

Losses in yield and quality of turmeric due to leaf spot disease caused by *Colletotrichum capsici*

B.V. HUDGE* AND S.A. GHUGUL

Department of Plant Pathology, Marathwada Agricultural University, PARBHANI (M.S.)INDIA

ABSTRACT

The turmeric crop suffers severely due to leaf spot disease which is caused by *Colletotrichum capsici* (Syd.) Buttler and Bisby. The losses by leaf spot are always considered to be a limiting factor for yield and quality of rhizomes. The present study revealed that maximum losses were found in severely diseased plants (>50 %) i.e. 25.83 and 62.12 per cent on fresh weight basis and 42.10 and 62.10 per cent on dry weight basis of mother and finger rhizomes, respectively. Maximum losses in curcumin content (50.11 %) were found in severely diseased plants. The per cent curcumin content in rhizomes from diseased plants and disease free plants ranged from 2.08 to 4.17.

Key words : Yield, Quality, Turmeric, Leaf spot, *Colletotrichum capsici*.

INTRODUCTION

Turmeric is one of the most important spice crop grown in India. Due to multidimensional use of turmeric it has become a major cash crop of Marathwada region. However, the yields are reduced due to different diseases. The important of them are leaf spot caused by *Colletotrichum capsici* (Syd.) Buttler and Bisby, leaf blotch caused by *Tapharina maculans* (Fr.) Keissler and rhizome rot caused by *Pythium aphanidermatum* (Saikia and Roy, 1974).

Leaf spot of turmeric caused by *Colletotrichum capsici* is one of the worst pathogen causing quantitative and qualitative losses all over the country. Taking into consideration the importance of crop and seriousness of disease prevailing on turmeric, the present study was undertaken to find out the losses in yield and quality of turmeric due to leaf spot disease.

MATERIALS AND METHODS

Assessment of losses in yield:

For calculating the losses in yield, five healthy, less diseased, medium diseased and severe diseased plants were separately harvested at maturity. Fresh weight and dry weight of these rhizomes were recorded. The per cent loss in yield was calculated by using the following formula:

$$\text{Per cent loss} = \frac{\text{WH} - \text{WD}}{\text{WH}} \times 100$$

where,

WH – Weight of rhizome from disease free (healthy) plants in gram

WD – Weight of diseased rhizome from diseased plants in gram

Processing of turmeric rhizome:

The cleaned finger / mother rhizomes were taken in iron pan with extended parallel handle and boiled in alkaline water by adding 0.05 per cent to 1 per cent sodium carbonate or lime. Practically fingers and mother rhizomes were cured in separate batches.

Cooked turmeric was spread in yards and dried in the sun. Sun dried turmeric had low moisture content.

Curcumin content :

The curcumin content in turmeric was estimated by using the method recommended by the American Spice Trade Association (ASTA,1968).

Apparatus :

- Flask, extraction device, 100 ml flat bottom flask with TS 24/40 ground joint.
- Condenser west type, with water cooled drip tip and TS 24/40 ground joint, 300-400 mm in length.
- Volumetric flask, 100 and 250 ml with TS stoppers.
- Spectrophotometer, capable for accurately measuring absorbance at 425 nm.

Reagents :

Ethyl alcohol (95 %)

Procedure :

- About 1 g turmeric sample was weighed accurately and taken into the extraction flask.
- Then 30 ml of the ethyl alcohol was added to it and refluxed for 2 hr.

- Then it was cooled and filtered into a 100 ml volumetric flask. Then it was diluted up to 100 ml with ethyl alcohol.

- Pippetted 20 ml of the filtrated extract into a 250 ml volumetric flask.

- The absorbance of the extract and the standard solution at 425 nm using 1 cm cells against an alcohol blank was measured.

Calculation :

$$\% \text{ curcumin in sample} = \frac{\text{Absorbance of extract} \times 125}{a \times w}$$

where,

a = Absorbance of standard solution / 0.0025

w = Weight of sample in g

RESULTS AND DISCUSSION

The per cent losses over disease free rhizomes were calculated. The data regarding losses are presented in Table 1. The results on fresh weight basis indicated that maximum losses were found in severely diseased plants (>50 %) *i.e.* 25.83 and 62.12 per cent in mother and finger

rhizomes, respectively. This was followed by moderate disease, 24.28 and 45.80 per cent in mother and finger rhizomes, respectively.

