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Research Article

EFFECT OF GIBBRALIC ACID ON POST SHOOT BUNCH ON MATURITY DAYS, BUNCH CHARACTER, YIELD AND ECONOMICS OF TISSUE CULTURE BANANA (*MUSA PARADISISCA* L.) *CV.* G-9

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Abstract: The present study was conducted through FLD & OFT programmes at farmer field of Lakhimpur-Kheri district (U.P.) India. Banana bunches were sprayed twice first after full emergence of inflorescence (last hand) and second spray 15 days after first spray with GA_3 @ 200 ppm on removal of male bud. The result of present study revealed that banana bunches GA_3 @ 200 ppm found effective in reducing maturity days (approximately 13 days) and peal weight (38.7g).Pulp weight (119.7 g.),pulp/ peal ratio (3.13%), finger weight (158.4g), bunch weight (29.45 kg.) and yield percentage (8056 %) were increases over untreated plot. It is also reported that on an average difference of gross cost spend Rs. 2020.00 /ha. may increases average differences of gross return Rs. 67680.00/ha. and differences of net return Rs. 65660.00/ ha. and it also affect C:B ratio (2.95) and input output ratio (3.93).

Keywords: *Banana, Gibbralic Acid, Maturity Days, Quality, Yield, Economic*

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Introduction

Banana (*Musa paradisiaca* L.) is one of the ancient fruits crop of tropics and subtropics of the world and known as "Apple of Paradise" and good source of income [1]. It is the staple food of the developing countries like Uganda, Bakauba and Tanzania. Banana is a source of food, fodder, fibers, fragrance, beverages, medicines, silage, rope, paper, and clothing, wrapping material, making house roofs & industrial uses like resin/gum/glue/latex, dye and tanning. Owing to these multifaceted uses it is referred as "Kalpataru" (plant of virtues). The fruit of banana contains carbohydrate (375 kilocalories per100 g pulp), various vitamins and therapeutic values for the treatment of many diseases [2]. India is the leading producer of banana, accounting for nearly 25.7% of total world production [3]. Area and production under banana are 884.0 (000 ha) and production 30808 (000 MT), respectively, with the productivity of 34.85 MT / ha [4]. Gibberellins are phyto-hormone attribute the growth by both ways cell division and cell elongation [5]. Now-a-days, the practice of application of plant growth regulators/chemicals for improving the growth, maturity, quality, yield net return per unit area of banana is gaining popularity. The present study entitled "effect of GA_3 on maturity days, quality, yield, and economic value of banana (Musa paradisiacal L.) cv."G-9" was conducted through OFT & FLD at farmer's fields [6,7].

Materials and Methods

Experimental site

The present investigation was carried out through three year OFT & four year FLD programmes at farmer's field in district Lakhimpur- Kheri, U.P., India.

Climate and weather conditions

According to agro-climatic zones Lakhimpur-Kheri falls in IV agro-ecological zone, which is typically characterized by humid and warm monsoon with rainfall (average1195 mm), moderately cold winter, hot and humid mansoon. The maximum temperature of 42°C in month of May-June and minimum temperature of 5°C in month of January were recorded. Monsoon generally starts from fourth week of June and last up to the second week of September.

Planting

30x30x30 cm sized pits were prepared at 1.8x1.8 sq.m and sapling of tissue cultured banana planted in last week of June to end of July.

Cultural operations

The cultural operation was adopted according to the recommendation for the cultivation of banana crop. Earthling up was done after completion of fertilizer dose in order to support the plant. Weeding was done manually/chemically to keep the experimental area weed free, de-suckering was also done manually with the help sharp sickles. The dry and diseased leaves were removed regularly in order to keep the field clean and hygienic. Propping is done before inflorescence emergence with the help of plastic strips to support the plants.

Irrigation

The crop was irrigated through flood method at 4-6 days interval during summer and 8-10 days interval in winter seasons.

