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ESTIMATION OF FRUIT QUALITY PARAMETERS IN ANTHRACNOSE INFECTED CHILLI FRUITS

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ABSTRACT

Chilli production is threatened by many biotic stresses such as insect pests and diseases. Among these, anthracnose disease caused by *Colletotrichum* spp. is one of the major economic constraint to chilli production worldwide, especially in tropical and subtropical regions. Anthracnose is mainly a problem on mature fruits resulting in yield losses up to 50 per cent and substantial deterioration in quality parameters. To assess the extent of loss in fruit quality parameters upon infection by anthracnose, capsaicin, oleoresin and phenol contents were estimated in both healthy and anthracnose infected fruits (with 40 per cent disease severity) in 15 varieties. Capsaicin, oleoresin and phenol contents reduced significantly in anthracnose infected fruits as compared to healthy fruits in all the 15 varieties. Reduction in phenol content in infected fruits was relatively high as compared to capsaicin and oleoresin. Reduction in phenol content varied from 16 to 69 per cent, while reduction in capsaicin varied from 20 to 60 percent and oleoresin from 17 to 55 per cent. The study clearly demonstrates that infection by anthracnose is caused substantial reduction in fruit quality parameters of chilli in general and phenol content in particular.

Key words: Chilli, Anthracnose, Fruit quality parameters

1. INTRODUCTION

Chilli (*Capsicum* spp.) is a remunerative vegetable, spice cum cash crop of the Indian subcontinent. Chilli is used as a spice, condiment, culinary supplement, vegetable and as an ornamental plant. The red colour of Chilli is due to capsanthin, capsorubin and capxanthin pigment and the pungency is due to capsaicin (Mathew, 2002). Chilli are a good source of vitamin 'A', 'B', 'C' (Ascorbic acid) and E (tocopheral), oleoresin, carbohydrates and minerals such as calcium, phosphorus, ferrous, sodium and copper in trace amounts.

The sustainability in chilli production is threatened by many biotic stresses such as several insect pests and diseases (Isaac, 1992), among these anthracnose caused by *Colletotrichum* spp. is a major economic constraint to chilli production in both tropical and subtropical regions (Than *et al*., 2008). Anthracnose of chilli has been caused by more than one *Colletotrichum* species including *C. acutatum* (Simmonds), *C. capsici* (Syd.) Butler and Bisby, *C. gloeosporioides* (Penz.) Penz. and Sacc., and *C. coccodes* (Wallr.) S. Hughes (Nirenberg *et al*., 2002 ;Voorrips *et al*., 2004; Sharma *et al*., 2005; Than *et al*., 2008). Anthracnose is mainly a problem on mature fruits resulting in yield losses up to 50 per cent and substantial deterioration in quality parameters (Bosland and Votava, 2003, Pakdeevaraporn *et al*., 2005). Thus, the present investigation was undertaken to assess the extent of loss in the quality parameters of chilli upon anthracnose infection.

2. MATERIALS AND METHODS

Fruit quality parameters such as oleoresin, capsaicin and phenol contents were estimated in both healthy and anthracnose infected chilli fruits (naturally infected fruits with 40 per cent disease severity). The differences in oleoresin, capsaicin and phenol contents between healthy and diseased fruits were compared for their statistical significance using paired two sample 'T' test (Snedecor and Cochran, 1968).

2.1. Oleoresin Estimation: Oleoresin content was estimated by following Gravity method (Ranganna, 1977). To a cleaned glass column, a small pinch of washed glass wool was added and pushed into the bottom of the column using a glass rod and gently packed. A known amount (10g) of finely powdered Chilli sample was transferred into the column and closely packed by tapping it. After fixing this column to an iron stand vertically, cold acetone was added in the ratio of 1:10 by weight to volume. It was added slowly from the top and the rate of flow of extract from the column was regulated and extract was collected in a porcelain dish. The extract was evaporated over water bath, dried and weighed again. The amount of oleoresin obtained was calculated by using following formula,

$$\% \text{ Oleoresin} = (W_3 - W_2) / W_1 \times 100$$

W_1= weight of the sample taken
W_2= weight of the empty porcelain dish
W_3= weight of the porcelain dish + sample extract after drying

2.2. Capsaicin Estimation: Capsaicin was estimated by following colorimetric method (Sadasivam and Manickam, 1996). In this method 500 mg of dry chilli powder was added into a glass stoppered test tube or volumetric flask. 10 ml of dry acetone was pipetted out into the flask and was kept on a mechanical shaker for three hours. The contents were centrifuged at 10,000 rpm for 10 min. One ml of clear supernatant was pipetted out into a test tube and evaporated to dryness in a hot water bath. The residue was dissolved in 5 ml of 0.4 per cent NaOH solution. Three ml of 3 per cent phosphomolybdic acid was added. The contents were mixed and were allowed to stand for 1 hour. The solution was quickly filtered into centrifuge tubes to remove any floating debris and centrifuged at 5000 rpm for 15 minutes. The clear blue coloured solution was transferred directly into the cuvette and the absorbance was read at 650 nm. Also, a blank reagent was run along with test samples. A standard graph was plotted using 1-200 µg capsaicin simultaneously i.e. 0.2, 0.4, 0.6, 0.8 and 1 ml of working standard solution was pipetted out and processed as above. Capsaicin percent was calculated by using the standard graph as follows

$$\text{Capsaicin (µg/ml)} = \frac{\text{µg capsaicin} \times 10 \times 100}{1000 \times 1000 \times 1 \times 0.5}$$

