FLORA AND FAUNA

2016 Vol. 22 No. 1 PP 11-16 ISSN 0971 - 6920

EFFECT OF DIFFERENT GROWTH PARAMETRS ON *FUSARIUM OXYSPORUM F. SP. CICERI* (WILT CAUSING PATHOGEN OF CHICKPEA)

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Received **:** 27.2.16; ***Revised*** **:** 24.3.16; ***Accepted*** : 5.4.16

ABSTRACT

Fusarium oxysporum f. sp. ciceri is important pathogen of chickpea, causing sever economic losses. A Survey was conducted in Bundelkhand region to estimate the severity of the disease and the wilt causing pathogen. In this study the isolation, identification of the pathogen was done and the radial growth and sporulation of the pathogen in different culture media, temperature and pH were taken under consideration to explore the optimum growth condition for the pathogen. The most favourable culture media was PDA. Optimum temperature was 25ºC and pH of 6.5. The pathogenicity of the pathogen was conducted.

Figure : 00 References : 18 Tables : 05

KEY WORDS : Chickpea, *Fusarium oxysporum f. sp. ciceri*, Growth factors, Isolation, Survey.

Introduction

Cicer arietinum L. (Chickpea) is the major pulse crop of the Indian sub-continent, Mediterranean region, the Middle East, Ethiopia and several other countries. In India, this crop occupies an area of 6.93 m ha with an annual production[2] of 50mt. The crop suffers from many diseases among which the chickpea wilt caused by *Fusarium oxysporum f. sp. ciceri* is one of the world's most catatrophic diseases causing losses upto 10-15% each year. However, in severe epidemics, the losses[7,10] may go upto 60-70%.

Materials and Methods

The survey and surveillance of chickpea wilt disease field was conducted during the month of December to January in the crop season of 2010 to 2012 in the districts of Bundelkhand region. The fields conducted in four Tehsils Mauranipur, Niwari, Kulpahad and Jhansi. The diseased plant of chickpea of different stages was collected in pre-sterilized polythene bags. The sample bags were brought to the laboratory for examination and isolation of the pathogens. All transfers were done under aseptic condition.

Isolation, Identification and Experiments for growth effects of pathogens on different parameters:

Diseased plant samples and infected roots were thoroughly washed with distilled water. The diseased plant roots were cut into 1-2cm segments. These samples were sterilized by dipping in 0.1% Mercuric chloride ($HgCl_2$) for 30 seconds.

The sterilized and unsterilized pieces having disease symptoms were transferred to sterilized potato dextrose agar media[1]. At least 2-3 segments of root were placed onto a single petriplate. Distance between segments was uniformly maintained. The plates were incubated is BOD incubator and temperature was maintained at 27±1ºC. After completion of the experiment pure culture of the causal pathogen was developed by repeated isolation of hyphal tips.

After the isolation and identification of the pathogen *Fusarium oxysporum f. sp. ciceri*, study was conducted for observing its colony growth and

TABLE-1: Disease incidence of chickpea in 61 villages of Bundelkhand Region.

S.No	Name of the village visited	No. of field	Wilt %	Average wilt % of village
A.	**District: Jhansi, Tehsil: Mauranipur**			
1.	Bhadarwara	10	30	25
2.	Bukhara	07	14	10
3.	Bhandra	03	00	00
4.	Nayagoan	06	15	10
5.	Bharua	01	00	00
6.	Rora	10	24	20
7.	Bhatpura	20	26	24
8.	Basariya	16	30	28
9.	Ghatkotra	04	16	14
10.	Kharka	12	35	30
11.	Bamory	02	00	00
12.	Chakara	10	34	36
13.	Dhavakar	05	10	10
14.	Melonei	05	00	00
15.	Satora	15	25	20
16.	Taktoli	01	00	00
17.	Siyauri Prithvipur	20	32	28
18.	Bangra	05	10	08
19.	Melwara	03	00	00
20.	Badagoan	07	12	10
21.	Lehchura	15	25	22
B.	**District: Tikamgarh,Tehsil: Niwari**			
1.	Simariya	07	15	12
2.	Mundi	05	20	18
3.	Bodheragaon	10	18	16
4.	Niwari	03	00	00
5.	Sakera	08	17	13
6.	Chakarpura	10	28	26
7.	Barav	04	15	13
8.	Choti khisni	06	18	16

9.	Badi khisni	05	15	12
10.	Orchha	03	00	00
11.	Taragram	02	00	00
12.	Nenguan	04	10	07
13.	Pardewaro	06	18	20
14.	Patten	04	10	10
15.	Chandgaon	03	00	00
C.	**District: Mahoba,Tehsil: Kulpahad**			
1.	Jaitpur(Belatal)	03	00	00
2.	Budhora	06	26	25
3.	Taparian	02	00	00
4.	Maheva	03	00	00
5.	Sarangpura	12	20	22
6.	Panvari	04	10	08
7.	Mahovkhanta	10	30	34
8.	Toiaia	02	00	00
D.	**District: Jhansi, Tehsil: Jhansi (Sadar)**			
1.	Baruasagar	12	22	20
2.	Sukwa	04	16	12
3.	Simariya	12	26	20
4.	Babina	05	10	10
5.	Thakarpura	14	28	26
6.	Taparian	10	24	20
7.	Tandoor	04	10	08
8.	Khelar	03	12	10
9.	Maharajpura	16	26	20
10.	Rasoi	05	10	09
11.	Tajpura	03	00	00
12.	Kanaura	06	12	10
13.	Manpur	08	14	12
14.	Azadpura	02	00	00
15.	Chirgaon	04	00	00
16.	Kochhabhawar	06	00	00
17.	Raksha	03	00	00

TABLE-2: Effect of different temperatures on the growth and sporulation of *Fusarium oxysporum f. sp. ciceri.*

S. No.	Temperature in ºC	Redial growth of colony in mm after 120 hours	Sporulation
1	5	2.60	Poor
2	10	9.36	Poor
3	15	16.48	Poor
4	20	55.30	Good
5	25	68.25	Excellent
6	30	60.15	Good
7	35	20.23	Poor
8	40	18.59	Poor
		Av. = 31.37	

sporulation on different culture media, temperature and pH.

