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Effect of plant age and duration of leaf wetness on pea powdery mildew development

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Abstract

Studies on the effect of plant age the susceptibility to pathogen revealed that plant age has no direct relationship with powdery mildew appearance in pea. There was non-significant differences in disease severity when plants were inoculated at different days after sowing. Whereas the disease severity increased significantly with age upto 70 days after sowing beyond which there was non-significant increase in disease severity. The incubation period of the pathogen ranged between 8-12 days. The effect of wetting periods on infection of pea with *Erysiphe polygoni* indicated that powdery mildew severity increased progressively with increase in duration of leaf wetness upto 36 hrs but the increasing rate of disease severity was observed more upto 24 hrs. Thus, 24 hrs leaf wetness after inoculation was found optimum for powdery mildew development in pea plant.

Keywords: Powdery mildew, *Erysiphe polygoni* Dc, *Pisum sativum*

1. Introduction

Pea (*Pisum sativum* L.) is one of the most popular vegetable crop grown throughout the county. Pea crop is severely affected with powdery mildew disease incited by *Erysiphe polygoni* DC. Most of the pea cultivars presently under cultivation are highly susceptible to the disease. The disease can cause 25–50 percent yield losses (Munjal *et al.* 1963; Warkentin *et al.* 1996), the reduction in number of pods per plant is estimated to be 28.6 percent, reducing total yield biomass, number of pods per plant, number of seeds per pod, plant height and number of nodes.

Research works on important aspect of this disease and pathogens previously have not been done. Hence, it is important to study Review of literature revealed that information regarding the effect of plant age and duration of leaf wetness on pea powdery mildew development.

2. Material and Methodology

Pot culture experiment in glasshouse was conducted in Completely Randomized Design (CRD) with seven treatments and three replications at Department of Plant Pathology and Agricultural Microbiology, Post Graduate Institute, MPKV, Rahuri during *rabi* seasons of 2016-17 and 2017-18.

2.1 Effect of plant age on powdery mildew severity

An experiment was conducted to find out the relationship, if any, of powdery mildew with pea age plants. Fifteen seeds of pea cultivar were sown in plastic pots (size 10 cm). Ten plants per pot were maintained and allowed to grow up to maturity. The sowing was repeated seven times at 10 Days interval so that during inoculation, the plants were 10, 20, 30, 40, 50, 60 and 70 days old. The plants were inoculated uniformly with spore suspension (10^4 spores /ml) of the test pathogen, kept wet for 24 hrs and incubated in humid chamber fabricated by using polythene sheets. Each treatment was repeated thrice. The disease severity was recorded 20 days after inoculation.

2.2 Effect of duration of leaf wetness on powdery mildew development

An experiment was conducted to find out the effect of duration of leaf wetness on disease development. Fifteen seeds of pea cultivar were grown in 10 cm plastic pots. One set of pots was placed in glasshouse while other was kept outside under natural conditions. Four week old plants were inoculated uniformly with a spore suspension of ascospores (10^4 spores / ml) and automatized with water to provide complete leaf wetness and maintained for different durations in humid chambers. The pots were taken out of the humid chambers after 4, 6, 12, 18, 24, 30 and 36 hrs, respectively and the leaves were dried in open and placed in glasshouse at a particular temperature regime for disease development. The experiment was repeated three times with 10 plants per replication.

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Observations were recorded in respect to incubation period at the initial appearance of symptoms. The disease severity was recorded 20 days after inoculation.

Numerical grades were assigned to the amount of disease observed applying 0-9 disease rating scale given by (Mayee

and Datar, 1986) and Further these scales were converted to per cent disease index using formula. Green pod yield (kg/ha) from each plot was recorded and finally converted in to qt/ha. The data recorded was statistically analyzed.

$$\text{PDI} = \frac{\text{Total sum of numerical rating}}{\text{No. of leaves examined}} \times \frac{100}{\text{Maximum grade value}}$$

3. Result and Discussion

3.1 Effect of plant age on powdery mildew of pea during Rabi season of 2016-17 and 2017-18

An experiment was conducted to find out the relationship of plant age for the disease development. The data recorded on disease severity on the plants inoculated at different days after sowing are presented in Table 1 and Fig.1

The data indicated that plant age has no direct relationship with powdery mildew appearance in pea. There were non-significant difference in disease severity when plants were inoculated at different days after sowing. Maximum severity was recorded in plants inoculated at 70 days after sowing (9.26 %) followed by 55 days (8.84 %) and 40 days after sowing (7.70 %), respectively, while, minimum disease severity was recorded at 10 days after sowing (6.32 %). The disease severity was increased significantly with age of plants upto 70 days but beyond that, there was non-significant increase. Similar trend was observed during both the season.

