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Effect of different plant growth regulators on mass propagation of banana cv. Kovvur Bontha (ABB) through macropropagation

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Abstract
Kovvur Bontha (ABB) is a plantain variety and a sport with heavier bunches of bigger sized and superior quality fruits. Larger stout with green thick rind having whitish pulp, less prominent ridges and bottle neck apex are the morphological characters of the fruits. The tall plants with sturdy and sucker freely nature, presenence of waxy bloom all over petioles and young regions, rhizome rot disease susceptible. Kovvur Bontha (ABB) tolerant to *Sigatoka* leaf spot, having good cooking quality and it is the only cooking banana variety commercially cultivated in Andhra Pradesh. The heavy, pendent and not compact fruit bunches, suitable for the entire State. Each bunch weighs approximately 16-18 kgs having 6-7 hands and 75-90 fruits on an average. The crop duration is 12-13 months and the spacing followed is 2m x 2m. Stimulation of lateral buds and plantlet production is generally done through decapitation methods in banana. In the present study attempts were made to enhance the efficacy of decortication in elite cv. Kovvur Bontha (ABB) using different concentrations of plant growth regulators. This research work was carried out with the suckers weighing 1.0-1.5 kg and saw dust as the basal substrate. All treatments tested, showed good response in terms of plantlet production and enhanced bud proliferation, growth and better root profiles compared to control.Days taken for the induction of number of primaries, secondaries and tertiaries were recorded for evaluation purpose. In the present experiment, the suckers treated with 0.10 $mgL^{-1}$of thidiazuron resulted in earliest days for bud initiation and maximum number of primaries, secondaries and tertiaries, hence concluded as the best treatment for macropropagation.

Keywords: Thidiazuron, Kovvur Bontha (ABB), growth regulators, macropropagation

Introduction
Banana which is also known as 'Adam's apple' or 'Plant of virtue' is the one of the most important fruit crops in India. It is a day neutral plant and can be grown throughout the year. It plays a vital role in the contribution of horticultural GDP in the Indian economy. Banana is also an integrated part of Indian culture and lifestyle which date back to five thousand years (Obiefuna, 1986; Persley and de Langhe, 1987) [8, 9]. Banana was generally divided into desert varieties and cooking varieties based on physical characters and genetic constitution (Rowe, 1998). In general, the desert varieties have A type dominance whereas cooking type of banana contain B type dominance in their genetic constituencies (Stover and Simmonds, 1987) [13]. Cooking type of banana contains high amount of fiber and starch when they are ripe (Rasheed 2003; Robinson, 1996) [10, 11].

Major propagation method for banana is through sword suckers. But the major disadvantage of sucker propagation is transmission of pests & diseases from unhealthy field to healthy fields (Boss, 2008) [1]. To overcome theses disadvantages, micropropagation plays a vital role by providing disease free planting materials to the farmers,due to the large capital investments required for tissue culture facility, the plantlets produced arefairly expensive and beyond the reach of poor farmers (Singh *et al.*, 2011) [5]. Macropropagation is one such cost effective technique where repression of apicalmeristem will stimulate the regeneration of lateralmeristem (Uma *et al*., 13). In this study, we are evaluating the effect of different plant growth regulators and their concentrations on the multiplication of cooking variety of banana cv. KovvurBontha (ABB).

Material and Method
Four to six months old banana suckers with a diameter of 15 cmto 20 cm were selected for the macropropagation. All the leaves and leaf sheaths were completely removed. The central

cortex was evacuated to remove the apical dominance of the suckers. Theses suckers were given with diagonal cuts which are perpendicular to each other which passes through the central part of the sucker. These suckers were treated with different concentrations of growth regulators like thidiazuronalso known as TDZ (T_1– 0.05, T_2 – 0.1, T_3 – 0.2 mgL^{-1}), benzyleaminopurine also known as BAP (T_4 – 3.5, T_5 – 5.0, T_6 – 6.5 mgL^{-1}), and kinetin also known as Kin (T_7 – 5.0, T_8 – 7.5, T_9 – 10.0 mgL^{-1}) by pouring 10ml in the evacuated portion of the suckers. Suckers with no hormonal treatment was kept as control. Theses suckers are planted in pit of 45 cm filled with saw dust medium. After fifteen days primaries will emerge. The same above procedure is repeated with primaries and the same will be repeated with secondaries also. After the initiation, during this experimental period, data of different parameters like days taken for primary shoot initiation, days taken for secondary shoot initiation, days taken for tertiary shoot initiation number of primary shoots, number of secondary shoots, number of tertiary shoots were recorded for the further evaluation of the results.

A. B. C.

Fig 1: Pictures showing different stages of macropropagation planting. A. Preparation of the suckers. B. excortication of the sucker. C. Planting of the suckers in the saw dust.

