MANAGEMENT OF 'KATTE' DISEASE OF SMALL CARDAMOM

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ABSTRACT

Influence of periodical roguing of 'Katte' affected clumps on disease spread was studied for three years in four different plantations with various levels of initial inoculum. Roguing of affected clumps at monthly interval has resulted in reduction of the disease to a manageable level of less than one percent incidence, within three years irrespective of initial level of inoculum in the plantation. However, higher the initial inoculum more is the number of clumps to be rogued and replanted with healthy plants during the first year. Comparison of data on expenditure incurred on roguing of affected clumps one one hand, and production during different years on the other, revealed that roguing was economical. Roguing of diseased clumps at shorter intervals (weekly) only for 3 months, which is an average disease incubation period in host, appeared to be more advantageous in reducing the chance of secondary spread before its elimination. Large-scale implementation of 'Katte' eradication programme in growers' plantations revealed that it was possible to extend such programmes whereby the growers pay for technical assistance in tracing and roguing of affected clumps.

INTRODUCTION

'Katte' or 'Mosaic' is a serious disease of cardamom caused by the systemic infection of a non-persistent virus transmitted by the banana aphid *Pentalonia nigronervosa* f. *caladii* (Verma and Capoor, 1958; Rao and Naidu, 1973). Diseased plants can be easily recognized by their stunted growth and by the presence of characteristic mosaic symptoms in young leaves (Verma and Capoor, 1958). Infected plants rarely die but remain as a continued source of inoculum. The spread of the disease within the plantation is mainly internal and the rate of spread is slow (Deshpande *et al.*, 1972). Recent studies conducted on distribution of the

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disease revealed that it is prevalent in all the major cardamom growing tracts with varying intensity (Venugopal and Naidu, 1981).

Roguing of affected plants has been successful in reducing losses or preventing the spread of disease in perennial crops where the disease spread is slow and infection source is mainly internal, e.g. Plum Pox Virus in England (Adam, 1978), Citrus Tristeza Virus in Israel (Bar-Joseph *et al.*, 1974), and Cacao Swollen Shoot Virus in South Africa (Posnette, 1980). The results of investigations carried out on the influence of roguing 'Katte' affected clumps on the spread of disease and its role in disease management in well established plantations are reported here.

Material and Methods

Field experiments were conducted by selecting four different plantations in an area of 15 ha with different levels of initial inoculum under various situations such as (a) old plantation (18–20 years) situated between two infected plantations, (b) old plantation (20 years) with moderate inoculum (11%) confined to the two ends, (c) old plantation (25 years) with a well established high initial inoculum (23%), and (d) young plantation (2 years) with low level of inoculum (< 1%). During January 1980, all the clumps in the 4 experimental plots were individually examined and 'Katte' affected plants marked on the basis of visual leaf symptoms. Affected clumps were sprayed with a systemic insecticide (10.05% dimethoate) and destroyed on the following day (Deshpande *et al.*, 1972). Spraying of affected clumps with the insecticide was not done from the 2nd year onwards based on the experimental evidence obtained by the authors that insecticidal application may enhance the spread of the disease. Subsequent surveys were carried out at monthly intervals over a period of three years and affected plants were rogued. Replanting of existing gaps due to roguing was taken up with healthy plants during the planting season. Data on the number of clumps rogued in various plantations during different years, expenditure incurred on roguing and yield of dry cardamom in different years were recorded.

During 1981, another experiment was conducted to study the effect of removal of affected clumps at weekly intervals on disease

incidence, in an area of 3 ha consisting of 8205 clumps. The first survey was taken up in September during which vector population was less and immediately all the affected clumps were rogued without spraying with insecticide. Totally, 13 weekly surveys were carried out, and continued later at monthly intervals. The data on number of affected clumps rogued during different surveys in various blocks were recorded.

In order to test the feasibility of the 'Katte' eradication programme and the response of growers, extension work was initiated on 14th April, 1982, under the name 'Katte Clinic Programme' with the help of trained mazdoors under the supervision of a Junior Technical Assistant, . The growers paid the wages to the labourers involved in survey and roguing of the affected clumps at the rate of Rs. 12/- per mazdoor per day. The latest findings on 'Katte' disease management and the availability of 'Katte' clinic facilities were made known to the growers through lecture demonstrations and training programmes organized in their locality. Soon after receiving the request from a grower, a survey team was sent for tracing and roguing of affected clumps The data on extent of area covered, disease incidence and cost involved in tracing, were recorded.