3.2 Effect of duration of leaf wetness on pea powdery mildew development during Rabi season of 2016-17 and 2017-18

The experimental findings on the effect of duration of leaf wetness on powdery mildew of pea development are presented in Table 2 and Fig.2.

3.2.1 Disease severity (%)

The data recorded in Table 2 with respect to disease severity at different durations of leaf wetness on plant kept in

glasshouse revealed that the severity of disease increased progressively with an increase in duration of leaf wetness. Maximum disease severity (8.08 %) was recorded at 36 hrs. of leaf wetness followed by 30 hrs. (7.74 %) and 24 hrs. (7.49 %), respectively. While, minimum disease severity was recorded at 4 hrs. leaf wetness (2.96 %). The disease severity increased significantly with an increase in duration of leaf wetness upto 36 hrs but the increasing rate of disease severity was observed more upto 24 hrs. Similar trend was followed in the plants kept under natural conditions. Maximum disease severity (7.73 %) was recorded at 36 hrs. of leaf wetness followed by 30 hrs. (7.35 %) and 24 hrs. (7.09 %), respectively. While minimum disease severity was recorded at 4 hrs. Leaf wetness (2.17 %). The disease severity increased significantly with an increase in duration of leaf wetness upto 36 hrs but the increasing rate of disease severity was observed more upto 24 hrs. Similar trend was observed during both the season.

3.2.2 Incubation period

Incubation period of the pathogen ranged between 8 to 12 days. The incubation period was 1 day more in the plants kept outside under natural conditions as compared to plants kept inside glasshouse (Table. 2). Similar trend was followed in the plants kept under natural conditions. Similar trend was observed during both the season.

Table 1: Effect of plant age on pea powdery mildew severity under glass house condition.

Age (Days)	Disease severity (%) 2016-17	Disease severity (%) 2017-18	Mean Disease severity (%)
10	6.44 (14.69)	6.19 (14.40)	6.32
25	7.28 (15.63)	7.48 (15.85)	7.38
40	7.34 (15.71)	8.06 (16.68)	7.70
55	8.36 (16.79)	9.32 (17.77)	8.84
70	9.03 (17.48)	9.50 (17.95)	9.26
85	8.22 (16.66)	8.10 (16.54)	8.16
100	7.53 (15.91)	7.20 (15.56)	7.36
SE _±	0.37	0.25	-
CD at 0.5%	1.09	0.74	-
CV %	4.59	3.10	-

