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'KATTE' DISEASE OF SMALL CARDAMOM AND ITS MANAGEMENT

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Mosaic disease of small cardamom *Elettaria cardamomum* Maton is locally known as 'Katte' disease, meaning a disorder in Kannada. This was first reported from North Kanara, Karnataka. Though India is the largest cardamom grower and exporter, the production per unit area in the country is very low and the yield is being reduced year by year. One of the factors that contribute to yield decline in cardamom is the wide occurrence of this malady in all the cardamom growing areas.

GEOGRAPHICAL DISTRIBUTION

Although cardamom is grown commercially in Guatemala, Sri Lanka, Tanzania, Papua New Guinea and other countries, 'Katte' disease is known to be present only in India since 1900. A systematic survey conducted during 1980–81, revealed that the disease is prevalent in most of the cardamom growing districts of Kerala, Karnataka and Tamil Nadu except Trivandrum, Kanyakumari, Tirunelveli and Shimoga. The disease incidence varied from 0.01 to 99% in different plantations. The intensity of the disease was more in Karnataka followed by Tamil Nadu and Kerala.

SYMPTOMS

The first visible symptom appears on the youngest leaf of the affected tiller as spindle shaped slender chlorotic flecks measuring 2.5 mm in length. Later these flecks develop into pale green discontinuous stripes. These stripes run parallel to the vein from the midrib to leaf margin. All the subsequently emerging new leaves show characteristic mosaic symptoms with stripes of green tissue almost evenly distributed over the entire leaf lamina. Often mosaic type of mottling is seen on the leaf sheath and young pseudostems. As the leaf matures, the mosaic symptoms are more or less masked. Infection is systemic in nature and gradually spreads to all the tillers in a clump. Usually young seedlings of 3–4 leaf stage express the symptoms within 15–20 days after inoculation, whereas grown up clumps show symptoms within 30–40 days during active growing period and 90–120 days during winter months.

Immediately after infection, there is no visible external malformation of any part of the plant, but within a year after infection there is gradual reduction in leaf size and stature of the plant. In advanced stage, the affected plants produced shorter and slender tillers

with few shorter panicles. Plants never die due to 'Katte' infection but survive for many years and serve as sources of inoculum for further spread to other plants.

CROP LOSS

The loss in yield due to the disease depends upon the number of years that the plants have been infected. If the plants are infected in the seedling stage or the year of planting, the loss will be total.

Studies conducted on yield loss in an area of 0.75 ha under natural infection revealed that the mean yield reduction will be 38, 62 and 68 per cent in the same year, one year and two years respectively after getting infection. Further, comparison of expenditure and return from healthy and infected plantations shows that net mean loss per rupee investment was Rs. 1.63, 2.70 and 3.25 during the first, second and third year of infection respectively.

CAUSE OF THE DISEASE

Various factors have been attributed to cause the disease in the past. The viral nature of the disease was established in 1945 with its successful transmission through the banana aphid, *Pentalonia nigronervosa* Coq. Recent studies indicate that the vector involved is *P. nigronervosa* f. *caladii*. All the stages of the aphid *i. e.*, nymphs, winged and non-winged form can transmit the disease. The vector virus relationship studies show that the 'Katte' virus is non-persistent and stylet borne type. In nature 'Katte' is disseminated either through the aphid vector or by the use of infected rhizomes as planting material. Seeds collected from the 'Katte' affected clumps fail to transmit the virus, but it has adverse effect on seed germination. Thus man acts as the main carrier of the disease over long distances. Secondary spread is mainly through vectors.

'Katte' disease has no relation with two virus diseases of large cardamom namely 'Foorkey' and 'Chirkey' diseases. However, the banana aphid acts as a vector for 'Katte' disease of small cardamom, 'Bunchy top' of banana and 'Foorkey' disease of large cardamom. Under laboratory conditions 'Foorkey' the 'Chirkey' diseases can infect small cardamom through aphid vector.

HOST RANGE AND VARIETAL RESISTANCE

All the cardamom cultivars are susceptible to the disease. Among other Zingiberaceous hosts tested, *Amomum cannaecarpum*, *A. involucratum*, *A. microstephanum*, *Alpinia nutans* and *Curcuma neilgherrensis* showed susceptibility to 'Katte' and they may act as additional hosts to the disease in nature. Mutation breeding has helped in identifying 13 plants resistant to a severe strain of 'Katte'.

MANAGEMENT OF THE DISEASE

Experiments conducted from 1947–1956 on 'Katte' eradication in affected gardens revealed that the disease could be kept at a very low level. Majority of the growers were not following regular roguing of affected plants and with the result disease incidence has increased in all the affected plantations. Experiments conducted with contact, systemic and granular insecticides did not help in reducing the disease spread, though there was a reduction in the vector population. Regular roguing taken up in the three cardamom growing states of S. India has helped in reducing the 'Katte' incidence (Table I). Regular roguing of affected plants at monthly intervals and replanting the existing gaps with healthy plants during the planting season were taken up in 4 different plantations in an area of 15.5 ha with different levels of inoculum under various situations. Irrespective of initial level and source of inoculum, the disease incidence in all the plantations was below 1 per cent. Different forms of vector naturally colonising on dried or partially dried pseudostems of affected clumps do not carry the virus. On the other hand the actively growing parts are the main source of inoculum for the disease spread. Thus retention of 'katte' affected plants in the plantation is not only uneconomical but also serves as a source of inoculum to the surrounding healthy plants.

