



### STUDIES ON CHLOROPHYLL CHANGES IN HEALTHY AND DISEASED LEAF OF COWPEA (*VIGNA UNGUICULATA* (L.) WALP)

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#### ABSTRACT

The present biochemical studies indicated that the chlorophyll content was found decrease due to the infection of *Colletotrichum destructivum*, *Colletotrichum capsici* and *Erysiphe polygoni*. In healthy leaves chlorophyll content was found to be more than infected leaves. In healthy leaf contained higher amount of chlorophyll a (0.692 mg/g), chlorophyll b (0.505 mg/g) and total chlorophyll (1.197 mg/g). The leaf infected with *C. destructivum* contained reduced amount of chlorophyll a (0.562 mg/g), chlorophyll b (0.367 mg/g) and total chlorophyll. *Colletotrichum destructivum* was higher to the tune of 18.78, 27.32 and 27.73 %, respectively of chlorophyll a, chlorophyll b and total chlorophyll. Similar types of results made by Chavan (2013) on soybean. Similar kind of observation was made by (Berger et al. 2007, Lobato et al. 2009) on different host plant.

**KEYWORDS:** *Vigna unguiculata*, Anthracnose and Brown blotch.

#### INTRODUCTION

India is an agriculture-based country and its growth, development and economy mainly depends upon agriculture. Presently, contribution of agriculture about one third of the national GDP (Gross Domestic Product) and provides employment to over 70 % of Indian population in agriculture and related activities. The importance of pulses has been realized due to their high protein, better nutritional food, and fodder and soil enrichment qualities. Pulses have been considered as an integral part of our diet from time immemorial and have also found their reference in ancient scriptures such as Puranas and Mahabharata. India ranks first in the world in terms of pulse production. In India during 2013-2014 total area under

pulses is about 25.2 million ha with total production of 19.3 million tonnes and average yield about 764 kg/ha (Anonymous 2014-2015).

Among the various pulses grown in India, Cowpea (*Vigna unguiculata* (L.) Walp) is an important vegetable pulses crop and is popularly known as 'Chowli'. It is an ancient pulse crop known to man and cultivated from ancient times in the tropics of old World. It probably originated in Asia, Africa and even South America. Central Africa is considered to be the original home of cowpea plant. Vavilov (1949) considered India is the main centre of origin of this crop. The crop is under cultivation since prehistoric time in India. Cowpea was introduced from Africa to the Indian sub-continent about 2000 to 3500 years ago (Allen 1983).

### MATERIALS AND METHODS

Chlorophyll estimation was carried out according to the method of Arnon (1949). The healthy and infected leaves (anthracnose, brown blotch and powdery mildew) of cowpea were collected and cut into small pieces. 1 gram of both healthy and infected samples was taken separately, washed with tap water followed by the distilled water. The samples were macerated in cold 80% acetone and centrifuged at 3000 rpm for 15 min. The pellet was thoroughly washed thrice with 80% acetone and the supernatants were pooled. The pellets were discarded and pooled supernatants were made up to 25 ml with 80% acetone and color intensity read at 663 nm and 645 nm. The chlorophyll a, chl- b and total chlorophyll were estimated using the formula Arnon (1949).

Chlorophyll a = [(12.7 x OD at 663 nm) - (2.69 x OD at 645 nm)] x df  
Chlorophyll b = [(22.9 x OD at 645 nm) - (4.68 x OD at 663 nm)] x df  
Total Chlorophyll = [(20.2 x OD at 645 nm) - (8.02 x OD at 663 nm)] x df.

Where O.D stands for optical density and df for dilution factor. The results were expressed as mg of chlorophyll per g fresh weight.

**Table 1: Chlorophyll changes in healthy and diseased leaf of cowpea infected with *C. destructivum*, *C. capsici* and *E. polygona*.**

Biochemicals	Healthyleaf	Anthracnose		Brown blotch		Powdery mildew	
		Infected	% decrease over healthy	Infected	% decrease over healthy	Infected	% decrease over healthy
Chl.a (mg/g)	0.692	0.562	18.78	0.537	22.39	0.510	26.30
Chl.b (mg/g)	0.505	0.367	27.32	0.342	32.27	0.335	33.66
Total chl.(mg/g)	1.197	0.865	27.73	0.844	29.49	0.785	34.41

## RESULTS AND DISCUSSION

The present biochemical studies indicated that the chlorophyll content was found decrease due to the infection of *Colletotrichum destructivum*, *Colletotrichum capsici* and *Erysiphe polygona*. In healthy leaves chlorophyll content was found to be more than infected leaves. In healthy leaf contained higher amount of chlorophyll a (0.692 mg/g), chlorophyll b (0.505 mg/g) and total chlorophyll (1.197 mg/g). The leaf infected with *C. destructivum* contained reduced amount of chlorophyll a (0.562 mg/g), chlorophyll b (0.367 mg/g) and total chlorophyll *Colletotrichum destructivum* was higher to the tune of 18.78, 27.32 and 27.73 %, respectively of chlorophyll a, chlorophyll b and total chlorophyll. Similar types of results made by Chavan (2013) on soybean. Similar kind of observation was made by (Berger et al. 2007, Lobato et al. 2009) on different host plant.

The leaf infected with *Colletotrichum capsici* contained amount of chlorophyll a (0.537 mg/g), chlorophyll b (0.342 mg/g) and total chlorophyll (0.844 mg/g). The rate of reduction of all three chlorophyll in the infected leaf with *Colletotrichum capsici* was higher to the tune of 22.39, 32.27 and 29.49 %, respectively of chlorophyll a, chlorophyll b and total chlorophyll. In infected leaves chlorophyll content was decreased up to half due to death of leaf tissues, change in the ultrastructure of chloroplast and degradation of pre-existing pigments. The reduction of chlorophyll in infected leaves under the present investigation may be due to interference by pathogen in the normal chlorophyll synthesis or breakdown of chlorophyll due to activation of enzymes that degrade chlorophyll (Rathore et al., 2001). The results are in conformity with Kulkarni *et al.* (2009) and Gupta *et al.* (2010).

The leaf infected with *Erysiphe polygona* contained amount of chlorophyll a (0.510 mg/g), chlorophyll b (0.335 mg/g) and total chlorophyll (0.785 mg/g).

The rate of reduction of all three chlorophyll in the infected leaf with *Erysiphe. polygona* was

higher to the tune of 26.30, 33.66 and 34.41 %, respectively of chlorophyll a, b and total chlorophyll. Similar type of observations was made by (Borah *et al.* 1978, Ali *et al.* 1992, Guleria *et al.* 1997).]

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