Result

During the crop season 2010 to 2012 the surveys were conducted for chickpea cultivating 61 villages in all the directions from Jhansi. The incidence disease regarding the visited sites is given in Table-1. The disease was present at all the places. Higher incidence of disease ranging from 20 to 35% was found in Bhadarwara, Rora, Bhatpura, Basariya, Kharka, Satora, Chakara, Lehchura, Siyauri Prithvipur, Bhudora, Sarangpura, Mahobkhanta, Baruasagar, Simariya, Thakarpura, Taparian and Maharajpura.

Among the environmental factors, temperature is the most important which affects the metabolic activity of the pathogen. In the present study, eight different temperatures 5ºC, 10ºC, 15ºC, 20ºC, 25ºC, 30ºC, 35ºC and 40ºC respectively were taken to the optimum temperature for growth and sporulation of the pathogen. The result is given in Table-2. Result revealed the optimum temperature 25ºC followed by 30ºC and 20ºC and growth was meagre at 35ºC and 40ºC.

The pH of the medium affects the rate of the growth and sporulation of the pathogen. For this study 10 different pH were taken 3.0, 4.0, 5.0, 5.5,

TABLE-3: Effect of different pH on the growth and sporulation of *Fusarium oxysporum f. sp. ciceri.*

S. No.	pH level	Colony Growth in (mm) after 120 hours	Sporulation
1	3.0	7.00	Poor
2	4.0	10.52	Poor
3	5.0	16.50	Good
4	5.5	23.42	Good
5	6.0	29.17	Good
6	6.5	37.09	Excellent
7	7.0	32.33	Excellent
8	7.5	30.31	Excellent
9	8.5	22.6	Good
10	9.0	7.9	Poor
		Av. = 21.68	

TABLE-4: Growth and sporulation of *Fusarium oxysporum f. sp. ciceri* on different Culture media.

S.No.	Culture Media	Colony Growth in (mm) after 168 hours			Average colony growth (mm)	Sporulation
		C_1	C_2	C_3		
1	Potato dextrose agar medium	85	86	80	83.66	Most abundant
2	Malt extract agar medium	35	30	29	31.33	Poor
3	Oat Meal agar	27	25	20	24.00	Very Poor
4	Corn Meal agar medium	60	55	58	57.67	Moderate
5	Czapek's Dox agar Medium	79	73	77	76.33	Most abundant
6	Sabourd's dextrose agar medium	73	67	62	67.33	Abundant

6.0, 6.5, 7.0, 7.5, 8.5 and 9.0. The maximum growth and excellent sporulation was recorded at pH 6.0 followed by 8.0, the growth was progressively decreased at 8.5 and 5.0 respectively. Thus it can be concluded that the range 6.0 to 8.0 was most favourable for the maximum growth and sporulation of the pathogen after 120 hrs (Table-3).

The growth of *Fusarium oxysporum f. sp. ciceri* in six different nutrient media was studied. In this experiment radial growth of colony found maximum on Potato dextrose agar medium followed by Czapek's Dox agar. Sabourd's dextrose agar medium and Corn Meal agar medium growth of colony is abundant and moderate sporulation. Growth of colony was poor on Malt extract agar and Oat meal agar medium (Table-4).

Pathogenicity test: The pathogenicity test was conducted by infesty chickpea seeds with *Fusarium oxysporum f. sp. ciceri* for different period.The infested seeds were raised in pots and the wilt symptom was observed. The period of appearance as well as intensity of disease was recorded and result is give in Table 5. Maximum symptom was recorded from seed incubated for 72hrs followed by 60hrs. Least symptom appeared from seeds incubated for and 12 and 24hrs.

Discussion

The survey of any disease and the assessment of the incidence of disease in an area

TABLE- 5: Symptoms of wilting plants after incubation for different days.

Inoculation period (hours)	Symptoms appearance (days)	Length of seedling (cm)	Wilting
12	14	7.92	Mild
24	15	7.44	Mild
36	15	6.25	Moderate
48	15	6.72	Moderate
60	16	5.21	Severe
72	16	4.98	Most
Control	13	8.89	No

is important to estimate the produce loss[16,18]. The reduction in crop health/yield is because of increase of the role of pathogen[8,11,13]. Temperature is one of the most important environmental factors responsible for the growth and sporulation of any pathogen. The effect of temperature for the growth and sporulation of *Fusarium oxysporum f. sp. ciceri* reported[4,17] 23ºC to 29ºC. The pathogen could grow at wide range of pH 3.0 to 9.0 in our study. It has been opined that in contrast to bacteria and actinomycetes fungi are relatively more tolerant[3] to acidic ions (H) than to basic ions (OH). The results obtained in the present study are in accordance with the previous results[15]. In our study, Potato dextrose agar was found to be best for sporulation and growth of pathogen and this finding is with confirmity to earlier ones[5,12]. The involvement of *Fusarium oxysporum f. sp. ciceri* was substantiated by pathogenicity test. Several results finding the pathogenicity were recorded[6.9.14] against the *Fusarium oxysporum f. sp. ciceri*.

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