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Change in Nutritive Value of Cabbage after Infection of Colletotrichum Dematium (Pers.) Grove

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ABSTRACT

Cabbage, Brassica oleracea is a leafy green vegetable. Maharashtra solely produce4.21lakh Metric ton 5% of total cabbage produced in India (NHB 2013) [1]. It mostly consumed by peoples of all over the world. It is very nutritive and consumed raw as salad or cooked as vegetable.

Colletotrichum dematium is a saprophytic as well as parasite in nature. It grows as parasite on many plants, cabbage is one of them. occur worldwide, grow in temperate regions. It grows luxuriously in temperate regions; the post-harvest condition is mostly responsible for severity of disease. Severely diseased cabbage is not look good and nutrients content also changes, it is perfectly unsuitable for consumption.

Keywords: Cabbage, Colletotrichum, Nutrient and Disease

I. INTRODUCTION

The cabbage is most popular and widely consumed leafy vegetable in world. it is consumed uncooked in salad and cooked in variety of dishes. its popularity is due to its adaptability to a wide range of climate and soil types. Cabbage is believed to be evolved from a wild form native to Europe, growing along the coast of North Sea, the English Channel and Mediterranean Tim Lambert (2017) [2].

China is the largest producer of cabbage (33.4 million of tonnes, followed by India 9.0 million of tonnes and Russia 3.5 million of tonnes (FAOSTAT of the United Nations2014) [3].

In India west Bengal shares 24% of total production of cabbage, Odisha 135, Bihar 8%, Gujarat 7% Assam 7%, Maharashtra 7 %, and Madhya Pradesh 7% etc. (NHB database 2014) [4].

II. METHODS AND MATERIAL

1. Collection of samples

Sample of diseased cabbage were collected from the various regions of Maharashtra (India). For this purpose, total Maharashtra was divided into 5 different zones i.e., Khandesh, Konkan, Vidarbha, Western ghat and Marathwada. From these five zones diseased and healthy cabbage were collected. Samples were sealed in clean

sterile plastic bag and later stored in cooling apparatus. Labelling of each sample is done on the site of collection. (James B. et al., 2010) [5].

2. Identification of pathogen related to disease

The collected sample were placed in moisture chamber to enhance the growth of fungi associated with it. Potato dextrose agar medium is used for culture practice, 28°C ± 2 is suitable temperature for growth.

After luxurious growth of fungi wet mounting in Aniline cotton blue stain provide the detailed structure of hyphae and conidia under microscope. Acervulli are easily visible under low power resolution, but conidia are seen in high resolution. Setae are the peculiar character of Colletotrichum, they are dark in colour. Conidia are hyaline, aseptate, falcate, fusiform, and tapered at both ends. Size of conidia ranges from 19 to 25 µm in length and 2.5 to 3.5 µm in diameter.

Setae are dark coloured 50 to 200 µm in length, septa are ranges from 1 to 3 in number. Acervulli are 500 µm in length and 370 µm in width.

All characters of setae conidia and accervulli suggest the pathogen is *Colletotrichum dematium* **(Pers.) Grove.,** Kyungseok Park & Choong-Hoe Kim (2001) [6].

3. Test for pathogenicity

Spraying water containing conidia on healthy cabbage in field condition confirm the pathogenic nature of *Colletotrichum dematium*.

4. Nutrient analysis of sample

Diseased and healthy sample collected from same site were analysed for nutrient content in it. For this purpose, standard protocols were strictly followed they are Carbohydrate was estimated by Anthron reagent (Hedge, J E and Hofreiter, B. T., 1962) [7] method, described by S. Sadasivam and A. Manickam, (2004) [8]. Nelson-Somogyi (1944) [9] and Somogyi (1952) [10] method were used to estimate Simple sugars or reducing sugars in vegetable. Total Protein Estimation by Lowry's Method (Lawry et al., 1951) [11]. Amino acids are estimated using method described by Hyman Rosen, 1957 [12]. Bligh and Dyer (1959) [13] procedure of extraction of lipids from plant material is by using Chloroform, Methanol and water is more suitable method than others (Breil, C. *et al.*, 2017) [14].Estimation of chlorophyll pigment were carried by using the method given by Arnon (1949) [15,16].Fibres estimated using procedure described by Murray Randall in 1977[17].Water content and dry matter were calculated using protocol of Ruck, 1969[18]. And finally Ascorbic acid estimation or Vitamin C estimation were carried by using Hughes, D. E., 1983[19].

