

Viral diseases – Threat to large cardamom plantation in Anjaw District of Arunachal Pradesh

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ABSTRACT

A comprehensive field survey was carried out from April 2015 to April 2017 spanning 4 circles 18 villages and 90 large cardamom plantations. It was carried out with the objective of identifying the problems of declining large cardamom plantations in Anjaw district of Arunachal Pradesh. According to the field survey, two (2) main viral diseases namely 'Foorkey and Chirkey' were found as the main reason for the declining. Another wide spreading symptom observed was sun scorching. Results revealed that foorkey disease incidence was highest (26.75%) in Hawaii followed by Manchal (21.08%), Goiliang (16.00%) and Chaglongam (14.55%) circle. Chirkey disease was found prevalent in Hawaii (8.70%) and Goiliang (5.32%) circle. Crop loss due to sun scorching was also reported from entire district, it was mainly due to their traditional practice i.e. open cultivation of large cardamom. It was observed extreme at Manchal (9.68%) followed by Hawaii (8.40%), Goiliang (7.60%) and Chaglongam (7.35%) circle. Lack of reliable and certified source of quality planting materials, traditional method of open cultivation, lack of pest and disease tolerant/resistant varieties and their negligence - as they visit their plantation only once i.e. during harvesting were the major causes observed.

Keywords: Large cardamom, viral disease, foorkey, chirkey, sun scorching

Large cardamom (*Amomum subulatum* Roxb.), is a shade loving plant (sciophyte) and perennial herbaceous spice crop belongs to the family Zingiberaceae. It is popularly known as Elaichi/Taliang in Mishmi dialect of Anjaw district. It is most commonly propagated through suckers (Chadda, 2016). It starts bearing in 3 to 5 years after planting and the economic age of the plants is 12 to 15 years. The fruits are about 2.5 cm long, ovoid and triangular in shape, brown or pink in colour when ripe. It contains 20 to 50 seeds in a capsule. Stem is a pseudo stem which is called tiller. Inflorescence is spike. Generally, 30 to 40 flowers are observed in a spike. Flowers are yellow, bisexual, zygomorphic and pollinated by bumble bees. It prefers elevation ranging from 900 – 2100 meter mean sea level and requires well distributed rainfall spread around 200 days with a total of about 3000-3500 mm/year for its proper growth and development (Kumar, 2014). It is a high value and low volume spice crop and has an extreme demand in International market, as it is used as an essential ingredient for culinary purpose.

Anjaw district of Arunachal Pradesh is situated in the remotest extreme corner of India sharing international boundaries with China in the north and Myanmar in the south-east. The only source of income generation for the farming community is through large cardamom cultivation as it is a low volume and high value crop. The district climatic condition is highly conducive for large cardamom cultivation. It is traditionally grown in wide open condition without any shade management. Its cultivation has tremendously increased during last 2-3 years.

Large cardamom is the most commercially cultivated cash crop and the only means of income generation among the farmers, making it a bonanza crop for the district. But presently many large cardamom gardens are declining and there is hue and cry among the farmers. Hence, a survey was conducted with the objective to find out the present problems of large cardamom in Anjaw district of Arunachal Pradesh.

MATERIALS AND METHODS

Field surveys were conducted from April 2015 to April 2017. Altogether 4 Circles (Chaglongam,

Manchal, Walong, and Hawaii), 18 Villages (Abohagam, Mithumna, Metengliang, Taflagam, Kambing, Kuibiang, Random, Tehuliang, Towa, Kasangglat, Tapang, Ritiliang, Duiliang, Gamliang, Ngi, Walla, Changung, and Watong) and 90 plantations were surveyed. 100 plants per plantation were randomly sampled for virus disease symptoms by walking across “W” shaped path in a field. Percentage incidence of viral diseases was calculated by using the formula

$$\% \text{ Disease incidence} = \frac{\text{No. of infected plants}}{\text{Total no. of plants}} \times 100$$

RESULTS AND DISCUSSION

As per survey, the data generated revealed that, in Chaglongam circle, foorkey infestation varied from 9.40 – 18.60% and highest incidence was found in Mithumna village. In Manchal circle, foorkey infestation varied from 13.80 – 29.00% and highest incidence was found in Towa village. In Goiliang circle, foorkey infestation varied from 12.40 – 18.20% and highest incidence was found in Duiliang village. Whereas in Hawaii circle, foorkey infestation varied from 24.40 – 29.20% and highest incidence was found in Changung village (Table 2).