Preparation of spray solution

Gibberelic acid @ 200 mg of powder was dissolved in alcohol then made up with 1 litre of normal water to get 200 ppm solution.

Spraying

First spray was done after complete emergence of inflorescence and second spray after 15 days of first spray by hand knapsack sprayer.

Observations and methodology for observation

i) Days required for flowering to harvesting

Table-1 *Effect of GA_3 spray on yield parameter of banana*

Programme	Year	Days taken in flowering to harvesting		Pulp weight (g.)		Peal weight (g.)		Av. weight of /finger (g.)		Av. weight of /bunch (kg.)		Pulp & peal ratio		Yield (q. /ha.)		yield Increase% over check
		Dem	Check	Dem	Check	Dem	Check	Dem	Check	Dem.	Check	Dem.	Check	Dem.	Check	
OFT	2010-11	98	114	123.8	99	32.8	44.5	156.6	143.5	29.76	27.26	3.77	2.22	922.56	845.06	8.40
	2011-12	101	113	120.7	101	41.5	47.3	162.2	148.3	30.16	27.58	2.91	2.14	934.96	854.98	8.56
	2012-13	99	112	117.5	100.6	36.5	41.2	154	141.8	27.26	25.10	3.22	2.44	845.06	778.10	7.93
	Average	99.3	113	120.7	100.2	36.9	44.4	157.6	144.5	29.06	26.65	3.30	2.26	900.86	826.15	8.29
FLD	2013-14	103	114	112.9	96	40.2	43.8	153.4	139.8	28.87	26.29	2.81	2.19	894.97	814.99	8.94
	2015-16	98	113	120.1	102.8	38.6	42.8	158.7	145.6	28.24	25.95	3.11	2.40	875.44	804.45	8.11
	2016-17	97	111	118.5	104.5	42.5	39.1	161	143.6	28.90	26.14	2.79	2.67	895.90	810.34	9.54
	2017-18	99	112	123.4	105.5	39.9	43.5	163.3	149	33.31	30.40	3.09	2.43	1032.6	942.40	8.74
	Average	99.3	112.5	118.7	102.2	40.4	42.3	159.1	144.5	29.83	27.20	2.95	2.42	924.73	843.05	8.83
Avg. of OFT & FLD		99.3	112.8	119.7	101.2	38.7	43.3	158.4	144.5	29.45	26.93	3.13	2.34	912.80	834.60	8.56

Table-2 *Socio-economic analysis of spray of GA_3 on banana production*

Programme	Year	Gross cost (Rs. ha.)		Diff. in G.C.	Goss return (Rs. /ha.)		Diff. in G.R	Net return (Rs. /ha.)		Diff. in N. R.	Cost benefit ratio		Input output ratio	
		Dem.	Check		Dem.	Check		Dem.	Check		Dem.	Check	Dem.	Check
OFT	2010-11	150800	149200	1600	593800	529200	64600	442000	380000	62000	2.93	2.55	3.94	3.55
	2011-12	153400	151650	1750	578550	519250	59300	425350	366750	58600	2.77	2.42	3.78	3.41
	2012-13	155500	153250	2250	614550	556750	57800	459050	403500	55550	2.95	2.63	3.95	3.63
	Average	153230	151365	1865	595633	535066	60567	442133	383416	58717	2.88	2.53	3.88	3.55
FLD	2013-14	159250	157100	2150	725625	666750	58875	566375	509650	56725	3.56	3.24	4.56	4.24
	2015-16	194350	192250	2100	702650	635700	66950	508300	443450	64850	2.61	2.31	3.62	3.31
	2016-17	207550	205450	2100	754100	669800	84300	546550	464350	81200	2.63	2.26	3.63	3.26
	2017-18	215450	213100	2350	906350	817300	89050	690900	604200	86700	3.21	2.84	4.21	3.84
	Average	194150	191975	2175	772180	697388	74792	578030	505413	72617	3.01	2.66	3.98	3.63
Avg. of OFT & FLD		173690	171670	2020	683907	616227	67680	510082	444415	65667	2.95	2.60	3.93	3.59

Fig-1 Spraying of GA3

Fig-2 Ready crop

The number of days were counted for first day of initiation of flower to harvest of bunch recorded and difference over treated and untreated of average was calculated.

ii) Fruit yield characters

Finger weight (g): The finger weight was individually weighted by 10 fruits from 3rd hand of selected bunch at harvesting time. The average value of all fruits shown in table.

