

ESTIMATION OF YIELD LOSSES IN SOYBEAN DUE TO YELLOW MOSAIC

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Experiments were conducted in the field over a period of 2 years to assess the extent of loss in soybean due to yellow mosaic which appears in high incidence at Kanpur. The incidence ranged from 30 to 58 per cent. Intense yellowing of the foliage, lesser branches and stunting of the plants were found to be the main contributory factors governing the reduction in yield. The disease caused reduction from 19 to 66 per cent in height 15.7 to 74 per cent in number of pods per plant and 26.3 to 73.2 per cent grain weight per plant in 4 disease intensity categories. The average loss recorded, however, was 18.96 and 21.52 per cent or 3.79 quls. and 4.3 quls. per hectare during 1975 and 1976 respectively.

Yellow mosaic commonly occurs on soybean (*Glycine max* (L.) Merr.) in Uttar Pradesh (Suteri 1971). The disease is of significant value to soybean industry since it may reduce oil and protein contents in soybean seed (Suteri 1975; Suteri and Srivastava, 1975). The present study of disease intensity and yield loss relationship, has been done with a view to determine the extent of losses in soybean.

MATERIAL AND METHODS:

For these studies a susceptible soybean variety T 49 was sown in a 30M x 25 M plot in the glass house compound of C. S. Azad University of Agriculture & Technology, Kanpur in the second fortnight of June during the years 1975 and 1976 and was exposed to natural infection of yellow mosaic. Two types of observations were made. In the first type 5 different grades viz. No disease, 25 per cent disease, 50 per cent disease, 75 per cent disease and 100 per cent

disease, were set up on the lines followed by Singh *et al.* (1976). The representative plants in each grade were selected and data on their height, number of branches, pods and grain weight were recorded in October each year.

In the second type, 10 samples each constituted of 50 plants were randomly selected in the field. In each sample percentage of disease (X1) was calculated on the basis of diseased and healthy plants and the intensity (X2) on the basis of per sample plants infected with different disease intensities (Singh and Singh 1975) and worked out by pooling as follows.

$$D. I. = \frac{0N + 1N \times 2N + 3N + 4N}{\text{total number of plants} \times 4} \times 100$$

The yield of diseased plants affected with different disease intensities and that of healthy ones per sample, was recorded at harvest each year separately and pooled. Yield of 50 healthy plants selected in similar manner was

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also recorded to serve as control. The yield of the diseased sample and that of the control sample was compared to estimate the degree of loss. The average percentage of loss in yield was worked out by using the following formula.

$$\text{Yield Loss \%} = \frac{H - D}{H} \times 100$$

Where H — Yield of healthy plants
D — Yield of healthy and diseased plants per sample

RESULTS AND DISCUSSION

The results obtained are summarized in tables 1 and 2. The disease appeared from the first fortnight of July and attained maximum incidence by September. It was observed that earlier infected plants, developed more severe symptoms than those infected later. Intense and complete yellowing of foliage, lesser branches and stunting of the plants were found to be the main contributory factors leading towards greater reduction in yield. The reduction in plant height was remarkable and on an average per plant was 19, 30, 58 and 66 per cent in 25, 50, 75 and 100 per cent diseased plants respectively.

Data contained in Table 1 show that average number of pods per plant declined with an advance in disease intensity. The reduction per cent was from 15.7 to 74 in different disease categories. There was a negative correlation between disease intensity and grain weight.

The yield loss in 10 samples during two years (Table 2) ranged from 11.1

to 30.9 per cent. The average loss, however, was 18.96 and 21.52 per cent during 1975 and 1976 respectively. The per cent loss was appreciably reflected in plants with 75 per cent and 100 per cent diseased plants per sample because such plants produced very low yield and contributed to great loss. Since the number of such plants per sample was the lowest the over all loss did not extend high and remained proportional to the disease percentage.

The diminution in yield in different disease grades was due to reduced number of pods/weight of grains per plant. In 100 per cent disease category, though many plants were devoid of pods and produced no yield but a good percentage of plants bore pods and contributed to grain weight and therefore, total loss in these sample grades were ruled out. Nair (1971) reported 100 per cent loss in *Urd* bean plants which were infected with yellow mosaic at 1 to 3 weeks age. Our observation also confirmed the similar trend of loss in soybean plants due to this disease but the percentage of plants giving 100 per cent loss under natural infection levels, was very low and therefore, 100 per cent loss per sample was not evident.

Analysis of the intensity complex of the disease in relation to yield losses, studied in 10 samples had shown that disease incidence and intensity were positively correlated with loss in yield. Similarly regression coefficients of yield over disease incidence and its intensity were positive which meant that per unit increase in yield loss depended on per unit increase in disease incidence

and its intensity factors. Every 2 per cent disease incidence or 1.2 per cent its intensity, was responsible for 1 per cent loss in yield. In commercially grown crop the intensity complex level of the disease worked out in this study over a period of two years did not vary significantly and fluctuated within closer limits.

The average loss worked out in these studies can be converted into per hectare loss as 3.79 quls. and 4.3 quls. or to a value of Rs. 1516 and Rs. 1720 during 1975 and 1976 respectively if on an average 20 quls. of yield/ha. and produce to be sold at Rs. 400/- per quls. are considered.

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Table 1 Reduction in yield of soybean due to yellow mosaic,

Disease intensity (per cent)	1975		1976	
	Yield Av. No. of pods	plant Av. Wt. of grain in gms	Yield Av. No. of pods	plant Av. Wt. of grain in gms
25	64	5.3	61	6.3
50	42	3.6	43	4.1
75	28	2.8	25	3.2
100	24	2.3	20	2.3
Corr. Coef.	-0.9685		-0.9748	

Table 2 Incidence, intensity and yield loss in soybean due to yellow mosaic

Samples	1975			1976		
	Disease % X_1	Disease intensity X_2	Yield loss % Y	Disease % X_1	Disease intensity X_2	Yield loss % Y
1	34	19.5	15.8	40	21.5	18.5
2	38	22.0	18.8	46	33.5	30.9
3	38	23.5	19.7	36	21.0	18.8
4	46	30.5	24.1	54	31.5	27.4
5	34	20.0	16.0	44	24.0	24.4
6	32	13.0	11.1	46	27.5	23.8
7	58	34.5	28.8	30	20.5	16.5
8	40	22.5	19.1	36	21.5	26.8
9	34	19.5	16.3	36	20.5	17.6
10	36	23.5	19.1	28	14.5	13.5
Av.	38	22.85	18.96	39.6	23.5	21.52

Regression Coeff. $b \times 1 Y = 1.75$ $b \times 2Y = 1.05$ Corr. Coeff. $r \times 1Y = 0.9126$ $r \times 2Y = 0.9226$ $b \times 1Y = 0.8929$ $b \times 2Y = 0.7004$ $r \times 1Y = 0.7561$ $r \times 2Y = 0.8378$