parts/pods with highly susceptible reaction. The test material was classified as resistant (score 1-3), tolerant (score 4-5) and susceptible (score 6-9) against powdery mildew (Jan, 1999). Data on days to 50% flowering, plant height (cm), days to maturity, number of pods per 5 plants, number of seeds per 5 pods, 100 seed weight (g) and dry seed yield in kg ha^{-1} were also recorded. The seeds were harvested in the third week of September and data were analyzed according to the Fisher's LSD test (Ott, 1988).

RESULTS AND DISCUSSION

Days to 50% Flowering

The number of days to 50% flowering (Table I) revealed significant difference in the varietal means. The test entry CL-840001 took minimum days of 35.0 to express 50% flowering followed by the entries PS-810106 (35.5 days), PS-210258 (36.6 days) and PS-310539 (36.0 days) as compared to 38.0 days of check cultivars 'Mingo-mark and Meteor' (Table I). There was however, no significant difference between CL-840001 and check cultivars.

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Plant Height
A significant difference was found in the plant height between the entries (Table I). The check cultivars 'Mingo-mark and Meteor' showed the lowest plant height of 44.2 and 45.1 cm respectively as compared with the tallest entries PS-110028 and PS-210377 exhibiting plant height of 93.3 cm and 91.7 cm respectively.

Days to Maturity
The Data in Table-I indicate that the test entries PS-210246, PS-810034, CL-840001, PS-810106 and PS-210258 matured significantly earlier within 71 to 73 days as compared to the others which took about 75 to 80 days. The early cultivars can catch early market and so can fetch higher cash returns.

Number of Seeds per five Pods
The Data show that the test entry PS-310396 gave significantly higher seeds (25.0) per five pods followed by entries PS-210246 (24.7), PS-210377 (24.7) and Mingo-mark (24.3) as compared to others with number of seeds per five pods ranging from 18.0 to 23.5 (Table I). Since both the Local check cultivars were highly susceptible to the disease, therefore, their seeds were found shriveled and squeezed with less weight.

Number of Pods per five Plants
The Data in Table-I reveal that the test entry PS-110028 expressed the highest number of pods (31.8) per five plants followed by the entries PS-110028 (26.3) and PS-210377 (26.0) significantly as compared to local check cultivars Mingo-mark (21.8) and Meteor (20.0). The higher pod number can be attributed to the high seed or green pod yield.

100 Seed Weight
Regarding 100 seed weight, significant difference was found among the entries in the trial. The data indicate that the test entry PS-310396 had the highest 100 seed weight of 24.0 g followed by the entries PS-810106 (22.9 g), PS-210377 (22.9 g) and PS-310539 (22.6 g) as compared to the others (Table I). Higher seed weight is attributed to the higher seed yield (Kazmi *et al.* 2002).

Reaction to Powdery Mildew
Powdery mildew appeared uniformly during the season, and severely infected the check cultivars "Mingo-Mark and Meteor" at each site. Five test entries i.e. PS- 810106, PS-310396, PS-310539, PS-210377, and PS-110028 were found resistant, one (PS-210246) tolerant and the rest were susceptible to the disease (Table I). These results are in conformity with those reported earlier (Jan, 1999).

Dry Seed Yield
The Data (Table I) revealed that the test entry PS-310539 out-yielded the others with the dry seed yield of 1406 kg ha^{-1} followed by entries PS-810106, PS-210377 and PS-310396 giving yield of 1276, 1203, and 1164 kg ha^{-1} respectively. The high yielding test entries being resistant to powdery mildew, gave significantly higher seed yield as compared to the local check cultivars which were highly susceptible to the disease (Jan, 1996; 1999).

Since development of resistant varieties is considered to be the best way to combat a disease (Mahmood *et al*. 1983; Agrios, 1988; Ahmed and Iqbal, 1993; Ahmed *et al*. 1995; Kazmi *et al*. 2002), therefore, high yielding and disease resistant lines need to be tested further to obtain more information for yield and other characters in order to develop improved variety for the area.

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Table 1 ***Evaluation of advanced pea lines for yield potential against powdery mildew at Battakundi (Kaghan Valley), NWFP, Pakistan during summer, 1997.****

Original name or Accession No.	Days to 50% flowering	Plant height (cm)	Powdery mildew score **	Days to maturity	No. of seeds/5 pods	No. of pods/5 plants	100 seed weight (g)	Dry seed yield (kg ha^{-1})
PS 810034 (Alaska-81)	38.0 ab	83.8 ab	7.8	72.0 a	18.0 b	24.0 ab	16.2 d	851.6 d
CL 840001 (Colombian)	35.0 a	74.7 bc	8.8	72.0 a	22.0 ab	22.0 b	17.0 c	471.9 e
PS 920001 (RNK-2100)	42.5 c	77.8 b	8.8	78.0 b	21.5 ab	19.5 b	14.0 e	710.9 d
PS 810106	35.5 a	74.8 bc	1.8	73.0 a	20.0 b	21.0 b	22.9 b	1274.0 b
PS 110028	39.5 b	93.3 a	3.0	74.0 ab	20.8 b	31.8 a	21.8 b	781.3 d
PS 210246	37.5 ab	87.2 a	3.8	71.0 a	24.7 a	26.3 a	22.3 b	645.8 de
PS 210258	36.0 a	79.9 b	5.8	73.0 a	21.5 ab	22.8 b	20.7 c	500.0 e
PS 210377	40.0 b	91.7 a	3.0	75.0 ab	24.7 a	26.0 a	22.9 b	1203.1 b
PS 310396	38.0 ab	80.6 b	2.0	80.0 b	25.0 a	23.8 ab	24.0 a	1164.1 c
PS 310539	36.0 a	86.8 a	2.8	77.0 b	23.5 a	23.0 ab	22.6 b	1406.2 a
Mingo-mark (Local Check)	38.0 ab	45.1 c	9.0	79.0 b	24.3 a	21.8 b	14.0 e	450.5e
Meteor (Local Check)	38.0 ab	44.2 c	9.0	78.0 b	23.0	20.0 b	12.0 f	431.0 e

* Means followed by the same letter are not significantly different from one another According to the Fisher's LSD test at P=0.05.

** 1= No lesions, and 9= Plant parts with highly susceptible reaction.

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