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RESEARCH ARTICLE

Effects of plant growth hormones on shoot proliferation of *Musa paradisiaca* cv. BANTAL

■ **BANDITA DEO AND BIKRAM PRADHAN**

SUMMARY

The present experiment was conducted to study the effects of three plant growth hormones BAP, kinetin and IAA for the enhancement of shoot proliferation of *Musa paradisiaca*, cv. BANTAL. From the *in vitro* multiplication culture the data analysed on the basis of parameters like percentage of response, days of response, number of shoot buds and number of shoots. Among all BAP with IAA was found to be more effective than kinetin along with IAA. Out of various treatments the optimum concentration for the growth and proliferation of shoot in multiplication phase was found in MS + 4 mg/l BAP + 0.5 mg/l IAA followed by 2 mg/l BAP and 4 mg/l kinetin.

Key Words : *Musa*, Plant growth hormones, Bantal

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Banana are large perennial herbs belongs to the family Musaceae. It is very important and widely grown popular fruit crop in the tropical and sub tropical regions through out the word (Rahman *et al*., 2013). It is known as the oldest fruit to word wide and is the most delicious fruit used as subsidiary food.

Banana plants are mostly propagated by vegetative means by using suckers which grow from lateral buds originating from corms, and suckers are used for production of individual plants. This process is very slow. The rate of multiplication of suckers through conventional vegetative means has been shown to express several negative impacts which include transmission of diseases, low production and poor preservation of original plant genetic material (Hussein, 2012). The non-professional cultivation practices and viral diseases affect the yield and quality of banana crop (Wambugu *et al*., 2008). The propagation of banana plantlets through *in vitro* tissue culture methods have shown to be faster, high plantlet production, genetic uniformity and disease free than those of conventional methods (Ortiz and Vuylsteke, 1996). The yielding capacity of tissue cultured banana plants have been marked to be 39 per cent higher than

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plants grown through conventional method (Pradeep *et al*., 1992). Plant growth regulators play an important role in growth and development of the cultured explant. Plant growth hormones such as 6-benzyleaminopurine (BAP) and kinetin (Kn) are known to induce auxiliary as well as adventitious shoots formation from the meristematic explants of banana (Khalid, 2011).

In the present study the plantain variety *Musa paradisiaca* cv. BANTAL was taken into consideration due to its high demand in the state. Though the suckers are not available from the farmers field in plenty, to fulfill this demand, large quantity of Bantal plant should be produced through micro propagation techniques. The main aim of the experiment was to study the effects of different plant growth hormones on shoot proliferation of Bantal explants through Murashige and Skoog (MS) medium to get more numbers of plantlets of this variety within a short period.

MATERIAL AND METHODS

Plant materials :

The explants for the present study were collected from the multiplication culture stages of *Musa paradisiaca* cv. BANTAL maintained in culture room of Banana Tissue Culture Laboratory of Regional Plant Resource Centre, Odisha, India.

Media preparation :

Murashige and Skoog (MS) medium was utilized for this experiment (Murashige and Skoog, 1962). The phytohormones used for the multiplication culture study was 6-benzyleaminopurine (BAP), kinetin (Kn) and indole acetic acid (IAA) in the following concentration (Table A).

Table A : Different concentration of phytohormones

Treatments	BAP (mg/l)	Kinetin (mg/l)	IAA (mg/l)
1	2	-	0.5
2	4	-	0.5
3	-	2	0.5
4	-	4	0.5

The media were poured into culture vessel and autoclaved at 121° C and 15 psi. Then they were transferred to laminar air flow to cool down. The laminar air flow was cleaned with 70 per cent alcohol and UV light was given for sterilization purpose for 20 minutes before use.

Culture condition :

The culture vessels containing the explants were kept in culture rack maintained at 24°C to 26°C, 16 hr photo period of 35-50 μEm-2s-1 intensity provided by cool white fluorescent tubes in the culture room of Banana Tissue Culture Laboratory.

Data collection:

The data were collected after three weeks on the basis of following parameters such as days of response, percentage of response, number of shoot buds and number of shoots. For each experiment 10 numbers of explants were taken and for optimum results each experiment was repeated 4 times.

RESULTS AND DISCUSSION

From the observation of the present study, the effects of different plant growth hormones on shoot buds formation, multiplication and development of shoots of *Musa paradisiaca* cv. BANTAL were dipicted. The data obtained from different parameters revealed the effect of BAP, Kn and IAA when used in combination with MS medium for multiplication culture. Explants with newly formed buds were transferred to media with different concentrations of BAP or kinetin at the proliferation stage.

