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Epidemiological studies on base rot disease of *Aloe vera* caused by *Fusarium oxysporum*

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Abstract

The relationship of disease severity (dependent variable) with weather parameter was studied by employing simple correlation. The correlation coefficients were presented in revealed that disease severity was significantly and positively correlated with minimum temperature. The disease severity was significantly and positively correlated with temperature while negatively correlated with relative humidity and rainfall. The disease severity was found to increase with increase in temperature. The maximum disease severity was recorded in the month of March and April whereas least disease severity was recorded in the month of November and December.

Keywords: *Aloe vera*, base rot, temperature, correlation

Introduction

Aloe barbadensis (L.) Burn. Fil. popularly known as *Aloe vera*, is a perennial, drought resistance, succulent medicinal herb belongs to the family Liliaceae. It has a long, fleshy sword shaped leaves, with sharp points arranged in a rosette pattern and originated in African continent specifically in Egypt (Daodu 2000) [3]. *Aloe vera* has long been a popular houseplant often called the 'miracle plant' or the 'natural healer'; it flourishes in warm and dry climates, with fleshy thorny leaves, staying moist where other plants wither and die by closing its pores to prevent moisture loss. There are over 300 species of *Aloe*, among them *Aloe barbadensis* Miller (*Aloe vera* or "true *Aloe*") plant which has been of most use to mankind because of the medicinal properties it displays. The plant stands 30-36 inches high, and a mature leaf is 2.5-3 inches wide at the base, weighing 1.5 to 2 kg. The ancient records of the Egyptians, Arab, African, Asians and Americans have discussed the different uses and pathological cases in which *Aloes* was administered Singh *et al.* (2012) [13]. It is used for its laxative, anti-inflammatory, immunostimulant and antiseptic effect (Capasso *et al.* 1998) [2] found very effective for the treatment of wounds, skin diseases, reduces blood sugars in diabetes, arthritic swelling, and constipation and pile (Rajendra *et al.* 2007) [9] as medicinal herb, *Aloe vera* has been used extremely to treat various skin conditions such as cuts, burns and eczema. *Aloe* plants can be used for treatment of asthma, ulcer and diabetes (Daodu, 2000 [3b]; Djeraba and Quere, 2000 [5]; Olusegun, 2000) [8]. It is all alleged that sap from *Aloe vera* eases pain and reduces inflammation (Davis and Moro, 1989) [4]. Natural products seem to be a viable solution to the environmental problems caused by the synthetic pesticides and many researchers are trying to identify the effective natural products to replace the synthetic pesticides (Kim *et al.*, 2005) [7].

Materials and Methods

The experiment falls under sub-tropical climate of Eastern parts of India. The district Ayodhya comes under Eastern region of Uttar Pradesh, which is distributed in three season viz., rainy, winter and summer. The rainy season occurs from mid June to mid September. The winter months prevails from November to March with mild to severe cool temperature. The severe cold was recorded in the month of December and occasionally winter rains and frost was also noticed. The summer month occur from April to June. The dry and hot wind waves were also noticed in the months of mid May and June.

The experiment on *Aloe barbadensis* was conducted during the course of investigation in 2018-19 and 2019-20 at MAP Experiment Station of Horticulture Farm, Acharya Narendra

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Deva University of Agriculture & Technology, Kumarganj, Ayodhya. Weekly Percent disease intensity was recorded from the date of initiation of disease. Weather data was recorded from Meteorological Observatory of the University. Correlation coefficient of PDI and weather parameter was calculated. The percent disease intensity (PDI) was calculated by adopting standard formula given by Wheeler (1969) [14]. Percent disease incidence and percent disease control was calculated as per formula.

$$\text{Percent disease intensity (\%)} = \frac{\text{Sum of total numerical}}{\text{Total No. of leaves examined} \times \text{highest rating}} \times 100$$

Results and Discussion

It is evident from the data (Table. 1 & 2) that the base rot disease symptoms were started with 45th week and continue to 25th standard weeks during both year 2018-19 and 2019-20. The relationship of disease severity (dependent variable) with weather parameter was studied by employing simple correlation. The correlation coefficients were presented in table no. 3 revealed that disease severity was significantly and positively correlated with minimum temperature (0.775, 0.417) first year is highly significant and second year is significant and maximum temperature (0.712, 0.501) during both years and highly significant and negatively correlated with relative humidity (-0.700, -0.765). The disease severity both year was negatively and correlated with rainfall is (-0.029, 0.138) while negatively. The maximum disease severity was recorded in the month of March and April whereas least disease severity was recorded in the month of November and December. The disease severity was significantly and positively correlated with temperature while negatively correlated with relative humidity and rainfall. The disease severity was found to increase with increase in