Results and Discussion

Percentages of affected clumps rogued during different periods in various plantations are shown in Fig. 1. The number of affected clumps rogued during the first three months in all the four plantations were high. This was mainly due to cumulative infection over a number of years. During the first year, 0.66 to 42.18% clumps were rogued and replaced with healthy clumps in the four plantations (Table 1). This clearly suggests that higher the initial inoculum, more the number of clumps to be rogued during the first year. The mean percent of affected clumps rogued in different plantations in the subsequent years decreased considerably from 15.6% during 1980, to 0.88% in 1982 (Table 1). There were 7-and 18-fold reductions in the number of clumps removed by the end of 24 and 36 months respectively. The disease incidence in Plantation (a) could be kept at a manageable level by periodical roguing, although it was situated in between

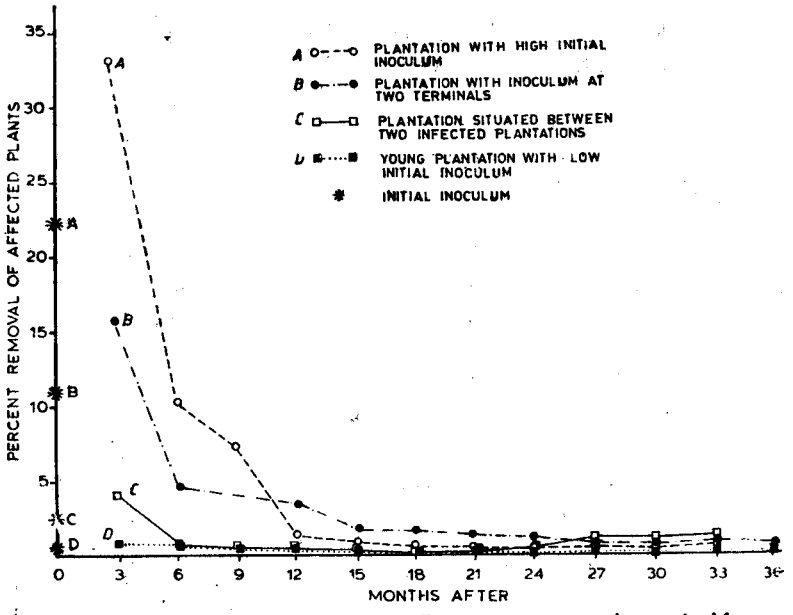

Fig. 1. Effect of roguing of 'katte' affected clumps on disease incidence

two affected plantations. This shows that, even if eradication of 'Katte' affected clumps is not practised in the neighbouring plantations this may not be a bottleneck in the management of disease in contiguous plantations. Varma (1962) studied the role of roguing of affected clumps with a view to eradicating the disease in severely affected plantations after complete removal and replanting with healthy clumps over a period of 7 years. The disease could not be eradicated completely. However, the disease incidence could be kept below 1% by periodical roguing of affected clumps as against 80–90% in plantations where no roguing was done. In the present study, only affected plants were rogued and the results are in conformity with the findings of Varma (1962). There was yield reduction in plantations (b) and (c) during 1980 due to roguing of more number of affected plants (Table 1), whereas in the subsequent years, an increase in yield was observed. The expenditure involved in tracing and roguing of plants has been compensated for by the additional production realized during 1981 itself (Table 1). Thus, timely roguing and replacement with healthy seedlings resulted in checking the

Table 1. Number of affected clumps rogued during different years and production in different plantations

Plantation No. and description	Area (ha)	Total No. of Clumps	Initial inoculum		Clumps rogued						Yield of dry cardamom in Kg			
					1980		1981		1982					
			No.	%	No.	%	No.	%	No.	%	1979	1980	1981	1982*
(*a*) Old Plantation situated between two infected ones	0.5	1120	27	2.67	52	5.14	16	1.43	27	2.25	NR	NR	NR	NR
(*b*) Old plantation with inoculum at extreme ends	3.5	9510	942	11.23	1428	17.02	558	5.97	116	1.62	792	750	806	900
(*c*) Old plantation with high initial inoculum	5.0	15317	2331	23.64	4159	42.18	437	2.21	152	0.94	245	217	317	400
(*d*) Young plantation with less initial inoculum	6.5	17742	21	0.12	118	0.66	40	0.23	40	0.22	NC	242	1440	2000
Total	15.5	43689	3321	7.61	5757	15.56	1051	2.44	205	0.88				

NR=Not recorded
NC=No crop; 2nd year of planting
*=1982 Estimated yield

further spread of the disease, thus maintaining the production at a stable level and increasing the economic life of the plantation.

