

Survey of Anthracnose Disease in Chilli Crop in Rewa Region

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Abstract: Anthracnose of chilli (*Capsicum frutescens*) is an economically important disease which affects chilli production. Typically, this disease is mainly caused by *Colletotricum capsici* and *C. gloeosporioides*. The appearance on fruits displays small, circular brown spots with concentric rings of acervuli. A survey was conducted to assess the incidence of anthracnose of chilli in five locations in Rewa Province. The percentage incidence of anthracnose affected fruits under field conditions was more on green fruits which the outcome indicated the incidence ranged from 55.53 to 71.10%. It was revealed the predominance presence of the anthracnose disease which is the major constraints to profitable cultivation of chilli in Rewa region.

Keywords: *Colletotricum*, chilli, survey, anthracnose, fruit rot, disease incidence

1. Introduction

Chilli (*Capsicum frutescens* L), is one of the major crop that is grown throughout the world especially in tropical and subtropical regions. This cultivation of this crop has existed for several years as a sustainable form of agriculture in many other countries like India, which accounts for 25% of the world's total production of chilli (Nayaka *et.al*, 2009). Chilli is an essential ingredient of Indian cuisine because of its pungency, colour, flavor and aroma.

While on that, Fiji population has consist of Itaukei and Indo-Fijians which makes up the total of 837,271 part of which is 313,798 who are Indo-Fijians. (Fiji Bureau of Statistics, 2013) and because of that it is an indispensable item in the kitchen, as it is consumed daily as condiment in one form or the other (Fiji Ministry of Agriculture, 2013). More people are eating chillies now and there is growing popularity of local chilli as a result of increasing number of Asian communities residing in the country (Market Watch, 2010).

Anthracnose caused by *Colletotrichum spp.* is a serious problem for chilli production in the tropics and subtropics worldwide. *Colletotrichum* also causes anthracnose in a wide range of hosts including cereals, legumes, vegetables, perennial crops and tree fruits. This problem can be seen in mature fruits which cause severe losses in relation to pre- and post harvested fruit decayed. Typical anthracnose symptoms on chilli fruits include sunken necrotic tissues with concentric rings of acervuli. According to figures provided by the Ministry of Agriculture, it revealed that in 2009, Fiji exported 58,477 kilograms of chillies overseas when compared to 78,219 kilograms in 2008. It indicated a drop of 34 per cent (Market Watch, 2010). According to Fiji Sun Online (2013), Chilli continued its exports despite reduction of production due to anthracnose disease impact. This crop is very significant source of income for Fijian populace.

Anthracnose of chilli caused by *Colletotricum capsici* has become a serious problem for chilli cultivation in Fiji. The disease causes both pre- and post-harvest fruit decay mainly on mature fruits. The crop is prone to be threatened by other factors as well like the main biotic stresses such as bacterial wilt, viruses and several insect pests. Appressoria that formed on immature fruits may remain quiescent until the fruits mature or ripen. Disease often has to exceed a certain threshold before it reduces the yield of a crop. Small amounts have little effect on yield and the disease may not be worth controlling. The amount of disease is measured as the proportion of the crop population (counted as individual plants or branches or leaves etc.) that is infected (disease incidence) or the proportion of the area of a plant or plant organ (e.g.leaf area) that is affected (disease severity). It is important to maintain national disease lists, for which the current survey was in support of this aim. A disease list helps the country to know what plant pathogens directly cause damages to the parts of Chilli plant and to target appropriate quarantine measures to keep out undesirable organisms. Keeping in view the importance of chilli, this present survey was aimed to investigate the disease incidence of anthracnose of chilli crop so as to provide information regarding integrated disease management to serve as an alternative guide for the decision making of the farmers.

2. Materials and Methods

The survey was conducted in Rewa region in the Central part of the country. The incidence of anthracnose diseases were recorded according to the disease assessments done in five locations of five subsistence farms as well as their accessibility. The study areas were Waivou, Nasali, Koronivia, Lokia and Waitolu. In every location, 30 plants of chilli were assessed in the field as it would represent the bulk of infected fruit rot. Field observation was also undertaken to find out other Solanaceae crops grown in parallel to the host that would also have the same symptoms.

