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Influence of growth substances through injection on economics of banana cv. Grand Naine

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Abstract

The present investigation on “Influence of growth substances through injection on economics of banana cv. Grand Naine” was carried out at Instructional Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during 2018-19. The experiment was laid out in Completely Randomized Design with three repetitions and nine treatments *viz.*, control (T₁), GA₃ @ 10 ppm (T₂), GA₃ @ 20 ppm (T₃), GA₃ @ 30 ppm (T₄), BA @ 2.5 ppm (T₅), BA @ 5.0 ppm (T₆), NOVEL⁺ @ 0.5% (T₇), NOVEL⁺ @ 1.0% (T₈), NOVEL⁺ @ 1.5% (T₉). Growth substances were applied through injection at the time of bell emergence. The results of present investigation revealed that the highest net realization (Rs. 11,41,968 per ha) and maximum benefit cost ratio (4.61) were recorded by the injection of GA₃ @ 30 ppm (T₄) closely followed by NOVEL⁺ @ 1.5% (T₉) with net realization (Rs. 11,09,356 per ha) and BCR (4.48). Thus, application of GA₃ @ 30 ppm and NOVEL⁺ @ 1.5% increased the yield and BCR of banana production.

Keywords: Banana, injection, BCR, gibberellic acid, novel plus organic liquid nutrients

Introduction

Primarily India is an agricultural country so the economics of farm produce plays an important role in the country's economy. Seventy percent of the rural household depends directly on agriculture for their livelihood in India. Horticulture is an inseparable part of agriculture, India has witnessed an increase in horticultural production over the last decade, the area under horticultural crops grew by 2.6% per annum and annual production increased by 4.8%. The production of fruits has increased from 50.9 million tonnes to 97.35 million tonnes from 2004-05 to 2017-18. Fruit crops cover 6506 '000 hectare area with production of 97,358 '000 metric tonnes and 14.96 metric tonnes per hectare productivity in India (Anon., 2018)^[1].

Banana (*Musa paradisiaca* L.) is a large herbaceous perennial monocotyledonous and monocarpic crop that belongs to the family Musaceae in the order Scitamineae. Its origin is in the tropical region of South-East Asia and it is known as the “Apple of Paradise”. Banana crop has nutritional, medicinal and industrial value and is interwoven with Indian heritage and culture. Owing to its greater socio-economic significance and multifaceted uses, it is referred to as “Kalpatharu” (Plant of Virtues). It is also a dessert fruit for millions, apart from a staple food owing to its rich and easily digestible carbohydrates with a calorific value of 67-137/100 g fruit. It is a good source of Vitamin A (190 IU per 100 g of edible portion) and Vitamin C (100 mg/100 g) and a fair source of Vitamin B₁ and B₂ (Rajan *et al.*, 2017)^[7]. In India, it is cultivated on an estimated area of 898.0 thousand ha with 11.1% of the total fruit area with an annual production of 31747.0 thousand MT with 32.6% share in fruit production and productivity of 35.35 MT/ha (Anon., 2018)^[1].

Nowadays, plant growth regulators and organic amendments are being applied for improving the growth, yield and quality of banana fruits. Gibberellins are phytohormones, known to contribute to growth in both ways, namely cell division and cell elongation. After anthesis, it is the cell expansion and cell density, which contribute the most to fruit growth and as such, a positive correlation between the growth of fruit tissues and gibberellin level is well established (Jackson and Coombe, 1966)^[4]. 6-Benzyladenine, also called 6-benzyl amino purine, is a synthetic cytokinin that stimulates cell division in plants. Among other actions, it spurs plant growth and improves fruit quality. The effect of synthetic cytokinin is consistent with the functions of the endogenous compounds. Following application, enhanced chloroplast differentiation and chlorophyll synthesis result in delayed senescence (Buban, 2000)^[2]. Novel plus organic liquid nutrients is a product of Navsari Agricultural University which was patented in the year of 2012. It is prepared from banana pseudostem sap.

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The NOVEL⁺ has been prepared using only organic input and hence suitable for use in the organic farming system as a liquid formulation. It is a good source of plant nutrients and secondary metabolites are among the group comprising N, P, K, Ca, Mg, S, Mn, Cu, Zn, Fe, phenol, urease, gibberellic acid, cytokinin and additional insecticidal properties which are due to incorporation of different botanicals in the formulation. The composition of Novel plus organic liquid nutrients was given in Table 1 (Desai *et al.*, 2016) [3].

The application of growth substances through injection is a new technique in banana. It is applied to the banana plant at the time of bell emergence and eventually leads to a higher yield. It was therefore felt worthwhile to study the influence of growth substances through injection on the economics of banana cv. 'Grand Naine'.