5. Comparison for change in content

To study impact of pathogen on the content of nutrient, it's very essential to compare the content in diseased sample and healthy one. Here % change in content were calculated for comparison purpose.

III. OBSERVATIONS

Nutrient content in healthy & diseased sample as well as their comparison is stated in table1.

TABLE-I Nutrient content in Healthy and Diseased vegetable and % alteration of content BY *COLLETOTRICHUM DEMATIUM*

Table I: Nutrient content in Healthy and Diseased vegetable and % alteration of content by *Colletotrichum dematium*				
Sr. no.	**Nutrients**	**Content in 100gram Healthy material**	**Content in 100gram diseased vegetable**	**% Alteration due to disease**
1.	Water content	89.3 Grams	86.1 Grams	-3.583
2.	Total carbohydrate	6.0 Grams	3.4 Grams	-43.333
3.	Reducing sugar	3.4 Grams	1.20 Grams	-64.705
4.	Fibre	2.5 Grams	2.1Grams	-16
5.	Protein	1.5 Grams	1.6 Grams	6.667
6.	Amino acids	1.6Grams	1.8 Grams	12.5
7.	Lipids	0.1 Grams	00 Grams	-100
8.	Vitamin C	37mg	00mg	-100
9.	Chlorophyll content(total)	24mg	00 mg	-100
10.	Dry matter	10.7 Grams	13.9 Grams	29.906

IV. RESULTS AND CONCLUSION

Colletotrichum dematium causing anthracnose disease on Cabbage in field as well as in post-harvest condition. Pathogen retard the nutritive values of the vegetable and, it's demand in market, this clearly explain the economic importance of the disease. In this the nutrient whose level increases are protein (6.667 %) and free amino acids (12.5 %). The percentage concentration of total carbohydrate (43.333 %), reducing sugar (64.705 %), fibre (16 %) is found to be decreases after disease development. While the lipids, vitamin C and chlorophyll is fully absent in diseased sample. (Graph 1)

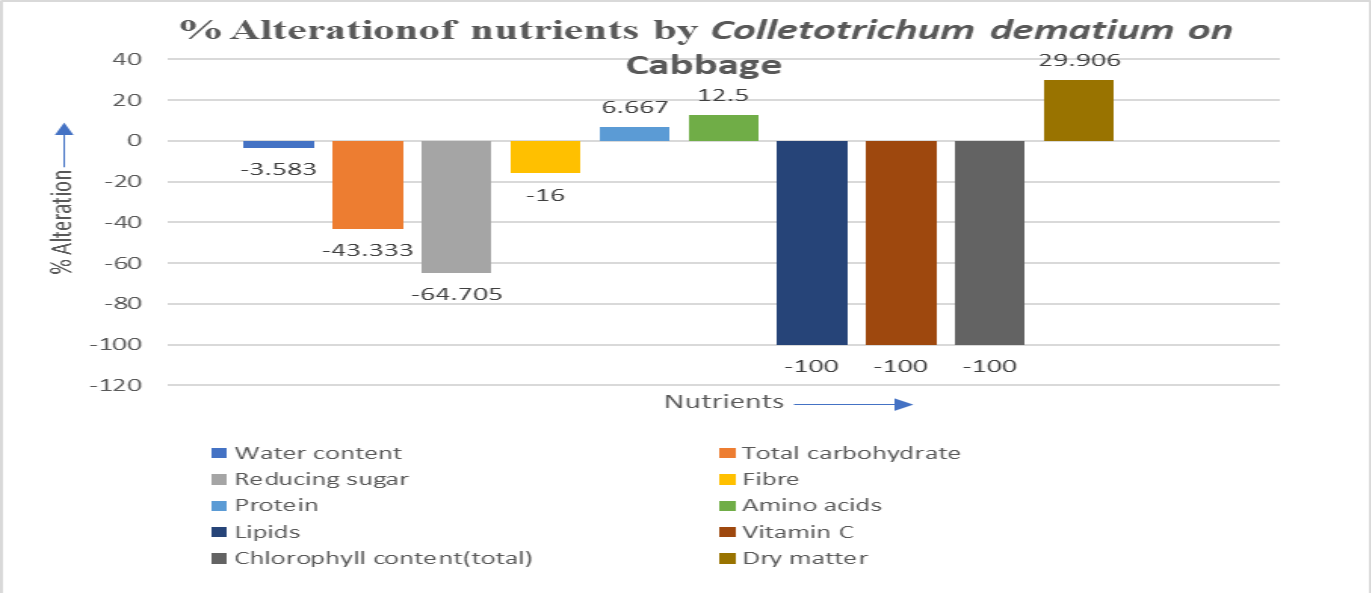

Figure 1: Graphical representation of result of nutrient change in content of vegetable Cabbage after Anthracnose disease caused by *Colletotrichum dematium.*

