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Ashok Kumar Meena

Assistant Agriculture Officer,
Department of Agriculture,
Jaipur, Rajasthan, India

PK Borthakur

Professor, Department of
Horticulture, Assam Agricultural
University, Jorhat, Assam, India

M Ch Marak

Former Ph.D. Scholar,
Department of Horticulture,
Assam Agricultural University,
Assam, India

Praveen Kumar

Assistant Professor, Department
of Genetics and Plant Breeding,
AICRP on Sesame, Agricultural
Research Station, Agriculture
University, Jodhpur Rajasthan,
India

Corresponding Author:

Ashok Kumar Meena

Assistant Agriculture Officer,
Department of Agriculture,
Jaipur, Rajasthan, India

Effect of macro-propagation and cultivars on disease-pest tolerance and mortality in Banana

Ashok Kumar Meena, PK Borthakur, M Ch Marak and Praveen Kumar

Abstract

The present investigation on “Performance of macro-propagated and sucker grown plants of banana CVS. Jahaji (AAA) and Barjahaji (AAA)” was carried out at the Horticulture Experimental Farm, Assam Agricultural University, Jorhat during the year 2017-18 and 2018-19, respectively. The main objective was to see the comparative performance of macro-propagated and sucker grown plants of banana with respect of growth yield and quality. The present experiment was laid out in Factorial RBD with five replications and two factors with two levels. First factor consists macro-propagated plantlets and conventional suckers and in second factor variety was taken as a source of variations. The observations were recorded on growth, yield attributes, quality parameters and mortality. Macro-propagated plantlets of Jahaji’ cultivar is comparatively less susceptible to pest-diseases than Macro-propagated plantlets of ‘Barjahaji’ cultivar. Sucker grown plants were recorded higher percent of mortality than macro-propagated plantlets. Treatments are Macro-propagated plantlets (P₁), Conventional suckers (P₂), Jahaji’ (V₁), ‘Barjahaji’ (V₂) and Interactions are Macro-propagated plantlets of ‘Jahaji’(P₁V₁), P₁V₂: Macro-propagated plantlets of ‘Barjahaji’ (P₁V₂), Conventional suckers of ‘Jahaji’ (P₂V₁), Conventional suckers of ‘Barjahaji’ (P₂V₂). Minimum mortality per cent was observed in the treatment P₁ (0.52%), V₁ (4.59%) and maximum mortality rate were observed in the treatment P₂ (9.94%), treatment V₂ (5.85%) respectively.

Keywords: Macro-propagation, cultivars, banana, propagated plantlets

Introduction

Banana is a monoecious, monocarpic and monocotyledons perennial herb belonging to the family Musaceae under the section *Eumusa* in the order *Zingiberales*. It is believed to originate from Southeast Asia. Banana is a tropical plant, but it can also be grown successfully in subtropical regions. Banana can be cultivated in the temperature range of 13°C-38°C with a high relative humidity of 75-85%. India is the leading country in the production of banana. India shares approx. 26% in world banana production. Banana is widely grown in the states of Gujarat, Andhra Pradesh, Tamil Nadu, Uttar Pradesh, Maharashtra, Karnataka, Madhya Pradesh, Bihar, Kerala, West Bengal, Assam, Chhattisgarh, Odisha etc. The climatic conditions of Assam are suitable for banana cultivation, as banana plants require warm, humid climate. Productivity of banana in the northern and southern states of India (Assam, Bihar, West Bengal, Kerala, Karnataka) is very low due to use of poor/infectious planting material that favourable condition disease and pest infections.

However, natural regeneration of banana plants is usually through sword sucker, water sucker, bits etc. They are less vigorous, susceptible to several pathogens and establish very slowly whereas tissue culture plants have higher mortality rate. Majority of Indian farmers are using conventional suckers as planting material. Farmers cannot afford, high-quality seedlings due to higher cost and unavailability of good method of propagation in rural areas. Currently, farmers rely on natural sucker which are inefficient and a potential source of pests. Conventional suckers are less vigorous and susceptible to biotic and abiotic stresses (Faturoti *et al.* 2002, Lefranc *et al.*, 2010)^[3, 6].

