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# Yield loss relationship with incidence and intensity of *Myrothecium* leaf blight of cotton*

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A leaf spot disease caused by *Myrothecium roridum* Tode Ex Fries was first reported from Delhi (Munjal 1960) and later from Hisar (Suryarayana 1965). Since then, the disease was of minor importance. However, during the last few years, the disease has been observed to occur in severe form in East Nimar of Madhya Pradesh (AICRP 2004). The disease is reported to cause severe losses to cotton (*Gossypium hirsutum* L.) crop due to defoliation (Shrivastava and Singh 1973, Chauhan *et al.* 1976), but no quantitative loss estimate has been made. Hence a study war conducted to estimate the losses in yield due to Myrothecium leaf blight of cotton.

A field trial was conducted in 2002–03 and repeated in 2003–04 at the experimental farm of JNKVV, Khandwa using a fungicide carbendazim (known as Bavistin 50% WP) to obtain different levels of the disease incidence and intensity on the cotton plants. This facilitated the correlation studies between the disease incidence/intensity and losses in the seed cotton yield. 'JK 4' *G. hirsutum* susceptible to *Myrothecium* leaf blight was planted in a randomized block design with 4 replications. During both the seasons (2002–03 and 2003–04), sowing was done in the last week of June. The following spray (Bavistin @ 0.1%) schedule was followed to obtain various levels of the disease. The plot size for each treatment was 6 m×3.6 $m^2$ with a plant-to-plant and row-to-row spacing of 60 cm×60 cm.

$T_1$, Five sprays at 30, 45, 60, 75 and 90 days after sowing; $T_2$, 4 sprays at 30, 45, 60 and 75 days after sowing; $T_3$, 3 sprays at 30, 45 and 60 days after sowing; T4, 2 sprays at 30, 45 days after sowing; $T_5$, 1 spray only at 30 days after sowing and $T_6$, No spray (control).

Observations on the intensity of *Myrothecium* leaf blight were recorded on 10 randomly selected plants from each plot. The intensity was recorded as per the scale (0–4) proposed by Sheoraj (1988). The per cent disease index (PDI) was calculated by using the following formula.

$$PDI = \frac{\text{Sum of all numerical ratings}}{\text{Total no. of leaves graded} \times \text{maximum grade}} \times 100$$

The incidence was recorded as per cent plants infected in each treatment. Seed cotton yield/plot was recorded and was scaled up to kg/ha before statistical analysis. Correlations and regression equation between the seed cotton yield and disease incidence as well as intensity as independent variables were calculated using standard statistical procedures. Test of significance for correlation coefficient and coefficient of determination ($R^2$) were also performed.

Table 1 Estimation of yield losses in cotton due to *Myrothecium* leaf blight disease caused by *Myrothecium roridum* at varying levels of disease intensity and incidence (pooled)

| Treatment | PDI | PDC | Incidence (%) | PDC | Yield (kg/ha) |
|---|---|---|---|---|---|
| 5 sprays of Bavistin | 8.51* (16.89)** | 76.85 | 10.21 (18.44) | 37.51 | 930.00 |
| 4 spray of Bavistin | 10.74 (19.06) | 70.78 | 11.94 (20.04) | 74.98 | 898.86 |
| 3 sprays of Bavistin | 12.40 (20.51) | 66.27 | 15.16 (22.83) | 68.23 | 878.42 |
| 2 sprays of Bavistin | 20.31 (27.99) | 44.75 | 24.91 (29.95) | 47.80 | 827.72 |
| 1 sprays of Bavistin | 28.14 (32.46) | 23.45 | 35.39 (36.37) | 25.84 | 793.56 |
| Water sprays | 36.76 (37.30) | | 47.72 (42.44) | | 736.21 |
| SEm± | 0.90 | | 0.98 | | 22.76 |
| CD (*P*=0.05) | 2.70 | | 2.95 | | 68.58 |
| CV (%) | 6.96 | | 6.90 | | 5.39 |

PDI, Per cent disease intensity; PDC, per cent disease control

*Mean of 4 replications; **Figures in parentheses are transformed (angular) values

*Short note

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Table 2 Regression equations of cottons yield, disease incidence and intensity

| Year | $R^2$ | Multiple coefficient Determination (%) | Regression coefficient | Regression equation |
|---|---|---|---|---|
| 2002–03 | 0.91 | 91 | $-0.592\ X_1 - 0.002\ X_2$ | $Y = 1.348 + 0.592\ X_1 + 0.002\ X_2$ |
| 2003–04 | 0.99 | 99 | $-0.356\ X_1 - 0.264\ X_2$ | $Y = 5.903 + 0.356\ X_1 + 0.267\ X_2$ |
| Pooled | 0.98 | 98 | $-0.394\ X_1 - 0.161\ X_2$ | $Y = 3.576 + 0.394\ X_1 + 0.161\ X_2$ |