Table 1: Nutritional and biochemical composition of Novel plus organic liquid nutrients

Chemical		Biochemical	
Parameters	Mean	Parameters	Content
N	0.062%	Total phenol	48.0-49.1 mg/100 ml
P	0.018%	Urease activity	63-81 U/ml/min
K	0.180%	Gibberellic Acid	110.2-205.0 mg/l
Ca	0.031%	Cytokinin	137.8-244.3 mg/l
Mg	0.092%	Microbe	Population
S	0.010%	Total viable count	1065X 10 ² CFU/ml
Mn	5.73 ppm	PSB	1025 X 10 ² CFU/ml
Cu	0.40 ppm	Rhizobium	285 X 10 ² CFU/ml
Zn	2.92 ppm	Azotobacter	460 X 10 ² CFU/ml
Fe	109.3 ppm	Fungal count	1200

Note: Alongside these contents, Novel plus organic liquid nutrients also have additional various botanicals which is the reason behind its insecticidal properties

Material and Methods

The present investigation was carried out at Instructional Farm, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari during 2018-to 19. According to the agro-climatic zones of India, Navsari falls in South Gujarat Heavy Rainfall zone-I and Agro-Ecological Situation-III (AES-III), which is typically characterized by humid and warm monsoon with heavy rainfall, moderately cold winter and fairly hot and humid summer. The average rainfall of this region is about 1500 to 1800 mm which is normally received from the first fortnight of June to September end. The experimental plot was prepared by deep ploughing, harrowing and levelling. The pits of 30 cm × 30

cm × 30 cm were dug out at a spacing of 2.4 m × 1.2 m and well decomposed fine textured farm yard manure at the rate of 10 kg per pit was applied at the time of planting. The experiment was laid out in Completely Randomized Design with three repetitions and nine treatments *viz.*, control (T₁), GA₃ @ 10 ppm (T₂), GA₃ @ 20 ppm (T₃), GA₃ @ 30 ppm (T₄), BA @ 2.5 ppm (T₅), BA @ 5.0 ppm (T₆), NOVEL⁺ @ 0.5% (T₇), NOVEL⁺ @ 1.0% (T₈), NOVEL⁺ @ 1.5% (T₉). 100 ml of the solution was injected at the base of ¼th tip of the spathe at the time of bell emergence. It is important to inject bud while it is still upright by using an injection gun. If the bell is injected when leaning or hanging down, the mixture will run to the outside of the bell.

The gross income in terms of a rupee per hectare was worked out based on the mean yield for each treatment and the market price at APMC Navsari of banana fruits. The cost of cultivation for each treatment was worked out by considering the cost of all the operation right from the preparation of land to the harvesting of crop. The net income was worked out by deducting cultivation cost and the cost required for different treatments from the gross income per hectare for respective treatments and recorded accordingly.

$$\text{Benefit: Cost ratio} = \frac{\text{Net return of individual treatment}}{\text{Total cost of cultivation of individual treatment}}$$

The data were subjected to statistical interpretation following the method of Panse and Sukhatme (1985) [6].

Results and Discussion

Effect on economics

The results of the investigation in Table 1 revealed that injection of GA₃ @ 30 ppm (T₄) and NOVEL⁺ @ 1.5% (T₉) significantly influenced on economics of banana production. The highest net realization (Rs. 11,41,968 per ha) and BCR (4.61) were registered by the injection of GA₃ @ 30 ppm (T₄) closely followed by NOVEL⁺ @ 1.5% (T₉) with net realization (Rs. 11,09,356 per ha) and BCR (4.48). While, the lowest net realization (Rs. 6,21,373 per ha) and BCR (2.55) were observed under the treatment T₁ (control). The results might be due to the reason that GA₃ is a key responsibility for increasing yield and Novel plus organic liquid nutrients contain a higher amount of macro and micro nutrients which improves photosynthesis, production of carbohydrates and their translocation from source to sink which excreted positive effect on yield (Kalariya *et al.*, 2018) [5]. These results are in line with (Salunkhe *et al.*, 2018) [8] in onion.

Table 2: Effect of growth substances through injection on economics of banana cv. Grand Naine

Treatments	Yield (t/ha)	Gross Realization	Fixed	Treatments cost (Rs./ha)	Total cost of cultivation	Net Realization	BCR
		(Rs./ha)	Cost (Rs./ha)				
		(A)	(B)	(C)	(D=B+C)	(E=A-D)	
T ₁ - Control	78.33	861630	243257	0	213257	621373	2.55
T ₂ - GA ₃ @ 10 ppm	97.23	1069530	243257	3768	247025	822505	3.32
T ₃ - GA ₃ @ 20 ppm	108.23	1190530	243257	3977	247234	943296	3.82
T ₄ - GA ₃ @ 30 ppm	126.31	1389410	243257	4185	247442	1141968	4.61
T ₅ - BA @ 2.5 ppm	89.27	981970	243257	3721	246978	734992	2.98
T ₆ - BA @ 5.0 ppm	92.86	1021460	243257	3881	247138	774322	3.13
T ₇ - NOVEL ⁺ @ 0.5%	101.15	1112650	243257	3785	247042	865608	3.50
T ₈ - NOVEL ⁺ @ 1.0%	108.08	1188880	243257	4011	247268	941612	3.80
T ₉ - NOVEL ⁺ @ 1.5%	123.35	1356850	243257	4237	247494	1109356	4.48

Conclusions

By considering the findings of the present experiment, it can be concluded that injection of GA₃ @ 30 ppm at the time of

bell emergence helps to improve yield along with higher net income (Rs. 11,41,968 per ha) and BCR (4.61). Further, the application of NOVEL⁺ @ 1.5% also emerged as the second-

best treatment for the yield along with higher net income (Rs. 11,09356 per ha) and BCR (4.48) in banana cv. 'Grand Naine'. So, in the company with all other treatments, T₄ and T₉ are considered economically viable for banana production.

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