TABLE I. **'Katte' disease incidence in plantations with regular, irregular and no roguing of affected clumps**

State	Mean disease incidence (%)		
	No roguing	Irregular roguing	Regular roguing
Kerala	20.12	4.15	0.44
Karnataka	57.21	5.77	2.21
Tamil Nadu	26.74	4.16	0.55
Mean	34.69	4.69	1.06

Roguing is economical, although during the first year there is yield reduction. This can be compensated for by the additional yield obtained during subsequent years (Table II).

TABLE II. **Percentage of affected clumps rogued during different years and production in different plantations**

Situation	Area (ha)	Total clumps	Initial inoculum (%)	clumps rogued (%)			yield of dry cardamom in kg			
				1980	1981	1982	1979	1980	1981	1982
Old plantation situated between two infected plantations	0.5	1120	2.67	5.14	1.43	2.25	NR	NR	NR	NR
Old plantation with inoculum at extreme ends	3.5	9510	11.23	17.02	5.97	1.62	792	750	806	900
Old plantation with high initial inoculum	5.0	15317	23.64	42.18	2.21	0.94	245	217	317	400
Young plantation with less initial inoculum	6.5	17742	0.12	0.66	0.23	0.22	N	242	1440	2000
Total	15.5	43689	7.61	15.56	2.44	0.88				

NR=Not recorded ; N=No crop ; Second year of planting.

It is advantageous to take up roguing of affected clumps at shorter intervals (weekly) for a period of 3 months (which is the average disease incubation period in the host). By this method most of the affected clumps in the initial stages of the disease could be eliminated, before it served as a source of inoculum for secondary spread.

'KATTE' CLINIC

In order to test the feasibility of 'Katte' eradication programme on a large scale and the response of the growers to adopt improved technology, 'Katte clinic' programme was evolved. In this programme trained mazdoors were employed in tracing and roguing of affected clumps. Wages for this operation were paid by the growers themselves. There was an encouraging response from the growers and in a period of 8 months 62 plantations of 402 ha area distributed in 30 villages in Kodagu district were covered. It was found that the disease was present in 88 per cent of the plantations surveyed with different degrees of infection, though isolated plantations free from infection were also observed.

In 70 per cent of the plantations with a disease incidence of less than 1 per cent, the disease could be managed economically by periodical roguing. Disease entered in many isolated young plantations through diseased planting materials. Nurseries raised adjacent to the affected plantations and also raised through the self sown seedlings collected from diseased plantations were found to be affected, serving as the source of inoculum for the further spread of the disease to disease – free areas.

Do's and Dont's of 'Katte clinic' programme

The following measures are suggested to avoid or to minimise the losses due to 'Katte' disease :

1. New plantations :

1. Have a thorough knowledge about 'Katte' disease in relation to symptoms, spread and disease management.
2. Use healthy seedlings raised through seeds.
3. Raise the nursery away from 'Katte' affected garden.
4. Avoid planting of seedlings raised from the self sown seedlings collected from diseased plantations.

5. Do not use the clones collected from the diseased plots for gap filling in the existing plantations.

6. Examine all clumps with the help of trained workers/mazdoors atleast twice a year. This may be done more frequently in areas adjacent to affected gardens.

2. Established plantations :

1. Plants may be surveyed with the help of trained workers to identify disease.

2. If there is no disease in the plantations, take precautions for not introducing the disease through planting material.

3. In case the disease incidence is high and the yield of the crop is also high in plantations the harvest of the crop is done first.

4. Trace the affected plants, gently cut them at ground level and put the pseudostems on the ground with the slightest disturbance. Allow it for drying and decay. The rhizome may be taken out and destroyed by burying deep or burning. The dried pseudostem, leaves etc. will not serve as a source of inoculum.

5. Repeat the tracing of the affected clumps at weekly intervals for a period of 3 months to rogue out the missing plants if any and also plants which expressed the symptoms after the previous survey.

6. If the disease is less than 10 per cent and the plantation is young, roguing of the affected clumps may be taken up during September–October when vector population is very low.

7. Destroy the affected clumps as in 2.4.

8. If the infection is very low and confined to only a few isolated plants, tracing may be followed at shorter intervals in the area around the infected clumps upto 10 rows only.

9. Once the disease has come down to negligible level, the survey intervals may be increased to either bimonthly (or) quarterly periods/intervals.

10. Spraying with insecticides against vector in diseased garden, may not help in the prevention of further spread of the disease.

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