Jahaji (AAA group)

This variety have several synonyms such as Dwarf Cavendish, Basrai, Kabuli, Bhusavali, Shendurni, Vamankeli, Chittedar etc. Plant is dwarfing in nature (1.0-1.8 m) and high yielder. The leaves are dark green in color with black spots on pseudo stem. It is resistant to Panama wilt but susceptible to bunchy top and leaf spot diseases.

Barjahaji (AAA group)

It is called 'Tall Cavendish' in other parts of India. Plants are taller than Jahaji. It is a tall cultivar of Cavendish group (AAA). It is a high yielding variety but need bamboo pole support during maturity stage. It has no persistent male bract; fingers are long and remains green even at ripening.

For expanding banana cultivation farmers need adequate quality method of propagation in sufficient quantity, and it should be available with minimal costs (Baiyeri and Ajayi, 2000)^[1].

Field performance of macro propagated plantlets is better than conventional suckers (Suryanarayana *et al.* 2018)^[9]. The occurrence of disease-pests is very less in case of macro-propagated banana plants. Macro-propagated plants are tolerance against insect-pests and diseases. Conventional suckers can also be a source of soil-borne pathogens such as *Fusarium oxysporum* f. sp. *cubense*, *Cosmopolites sordidus*, *Meloidogyne incognita*, *Radopholus similis*. Disease incidence is per cent of banana infected with diseases. The incidence of banana was recorded at every five days intervals. The infected plants were identified as symptomatically. Higher incidence of disease observed in the conventional suckers.

Methodology

The field experiment was conducted at experimental farm,

Department of Horticulture, Assam Agricultural University; Jorhat during 2017-19. The site was located at 26°47'N latitude, 94°12'E longitude and at an altitude of 86.6 m above means sea level. The plot was ploughed two-three times then leveled it. The plot had a good slope and drainage facility. The experiment was laid with Factorial design having five replications and two factors namely method of propagation and cultivar with two levels in each factor and each treatment condition has an equal proportion of nutrients, natural resources by randomization. Banana varieties 'Jahaji' and 'Barjahaji' were grown in five replications each replication comprehends four treatments. The experiment was carried out during the 2017-2019 to observe performance of macro-propagated and sucker grown plants of banana CVS. 'Jahaji' and 'Barjahaji'.

Result and Discussion

The data presented in Table-1 revealed that the macro-propagated plants were significantly tolerant against pest-diseases while conventional suckers were found sensitive to disease-pests. Jahaji cultivar was performed better than Barjahaji in Assam conditions. Approx 30-40% of conventional sucker grown plants were observed infected by bunchy top virus, removed most of infected plants at early detection of disease and replanted.

Table 1: Effect of method of propagation and cultivar on mortality (%)

Treatments	2017-18	2018-19	Pooled
Method of propagation			
P ₁	0.00	1.03	0.52
P ₂	9.18	10.70	9.94
SEd (±)	1.47	0.81	1.14
SEm(±)	1.04	0.57	0.80
C.D. (0.05)	3.23	1.79	2.51
Cultivar			
V ₁	3.59	5.60	4.59
V ₂	5.59	6.13	5.85
SEd (±)	1.47	0.81	1.13
SEm(±)	1.04	0.57	0.80
C.D. (0.05)	NS	NS	NS
Interactions (P X V)			
P ₁ V ₁	0	0.8	0.4
P ₁ V ₂	0	1.26	0.63
P ₂ V ₁	7.18	10.4	8.79
P ₂ V ₂	11.174	11	11
SEd (±)	2.071	1.15	1.61
C.D. (0.05)	NS	NS	NS