In case of chirkey disease, it was found prevalent only in Goiliang and Hawaii circles, the infestation varied from 3.60 – 7.00% and 7.60 – 10.00% respectively (Table 2).

Apart from the viral diseases, sun scorching was also observed in most of the visited garden and its symptoms varied from 6.00 - 8.60% in Chaglongam, 5.60 - 13.40% in Manchal, and 7.20 - 8.00% in Goiliang and 7.20 - 9.60% in Hawaii (Table 2).

Results showed that the incidence of viral diseases of large cardamom varied across the circle. A relatively high incidence of foorkey was observed in Hawaii circle (26.75%) followed by Manchal (21.08%). The affected plants produced large number of stunted dwarf shoots which did not bear flowers or fruits and the whole plant later died, causing heavy economic loss (Fig. 1). The spread of viral diseases was also found in Chaglongam and Goiliang circle, but its infestation was less as compared to others circles.

The Chirkey viral disease was observed in large cardamom plantations of Manchal and Hawaii circles.

Table 1. Location and elevation of surveyed village:

Village	Longitude/Latitude	Elevation
Abohagam	N 28°18'609"/E 96°36'458"	1599 m
Mithumna	N 28°14'725"/E 96°32'020"	1427 m
Metengliang	N 28°12'504"/E 96°31'919"	1142 m
Taflagam	N 28°19'050"/E 96°36'676"	1643 m
Kambing	N 27°59'389"/E96°38'204"	893 m
Kuibiang	N27°56'629"/E96°44'928"	895 m
Random	N27°57'226"/E96°42'120"	1156 m
Teluliang	N28°01'892"/E96°37'181"	796 m
Towa	N27°67'448"/E96°38'368"	680 m
Kasangglat	N 27°57'55"/E96°46'01"	1200 m
Tapang	N 27°57'55"/E96°46'01"	1120 m
Ritiliang	N 27°7'8"/E96°36'50"	1502 m
Gamliang	N 27°35'82"/E96°62'25"	802 m
Duiliang	N 28°5'50"/E 96°34'36"	670 m
Ngi	N 27°52'565"/E 96°49'092"	1476 m
Walla	N 27° 52'842"/E 96 ° 49'672"	1196 m
Changung	N 27°52'995"/E 96°49'897"	1108 m
Watong	N 27°52' 121"/E 96°47'222"	1481 m

The disease symptoms can be seen on the plants as mosaic with pale streak like spots on the unfolding leaves (Fig. 2). These spots slowly turn pale brown resulting in leaf drying and withering of plants (Raychaudhuri and Chatterjee, 1958). Flowering and fruit setting of diseased plants are also reduced.

Heavy incidence of viral diseases has been due to two main reasons i.e. lack of reliable & certified source of quality planting materials and farmer's negligence, as they visit their plantation occasionally during weeding and harvesting. Many workers reported that virus is transmitted by infected rhizomes and its further spread is done through a vector i.e. banana black aphid, *Pentalonia nigronervosa* (Raychaudhuri and Chatterjee, 1958; Basu and Ganguly, 1968). Use of quality and certified rhizomes as planting materials and continuous monitoring and survey is needed so that the virus can be controlled at its initial stage – by cultural or mechanical operations i.e. roughing the viral infected plant at early stage and burning it or burying it under the soil to control further infestation of the disease.

Crop losses due to sun scorching were also reported from the entire Anjaw district of Arunachal Pradesh. Farmers of this region still practice their

Table 2. Problems in large cardamom plantation

Circle	Locations*	Per cent incidence (mean)			
		Foorkey	Chirkey	Sun scorching	
Chaglongam	Abohagam	12.80	NF	6.00	
	Mithumna	18.60	NF	7.60	7.35
	Metengliang	17.40	NF	8.60	
	Taflagam	9.40	NF	7.20	
		14.55	NF		
Manchal	Kambing	14.20	NF	9.40	
	Kuibiang	27.40	NF	7.00	
	Random	13.80	NF	5.60	9.68
	Teluliang	21.00	NF	13.40	
	Towa	29.00	NF	13.00	
		21.08	NF		
Goiliang	Kasanglat	17.40	7.00	7.40	
	Tapang	15.80	5.40	7.60	
	Ritiliang	16.20	5.00	7.80	7.60
	Gamliang	12.40	3.60	7.20	
	Duiliang	18.20	5.60	8.00	
		16.00	5.32		
Hawai	Ngi	24.80	7.60	7.40	
	Walla	24.40	7.80	7.20	8.40
	Changung	29.20	9.40	9.40	
	Watong	28.60	10.00	9.60	
		26.75	8.70		