Data analysis: The formula used based on the Mean incidence calculated for each area. Mean anthracnose incidence of each location was used to make quantitative comparison between the survey sites.

$$\text{Percent of Disease Index (PDI)} = \frac{\text{No. sample of Infected fruits}}{\text{Total number of Fruits per plant}} \times 100$$

For estimation of fruit area diseased, the whole fruit surface area was considered as 100 and thereby the infected area was determined by eye estimation for Percent of Disease Index (PDI), i.e. severity (Hossain *et al.*, 2010). Implementing this survey was necessary to know the distribution of the pathogen *C. capsici*, the rate of spread that it causes to other crops as well its presence to other hosts.

3. Results and Discussion

The assessment of plant diseases and their effects on yield normally involves five distinct processes: developing a descriptive growth stage key for the particular crop species in question, developing methods to assess the incidence and severity of disease, developing statistically sound methods of sampling crop populations for assessment of the amount of disease, estimating the negative impact of particular levels of the disease on crop yield and quality and evaluating the economic benefit from various methods available for reducing the amount of disease.

Rewa district is located on the Central part of the country and the climatic condition of high humidity and moderate temperature may resulted in increased fruit rot (anthracnose), the climatic condition suit the growth and reproduction of the fungal *Colletricum capsici*. The spread of the disease in the field was greatly influenced by the direction of prevailing winds, indicating the importance of wind-borne spores to disease spread. Rainfall influenced disease depending on the amount, duration, intensity and pattern of rainfall during a crop cycle (Ying 1987).

Incidence and severity are the tools for measuring the diseases. Of the total sample of fruits counted (Table 1), 15,763 fruits were infected by anthracnose and this is present in all the locations. Anthracnose lesion was initiated in green fruit started to reached the red ripen stage (Rajapakse & Ranasinghe, 2002). The highest disease incidence of 71.1% was recorded at Nasali, 66.7% at Waivou, 61.8% at Waitolu, 59.8% at Koronivia and 55.5% at Lokia. This disease was found to be wide spread with an average incidence as 63.7%. Most of the subsistence farmers have cultivated this crop on the basis of generating little income to sustain their livelihood. The presence of the anthracnose disease is an on-going dilemma which no consideration is of priority. It is obvious therefore, that severity of the disease can be improved by using alternate integrated disease management which is conducive to the environment.

4. Conclusion

The information obtained from plant disease surveys enables the relative importance of different diseases to be

determined, which in turn enables rational allocation of resources for research as well as control and eradication programs. It is obvious therefore, that decisions based on disease assessment data are critical in the economy of any farm. Furthermore, from the national standpoint, disease assessment information is fundamental for the prediction of crop yields as a basis for the smooth running of markets and financial planning and further proper management practices should be taken into consideration.

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Table 1: Anthracnose Disease incidence at different locations in Rewa District

Location	Total No. Plants	Total Number of fruits	No. of infected fruits	% Disease Incidence
a. Waivou	30	5964	3979	66.7
b. Nasali	30	5648	4016	71.10
c. Koronivia	30	4725	2829	59.8
d. Lokia	30	4039	2243	55.5
e. Waitolu	30	4357	2696	61.8
Total	150	24,733	15,763	63.7%

Tables 1(a): Status of anthracnose disease presence in Chilli plants in Waivou locations

Sl. No.	Waivou		
	Total No of Fruits	No. of fruits affected	% of Disease Incidence
1	267	218	81.65
2	186	148	79.57
3	160	122	76.25
4	238	169	71.01
5	96	78	81.25
6	160	142	88.75
7	370	289	78.11
8	159	148	93.08

9	277	152	54.87
10	170	153	90.00
11	187	116	62.03
12	145	132	91.03
13	99	76	76.77
14	177	158	89.27
15	160	132	82.50
16	63	46	73.02
17	89	59	66.29
18	285	110	38.60
19	83	63	75.90
20	173	129	74.57
21	79	58	73.42
22	140	134	95.71
23	235	154	65.53
24	260	110	42.31
25	352	165	46.88
26	276	199	72.10
27	365	167	45.75
28	181	147	81.22
29	382	158	41.36
30	250	134	53.60
Total	6064	4066	67.7%

