GAU Res. J. 1995. 21 (1) : 114-118

Statistical Estimation of Crop Loss Due to Leaf Curl Disease in Bidi Tobacco

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ABSTRACT

A field survey was carried out during the crop season of 1988-89 for assessing crop loss due to leaf curl disease in bidi tobacco (*Nicotiana tabacum*, L.) at two locations (Anand and Sarsa) in Kheda district of Gujarat State. Maximum crop loss of 41.3% and 26.9% was observed in the varieties GT-5 and A-119 at Anand while at Sarsa (Ta. Anand), the over all crop loss was 9.1 and 4.7 per cent in early and late planted variety A-119 respectively. The results thus revealed that the variation in crop loss estimation due to leaf curl disease in the bidi tobacco crop depends on location, variety and time of planting. The comparison of different sampling methods for estimation of crop loss indicated that the stratified random sampling with 10 per cent sample size was the most appropriate sampling plan.

(Received on 2nd Dec., 1994)

INTRODUCTION

Tobacco is an important cash crop of the country suffering from many devastating diseases, caused by virus, fungi, bacteria, nematodes, etc. Among viral diseases, leaf curl is the most destructive disease causing quantitative as well as qualitative losses. This disease is very serious in FCV and bidi tobacco. Very limited work has been reported on tobacco. The present study was conducted on bidi tobacco cultivated in Gujarat to estimate the losses caused by leaf curl disease during monsoon, 1988 at two locations viz. (1) Bidi Tobacco Research Station, Anand (Dist. Kheda) and (ii) Patel Dairy Farm, Sarsa (Dist. Kheda), with a view to asses the crop losses due to leaf curl disease in bidi tobacco.

MATERIALS AND METHODS

The observations on the incidence of the leaf curl disease were recorded after 3 months of planting of crop. At Anand two fields one each of tobacco variety A-119 and GT-5 and at Sarsa two fields of tobacco variety A-119 were selected for the purpose. The intensity of disease was scored on the basis of outward symptoms of the plants. The scoring was as under :

Score	Plant description
0	Plant having not a single leaf affected by the disease.
1	Plant having upper one to two leaves affected due to disease.
2	Plant having upper three to four leaves affected due to disease.
3	Plant having severe attack of the disease

Percentage loss in yield due to intensity of disease was worked out as under :

$$(PL)\ i = \frac{\bar{Y}o - \bar{Y}i}{\bar{Y}o} \times 100$$

Where :

(PL) i = Percentage loss due to i th score : i = 1, 2, 3
$\bar{Y}o$ = Average yield per disease free plant
$\bar{Y}i$ = Average yield per plant having i th score of incidence

Overall percantage loss (L) was estimated by using following relation :

$$L = \sum_{i=1}^{3} [\ (PL)\ i \times Ni/N\ ]$$

Where,

Ni = No. of plants possessing i th score of incidence
N = Total number of plants in the population

With a view to find out appropriate sampling plan for estimating percentage loss due to leaf curl disease, three sampling methods viz., (i) simple random sampling, (ii) stratified random sampling and (iii) cluster sampling were also compared using different sample sizes (Singh *et al.* 1977).

RESULTS AND DISCUSSION

The results presented in Table 1 indicated that at Anand, bidi tobacco variety GT-5 had maximum overall loss of 41.3 per cent in crop yield, while variety A-119 had overall loss of 26.9 per cent. Both these varieties were transplanted late in first week of October hence suffered more. At Sarsa, variety A-119 transplanted during third week of August had overall loss of 9.1 per cent, while same variety transplanted little late during third week of September yielded overall loss of 4.7 per cent.

The results thus revealed that the crop loss due to leaf curl disease in bidi tobacco depended on locations, varieties and planting period.

The results presented in Table 2 indicated that overall loss as estimated by simple random sampling for both the varieties at Anand with 10 per cent sample size had the estimates deviating less from their population value (26.9%), when incidence was more severe. While at Sarsa, 20 per cent sample size for early planted crop had the estimate deviating less from their population value, while for the late planted crop simple random sampling (SRS) could not give satisfactory estimate with any of the sample size studied.

Crop loss estimated by stratified random
ling, it was observed that with 10 per cent
sample size had the estimates less deviating
from their popula value of over all loss in all
the fields under study.

TABLE 1

Per cent loss in tobacco green leaf yield due to leaf curl disease and their plant density coefficient at Anand and Sarsa.