On dry weight basis maximum losses were found in severely diseased plants (>50 %), *i.e.* 42.10 and 62.16 per cent in mother and finger rhizomes, respectively, which was followed by moderate disease rhizomes 36.09 and 45.16 per cent in mother and finger rhizomes. The minimum weight losses were recorded in less disease rhizomes up to 25.56 and 27.47 per cent in mother and finger rhizomes, respectively (Table 2).

The per cent losses in curcumin content over disease free rhizomes were calculated (Table 3). The results revealed that maximum losses in curcumin content were found in severely diseased plants (>50 %) *i.e.* 50.11 per cent followed by moderately diseased plants (32.61 %) and less diseased plants (14.62 %). The per cent curcumin content in rhizomes from diseased plants and disease free plants ranged from 2.08 to 4.17.

These results support the findings of earlier workers (Nair and Ramkrishnan, 1973, Patil and Patil, 1983, Narasimhudu and Balasubramaniam, 2002; Prasadji *et al.*, 2005) who reported losses in quality and quantity of rhizomes of turmeric, due to leaf spot disease.

Table 1 : Assessment of losses in yield of fresh (wet) mother and finger rhizomes of turmeric caused due to leaf spot

| Sr. No. | Treatment | Disease severity (%) | Fresh weight of rhizomes / plant (g)* | | Per cent loss over disease free rhizomes | |
|---------|------------------|----------------------|---------------------------------------|--------|--|--------|
| | | | Mother | Finger | Mother | Finger |
| 1. | Less disease | Up to 25 | 59.20 | 228.80 | 23.51 | 26.80 |
| 2. | Moderate disease | 26 - 50 | 58.60 | 169.40 | 24.28 | 45.80 |
| 3. | Severe disease | > 50 | 57.40 | 118.40 | 25.83 | 62.12 |
| 4. | Disease free | 0 % disease | 77.40 | 312.60 | 0.00 | 0.00 |

* Mean of five plants

Table 2 : Assessment of losses in yield of dry mother and finger rhizomes of turmeric caused due to leaf spot

| Sr. No. | Treatment | Disease severity (%) | Dry weight of rhizomes / plant (g)* | | Per cent loss over disease free rhizomes | |
|---------|------------------|----------------------|-------------------------------------|--------|--|--------|
| | | | Mother | Finger | Mother | Finger |
| 1. | Less disease | Up to 25 | 19.80 | 32.20 | 25.56 | 27.47 |
| 2. | Moderate disease | 26 - 50 | 17.00 | 24.00 | 36.09 | 45.16 |
| 3. | Severe disease | > 50 | 15.40 | 16.80 | 42.10 | 62.16 |
| 4. | Disease free | 0 % disease | 26.60 | 44.40 | 0.00 | 0.00 |

* Mean of five plants

Table 3 : Assessment of losses in curcumin content in finger rhizomes of turmeric caused due to leaf spot

| Sr. No. | Treatment | Disease severity (%) | % curcumin content | % losses over disease free rhizomes |
|---------|------------------|----------------------|--------------------|-------------------------------------|
| 1. | Less disease | Up to 25 | 3.56 | 14.62 |
| 2. | Moderate disease | 26 - 50 | 2.81 | 32.61 |
| 3. | Severe disease | > 50 | 2.08 | 50.11 |
| 4. | Disease free | 0 % disease | 4.17 | 0.00 |

REFERENCES

- American Spice Trade Association (ASTA) (1968).** *Official analytical methods*, 2nd edn., American Spice Trade Association, New York, : 53.
- Nair, M.C. and Ramkrishnan, K. (1973).** Effect of *Colletotrichum* leaf spot disease of turmeric on the yield and quality of rhizomes. *Curr. Sci.*, **42** : 549-550.
- Narasimhudu, Y. and Balasubramaniam, K.A. (2002).** Fungicidal management of leaf spot of turmeric incited by *C. capsici*. *Indian Phytopathol.*, **55** (4) : 527-528.
- Patil, B.K. and Patil, R.B. (1983).** Varietal resistance in turmeric to leaf blotch disease, *Indian Coca, Arecanut & Spices J.*, **6** (3) : 59-60.
- Prasadji, J.K., Bhagavan, B.V.K., Ramapandu, S. and Muralidharan, K. (2005).** Genetic diversity in turmeric genotype with differential reaction to foliar biotech and spot diseases. *J. Mycol. Pl. Pathol.*, **35** (3) : 451-459.
- Saikia, U.N. and Roy, A.K. (1974).** Leaf blight of turmeric caused by *Corticium sasaki*. *Indian Phytopathol.*, **29** : 519.

Received : May, 2009; Accepted : July, 2009