Tables 1 (b): Status of anthracnose disease presence in Chilli plants in Nasali location

Location 2		Nasali	
Sl. No.	Total No. fruits	No. of fruits affected	% disease incidence
1	268	132	49.25
2	85	47	55.29
3	228	154	67.54
4	155	122	78.71
5	230	133	57.83
6	177	132	74.58
7	192	167	86.98
8	86	54	62.79
9	180	154	85.56
10	133	127	95.49
11	278	245	88.13
12	234	173	73.93
13	48	34	70.83
14	157	126	80.25
15	289	157	54.33
16	187	156	83.42
17	95	67	70.53
18	52	32	61.54
19	254	178	70.08
20	63	39	61.90
21	342	218	63.74
22	98	68	69.39
23	167	135	80.84
24	234	176	75.21
25	350	214	61.14
26	211	163	77.25

27	144	118	81.94
28	253	102	40.32
29	132	161	121.97
30	326	232	71.17
Total	5648	4016	71.10%

Tables 1 (c): Status of anthracnose disease presence in Chilli plants in Koronivalocation

Location 3	Koronivia		
	Sl. No.	Total No. of fruits	No. of fruits affected
1	22	8	36.36
2	158	126	79.75
3	39	21	53.85
4	185	153	82.70
5	93	54	58.06
6	156	122	78.21
7	89	34	38.20
8	219	88	40.18
9	268	120	44.78
10	152	135	88.82
11	289	137	47.40
12	178	154	86.52
13	94	43	45.74
14	203	167	82.27
15	98	75	76.53
16	163	149	91.41
17	128	65	50.78
18	322	157	48.76
19	245	105	42.86
20	117	89	76.07
21	233	108	46.35
22	181	74	40.88
23	77	33	42.86
24	151	106	70.20
25	89	56	62.92
26	152	119	78.29
27	172	94	54.65
28	244	87	35.66
29	163	133	81.60
30	45	17	37.78
Total	4725	2829	59.87%

Tables1 (d): Status of anthracnose disease presence in Chilli plants in Lokialocation

Location 4	Lokia		
Sl. No.	Total No. of fruits	No. of fruits infected	% of disease incidence
1	87	45	51.72
2	129	67	51.94
3	83	55	66.27
4	110	76	69.09
5	75	52	69.33
6	78	49	62.82
7	380	187	49.21
8	215	94	43.72
9	274	106	38.69
10	123	80	65.04
11	155	120	77.42
12	125	60	48.00
13	223	109	48.88
14	321	153	47.66
15	67	35	52.24
16	49	32	65.31
17	118	95	80.51
18	125	73	58.40
19	131	95	72.52
20	72	44	61.11
21	89	52	58.43
22	63	32	50.79
23	73	48	65.75
24	46	29	63.04
25	132	91	68.94
25	289	137	47.40
27	79	42	53.16
28	56	32	57.14
29	89	63	70.79
30	183	90	49.18
Total	4039	2243	55.53%

16	96	67	69.79
17	286	167	58.39
18	32	12	37.50
19	93	34	36.56
20	155	138	89.03
21	125	98	78.40
22	207	134	64.73
23	84	30	35.71
24	78	56	71.79
25	118	106	89.83
26	172	76	44.19
27	236	134	56.78
28	68	45	66.18
29	266	147	55.26
30	354	167	47.18
Total	4357	2696	61.88%



Figure 1: Severity of anthracnose disease on Chilli fruit in Rewa (Fiji)

Tables 1 (e): Status of anthracnose disease presence in Chilli plants in Waitolulocation

Location 5	Waitolu		
Sl. No.	Total No. fruits	No. of fruits affected	% disease incidence
1	87	36	41.38
2	56	23	41.07
3	131	118	90.08
4	263	103	39.16
5	166	92	55.42
6	92	56	60.87
7	357	326	91.32
8	36	21	58.33
9	69	34	49.28
10	91	36	39.56
11	122	98	80.33
12	167	119	71.26
13	228	145	63.60
14	39	14	35.90
15	83	64	77.11