Result and Discussion

The research was aimed to get low cost standardize the hormonal dosage for the production of planting material through micropropagation. In the experiment, lowest number (12.33) for bud initiation was observed in the suckers which are treated with T_2 (TDZ – 0.10 mgL^{-1}) for the primary bud initiation.

Table 1: Data regarding the days taken for primary, secondary, and tertiary bud initiation in response of TDZ, BAP, and Kin.

Treatment	Days taken for primary bud initiation	Days taken for secondary bud initiation	Days taken for tertiary bud initiation
T_1 (TDZ – 0.05 mgL^{-1})	16.33	16.67	14.67
T_2 (TDZ – 0.10 mgL^{-1})	12.33	12.00	10.33
T_3 (TDZ – 0.20 mgL^{-1})	14.67	15.00	13.00
T_4 (BAP – 3.5 mgL^{-1})	16.00	16.33	14.33
T_5 (BAP – 5.00 mgL^{-1})	15.33	15.67	13.67
T_6 (BAP – 6.50 mgL^{-1})	17.33	17.67	15.67
T_7 (Kin – 5.00 mgL^{-1})	18.33	18.37	16.11
T_8 (Kin – 7.50 mgL^{-1})	16.67	17.00	15.00
T_9 (Kin – 10.00 mgL^{-1})	17.33	17.67	15.67
T_{10} (control)	18.54	18.67	16.67
SE(m)	0.78	0.61	0.83
C.D.	2.34	1.83	2.49

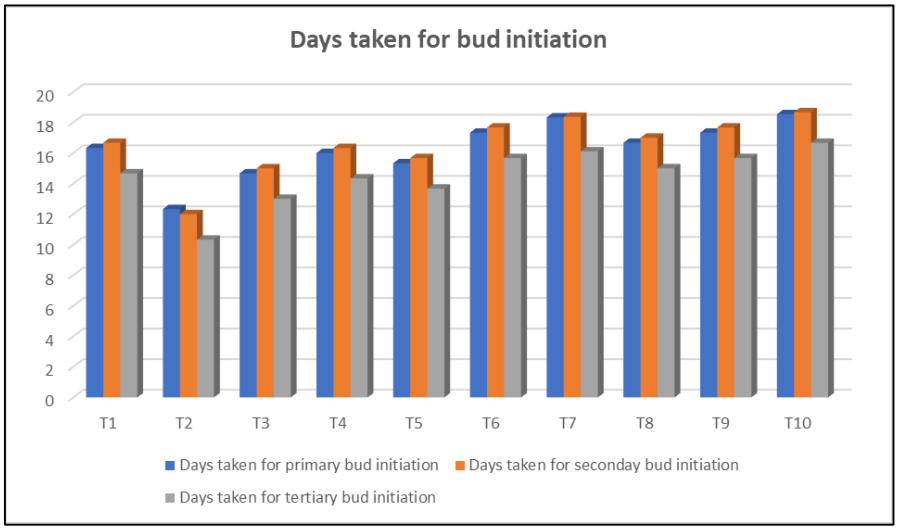

Fig 2: Graph showing the number of days taken for initiation of the primary, secondary and tertiary buds.

The suckers treated with T_2 (TDZ – 0.10 mgL^{-1}) had recorded minimum number of days (12.00) for initiation of secondary buds. Further observed that the tertiary buds were initiated in 10.33 days when the secondaries treated with T_2 (TDZ – 0.10 mgL^{-1}) as recorded in Table 1. Palm frond is probably the oldest and most common nursery shade used in Nigeria (Baiyeri 2006), and had proved satisfactory for the young delicate *Musa* plantlets (Baiyeri and Aba 2005) [3, 4]. The initiation media essentially served for anchorage, moisture supply and proper root aeration. Similarity oftheir effects on sucker plantlets initiation might beassociated with their relative similarity in amounts of porespaces and moisture retention capacity.

Table 2: Data regarding the number of primary, secondary and tertiary bud initiation in response of TDZ, BAP and Kin.

Treatment	Number of primary buds	Number of secondary buds	Number of tertiary buds
T_1 (TDZ – 0.05 mgL^{-1})	4.33	9.67	16.67
T_2 (TDZ – 0.10 mgL^{-1})	6.67	12.33	19.43
T_3 (TDZ – 0.20 mgL^{-1})	4.00	9.33	16.33
T_4 (BAP – 3.5 mgL^{-1})	5.33	10.67	17.67
T_5 (BAP – 5.00 mgL^{-1})	6.33	11.67	18.67
T_6 (BAP – 6.50 mgL^{-1})	5.00	10.33	17.33
T_7 (Kin – 5.00 mgL^{-1})	3.67	9.00	16.00
T_8 (Kin – 7.50 mgL^{-1})	4.67	10.00	17.00
T_9 (Kin – 10.00 mgL^{-1})	3.33	8.67	15.67
T_{10} (control)	2.67	6.33	13.33
SE(m)	0.43	0.66	0.69
C.D.	1.28	1.96	2.06

