

VIRAL DISEASES CAN BE A FUTURE THREAT TO VANILLA IN INDIA.

Bhat A. I.¹, Sarma Y.R.², Anandaraj M¹ and Suseela Bhai R.¹

Vanilla is the second most expensive spice on the world market. Natural vanillin obtained from the cured pods (fruits) of this plant is used for spicing a variety of food and confectionaries. There are three important cultivated species namely *V. planifolia* (Mexican vanilla), *V. pompona* (West Indian vanilla), and *V. tahitensis* (Tahitian vanilla). The important vanilla growing countries are Madagascar, Indonesia, Mexico, Comoro and Reunion. Vanilla is a native of Mexico and was introduced to India as early as 1835. Large

scale expansion of the area under vanilla occurred in India only for the last few years due to global demand for natural vanillin. Vanilla crop is known to be affected by various fungi and viruses. Among fungal diseases, bean rot, stem rot and root rot are important causing yield reduction. Viruses are also known to cause highly significant yield reduction of vanilla in many of the vanilla growing countries of the world. Viruses belonging to several genera have been reported on vanilla from different countries (Table 1)

Table 1: Viruses infecting vanilla crop in different parts of the world

Virus	Virus genera (genome)	Important symptoms	Mode of spread	Occurrence
CMV	Cucumovirus (+ ssRNA)	Stem & leaf deformation, stunting of plants and sterile flowers	Vegetative	French Polynesia, Re Union Island
CyMV	Potexvirus (+ ssRNA)	Symptomless or occasionally mild mottle or chlorotic streaks on leaves	Vegetative, mechanical	South Pacific, Tonga, La reunion
ORSV	Tobamovirus (+ ssRNA)	Symptomless or occasionally mild mottle symptoms on leaves	Vegetative, mechanical	South Pacific, Tonga, French Polynesia
VMV	Potyvirus (+ ssRNA)	Leaf distortion and mosaic. Later leaves become hard, leathery, crinkling and twisting	Vegetative	French Polynesia, Cooks Island, Vanuatu, India
VNV	Potyvirus (+ ssRNA)	Distorted younger leaves with diffuse chlorotic patches and necrotic lesions on older leaves and stems causing defoliation and death	Vegetative	Tonga, India
Uncharacterized	Potyvirus (+ ssRNA)	Sunken chlorotic patches and mosaic	Vegetative	Fiji, Vanuatu
Uncharacterized	Rhabdovirus (- ssRNA)	Distorted leaf margins, sunken chlorotic patches, spreading necrotic lesions	Vegetative	Fiji, Vanuatu

CMV, cucumber mosaic virus; CyMV, Cymbidium mosaic virus, ORSV, Odontoglossum ring spot virus; VMB, Vanilla mosaic virus; VNV, Vanila necrosis virus

¹Division of Crop Protection, Indian Institute of Spices Research, Calicut, Kerala 673012.

² M 10/5, Aramam, KHSB Colony, Malaparamba, Calicut 673 009, Kerala

1. Indian Scenario

Large scale cultivation of vanilla has started only recently in India. At present it is grown over 1600 hectares with a production of 60 metric tonnes in the states of Karnataka, Kerala and Tamil Nadu. So far there is only one report of the occurrence of a mosaic disease possibly caused by a potyvirus (Thomas, 2002). The symptoms of the disease include chlorotic spots or streaks parallel to venation. In a few occasions, leaves of infected plants show wavy margin and reduced leaf size. The affected leaves become hard and leathery. The disease has been reported from Idukki district of Kerala with an incidence ranging from 0.13 to 5.0%. In addition, recent random survey of vanilla gardens of Kerala has revealed the presence of more than one kind of viral diseases (Figure 1).



Fig.1(a): Mosaic affected plant showing mosaic symptoms on leaves

Among them, important one is the necrosis disease characterized by the presence of necrotic lesion on stem and leaf surface (Figure 1). In advanced stages of disease drying and death of vines are noticed. The other kind is characterized by typical mosaic symptoms with chlorotic to yellow green patches and also distorted leaf margins, chlorotic streaks followed by necrotic lesion (Figure 1). Efforts are on at Indian Institute of Spices Research, Kozhikode for the identification, characterization and development of sensitive diagnostic techniques for the detection of viruses in the planting material.

Transmission and spread

The causal viruses are not transmitted through seed. The major means of spread of the virus is through the use of infected stem cuttings. When infected plants are used as source of planting material, the cuttings from these plants will also be diseased resulting in disease spread. Some of the viruses belonging to the genera *Tobamovirus* and *Potexvirus* (see Table 1) could also be transmitted through contact between plants, cutting knife and other implements used in agricultural operations. Experimentally all the viral diseases can be transmitted through grafting, in addition, a few of them could also be transmitted through sap inoculation. Although at present information is not available, insects may also play an important role in the transmission and spread of the disease in nature. Information is also lacking on the natural host range of different viruses infecting vanilla and also weed hosts serving as source of virus.

