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Screening of Selected *musa* Cultivars against Banana Aphid, *Pentalonia nigronervosa* (Coq)

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Abstract

The banana aphid *Pentalonia nigronervosa* (coq) and their incidence are reported in various plantations. In the present study, different commercial genotypes were collected from banana growing areas and screened against the *Pentalonia nigronervosa* Coq. (banana aphid) to identify the source of resistance to this pest. The study has also focused on the banana aphid fecundity on different commercial accessions. Banana leaf midrib was used for screening test. Among the 15 commercial cultivars evaluated against banana aphid and based on the fecundity, it reveals that Saba, Nendran and Poovan shows high susceptibility to Aphids. Peyan, Pachaladan and Pidimonthan were found less susceptible from banana aphid colonization and fecundity. It can be concluded that these accessions may be utilized for further studies.

***Key words*:** Susceptibility evaluation, Banana cultivars, Aphid, *Pentalonia nigronervosa*

The fruit banana is considered as one of the most popular fruits and fourth most agricultural important food crops in the world and is grows in the vast majority of tropical nations. India is the leading country from the perspective of banana production. In India more than 70% of banana cultivated in Gujarat, Andhra Pradesh, Maharashtra, Tamil Nadu, Kerala, Bihar, Madhya Pradesh and Uttar Pradesh [1]. Pest banana aphids, banana rhizome weevil, and banana stem weevil such as *Pentalonia nigronervosa*, *Cosmopolites sordidus* (Germ.) and *Odoiporus longicollis* (Oliv.) respectively cause serious damage to the plants which resulted in the decreased production. According to Padmanaban and Sundararaju [2], these insects have posed a menace to the banana cultivation on garden land as well as non-traditional locations of Tamil Nadu.

Pest insect populations are the major obstacles for the proper development of cultivated plants. Aphids are one of the most significant arthropod pests of glasshouse and field crops worldwide. They have the ability to destroy plants directly and indirectly. They can attack both the leaves and the roots of plants. This insect is observed inside the inflorescence, leaf sheath, abaxial epidermal leaf tissues and pulvinus regions of the leaf. According to Kakathi and Nath [3], seven weather parameters were tested in the field for the growth of banana aphid and it was that relative humidity and temperature (evening) showed negative substantial relationship against aphid population and also proved that there were no aphid population until 180 days after planting it reaches its peak at 195 days and it starts decreasing at 195 days and it completely disappears after 285 days of planging. The banana aphid activity was found absent during the months of May to October and maximum was recorded in the month of November to February on all the germplasm [4].

The phytophagous pest banana aphid use their long stylets for piercing and finally sucks the phloem sap directly from the vascular tissues. Ngatat *et al*. [5] reported the high cumulative incidence of aphids and positive correlation for its species richness varied with genotype in fields. Aphids growth is reported faster in plantain and also maximum population was noticed in plantain as compared to banana. Significantly positive correlation observed between the incidence of banana bunch top disease (BBTD) and aphid species were observed in genotype such as PITA 23, Williams and PITA 14. Arubi *et al*. [6] states that in Indonesia banana cultivars can be grouped into four categories such as immune (Klutuk NTT, SPn-001, LNT-001, Microcarpa, and Tanduk), highly resistance (Halabanensis and Goroho), moderately resistance (Bebek), and highly susceptible (Cavendish) based on the banana bunch top disease severity index and also demonstrated that the effect of BBTV infection tends to be more significant on the growth of commercial cultivars than on wild banana accessions.

For the transmission of virus from plant to the banana aphid, the pest should nourish on the plant with minimum of 15 minutes to at least 4 hours [7]. The *musa* genotypes AA and AAA showed less tolerance than compared to the ABB and BBB genotypes which concluded that presence of B genome either one or two allele showed high tolerant towards BBTD [8].

Robson *et al*. [9] determined that the effective method to study the banana aphids under laboratory conditions, the aphid performance was better on leaf midrib and plantlets. Aphids are

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hidden under leaf sheath hence limits the efficacy of insecticide application on banana aphid population [10]. In the present study, the selected banana plants screened against banana aphid, *Pentalonia nigronervosa* under laboratory conditions, to study the reaction of aphid to various accessions and to identify less preferred host.

MATERIALS AND METHODS

Banana aphid culture

The aphid *Pentalonia nigronervosa* (Coq.), commonly known as banana aphids. These aphids were collected from ICAR-NRCB, Tiruchirappalli and maintained under *in vitro* conditions. Cv. Nendran at 24±2°C (Fig 1-4) is susceptible for aphid. The required aphids were collected using a fine Camlin hair brush. The aphids required for this study was maintained in banana plants grown in earthen pots which were kept inside the net house (Fig 1).

Fig 1 Maintenance of banana aphid culture (*P. nigronervosa*)

Collection of suckers and plantings

Banana suckers were collected from ICAR- NRCB farm, Tiruchirappalli and planted in the earthen pots. The name and description of the varieties are listed in (Table 1). The cultivars were allowed to grow for three months. Then the midrib portions of different cultivars were collected for conducting further experiment.