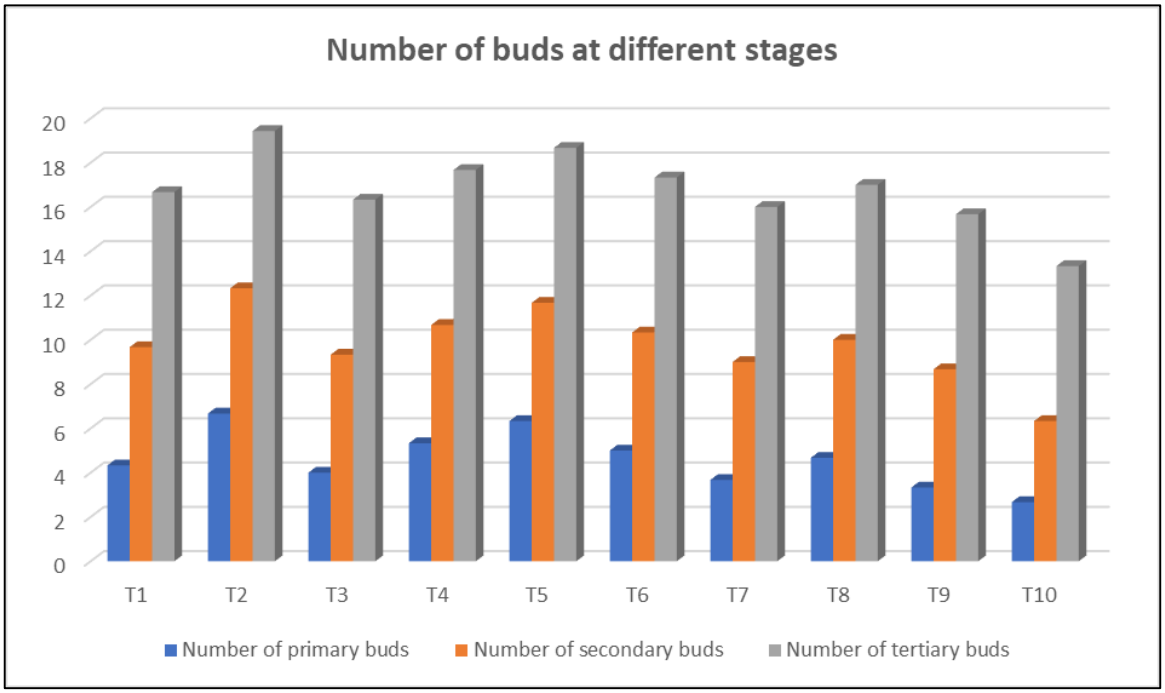

Fig 3: Graph showing the different number of buds which recorded during initiation of primaries, secondaries and tertiaries.

As per the Table 2, maximum number primary buds (6.67) were observed when the suckers were treated with treatment T_2 (TDZ – 0.10 mgL^{-1}). The maximum number of secondary buds (12.33) were also observed when the suckers were treated with the treatment T_2(TDZ – 0.10 mgL^{-1}). Further it was observed that maximum number of tertiaries (19.43) were obtained in the suckers treated with the treatment T_2 (TDZ – 0.10 mgL^{-1}). The numbers of plantlets produced from treated corms were significantly lower than the numbers foundin the literature (Boss, 2008, Osei, 2004, Yeboah and Darkey, 2000) [1, 2].

In the field experiment, it is likely that the apical dominance of the older mother stalks had too much influence over the mats, preventing treated suckers from producing lateral bud formation.Because of apical dominance, a mat will only produce 5-20 suckers in a stalk's lifetimeof 12-14 months (Singh *et al.*, 2011) [5].

Hirimburegama and Gamage (1997) [7] reported that multiplication rate was found to be variable amongcultivars, and it appeared that genome B had the lowestmultiplication rate whereas the cultivars of the AAA grouphave the highest rate. The current *ex vitro* multiplication study confirmed variable cultivars effect but observed that AAB genome group had more plantlets than the AAA genome group.

Fig 4: Figure showing different stages of propagule development. A. Early stage of primary development. B. Completely developed primaries. C. Completely developed secondaries. D. Completely developed Tertiaries. E. Macropropagated plants after rooting.

Conclusion

This experiment concludes that lowest days for plant initiation and maximum number of shoots at primary, secondary and tertiary stages were observed when the suckers were treated with 0.10 mgL^{-1} of thidiazuron.

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