$X_1$= Disease incidence $X_2$ = Disease intensity Y = Seed cotton yield

The data on the seed cotton yield at varying levels of the incidence and intensity of *Myrothecium* leaf blight disease over 2 seasons and pooled data has been presented in Table 1. The observations (Table 1) clearly reveal that as the incidence and intensity of *Myrothecium* leaf blight increased there was a corresponding decrease in the seed cotton yield during both the seasons. In 2002–03, as the disease intensity increased from 7.15 to 33.64% there was a corresponding decrease in seed cotton yield from 832.72 kg/ha to 683.60 kg/ha. Similarly, with an increase in disease incidence from 8.43 to 41.98% there was the corresponding level of reduction in seed cotton yield. During 2003–04 season, as the disease intensity increase ranged between 9.86 and 39.87% and there was a corresponding decrease in seed cotton yield from 1027.28 kg/ha to 788.82 kg/ha. The same level of decrease in seed cotton yield was recorded as the incidence rose from 11.98 to 53.46%.

The pooled data of both the seasons (Table 2) indicate that as the disease intensity increased from 8.51 to 36.76% there was a corresponding decrease in seed cotton yield from 930.00 kg/ha to 736.21 kg/ha. The same level of reduction in seed cotton yield was observed when the incidence increased from 10.21 to 47.72%. To understand the influence of incidence and intensity of *Myrothecium* leaf blight on seed cotton yield correlation analysis was carried out and described.

The correlations revealed highly significant and negative correlation between the seed cotton yield and the disease incidence, i e –0.95 and –0.99 in 2003–04) and on pooled data (–0.99) also. The results also indicate a highly significant and negative relationship between the seed cotton yield and disease intensity, i e –0.96 and –0.99 m 2002–03 and 2003–04 and in pooled the data (–0.98). This shows that there is a consistent negative effect of both the intensity and the incidence of *Myrothecium* leaf blight on seed cotton yield.

The regression equations between seed cotton yield and disease intensity and incidence for each season and for both the seasons (pooled data) has been presented in Table 4. The regression equations reveal that in 2002–03 season a unit change in disease incidence could influence the seed cotton yield up to an extent of 0.592 units followed by disease intensity with 0.002 units both in the negative direction, whereas in 2003–04 a unit change in disease incidence influenced the seed cotton yield to an extent of 0.356 units, followed by disease intensity with 0.264 units both again in the negative direction. From pooled data analysis it is observed that a unit change in incidence influenced the seed cotton yield up to an extent of 0.394 units, followed by the intensity with 0.161 units in the negative direction.

Thus it is obvious that both the incidence and intensity of *Myrothecium* leaf blight influenced the seed cotton yield and that the incidence exerts higher influence on seed cotton yield as compared to the intensity.

There are reports on the loss in seed cotton yield as influenced by *Myrothecium* leaf blight (Patil and Ghoderao 2002, AICRP 2002). However, only one attempt has been made earlier to quantify the estimates in seed cotton yield on the basis of simple correlation studies between disease intensity and yield loss (Taneja *et al.* 1989). The incidence of the disease was ignored in the reported studies. In view of this, the effect of both, the incidence and intensity of *Myrothecium* leaf blight on the seed cotton yield was studied in detail through correlation and regression studies.

Correlation studies reveal highly significant and negative correlation between the seed cotton yield and the disease incidence as well as disease intensity. Correlation coefficient between seed cotton yield and both disease incidence also reveal a highly significant and negative influence. The regression equation studies reveal that in 2002–03 season, a unit change in disease incidence could influence the seed cotton yield up to an extent of 0.592 units, followed by disease intensity with 0.002 units both in the negative direction, whereas in 2003–04 a unit change in disease incidence influenced the seed cotton yield to an extent of 0.356 units, followed by disease intensity with 0.264 units both again in the negative direction. On a pooled basis it is observed that a unit change in incidence influenced the seed cotton yield up to an extent of 0.394 units, followed by the intensity with 0.161 units in the negative direction. The present investigations clearly reveal that both the incidence and intensity of *Myrothecium* leaf blight influenced the seed cotton yield and that the incidence exerts higher influence on seed cotton yield as compared to the intensity. This confirms the observations of Taneja *et al.* (1989) that the loss in seed cotton yield increased with the increase in disease intensity and a negative correlation existed between PDI and seed cotton yield. The significance of the incidence (greater than the intensity under field situations) in reducing the yield

which was hitherto ignored has been highlighted in the present investigations.

## SUMMARY

Estimation of losses due to the varying levels of intensity and incidence of the disease on seed cotton yield of 'JK 4' *Gossypium hirsutum* L. was studied for 2 years (2002–03 and 2003–04). It was found that significant negative correlation existed between per cent disease intensity and incidence. Both the incidence and intensity of Myrothecium leaf blight influenced the seed cotton yield but the incidence exerts higher influence on seed cotton yield as compared to the intensity.

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