temperature. Borkar and Patil (1995) [1] studied the weather in relation to Alternaria leaf blight disease development in Maharashtra. Temperature of 25.9 °C to 33.7 °C with a relative humidity of 89 to 95 per cent favoured disease development. They further reported that development of the disease was influenced by rainfall. Sharma *et al.* (2016) [11] conducted epidemiological studies on Alternaria blight of *Aloe barbadensis* caused by *Alternaria alternata*. Correlation of disease with environmental factors revealed that high relative humidity coupled with temperature of 27-28°C is most favourable for the disease development. Ghosh *et al.* (2018) [6] studied epidemiology of leaf spot disease of *Aloe vera* and found that, the FBI peaked during the hot and humid conditions of May to September (76.57%-98.57%) but decreased during the winter, December-January (35.7 1-46.66%). Saini *et al.* (2018) [10] reported that the highest disease severity (86.89%) for leaf rot disease was recorded in the month of July at an average temperature of 28.7°C and 80.3% relative humidity. Singh *et al.* (2019) [12] *Aloe vera* is one of the important medicinal plants in India and is known for its various nutritive and therapeutic values. The Leaf spot is a very serious destructive disease of *Aloe vera* causes loss to crop. Weekly percent disease intensity was recorded from the date of initiation of disease and weather data was recorded from meteorological observatory of the university. Correlation coefficient of percent disease intensity and weather parameter was calculated and recorded that disease severity was significantly and positively correlated with temperature. The disease severity was found to increase with increase in temperature. Maximum disease severity was recorded in the month of June followed by April and March whereas least disease severity was recorded in the month of December and January.

Table 1: Effect of meteorological factors on severity of base rot disease of *Aloe vera* during 2018-2019

Month	Standard week	Temperature (°C)		Relative humidity (%)	Rainfall (mm)	PDI
		Min.	Max.			
November	45	12.7	28.7	68.3	0	0.0
	46	13	28.7	71.2	0	2.5
	47	11	27.8	67.5	0	3.2
	48	11	26.8	70.7	0	3.9
December	49	8.5	25.2	71.0	0	4.5
	50	7.5	24.2	69.0	0	6.6
	51	5	23.2	71.3	0	8.4
	52	3.5	21.1	70.8	0	10.2
January	1	5.3	22.2	72.2	0	12.2
	2	5.7	21.8	72.0	0	13.2
	3	5	22.5	70.5	0	15.3
	4	10.6	21.1	76.1	41	17.6
	5	7.1	21.7	74.9	0	19.3
February	6	8.9	22.3	75.1	9	22.3
	7	10.5	21.8	76.6	2	25.3
	8	11.2	25.3	69.1	2.5	28.2
	9	10	22.9	72.7	0	30.2
March	10	10.6	26.5	66.9	0	34.7
	11	12.7	30.0	61.4	0	37.3
	12	14.2	31.9	60.5	0	40.0
	13	17.4	34.0	62.1	5	44.0
April	14	18.9	34.8	61.3	2	48.7
	15	21.2	37.5	56.6	0	52.3
	16	19.2	35.0	66.6	0	55.0
	17	23.2	37.2	53.0	0	61.2

Table 2: Effect of meteorological factors on severity of base rot disease of *Aloe vera* during 2019-2020

Month	Standard week	Temperature (°C)		Relative humidity (%)	Rainfall (mm)	PDI
		Min.	Max.			
November	43	17.4	29.2	75.9	0	0.0
	44	16.9	29.2	78.8	0	1.3
	45	15.5	29.7	74.0	0	3.0
	46	13.1	29.4	81.6	0	5.1
December	47	12.5	27.2	75.4	0	8.3
	48	14.2	26.8	77.5	0	10.1
	49	9.7	24.9	70.7	0	12.1
	50	11.2	23.1	74.4	22	14.3
January	51	8.5	17.6	82.7	0	18.3
	52	5.3	14.0	84.7	0	20.2
	1	9.1	19.3	75.7	7.8	21.7
	2	8.2	16.5	85.4	6.6	25.3
February	3	10.2	18.6	86.1	21	27.7
	4	6.4	20.5	78.2	0	30.4
	5	7.3	21.8	74.2	0	31.7
	6	6.2	22.5	70.3	0	34.2
March	7	8.8	22.8	67.3	0	36.1
	8	12.4	25.4	76.5	53	38.4
	9	14.0	26.8	72.6	0	41.1
	10	13.9	26.2	73.9	68	42.7
April	11	14.7	26.8	72.3	9	44.8
	12	15.7	29.5	68.4	2	47.8
	13	16.6	31.9	54.2	0	50.5
	14	16.0	34.7	46.0	0	52.1
	15	18.7	36.6	50.4	0	53.9
	16	21.5	36.8	55.9	1.0	56.9

Table 3: Correlation coefficients between percent disease intensity of base rot of *Aloe vera* and meteorological factors during 2018-19 and 2019-20.

S. No.	Weather parameters	Correlation coefficient	
		2018-19	2019-20
1.	Minimum temperature	0.775**	0.417*
2.	Maximum temperature	0.712**	0.501**
3.	Relative Humidity	-0.700**	-0.765**
4.	Rainfall	-0.029	0.138

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