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# Studies on Seed Transmission of Black Gram Leaf Crinkle Virus — Effect of Age of Plants at Infection

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ABSTRACT

The experiments with black gram plants inoculated with Black gram leaf crinkle virus (BLCV) at 5-day interval from 5 to 50 days of age showed that the plant susceptibility and the percentage of seed transmission of BLCV were reduced, as the age of the plants increased. The higher percentage of infection observed in young infected plants induced higher rate of seed transmission. The incubation of BLCV in black gram plants was positively correlated with the age of plants at the time of inoculation, but it showed a negative linear relationship with the percentage of seed transmission of BLCV. The necessity of protecting the plants at early stages of growth to avoid seed transmission of BLCV has been discussed.

## INTRODUCTION

The transmission of plant viruses through true seeds of host plants, once considered as rare, is known to occur in many plants (Shepherd, 1972). Kolte and Nene (1972) reported the seed transmission of Black gram leaf crinkle virus (BLCV) through the seeds. The age of plants at infection is known to influence the plant susceptibility and the ability of plants to act as sources of virus infection (Ling and Palomar, 1967 and Narayanasamy, 1972). Detailed studies have been initiated to find out the various factors that influence the transmission of BLCV through the seeds and the effects of age at infection on the seed transmission of BLCV are presented in this communication.

## MATERIALS AND METHODS

Black gram (*Phaseolus mungo* L.) variety CO 1 was used in the present study. The plants at 5, 10, 15, 20, 25, 30, 35, 40, 45 and 50 days of age were inoculated with the infective sap obtained by grinding the infected black gram leaves with 0.1 M phosphate buffer added at the rate of 1 ml/g of leaf tissue and expressing the sap through the cheese cloth. The seeds collected from the infected plants were sown separately in pots. The observations on the germination of seeds and number of plants showing symptoms of infection were made. The correlation coefficients among different factors affecting seed transmission of BLCV were worked out and are presented in Table 3.

## RESULTS AND DISCUSSION

It may be observed from Table 1 that the susceptibility of black gram plants to BLCV was progressively reduced as the plants became older. The incubation period of BLCV was proportionately increased with the age

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of the black gram plants at the time of inoculation. There was a significant negative correlation between the age of plants at infection and the percentage of plants infected (Table 3). A significant positive linear relationship between the age of plants at infection and the average incubation period in the inoculated plants was observable (Table 3). These factors may have some influence on the seed transmissibility of BLCV.

TABLE 1. Effect of age of plants at infection on BLCV infection and incubation period

| Age of plants at infection (days) | No. of plants infected/ inoculated | Incubation period Range | Average |
|---|---|---|---|
| 5 | 17/20 | 12–15 | 13 |
| 10 | 11/20 | 14–18 | 16 |
| 15 | 10/20 | 15–20 | 17 |
| 20 | 10/20 | 18–22 | 20 |
| 25 | 8/20 | 18–21 | 20 |
| 30 | 6/20 | 25–26 | 25 |
| 35 | 5/20 | 25–28 | 26 |
| 40 | 5/20 | 30–35 | 32 |
| 45 | 4/20 | 30–38 | 34 |
| 50 | 4/20 | 35–39 | 37 |

The germination of seeds was adversely affected due to virus infection (Table 2). However, there was no distinct effect due to the age of plants at the time of inoculation on the percentage of seeds germinated. The seeds collected from the plants inoculated at 10 days of age showed the minimum percentage of germination (43.64), while the maximum percentage of germination (94.19) was exhibited by the seeds collected from plants inoculated at 25 days of age.

The age of plants at the time of infection was observed to exert definite

TABLE 2. Effect of age of plants at infection on seed transmissibility of BLCV

| Age of plants at infection / days | No. of seeds sown | No. of seeds germinated | No. of plants infected | Percentage |
|---|---|---|---|---|
| 5 | 53 | 43 | 18 | 41.86 |
| 10 | 55 | 24 | 7 | 29.17 |
| 15 | 62 | 42 | 11 | 26.19 |
| 20 | 123 | 85 | 16 | 18.82 |
| 25 | 86 | 81 | 27 | 33.33 |
| 30 | 97 | 59 | 12 | 20.34 |
| 35 | 99 | 55 | 2 | 3.64 |
| 40 | 111 | 84 | 3 | 3.57 |
| 45 | 134 | 117 | 3 | 2.56 |
| 50 | 177 | 146 | 0 | 0.00 |
| Control (uninoculated) | 100 | 98 | 0 | 0.00 |

influence on the transmission of the virus through the seeds of black gram (Table 2). There was a significant negative correlation between the age of plants at the time of inoculation and the percentage of seed transmission obtained (Table 3). There was a progressive reduction in the percentage of plants, developing from the seeds collected from plants infected at different ages, getting infected as the age of the plants increased at the time of inoculation. The germinating seeds collected from plants inoculated at 5 days of age carried the virus to the extent of 41.86 per cent. The data in Table 2 indicated that the transmission of BLCV through black gram seeds was high, when the plants were infected before 30 days of age. The percentage of seed transmission of BLCV was progressively reduced and there was no transmission of the virus through the seeds of 50 day old inoculated plants.

TABLE 3. Correlation coefficients of relationship between age of plants at infection and seed transmission of BLCV

| Factors involved | Age of plants at infection | Percentage of seed transmission |
|---|---|---|
| Percentage of infection | −0.925** | +0.878** |
| Average incubation period | +0.986** | −0.918** |
| Percentage of seed transmission | −0.909** | — |

** Significant at 1 per cent level.

The seed transmissibility of viruses is affected by various factors among which the age of plants at the time of infection is considered to be important. The earlier the plants are infected more will be the chances of transmission of virus through seeds (Matthews, 1970). The multiple correlations worked out (Table 3) clearly indicated that when black gram plants were infected at early stages the percentages of infection was higher and this had a direct influence on the percentage of seed transmission of BLCV (Table 3). The incubation period of the virus in such plants was short and the virus was able to invade systemically all the tissues resulting in higher percentage of seed transmission (Table 3). If infection occurred later, the percentage of infection was low; the incubation period was long and the virus was unable to get distributed evenly in all plant part resulting in the lower percentage of seed transmission.

Crowley (1959) observed that transmission of tobacco ringspot virus through the seeds was low, if the plants were infected just prior to or soon after flowering. The soybean plants exhibited increased resistance to infection and systemic spread of tobacco ringspot virus after flowering (Owusu *et al.*, 1968). In black gram also the resistance of plants was increased and the incubation period of BLCV was longer, as the age of the plants increased. Moreover, it may not be possible for the virus to reach a

concentration that may be required for the thorough distribution of BLCV in all tissues. The lower percentage of seed transmission of BLCV in plants infected at later stages may be due to increased resistance of host plants to infection and systemic spread as evidenced by longer incubation period, and irregular distribution of the virus in such plants. It is, therefore, imperative to take up adequate measures to give protection to black gram plants during early stages of growth, as the plant susceptibility to virus infection and the percentage of seed transmission are more in the case of young plants when infected.

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