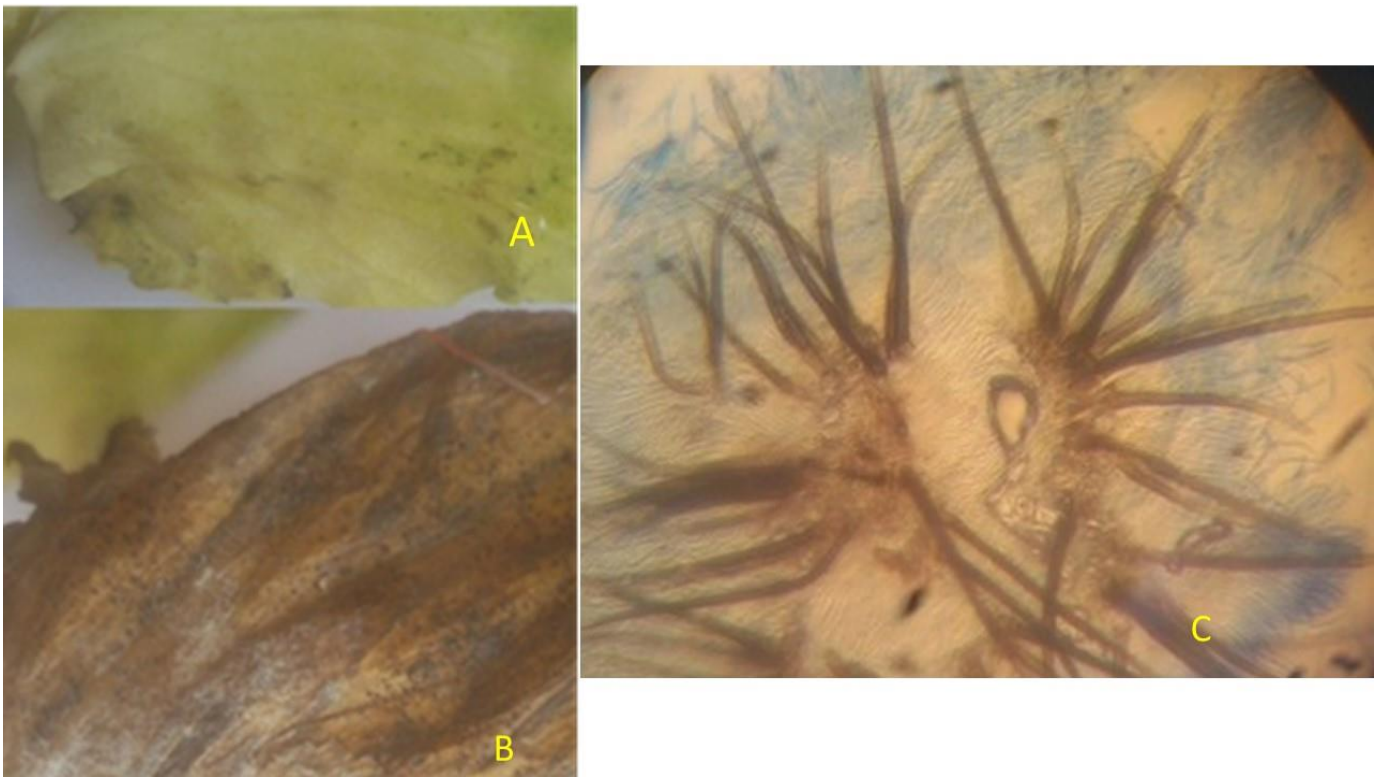

Figure 2: *Colletotrichum dematium* on Cabbage- (before inoculation -A and after three days of incubation- B), and C- Acervulli under high resolution showing Setae and conidia.

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