

Studies on Host-Pathogen Interaction of Banana Bunchy Top

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SUMMARY

An investigation was made to know the host-vector relationship of Banana Bunchy Top Disease (BBTD). The role of different host plants was investigated by *P. nigronevosa* for transmission of BBTV to three cultivars of banana, cotton and *Canna indica*. The host plants having 3-4 leaf stage were exposed to viruliferous *P. nigronevosa* for 24 hours. Likewise, different insect-vectors viz., *A. gossypii*, *M. persicae* and *P. nigronevosa* were tried for transmission studies under greenhouse conditions. None of the vectors except *P. nigronevosa* was found to transmit BBTV to banana. Further, *P. nigronevosa* was found restricted only on banana for propagation and BBTV transmission.

Key words :
BBTD, BBTV,
Vector, Host,
Banana

Banana is the second largest fruit crop in the world, produced in tropical and subtropical region of developing economics, recognized to be the fourth important food crop in terms of gross value exceed by paddy, wheat and milk products of the total production of 88.24 million tones of banana and plantain globally. India is the largest producer of banana in the world with a production of 13.2 million tones. India also records the highest area under banana cultivation with 433 thousand ha of the total global area of 4.75 million ha contributing to nearly 12.0 per cent.

Banana Bunchy Top Disease (BBTD) caused by Banana Bunchy Top Virus (BBTV) is one of the major limiting factors and the most damaging virus disease of banana production throughout the world including India. The disease was first reported from Fiji in 1889 and later on spread globally. BBTV is an aphid borne isometric (18-20nm), multi-component, circular single stranded DNA virus belonging to 'nanavirus' group (Dale *et al.*, 1998). The infected banana plants produce distorted leaves with dark green streaks, stunted growth and bunchy appearance at the top of the plant and quite often do not produce fruit (Smith *et al.*, 1998).

BBTV and its aphid vector, *Pentalonia nigronervosa* Coquarrel are reported to have limited hosts, mainly in Musaeae family (Hu *et al.*, 1996). Some reports suggest that BBTV could be transmitted to cucumber (*Cucumis*

sativus) through other aphid species viz., *Myzus persicae*, *Aphis gossypii* etc. (Rao, 1998). These reports suggest that banana may not be the only host of BBTV and the virus may be transmitted through other aphid species. Therefore, the present study was carried out to know the exact relationship of host and vector of BBTD. The main aim of the study was to determine the host range of BBTV among the hosts growing.

MATERIALS AND METHODS

Healthy banana suckers of cv. Grand Naine, Gandevi Selection and Basrai were grown in pots containing growing media in green houses. Banana plants of three months age, having 3-5 leaves on average were used in the experiment. Infected banana plants showing typical BBTV symptoms were maintained in insect free green houses at Fruit Research Station, Gandevi. Banana aphids (*P. nigronervosa*) were collected from BBTV free fields and kept in laboratory in Petri dishes having disease free banana leaves as food material. The aphids were shifted to new leaves with the help of camel hair brush in order to minimize over crowding.

Insect vectors like *Aphis gossypii* and *Myzus persicae* were reared and maintained separately on healthy banana plants and on cotton (*Gossypium hirsutum*) and *Canna indica* under greenhouse conditions. For host

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range studies, ten plants were raised in pots containing proper soil media. At 3-4 leaf stage, a group of 10 viruliferous *P. nigronervosa* per plant was transferred to test plants for inoculation feeding period of 24 hours. Four plants of each species viz., banana cv. Grand Naine, Gandevi selection Basrai, *Gossypium hirsutum* and *Canna indica* were inoculated and one was kept non-inoculated. Similarly, in each set of test plant, one banana plant was also included as control. The aphids were killed mechanically. The test plants were then shifted to greenhouse and symptoms were observed upto three months.

For vector range studies, adult forms and non-viruliferous vectors including *P. nigronervosa* were then transferred to BBTB affected banana plants separately for feeding period of 8-10 days. Ten viruliferous vectors were shifted to each test plants separately in cages for inoculation feeding period of 24 hours. In each set, four plants were exposed to vectors and one kept free as control. After inoculation (feeding period) aphids were killed mechanically. The plants were later shifted to greenhouse and were observed for symptoms development for up to three months.

RESULTS AND DISCUSSION

In host range studies, BBTB were only transmitted through *P. nigronervosa*, but not through other aphids viz., *A. gossypii* and *M. persicae*. Nevertheless, these aphid species did feed on banana during their rearing, which confirms the host status of banana to the above insect vectors, but they were unable to transmit the BBTB. As comparison to *P. nigronervosa* the intensity and reproductive potential of other aphid species was nil, which also confirmed that only *P. nigronervosa* was a specific pest of banana. Among the host plants tested, all three cultivars of banana viz., Grand Naine, Gandevi selection and Basrai showed typical BBTB symptoms, while rest of the plants i.e., *G. hirsutum* and *Canna indica* were free from the disease (Table 1). All control banana plants developed typical BBTB symptoms within 40 to 50 days of post inoculation. This study also confirms that host plants other than banana probably do not play any role as reservoir of BBTB. The present results

Table 1 : Host range of BBTB

Host plants	BBTB symptoms
1. Banana cv Grand Naine	Present
2. Banana cv Gandevi Selection	Present
3. Banana cv Basrai	Present
4. <i>G. hirsutum</i>	Absent
5. <i>Canna indica</i>	Absent

confirms the earlier findings of Dale (1987) and Hu *et al.* (1996) who stated that *P. nigronervosa* is the only vector of BBTB.

In vector range studies, *P. nigronervosa* prefers only banana. All the test plants used in this study remain symptomless except all three cultivars of banana viz., Grand Naine, Gandevi selection and Basrai, which showed typical BBTB symptoms within 50 days of post inoculation period (Table 2). In the present study, *Canna indica* which is reported as one of the possible host of BBTB,

Table 2 : Host-vector relationship and development of BBTB symptoms

Host plant	<i>P. nigronervosa</i>	<i>A. gossypii</i>	<i>M. persicae</i>
Banana cv Grand Naine	Present	Absent	Absent
Banana Gandevi selection	Present	Absent	Absent
Banana cv Basrai	Present	Absent	Absent
<i>G. hirsutum</i>	Absent	Absent	Absent
<i>Canna indica</i>	Absent	Absent	Absent

showed no symptoms of disease. The present study was supported by the earlier findings of Hu *et al.* (1996) who reported BBTB was not transmitted in *Canna* species.

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