

Short Communication

Effect of meteorological factors on rust severity of pea at Rahuri, Maharashtra

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Pea (*Pisum sativum* L.) is the second most important food legume crop in the world because of its high yield potential. It belongs to the *Leguminoceae* family and occupies a prominent position on account of its many fold uses in daily life (Smykal *et al.*, 2012). Pea production, is threatened by a large number of fungal, bacterial and viral diseases as well as by insects vectors which cause considerable quantitative and qualitative yield loss. Among these rust is one of the most important worldwide destructive disease caused by *Uromyces viciae fabae* (Pers.) de Bary of a wide range of hosts including pea crops causes significant yield losses up to 20 to 100 per cent by affecting all the green plant parts including the pods (Sharma, 1998). This disease normally not serious may assume epidemic proportions in certain years because of favourable climatic condition for their development and spread. The disease is favoured by high humidity and cloudy weather condition. Pathogen survives in different forms during unfavourable environmental condition and the appearance and progress of disease is region specific. Environment factor play important role in development of the disease. The environmental variables *viz.*, temperature, humidity, sunshine and wind velocity are the most crucial, since they affect the pathogen, host or host pathogen interaction during pathogenesis. Weather based models have also been developed to predict the incidence and spread of disease (Kumar and Chakravarty, 2008; Bhattiprolu and Monga, 2018). However, meagre information is available on the role of this environmental factors on the development of rust of pea, hence, this study was proposed.

The field experiments were conducted at the field of Department of Plant Pathology and Agricultural Microbiology, Post Graduate Institute, MPKV, Rahuri during *rabi* season of the year 2014-15 and 2015-16. This area falls in the scarcity zone (semi-arid tropics) with annual rainfall ranging between 307 and 619 mm. Pure and viable pea seeds of "Phule Priya" was sown on 29th November during both seasons. The appearance of the disease on plants was first observed in third week of January during both the crop seasons. For measuring weekly disease severity lower, middle and upper crop canopy were observed and evaluated individually using 0-9 rating scale (Table 1) based on leaf area covered by pustules following Mayee and Datar (1986).

Further these scales were converted to per cent disease index using formula given by Wheeler (1969)

$$\text{Disease index (\%)} = \frac{\text{Sum of all numerical rating}}{\text{Number of leaves examined} \times \text{Maximum grade}} \times 100$$

The weekly weather data on temperature, relative humidity, wind speed, sunshine and evaporation rate from January to March were collected from Agrometeorological observatory and correlated with disease index. Two years mean data are presented in Table 2.

The disease started during 3rd SMW and it increased continuously during subsequent period and reached to its maximum (78.6%) value during 11th SMW. During the period of disease infestation the maximum temperature varied between 28.7 and 34.1°C, minimum temperature varied between 11.2 and 17.1°C, morning relative humidity was between 50 and 63 per cent, afternoon relative humidity was

Table 1: Rating scale (grade) used for disease severity

Rating scale (Grade)	Description
0	No symptoms on leaf.
1	Rust pustules small, scattered covering 1% or less of leaf area.
3	Rust pustules more in number covering 1-10% of leaf area.
5	Typical rust pustules covering 11-25% of leaf area.
7	Typical rust pustules covering 26-50% of leaf area.
9	Typical rust pustules covering 51% or more of leaf area.

Table 2: The weekly mean data of temperature, relative humidity (RH), sunshine hours, wind velocity, evaporation and disease severity during *rabi* 2014-15 and 2015-16.

Standard week no.	Max. temp.(°C)	Min. temp.(°C)	RH-I (%)	RH-II (%)	Sunshine (h)	Wind velocity (km h ⁻¹)	Evaporation (mm)	Disease severity (%)
1	28.2	12.2	61	42	6.9	0.4	4.8	-
2	28.8	9.3	48	42	9.1	0.5	5.2	-
3	28.7	11.2	57	32	9.1	1.0	5.3	2.7
4	29.4	11.7	54	30	8.4	0.7	5.0	10.2
5	31.8	12.5	50	30	9.8	0.7	5.7	17.7
6	31.9	12.9	52	24	9.4	1.4	5.7	28.1
7	32.9	14.0	59	25	9.3	1.1	6.1	36.2
8	34.1	15.6	53	23	9.8	0.9	4.8	43.0
9	32.1	15.8	63	43	7.6	1.6	6.4	58.9
10	33.2	16.0	52	30	6.9	0.4	4.8	68.9
11	33.4	17.1	54	30	9.1	0.5	5.2	78.6
Average	31.3	13.4	55	32	8.8	0.9	5.6	
Correlation with disease severity	0.902**	0.900**	-0.300	-0.367	0.258	0.758**	0.573	—

** = 1 % level of significance

between 23 and 43 per cent (Table 2).

The correlation of the data of environmental factors with two week before disease severity indicated that, highly significant and positive correlation of disease severity with maximum temperature (0.902**), minimum temperature (0.900**) and wind velocity (0.758**). While, positive correlation of disease severity with sunshine hours (0.258) and evaporation (0.573) was observed but they are non-significance. The morning relative humidity (-0.300) and evening relative humidity (-0.367) was non-significantly negatively correlated with disease severity. Singh *et al.* (2012) also reported significant positive correlation of pea rust severity with temperature.

Based on the study, it can be concluded that temperature, wind velocity, evaporation and sunshine hours have significant effect on the rust severity on pea.

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