Table 1 List of *musa* cultivars chosen for the study

Cultivars	Accn. No	Genome	Sub group
Njalipoovan	0118	AB	Neypoovan
Grand Naine	0580	AAA	Cavendish
Robusta	0200	AAA	Robusta
Chenkadali	0161	AAA	Red banana
Karpuravalli	0173	ABB	Pisang awak
Pidimonthan	0115	ABB	Monthan
Monthan	0293	ABB	Bluggoe
Peyan	0193	ABB	Peyan
Palayankodan	0192	AAB	Mysore
Poovan	0294	AAB	Mysore
Rasthali	0297	AAB	Silk
Virupakshi	0118	AAB	Pome
Pachaladan	0190	AAB	Pome
Nendran	0296	AAB	Plantain
Saba	0536	ABB	Saba

Screening of selected commercial cultivars against banana aphid under invitro

The banana midrib was used for the screening of aphids and the mid rib was cut into 5 cm with a sharp knife and three such pieces were kept in a 100 ml plastic container (Fig 3). A 4th instar aphid nymph was released into the container (Fig 2). Observations on aphid development were recorded for a period of ten days. The number of aphid nymphs developed during the period was recorded. Further study was carried out in the net house, for accessions of low and highly susceptible. The two category plants suckers were collected from ICAR-NRCB farm, Tiruchirappalli and planting earthen pots kept into the net house. After the establishment of plants and they were kept in the laboratory condition at the temperature 26 °C. The one fourth instar nymphs were released into the plants and observation was recorded for 10 days.

Table 2 List of Musa cultivars screened against aphid *Pentalonia nigronervosa* to record fecundity

Cultivars	No. of aphids (Mean ± SD)
Peyan	0.33 ± 0.52^{g}
Pachaladan	0.67 ± 0.52^{g}
Pidimonthan	0.67 ± 0.52^{g}
Grand naine	2.67 ± 0.52^{f}
Karpuravalli	2.67 ± 0.52^{f}
Robusta	3.00 ± 0.89^{f}
Monthan	3.00 ± 0.00^{f}
Virupakshi	3.67 ± 1.37^{ef}
Njalipoovan	4.00 ± 0.89^{ef}
Palayankodan	4.67 ± 0.52^{de}
Chenkadali	5.00 ± 0.89^{cde}
Rasthali	5.67 ± 0.52^{cd}
Nendran	6.33 ± 1.37^{bc}
Poovan	7.33 ± 0.52^{ab}
Saba	8.00 ± 0.89^{a}
Significance (1% and 5%)	CD (0.01) = 1.992 CD (0.05) = 1.476

RESULTS AND DISCUSSION

The present evaluation states that susceptibility can be classified into three categories according to the susceptibility of banana aphid against each cultivar. It is the total number of aphids including adults and nymph instars present in each container and 6 replications were taken against each treatment. According to the banana aphid fecundity indicates that about 3 accessions are less susceptible, 8 accessions showed moderate susceptibility and 4 accessions showed high susceptibility among the selected commercial cultivators. When a mid-rib of the banana plant becomes highly infected with the banana aphid, the mid rib will lose its texture. Net house evaluation showed a similar trend as recorded in the laboratory evaluation. It was found that the moderately susceptible cultivars such as Karpuravalli can be used for maintaining aphids under laboratory culture.

Ngatat *et al*. [11] reported a limited number of aphids (9.7±4.6/plant) in Calcutta AA diploid 4 varieties whereas high species density of 395.6±20.8/plant in Waema AAB triploid variety has been identified. Field test results showed high aphid species as 29.2±6.7/plant in Batard AAB triploid variety whereas Pisang Tongat AA diploid showed least species density as 0.4±0.2/plant. Various aphid genotypes such as PITA 21 (AAB), AA diploid Tapo, Balbisiana Los Banos (BB), Calcutta 4 (AA) and Balonkawe (ABB) were tested against BBTD. Among the tested genotypes, Tapo diploid (AA) showed high

incidence of BBTD as 100% infection rate than compared to the other genotypes. According to Poorani *et al*. [4] among 369 *musa* germplasm accessions studied only one accession Bathesa Ash –ABB genome shows free from aphids under field condition. Therefore, the present study showed great interest to identify the aphid resistant *musa* accessions from germplasm for aphid management. Moreover, the field survey revealed that all the commercial Musa germplasm accessions are not infected with BBTD but most of the accessions are susceptible to the growth of aphids.

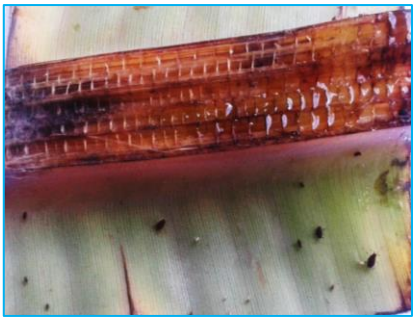

Fig 2 Banana aphid on the banana leaf midrib

Fig 3 The plastic container with midrib and aphids

Fig 4. Mass rearing of banana aphids in a closed container

CONCLUSION

Present study clearly indicated that host *Pentalonia nigronervosa* is distributed more in the genome AAB (Nendran (French plantain) and Poovan (Mysore)) and ABB (Saba (Saba)). The lowest population of *Pentalonia nigronervosa* was found in the genome ABB (Peyan (Peyan) and Pidimonthan (Bluggoe)) and AAB (Pachaladan (Pome)).

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