Pulp, peal weight (g) and ratio: Artificially ripped banana fruit were taken for pulp, peal weight and ratio. Pulp & peal ratio was calculated by dividing pulp weight by peal weight.

c) Bunch weight (kg): The physiologically mature bunches were harvested when the fruit skin colour changed from green to light green and the ridges of the fruits disappeared. Bunches were weighed immediately after harvest.

f) Yield (q/ha): The yield per plot was recorded and multiplied by average bunch weight and total number of plants per hector.

g) Yield increase percentage: Yield increasing percentage was computed by yield of treated plot over untreated one multiplied by hundred.

iii) Economic evaluation (Rs. /ha.)

Gross cost, gross return, net return and differences in terms of rupees per hectare were calculated on the basis of marketable fruit yield and prices at market gate. The gross cost was worked out by considering the cost of all the operation right from preparation of land to harvesting of crop. Net return was worked out by subtracting the gross cost from gross return.

Gross cost & differences of gross cost over check
Gross return & differences of gross return over check
Net return & differences of net return over check
C: B ratio= Net return / Gross cost
Input output ratio= Gross return / Gross cost

Result and Discussion

Three years OFT and four years FLD data has been polarized and average data of both programmes shown in [Table-1 and 2] in respect of harvesting days, finger weight, pulp, peal, weight and ratio, yield and economic parameters, respectively.

It is clear from [Table-1] that the minimum day (reduces approximately 13 days) taken from flowering to harvesting was recorded when bunch was sprayed with GA_3 after male bud removing. It might be faster growth of finger due to cell elongation & cell division owing to additional nutrient supply and faster the physiological process. The result is consonant by Sanna *et al*., (2008) [8], Dinesh Kumar and Reddy (1998) [9] and Chattopadhyay and Jana (1988) [10].

The data presented in [Table-1] that pulp & peal weight, pulp/peal ratio, bunch weight, told yield and percentage of yield was increased with GA_3 spared bunches over without spared bunches. The pulp weight (119.7 g), pulp/peal ratio (3.13 %), finger weight (158.4 g), bunch weight (29.45 kg), total yield (912.8q/ha.) and percentage of yield (8.56%) superior over without spray of GA_3. It might be due to GA_3 function on cell elongation, cell division [11] and its impact on all physiological activities of plant. The results are in agreement by Rajni, *et al*., (2017) [12], Mulagund, *et.al*., (2015) [13], Sanna *et al*., (2008), Dinesh Kumar (1998) Samra *et.al.* (1989) [14] in banana.

The increase in pulp to peel ratio is due to the displacement of water from the peel towards the fruit pulp during the ripening process, resulted from the osmotic pressure from the higher sugar concentration of the pulp relative to the peel.
Data showed in [Table-2] that gross cost, gross return, net return, C: B ratio and input output ratio also affected by spraying of GA_3 on banana production. It is reported that average differences of gross cost Rs.2020.0/ ha. increases average differences of gross return Rs. 67680.0/ ha. and differences of net return Rs. 656670.0/ha., C:B ratio (2.95) and input output ratio (3.93) were also increases in treated plots over untreated plots. The results are in agreement by Patil *et al*., (2018) [15] and Digal (2016) [16].

Application of research: Gibralic acid has cell elongation property though it affects production of banana crop

Research Category: Agriculture economics

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1. Assessment of bio agent to control nematode in Chilli
2. Assessment of cowpea varieties
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4. Assessment of tomato variety
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