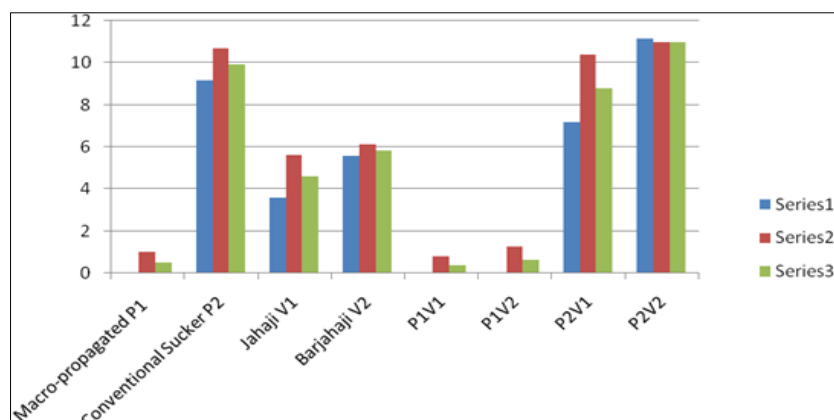


Fig 1: Effect of method of propagation and cultivar on mortality (%)

The data has been shown in the fig.1 that sucker derived plants were highly susceptible to bunchy top virus disease.

The highest mortality rate (9.18%) recorded in the conventional suckers (P_2) and zero per cent mortality observed in the macro-propagated plants (P_1) during the first year of investigation. In the second-year minimum mortality rate (1.04%) was recorded in the macro-propagated plants and maximum mortality (10.7%) was observed in the conventional suckers (P_2). 'Jahaji' cultivar is comparatively less susceptible to pest-diseases than 'Barjahaji' cultivar.

Minimum mortality per cent was observed in the treatment V_1 (3.59%) and maximum mortality rate (5.59%) was noted V_2 . The interactions between propagation method and cultivar were found non-significant.

In the pooled data analysis, negligible mortality (0.52) was observed in the treatment P_1 and maximum mortality (9.9) recorded in (P_2). 'Barjahaji' cultivar plants were more susceptible to pest and diseases. Minimum mortality (4.6) observed in the cultivar 'Jahaji' and maximum mortality (5.86) recorded in the cultivar 'Barjahaji'.

It might be due to the presence of antagonistic endophytic fungi in the corms of banana, endophytic fungi are resistant to several fungal diseases. Some tolerance developed in the corms of banana through macro-propagation process via treatment of method of propagation with fungicides and with some chemicals *viz.* Bavistin and benzyl amino purine during the macro-propagation process, thereby tolerance developed in the newly emerged plantlets. Through macro propagation technology helps in producing healthy and disease-free plantlets. Therefore mortality is negligible in macro-propagated plants and very high in sucker grown plants due to use pre-infected suckers for planting.

Zero per cent of mortality was observed in macro-propagated plants (Njau *et al.* 2011) [7]. Macro-propagated plants are highly adaptable in field conditions observed by Dayarani *et al.* (2013) [2], Kajumba *et al.* (2003) [4]. Through macro-propagation pseudo stem weevil attack can be reduced through selection of healthy corms and then treated with hot water or insecticidal solution (Kiggundu *et al.* 2003) [5]

Banana corms contain higher percentage of endophytes that helps plant to become tolerate against several pathogens such as fungus, bacteria, moulds etc.

Conclusion

Comparatively fewer incidences of infections/diseases were recorded in the macro-propagated plantlets of 'Jahaji' than in sucker grown plants. Conventional sucker grown plants were found more susceptible to diseases. Jahaji cultivar were observed more tolerant to biotic and abiotic stress than Barjahaji cultivar of Banana in Assam conditions. 'Jahaji' cultivar is comparatively less susceptible to disease-pests than 'Barjahaji' cultivar. Treatment P_1 was found most tolerant to biotic and abiotic stresses followed by V_1 . It concluded that macro-propagated plantlets of Jahaji were less affected by disease and pests and very less mortality was reported.

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