Figures in parenthesis are arc sin transformed value

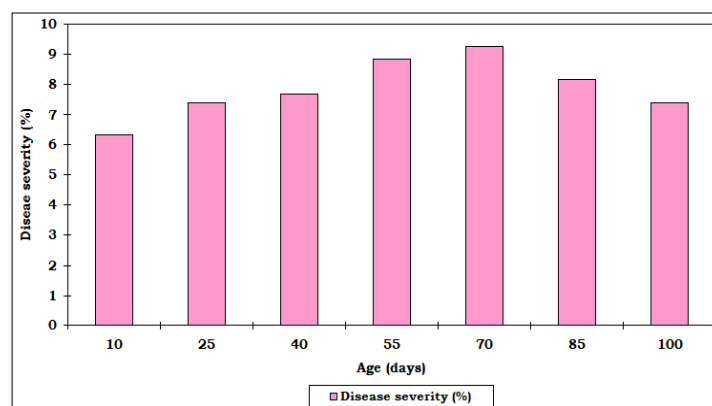
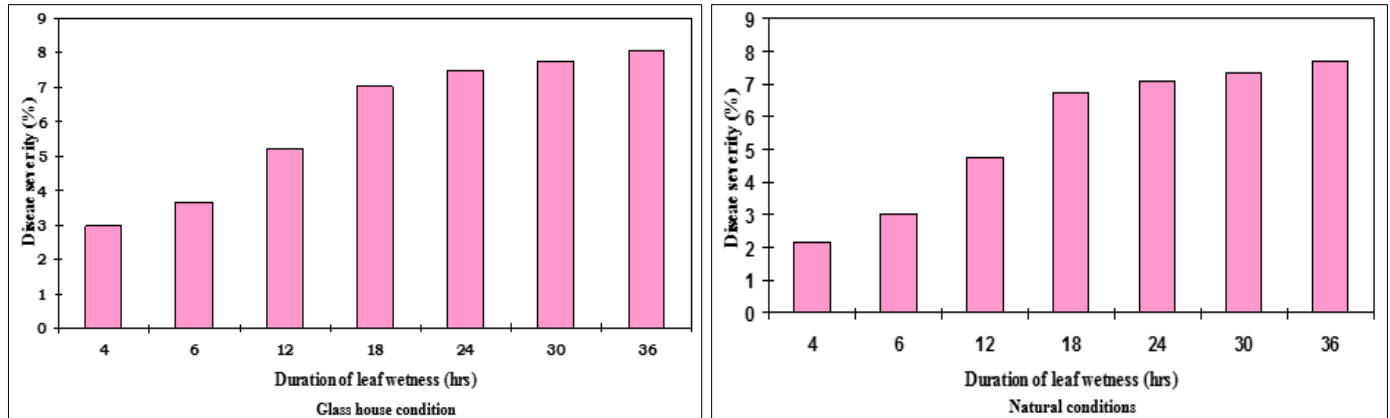


Fig 1: Effect of plant age on pea powdery mildew severity under glass house condition during Rabi 2016-17 and 2017-18

Table 2: Effect of duration of leaf wetness on pea powdery mildew development caused by *Erysiphe polygoni* DC.

Duration (hrs)	Disease severity (%)						Incubation period (Days)					
	Glass house condition		Mean (%)	Natural condition		Mean (%)	Glass house condition		Mean (Days)	Natural condition		Mean (Days)
	2016-17	2017-18		2016-17	2017-18		2016-17	2017-18		2016-17	2017-18	
4	3.19 (10.24)	2.72 (9.46)	2.96	2.22 (8.57)	2.17 (8.47)	2.19	10	10	10	12	11	11.5
6	3.56 (10.85)	3.79 (11.17)	3.67	2.89 (9.75)	3.20 (10.29)	3.04	8	9	8.5	10	10	10.0
12	5.20 (13.17)	5.20 (13.17)	5.20	4.66 (12.46)	4.88 (12.75)	4.77	9	9	9	11	13	12.0
18	7.11 (15.45)	6.96 (15.29)	7.03	6.64 (14.92)	6.78 (15.09)	6.71	9	8	8.5	10	10	10.0
24	7.45 (15.83)	7.53 (15.93)	7.49	6.99 (15.33)	7.19 (15.54)	7.09	8	9	8.5	12	10	11.0
30	7.66 (16.07)	7.82 (16.24)	7.74	7.31 (15.68)	7.39 (15.77)	7.35	9	9	9	10	13	11.5
36	8.05 (16.47)	8.10 (16.53)	8.08	7.69 (16.09)	7.77 (16.18)	7.73	8	9	8.5	10	10	10.0
SE _±	0.351	0.365	-	0.255	0.22	-	-	-	-	-	-	-
CD at 5%	1.03	1.07	-	0.751	0.65	-	-	-	-	-	-	-
CV %	5.01	5.23	-	3.85	3.28	-	-	-	-	-	-	-

**Fig 2:** Effect of duration of leaf wetness on pea powdery mildew development caused by *Erysiphe polygoni* 2016-17 and 2017-18

4. Conclusions

The plant age has no direct relationship with powdery mildew development in pea and duration 24 hrs of leaf wetness after inoculation was found optimum for powdery mildew development in pea plant.

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