

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 *Colletriumcapsici*. 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.

References

- [1] Nayaka, Chandra; S.C., Shankar, A.C.,Niranjana, S.R., Prakash, H.S. and Montensen, C.N, (2009) Anthracnose Disease of Chilli Pepper. Technical Bulletin 15pp.
- [2] Fiji Bureau of Statistics (2013) Census of Population and Housing. www.statsfiji.gov.fj/
- [3] Fiji Ministry of Agriculture (2013) Chilli Anthracnose disease. KRS Factsheet No.D.3
- [4] Market watch (2010) www.agriculture.gov.fj/index.php/market-info/market-watch
- [5] Rajapakse R. G. A. S. and Ranasinghe, J.A.D.A.R. (2002) Development of variety screening method for anthracnose disease of chilli (*Capsicum annum L.*) under field conditions. Tropical Agriculture Research and Extension 5 (1&2).
- [6] Ying. S.M., (1987). Anthracnose fruit rot of chilli (*Capsicum annum.L*) Some aspects of its Etiology, Epidemiology and Control in Peninsular. MSc. Thesis submitted to Universiti Pertanian, Malaysia.

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 | | <i>Nasali</i> | |
|------------|------------------|------------------------|---------------------|
| 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 | <i>Koronivia</i> | | |
|------------|------------------|---------------------|------------------------|
| | 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 |