Remarkable result was observed in explants cultured in MS medium containing 4 mg/l BAP + 0.5 mg/l IAA with 37 ± 1.7 number of shoot buds (Table 1) and had the least days of response (9). The highest percentage of response was seen in explants cultured in media containing 2 mg/l BAP + 0.5 mg/l IAA. Kinetin along with IAA had least effect on shoot proliferation. Nearly similar results (number of shoot duds and number of shoots) were observed in explants cultured in 2 mg/l BAP and 4 mg/l Kn. The explants cultured on 2 mg/l Kn took longest period of time to proliferate in comparison to other phytohormones (Fig. 1).

In the present study it was observed that the explants cultured in MS medium containing 4 mg/l BAP + 0.5 mg/l IAA had highest number of shoot buds and number of shoots. Similar result was studied by Muhammad *et al*. (2007) where the highest multiplication ratio was observed at 4 mg/l BAP along with 1 mg/l IAA. Habiba *et al*. (2002) and Ahmed *et al*. (2014) reported that 4 mg/l BAP in combination with 2 mg/l IAA shown remarkable results.

The *Musa* explants grown in MS medium with

Table 1 : Effects of different phytohormones on shoot development of *Musa* sp. cv. BANTAL

Phytohormones	Days of response	Percentage of response (%)	Number of shoot buds	Number of shoots
2 mg/l BAP + 0.5 mg/l IAA	11	100	34 ± 1.3	5
4 mg/l BAP + 0.5 mg/l IAA	9	80	37 ± 1.7	7
2 mg/l Kn + 0.5 mg/l IAA	13	70	28 ± 1.5	3
4 mg/l Kn + 0.5 mg/l IAA	12	90	31 ± 1.2	5

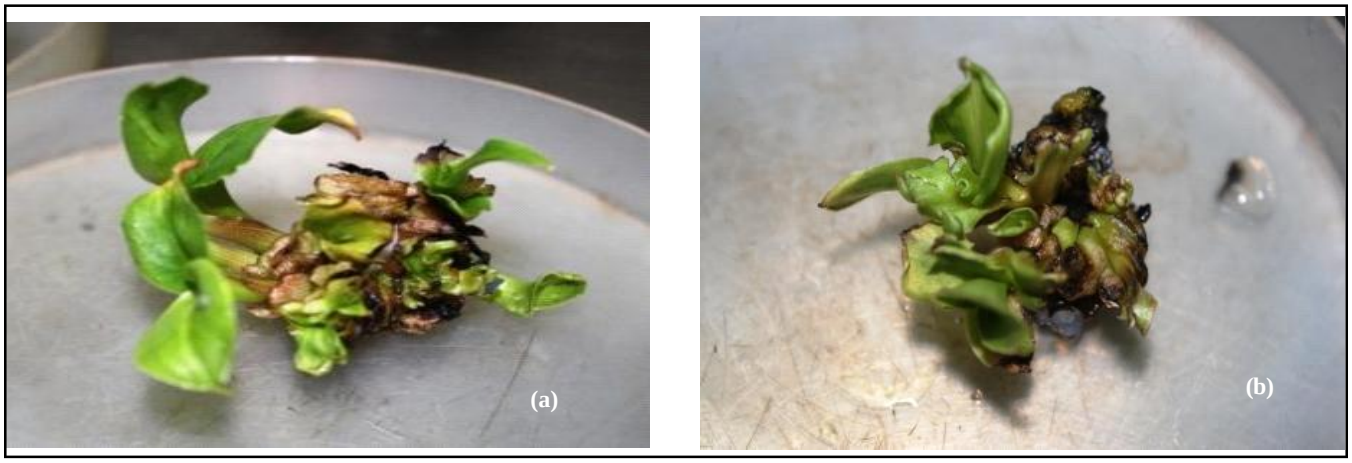

Fig. 1 (a) : Explant cultured in MS medium with 4 mg/l BAP, b: explant cultured in MS medium with 4 mg/l Kn

Kinetin and IAA had little impact on shoot proliferation in comparison to BAP along with IAA. The number of shoot buds and number of shoots were nearly similar in 2 mg/l BAP + 0.5 mg/l IAA and 4 mg/l Kn + 0.5 mg/l IAA. The percentage of response and days of response greatly varied in all the treatments. Apart from the genotypes of species the shoot proliferation also affected by cytokinin concentration in growth medium (Ngomuo *et al*., 2014).

From this experiment it was indicated that out of various phytohormones concentration and combination tried, the explants established on MS medium supplemented with 2 mg/l Kn + 0.5 mg/l IAA gave the minimum number of shoot buds, shoots and took the longest time for culture establishment. Many researchers depicted that the presence of BAP along with IAA in the culture medium induced the shoot proliferation in different varieties of *Musa* sp. In this study explants recorded highest percentage of response cultured in MS medium along with 2mg/l BAP + 0.5 mg/l IAA. Here the MS medium with phytohormones proved that combination of 4 mg/l BAP and 0.5 mg/l IAA had highest number of shoot buds formation and number of shoots with less time taken for culture establishment.

To carry out the future research work regarding this result further study is required to gain more knowledge regarding shoot proliferation of *Musa* species.

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