

Banana Bunchy Top Virus (BBTV) Infecting Banana in India: Current Status

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SUMMARY

Banana is an important fruit crop in India and is widely cultivated and ranks 2nd to mango in production in the country. Of various factors affecting the yield and quality of production of banana, biotic stress is constricting its production. Virus disease amongst the biotic stress is an important factor affecting severely. Banana bunchy top virus (BBTV) is a deadly phytopathogen which affects many areas of the banana industry world-wide including India. Infected banana plants produce increasingly smaller leaves on shorter petioles giving the plants a bunched appearance. Fruits become distorted and plants become sterile before the whole rhizome eventually dies. The primary source of spread of BBTV is through infected planting materials. This article briefly explains the Banana bunchy top virus (BBTV) infecting banana in India.

INTRODUCTION

Banana is one of the major and economically important fruit crops of India. Indian banana exports are looking northwards with the rising demand of banana in gulf countries. The West-Asia countries that traditionally sourced bananas from Philippines have been gradually shifting their focus towards India because of improved quality and price advantage. With 97.5 million tonnes of production, Banana has become globally important fruit crop. In India, it supports livelihood of millions of people with total annual production of 16.91 million tonnes from 490.70 thousand ha with national average of 33.5 T/ha. (F.A.O.S.T.A.T, 2014) Banana has been predicted to contribute 37% to total fruit production in India. The major banana growing states are Maharashtra, Tamil Nadu, Gujarat, Assam, Karnataka, Kerala, Bihar, West Bengal, Andhra Pradesh, Orissa and Madhya Pradesh. Despite the importance of Banana as a fruit crop and a potential commodity for earning foreign exchange, banana growers face various problems of which yield loss due to biotic stresses is worth mentioning. Banana bunchy top virus as a phytopathogen is found in all banana growing areas; thereby numerous researches have been carried out to study the nature of the virus and its effects on banana plantation.

Banana Bunchy Top Virus (BBTV)

A single stranded virion which is capable of infecting a huge span of banana production is the Banana bunchy top virus. It is one of the diseases in banana whose pernicious effect causes a dramatic loss in its yield and cropping area as well. The circular DNA virus belongs to the genus Babuvirus and family Nanoviridae (Fauquet, 2005). BBTV is an isometric virion measuring up to 18-20nm in diameter (Harding, 1991). BBTV has a multicomponent genome which consists of six active and distinct circular, single stranded DNA genome components. (H.J. Vetten, 2005). Each of the components plays a different role and portrays a similar organisation with size approximately up to 1Kb. (Burns, 1994). BBTV is mainly infected with the transfer and movement of planting material like suckers and rhizome and transmitted by the banana aphid *Pentalonia nigronervosa* (Hu JS, 1996) but it is not

mechanically transmitted. The transmission is done in a persistent, non-propagative manner by the aphid (Bressan A, 2011). It has an acquisition feeding period of at least four hours and inoculation feeding period of at least fifteen minutes.

Banana plants infected with BBTv generally showed bunching of leafs on the tree top. Fruit is not often produced on infected plants, but if it is, the fruit will be deformed, so thus the whole plant is a lost. Dark green streaks on the lower portion of the leaf's midrib and later on the secondary veins are of common observance in BBTv infected plants in the present study. Streaking consisting of dot-dash patterns 'Morse code', the most diagnostic symptom of bunchy top can also be conveniently recorded in the diseased banana plants. As infection progresses, streak symptoms become more evident on the leaf blade. Dark-green hook-like extensions of the veins can also be seen in the narrow, light-green zone between the midrib and the lamina. Mature Banana plants infected with BBTv observed difficulty in emergence of new leaves, leaf look narrower with wavy margin and yellow leaf margins in certain case. And commonly, infected banana plants do not bear fruits, but if fruit is produced, the banana hands and fingers are distorted, stunted, twisted or otherwise deformed and of little use.

Components	Functions
DNA-R	Encodes the master replication initiation protein (Rep) which is essential for trans-replication of the BBTv genomic components through its nicking and joining activity
DNA-S	Encodes the coat protein (CP)
DNA-M	Encode the movement protein (MP)
DNA-C	Encodes the cell cycle link protein that has plant retinoblastoma-like binding ability to switch the host plant cells to S phase to make them more permissive for viral replication
DNA-U3	The functionality of a potentially encoded protein remains unknown
DNA-N	Encodes the to and fro transportation of the DNA and nucleus

Diagnosis and Detection

Various diagnostic methods have been introduced for the identification of BBTv. One of the simplest and convenient ways to detect is by enzyme-linked immunosorbent assay i.e. ELISA but due to lack of sensitivity it is not considered (Landgraf, 1991). Molecular diagnostics on BBTv genome showed more prominent results with the use of Polymerase chain reaction assay i.e. PCR and hybridisation methods. (Stellrecht KA, 2004). PCR based detection has the capability to amplify the targeted nucleic acid and validate the presence of BBTv in infected plants. It is henceforth the most effective tool for screening of BBTv in banana.

CONCLUSION

Today commercially plantation of banana is done using tissue culture produced plantlets, it becomes important to identify the planting material to be free from viral pathogens. If once infected the virus remains in the plants and has no remedy to control or remove it from the banana plants. Thus it is of esteem necessity to develop effective detection tools and techniques. Traditional way to help control the virus such as to remove and destroy any infected plants before the virus can spread, rogueing, is not so effective. Time and cost of the farmers will be lost if the planted material are not free from BBTv like drastic banana virus. Importance also needs to be extended in timely control of insect vectors. As since the long distance

movement of viral pathogens is due to import of planting material without any quarantine measures, so raise the necessity for further easy, quick and large scale detection methods. Recent works and findings help to elucidate the study of BBTV. It deepens our knowledge for the control of alternate host for both the virus and the aphid and further aid to tackle this devastating viral disease of bananas with the development of onsite detection tools.

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