2.3. Phenol estimation: Phenol content was estimated using the Folin-ciocalteau reagent technique (Singelton *et al*., 1999). In this method 500 mg of dry chilli powder was added with ten times the volume of 80 per cent ethanol. The homogenate was centrifuged at 10,000 rpm for 20 minutes, the supernatant was saved and the residue re-extracted with five times the volume of 80 per cent ethanol, centrifuged and supernatant was dissolved. The supernatant was evaporated to dryness and the residue was dissolved in a known volume of distilled water. Different aliquots were pipetted out into test tubes and volume was made up to 3 ml in each tube with water. 0.5 ml of folin-ciocalteau reagent was added and after 3 min, 2ml of 20 per cent Na_2Co_3 solution was added to each tube. The contents were mixed thoroughly, and the tubes were placed in boiling water for one minute. After cooling, absorbance was measured at 650 nm against a blank reagent. A standard curve was plotted using different concentrations of catechol. From this standard curve, the concentration of phenols in the test sample was determined.

3. RESULTS AND DISCUSSION

The quality parameters of chilli fruits such as capsaicin, oleoresin and phenol contents were reduced significantly in infected fruits as compared to healthy fruits in all the varieties. However, phenol content reduction was relatively high as compare to capsaicin and oleoresin. The extent of reduction of phenol content varied from 16 to 69 %, reduction in capsaicin varied from 20 to 60 % and oleoresin varied from 17 to 55 %.Phenol content reduction was more in cultivars 6B and CA 9 (69%) followed by LCA 960 (61%), while least reduction was observed in D369 (16%). The capsaicin content reduction was higher in LCA 960 (60%) followed by Arka Suphal (54%), while least reduction was observed in Byadagi Kaddi and LCA 353 (20%). Highest reduction in oleoresin content was observed in Aparna (55%) followed by Byadagi Kaddi (48%) and least reduction was observed in Vangara and LCA 335 (17%) as shown in table1.

The changes in fruit quality parameters such as capsaicin, oleoresin and phenol contents due to anthracnose infection as explained above are in confirmation to the previous workers. Jeyalakshmi *et al.* (1994) recorded 50 per cent reduction in capsaicin and oleoresin contents due to anthracnose incidence. Similarly, the investigation carried out by Khodke and Wankhede (2000) revealed less content of ascorbic acid and capsaicin in fruits heavily infected due to anthracnose disease.

4. CONCLUSION

We conclude that anthracnose disease causes substantial reduction in fruit quality parameters of chilli in general and phenol content in particular.

Table 1: Estimates of quality parameters in healthy and infected chilli fruits

Genotypes	Capsaicin (µg/ml)			Oleoresin (%)			Phenol (µg/ml)		
	Healthy	Infected	Per cent reduction	Healthy	Infected	Per cent reduction	Healthy	Infected	Per cent reduction
Pusajwala	759.3	477.7	37.0	12.0	10.1	18.0	270.0	220.0	19.0
LCA271	922.9	511.6	45.0	12.5	8.7	30.0	515.0	225.0	56.0
LCA335	1049.5	685.6	35.0	12.8	10.6	17.0	485.0	275.0	43.0
LCA273	635.3	396.3	38.0	13.8	8.8	36.0	410.0	260.0	37.0
LCA353	531.9	425.6	20.0	12.3	9.7	18.0	617.0	315.0	49.0
Susanjoy	715.6	533.0	26.0	10.0	5.7	43.0	227.0	180.0	21.0
LCA330	825.0	481.6	42.0	10.5	8.1	23.0	365.0	240.0	34.0
CA9	485.3	342.8	29.0	13.6	9.1	33.0	560.0	175.0	69.0
Arksuphal	906.0	415.0	54.0	13.2	8.5	36.0	305.0	235.0	23.0
Vangara	578.7	330.0	43.0	13.4	11.1	17.0	270.0	225.0	17.0
Aparna	707.6	525.6	26.0	9.4	4.2	55.0	275.0	141.0	49.0
LCA960	1345.0	452.9	60.0	12.1	9.9	18.0	545.0	215.0	61.0
6B	975.6	591.3	39.0	12.9	8.0	38.0	741.0	230.0	69.0
D369	448.4	300.8	33.0	11.4	7.8	32.0	310.0	260.0	16.0
Byadagi kaddi	590.0	471.9	20.0	10.0	5.2	48.0	376.0	250.0	34.0
Two sample paired 't' test probability	0.000133			0.0000068			0.000078		

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