

bromide fumigated nursery mixture (sand, forest soil and cowdung at 1:2:1 ratio by volume) contained in polythene bags (15 × 10 cm). *R. similis* isolated from black pepper roots and multiplied axenically on carrot discs was used for inoculations. At 4-5 leaf stage the plants were inoculated @ 250 nematodes per plant. Each accession had five single plant replications and maintained under green house conditions. Six months after nematode inoculation, the plants were removed carefully from the polythene bags and roots washed free of soil particles. The root infection was assessed using a root lesion index based

on the intensity of root lesions and damage to the root system. (1=no lesions; 2=few isolated lesions; 3=many lesions; few coalescing, root tips damaged; 4=many lesions, coalescing encircling the main roots, lateral roots damaged; 5=whole root system damaged). Nematode populations per gram of roots were estimated except in plants showing complete root damage.

None of the cultivars/wild collections showed resistance/tolerance to the nematode. All the accessions screened were highly susceptible and had a root lesion index of 4.

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## A Sampling Procedure to Assess the Yield Loss Due to 'Koleroga' of Arecanut Palm (*Areca catechu* L.)\*

Fruit rot or *Koleroga* of arecanut caused by the fungus *Phytophthora arecae* (Coleman) Pethybridge occurs during southwest monsoon in all major arecanut growing areas in India. This disease starts usually in the month of

July and prevails upto September. Although there are several reports placing the yield loss due to this disease from 10 to 90 per cent, (Coleman, 1910, Kotireddy and Anandaraj, 1980, Rawther, Nair and Saraswathy, 1982) no systematic

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study has so far been reported. In the present study an attempt is made to evolve a sampling procedure to assess the yield loss of arecanut, based on two years data on the fruit rot disease of arecanut, obtained from a plot located at Central Plantation Crops Research Institute, Regional Station, Vittal. The double sampling procedure suggested by Kaistha and Goel (1981) has been adopted. This procedure is suggested to estimate the precise yield of a multi-harvested crop, if there is good correlation between partial harvest data and total harvest. Since the fruit rot of arecanut is season bound and occurs only during southwest monsoon every year the double sampling procedure could be adopted to estimate the yield loss.

The incidence of fruit rot was recorded for two consecutive seasons of 1981 and 1982. The infected fallen fruits were removed from each palm and counted at fortnightly intervals after noticing the disease. The data was analysed as follows: For both the years 25 random samples of sizes 6, 10 and 16 were generated. The relationships between the fruit fall in individual fortnight and the total fruit fall for the entire season was evaluated by regression techniques (Sukhatme and Sukhatme, 1970). The ratios of combinations among them to the total count of fruits fallen for the season were computed and the coefficient of variation for the ratios evaluated for the chosen sample sizes of 6, 10 and 16.

It was found that 3.6 per cent of the total fruitfall occurred during the first

fortnight. The count of fruit fall added over third and fourth fortnights after the first occurrence of the disease had a high correlation with total count for the season ( $r=0.97$ ) in both the years. This correlation was stable for the sample sizes of 6, 10 and 16. The coefficient of variation in the ratios of fruit fall added over third and fourth fortnights to the total fruitfall for the season was minimum and fairly low, the value ranging from 6.7 to 14.77. The correlations were not stable for the other fortnights or the combinations among them. The sample size of 6 itself had a high value of correlation coefficient ( $r=0.97$ ) with regard to combination of third and fourth fortnight. Taking advantage of this, a suitable sampling procedure could be adopted for estimating the total loss in arecanut yield in a plantation. In this method, a larger sample of  $n''$  groups (each group consisting of 6 randomly selected palms) could be selected for recording the fruit fall from the third fortnight and a subsequent sub sample of  $n'$  groups could be selected from the larger group to record the fruit fall for the whole season. Using the regression of total fruit fall on the third and fourth fortnights, an estimate of the mean loss in yield per sampling unit could be obtained by the relation,

$$\bar{y}_{ld} = \bar{y}_{n'} + \beta [\bar{y}_{n''(p)} - \bar{y}_{n'(p)}]$$

where  $\beta$  is the estimated regression and  $\bar{y}_{n'}$  is the mean of total fruits fallen per sampling unit based on  $n'$  units,  $\bar{y}_{n''(p)}$ ,  $\bar{y}_{n'(p)}$  are the mean fruit fall per sampling unit for the third and fourth fortnights evaluated based on  $n''$  and  $n'$  units respectively. If the total

number of palms in a plantation is known, the total loss can be estimated. The relative efficiency of the suggested sampling procedure compared to simple random sampling procedure for a given cost of estimation is given by,

Relative efficiency=

$$K/(K-2) \times \left( \sqrt{1-r^2} + r\sqrt{2/(K-2)} \right)^{-2}$$

where K is the number of fortnights (K=4) and r is the correlation coefficient. The estimated relative efficiency of the suggested procedure works out to be 136 per cent. Alternatively, the

percentage reduction in cost of estimation using the suggested procedure can be worked out for getting an estimate with a precision equal to that of simple sampling procedure. It was found that for estimating the population mean with an accuracy of 10 to 20 per cent and the coefficient of variation of fruitfall per palm ranging from 30 to 50 per cent, the suggested procedure resulted in a cost reduction of 25 per cent. Though, this procedure is tried on individual plantation basis, it is expected that this can be adopted for estimating the yield loss in larger areas where arecanut is grown.

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