*No. of plantations surveyed = 5

traditional open method of cultivation and they don't use any kind of shade tree or follow any shade management practice. As a sciophyte plant, it performs well under judicious shade management (Dutton, 2001). Proper shade is very important for good growth, timely flowering and for better crop (Gudade *et al.*, 2013). Utis (*Alnus nepalensis*) is the most commonly used shade tree in large cardamom plantation (Kishore *et al.*, 2012). The tree is beneficial as it takes care of the nutrient requirements since it is a nitrogen fixing plant. The other species of shade trees are Panisaj (*Terminalia myriocarpa*), Pipli (*Bucklandia sp.*), Malito (*Macaranga denticulate*), Argeli (*Edgeworthes gardneri*), Asare (*Viburnus eruberens*), Bilaune (*Maesa cheria*), Kharane (*Symplocos sp.*), Siris (*Albizia lebbek*), Faledo (*Erythrina indica*), Jhingani (*Eurja tapanica*), Chillowne (*Schima wallichii*) etc. (Gudade *et al.*, 2013). Large cardamom plantation situated on slopes near river and streams gives better performance as compared to others. It is mostly because the plants get continuous irrigation as well as the air near the river or stream remains humid. Chen *et al.* (2000) also stated the importance

of sufficient air humidity when there are no rain and temperatures is high.

The survey resulted in providing the baseline information on the infestation of viral diseases and its widespread prevalence in large cardamom plantation in Anjaw district of Arunachal Pradesh. The root cause of its heavy invasion was the use of infected planting materials/ suckers. The viruses were potentially very damaging and caused serious crop loss. Apart from viral diseases, sun scorching also caused profound crop loss. Thus, there is an urgent need for establishing certified nursery for providing quality planting materials. Farmers should also follow shade management by introducing shade trees like Utis (*Alnus nepalensis*), Panisaj (*Terminalia myriocarpa*), Pipli (*Bucklandia sp.*), Malito (*Macaranga denticulate*) etc. to overcome the problems of sun scorching. Constant monitoring of the large cardamom fields should also be followed as it will facilitate the use of effective management strategies and might be helpful to tackle other major issue.



Fig. 1. Foorkey disease of large cardamom



Fig. 2. Chirkey disease of large cardamom



Fig. 3. Aphid: Vector of Foorkey disease



Fig. 4. Sun scorching



Fig. 5. Traditional method of cultivation (without any shade tree)

Plates 1. Problems in large cardamom

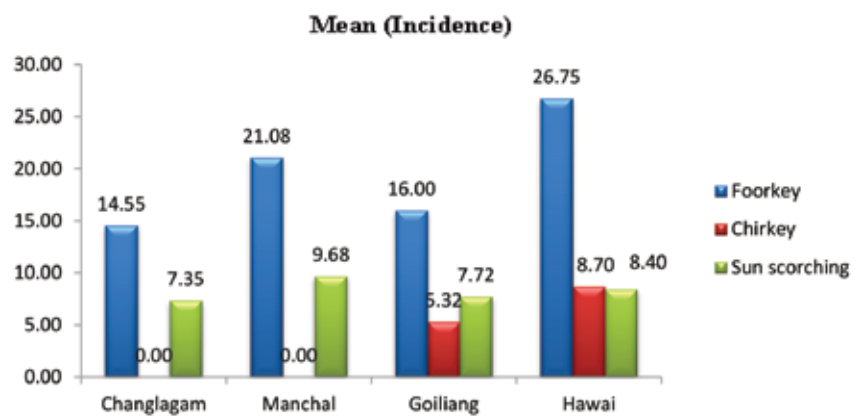


Fig. 1. Graphical presentation of viral disease and sun scorching in 4 circles

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