Effect of roguing at shorter intervals on disease incidence: The results presented in Table 2 show that the number of new outbreaks was very much less if the roguing is carried out at shorter intervals. The percent infection had reduced from 2.15 to 0.12 by the end of fourth month. Thus, it is advantageous to have a few surveys at shorter intervals for a period of 3 months which is the average disease incubation period in the host and most of the diseased clumps could be eliminated before they could serve as a source of inoculum for secondary spread. The results show, however, that total eradication of the disease is not possible because plants at symptomless stage or latent infections cannot be detected except through serological methods.

'Katte' Clinic Programme: There was encouraging response from the growers to this and in a period of 8 months, 60 plantations extending to 393 ha area distributed in 30 villages in Coorg District were covered. The salient findings of the 'Katte' clinic campaign are: (1) Disease is present in 88% of the plantations surveyed with different degrees of infection. (2) Isolated plantations remain free from the disease though these were planted 15–20 years ago. (3) disease incidence is very low (1%) in 70 per cent of the plantations and could ne economically managed by roguing the affected plants. (4) Disease is introduced in many isolated young plantations through the infected planting material due to lack of knowledge about the disease. (5) Nurseries raised adjacent to the affected plantation and also those raised through self-sown seedlings collected from diseased plantations were the sources of inoculum for the disease spread to disease-free areas. (6) Area covered by a mazdoor is 0.75–1.50 ha per day depending upon topography and age of the plantation, and the cost of tracing the affected plants is Rs. 12–18/ha.

The above study indicates that the 'Katte' eradication programme could be successfully implemented by charging the growers for the technical assistance rendered in tracing and roguing of affected plants. A 'Katte' clinic unit consisting of one Junior Technical Assistant and 3–4 trained mazdoors may be

Table 2. No of 'Katte' affected clumps eradicated in different blocks at CPCRI Res. Centre, Appangala.

Block No.	Total No. of Clumps	1981*															1982											
		Sept.	Oct.				Nov.						Dec.				Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sep.	Oct.	Nov.
1.	1275	108	5	1	3	1	0	1	2	4	4	2	1	0	1	2	0	0	0	0	1	0	2	0	1	1
2.	750	19	1	2	2	1	1	0	2	2	2	0	0	0	0	0	0	0	1	1	0	2	1	1	1	0
3.	810	3	1	0	2	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.	682	15	2	2	2	0	0	0	3	1	2	1	1	0	0	1	0	1	0	0	1	0	0	0	0	0
5.	1948	3	7	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
6.	385	10	3	2	0	0	0	1	2	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	2	2
7.	790	10	0	0	1	3	4	0	0	0	0	0	0	1	1	4	2	0	1	0	1	0	1	0	0	0
8.	746	11	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	2	2	0	0	0	0	0	3	2
9.	809	—	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0	0	1	1	0	2	2	0	1	3
Total	8205	176	19	10	10	8	6	3	9	8	10	4	2	1	3	8	2	3	6	1	4	4	6	1	8	8
Per cent		2.15	0.65				0.35					0.12				0.1	0.02	0.04	0.07	0.01	0.05	0.05	0.07	0.01	0.1	0.1

*Roguing done at weekly intervals in Oct., Nov., & Dec., 1981, and subsequently at monthly intervals.

opened in all the cardamom growing areas, at taluk level to help the growers in managing the disease.

The Govt. of Bombay tried to eradicate the 'Katte' disease in North Canara district by providing technical assistance at Govt. cost (Varma, 1962). Similarly, Cardamom Board also took up eradication programme in contiguous blocks by giving technical assistance for roguing, and supplying healthy plants free of cost, besides a subsidy of Rs. 0.75 per plant in the form of inputs (pesticides and fertilizers) over a period of five years. However, the disease could not be totally eradicated from plantations (Anon., 1981). The response from the growers for the Katte clinic in a short period clearly suggests that charging them for the technical assistance given in tracing the affected plants may help in the sucessful implementation of eradication programme, rather than giving inputs free of cost or on subsidy basis. Plant disease clinics for rendering diagnostic services on payment system are quite common in the advanced countries (Gail Evans–Ruhl, 1982).

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