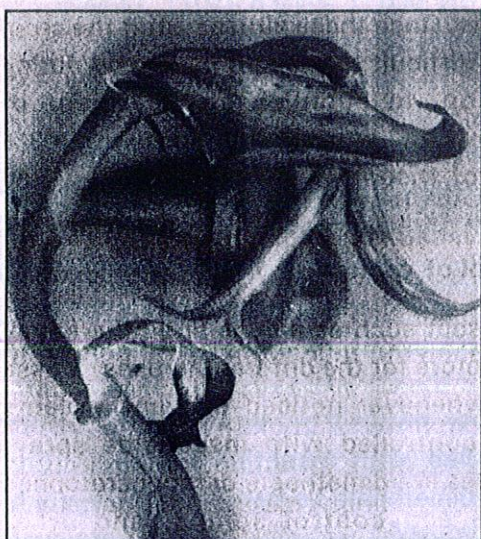


Fig.1(b) : crinkling and twisting of leaves



Fig.1(c): Necrosis affected plant showing necrosis of terminal portion

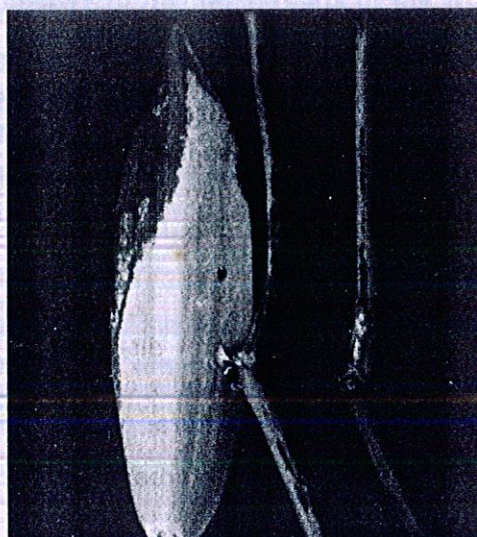


Fig.1(d) : Stem

Management

Viral diseases are known to cause significant yield reduction in many of the vanilla growing countries. However, in India, viral disease problems are noticed only recently. These diseases are in their initial stages and large scale spreading has not started. At present they are only in certain isolated pockets. Considering the nature of

spread and potential damage, which can be caused in future, it is highly essential that adequate preventive measures be taken up in the initial stages itself. Unlike fungal and bacterial diseases, viral diseases are always systemic in nature and cannot be cured by using chemicals. Hence maximum care should be taken to minimize or check their spread.

The following measures are recommended:

1. Virus-free vegetative planting material

If the mother plant used for tissue culture is infected with the virus, the plantlets derived from this also will carry the virus thus contributing for the spread of the virus. Hence selection of virus-free mother plants is very important. As visual inspections for symptoms are inadequate to confirm the virus-free nature, use of sensitive diagnostic techniques based on serology (enzyme linked immunosorbent assay or electro-blot immunoassay) or nucleic acid (nucleic acid hybridization or polymerase chain reaction) are essential. Once a good virus-free clone is obtained, foundation stock or 'mother' line must be maintained virus-free. Mother clone tissue cultured plantlets must also be free from viruses. Cuttings obtained from these virus-free stocks are then grown up on a sufficiently large scale under conditions where re-infection with virus is minimal or does not take place. These stocks are then used for commercial planting after ascertaining their virus-free nature.

2. Rouging and eradication of infected plants

Regular inspection and removal of infected plants and replanting with healthy plants should be resorted to. Other potential weed and crop hosts, which might act, as reservoir for the virus also needs to be removed. The removed plants may be burnt or buried deep in the soil.

3. Phytosanitation

Some of the mechanically transmitted viruses infecting vanilla spread easily through cutting knife and other tools used in farm

operations. Once these viruses enter the crop, it is very difficult to prevent its spread during cultivation. In such cases treatment of implements and washing of hands with a 3% solution of trisodium orthophosphate would be useful.

4. Control of vectors

Insect such as aphids and others may act as vectors for the different viruses. These insects whenever noticed on vanilla plants may be controlled with insecticide spray. Insecticides like dimethoate or monocrotophos @0.05% can control aphids, and other sucking insects.

5. Movement of vanilla germplasm

In addition to the above measures, whenever a new vanilla germplasm is brought into the country the technical guidelines specified for the safe movement of vanilla germplasm provided by Pearson *et al.* (1991) should be followed.

Unless all these measures are taken up, viral diseases can pose a serious threat to vanilla cultivation in the country in the near future.

References

- Pearson, M.N., Jackson, G.V.H., Zettler, F.W. and Frison, E.A. (eds.), 1991. FAO/IBPGR Technical Guidelines for the safe movement of vanilla germplasm, Food and Agriculture Organization of the United Nations, Rome/ International Board for Plant Genetic Resources, Rome.
- Thomas, J. 2002. Mosaic- a new virus disease of vanilla in India. Spice India 2002, 2-3.