Location Anand

Variety A 119					*Variety GT 5*				
Disease intensity score	*Average yield, kg/plant*	*Plant density coefficient*	*Per cent loss*	*Overall per cent loss*	*Disease intensity score*	*Average yield, kg/plant*	*Plant density coefficient*	*Per cent loss*	*Overall per cent loss*
0	0.73	0.35	—		0	0.92	0.23	—	
1	0.64	0.09	12		1	0.65	0.10	29	
2	0.50	0.18	32	26.9	2	0.56	0.20	39	41.3
3	0.34	0.38	53		3	0.32	0.47	65	
S. Em.	0.03					0.03			
CD at 0.05 %	0.08					0.09			
CV %	41.65					45.56			

Location Sarsa

Early planted A 119 variety					*Late planted A 119 variety*				
Disease intensity score	*Average yield, kg/plant*	*Plant density coefficient*	*Per cent loss*	*Overall per cent loss*	*Disease intensity score*	*Average yield, kg/plant*	*Plant density coefficieint*	*Per cent loss*	*Overall per cent loss*
0	0.85	0.73	—		0	0.67	0.85	—	
1	0.66	0.13	22		1	0.56	0.07	16	
2	0.58	0.09	32	9.1	2	0.37	0.06	45	4.7
3	0.27	0.05	68		3	0.36	0.01	46	
S. Em.	0.05					0.06			
CD at 0.05 %	0.13					0.18			
CV %	42.17					41.75			

TABLE 1

Estimation of overall crop loss by various sampling designs *in bidi tobacco.*

Location		Anand		Sarsa		Anand		Sarsa		Anand		Sarsa	
Samples	Samples	Simple Random Sampling				Stratified Random Sampling				Cluster Sampling			
size		A 119	GT 5	A 119*	A 119@	A 119	GT 5	A 119*	A 119@	A 119	GT 5	A 119*	A119@
5	1	8.1	38.0	8.3	1.2	21.9	40.0	13.4	3.9	27.0	36.7	7.3	4.1
	2	24.2	27.7	9.7	0.0	23.7	40.3	5.7	5.2	21.8	27.6	6.5	5.9
	3	16.3	34.0	15.8	0.0	37.7	46.1	6.4	0.2	25.8	30.6	8.3	3.1
	4	26.0	44.5	13.4	2.9	29.0	8.9	11.3	3.0	9.3	30.7	12.2	14.1
	5	27.4	41.1	11.6	4.9	28.8	30.9	11.0	1.1	18.9	45.3	12.1	4.0
10	1	15.8	49.9	12.6	4.2	24.1	47.8	5.8	3.0	24.2	45.5	7.6	9.9
	2	27.3	34.6	4.6	0.0	30.1	38.4	4.5	10.3	22.4	40.3	10.5	3.4
	3	28.1	37.1	12.6	1.4	25.3	33.6	5.1	5.1	20.4	42.1	5.1	5.8
	4	19.1	39.4	4.5	5.1	29.3	40.8	8.9	2.6	24.2	37.8	3.5	2.6
	5	19.0	41.5	14.7	3.6	32.8	49.3	8.1	4.5	31.3	18.5	9.4	4.9
15	1	27.2	43.5	13.6	0.0	31.9	29.1	10.0	7.9	5.6	37.7	4.8	2.8
	2	22.8	40.7	14.0	3.9	25.9	38.1	4.3	4.3	25.7	37.2	6.7	1.8
	3	22.4	42.1	7.6	0.0	27.4	32.2	6.4	2.4	37.2	37.7	10.9	6.0
	4	10.4	32.6	13.1	0.2	25.9	35.8	9.9	6.8	25.2	34.2	5.2	3.6
	5	28.1	35.6	11.5	4.2	28.8	38.2	6.5	3.3	18.4	22.6	9.3	1.9
20	1	24.9	33.6	7.9	4.2	19.0	40.2	6.6	2.3	25.5	36.3	5.1	0.7
	2	22.1	42.0	12.2	1.3	20.1	47.2	10.0	6.0	23.4	42.8	12.2	3.3
	3	21.4	38.1	9.9	4.3	30.5	49.7	8.3	3.9	33.4	39.6	10.5	2.1
	4	22.4	45.0	12.7	1.7	32.9	40.9	10.2	4.7	23.9	38.8	7.8	3.9
	5	24.7	38.6	8.1	3.4	29.0	50.3	14.7	3.0	20.2	41.2	6.0	4.9
Over all loss %	—	26.9	41.3	9.1	4.7	26.9	41.3	9.1	4.7	26.9	41.3	9.1	4.7

* Indicates early planted variety;
@ Indicates late planted variety.

The over all loss as estimated by cluster sampling with 5, 10, 15 and 20 per cent sample sizes ranged from 3.1 to 14.1 per cent, 2.6 to 9.9 per cent, 1.8 to 6.0 per cent and 0.7 to 4.9 per cent respectively for a population value of 4.7 per cent. Thus, for such low incidence of disease, cluster sampling does not seem to give very satisfactory estimates of crop loss.

The results thus revealed that, for estimation of crop loss, the stratified random sampling with 10 per cent sample size was the most appropriate sampling plan as compared to simple random sampling and cluster sampling.

REFEREANCE

Singh, D.: Padam Singh and Pranesh Kumar, 1977. Hand Book on Sampling Methods. I.A.S.R.I., New Delhi.