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# EFFECT OF POWDERY MILDEW INFECTION ON THE NITROGEN METABOLISM OF BLACKGRAM

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Changes in the total nitrogen and amino acid content of the infected leaves along with the protein content of the grains in the pods were studied. There was an overall increase in the total nitrogen and free amino acid contents of the infected leaves while the protein content of the infected grains in the pods decreased with increased in intensity of infection.

Infection of plants by powdery mildew pathogen has been reported to cause considerable changes in the physiological processes of the host. Of all the effects which the powdery mildew pathogens induce in host plants, the effect on then itrogen metabolism appears to be very pronounced. The present investigation was therefore, carried out to study the changes in the nitrogen metabolism of the powdery mildew infected blackgram plants, and the results are presented hereunder.

## MATERIAL AND METHODS

Blackgram (*Vigna mungo* Roxb.) plants were grown in pots with 20 cm diametre at the rate of 5 plants/per pot in glass house at 20-30 °C. The plants were inoculated at 30 days of age. A water suspension of powdery mildew conidia was prepared and the spore concentration was adjusted to $10^6$ spore/ml of water. This suspension was sprayed on healthy leaves of 30 days old plants. After inoculation, the plants were covered for 3 days by using polythene bags to maintain a high humidity for disease development. The leaves of the plants were examined, and according to the intensity of infection, were graded into the following categories.

Grade 0 : No infection of leaves in the plant as a whole

Grade 1 : 1-10 percent of the leaf area/pods infected.

Grade 2 : 11-25 percent of the leaf area/pods infected.

Grade 3 : 26-50 percent of leaf area/ pods infected.

Grade 4 : More than 50 percent of leaf/pods infected and also with extensive drying and defoliation of the leaves. Pods shrivelling and malformed.

Total nitrogen contents were estimated by the Microkjeldahl's method developed by Jackson (1962). Protein content was determined by Microkjeldahl method (Jackson 1962).

The free amino acids in leaves were estimated by unldimensional ascending paper chromotography method (*Blick et al.* 1955).

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## RESULTS AND DISCUSSION

The data presented in table 1 showed that there was a gradual increase in the total nitrogen content of the infected leaves as the intensity of the disease increased, though the increase in the early stage of infection was not appreciable. It was noted that the leaves exhibiting grade 4 intensity of infection contained maximum nitrogen content when compared to the other treatments. In infected pods the protein content was considerably reduced. The protein content, when the pods were infected registered a gradual decrease with the increase in the intensity of the disease.

The free amino acid contents following infection showeld remarkable changes (Table 2). Arginine and isoleucine contents were increased to a great extent due to infection while the levels of other free amino acids such as Alanine, Lysine, Leucine, Methionine, Glutamic acid and cystine also exhibited some increase with the increasing Intensity of infection of the disease.

Powdery mildews have been shown to be responsible for various alterations in the nitrogen metabolism of infected plants. Bushnell (1971) observed that the barley plants infected with *E. graminis* f. sp. *hordei* showed an increase in the contents of total nitrogen and especially during sporulation, the total nitrogen content was doubled. Fric (1964) reported the host nitrogen content of wheat plants increased especially beneath the tissues infected by *E. graminis*. In the present study also similar corroborative evidences were obtained indicating that there was gradual increase in the total nitrogen content of the infected leaves when compared to the healthy leaves. The leaves exhibiting grade 4 intensity of infection had the highest total nitrogen content.

The protein content of the pods showing disease intensity grade of 4 had only half of protein content of healthy grains. These finding were in agreement with those of Jamaluddin and Prasad (1977) who reported gradual depletion of protein in the seeds of black gram due fo *E. polygoni* infection of pods. They considered that the decrease in contents of protein nitrogen and soluble nitrogen was due to the hydrolysis of seed protein, caused by fungal infection. Sadler and scott (1974) reported that certain soluble nitrogen compounds consistently increased in mildewed barly leaf tissues, principally asparatic, and glutamic acids their corresponding amines asparagine glutamine and ammonia. Sadler and Scott (1974) reported that incorporation of 14 C from 14 $C9_2$ into lanine, asparatic acid and glutamic acid was found to be increased in powdery mildew pathogen of barley. They observed progressive increase in amino acid contents of blackgram plants infected with powdery mildew, with increase in intensity of infection, may be indicating the greater cemand of powdery mildew pathogens and the positive response of the sus ceptable host to meet the demand of the pathogen.

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Table 1 Effect of powerdy Mildew infection on the Total Nitrogen and proten content Black gram

| Grade | Total Nirogen in leaf | Protein in pods | Percentage reduction of protein over control |
|---|---|---|---|
| Healthy | 8.02 | 24.73 | — |
| 1 | 8.12 | 23.52 | 7.10 |
| 2 | 8.55 | 23.25 | 11.45 |
| 3 | 8.86 | 19.96 | 33.70 |
| 4 | 9.46 | 16.80 | 52.20 |
| CD | 0.39 | 0.16 | |

Table 2 Effect of infection on the Amino acid contents. (Mg/g fresh weight)

| Disease intensity. | Argi nine | Ala- mine | Lys ine | Iso leucine | Leu cine | Me- thionine. | Glu- ta mic acid | Cys tine |
|---|---|---|---|---|---|---|---|---|
| (healthy) | 3.71 | 3.14 | 2.52 | 1.25 | 14.45 | 6.80 | 30.5 | 6.82 |
| 1. | 3.79 | 3.15 | 2.54 | 1.28 | 14.80 | 6.87 | 30.5 | 6.87 |
| 2. | 3.79 | 3.18 | 2.58 | 1.36 | 15.08 | 6.96 | 30.6 | 6.91 |
| 3. | 3.80 | 3.20 | 2.56 | 1.37 | 15.10 | 6.98 | 30.6 | 6.97 |
| 4. | 3.90 | 3.27 | 2.61 | 1.41 | 13.13 | 7.01 | 30.7 | 6.99 |

CD P=(0.05) : Interaction between Amino Acids and Grade : 0.045
Between grades : 0.0159
Between Amino Acids : 0.0262