International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(6): 1023-1027

Received: 25-09-2019
Accepted: 27-10-2019

PK Modi
Fruit Research Station, Navsari Agricultural University, Gandevi, Gujarat, India

SM Chavan
Krishi Vigyan Kendra, NAU, Vyara- Tapi, Gujarat, India

SN Sarvaiyya
ASPEE College of Horticulture and Forestry, NAU, Navsari, Gujarat, India

Kirti Bardhan
ASPEE College of Horticulture and Forestry, NAU, Navsari, Gujarat, India

Corresponding Author:
PK Modi
Fruit Research Station, Navsari Agricultural University, Gandevi, Gujarat, India

Effect of IBA and its combinations with NAA on propagation of little gourd (*Coccinia grandis* L. Voigt) in plug trays

PK Modi, SM Chavan, SN Sarvaiyya and Kirti Bardhan

Abstract
Propagation trial was conducted for Little gourd [*Coccinia grandis* L. Voigt). Based on foregoing discussion it can be concluded that minimum days taken for sprouting of cuttings (7.21 days) of little gourd cv. GNLG-1 with treatment T_3 (500 ppm) IBA, maximum plant height (60.28 and 65.66 cm) 60 and 75 days after treatment as well root length (6.53, 6.84, 7.09 and 7.35 cm) was obtained with treatment T_3 (500 ppm IBA), significantly higher number of branches (2.58, 3.62, 3.84 and 4.11) 30, 45, 60 and 75 days after treatment and maximum number of roots (4.98, 5.71, 6.26 and 7.26) was obtained with treatment T_5 (IBA 1000 ppm) 30, 45, 60 and 75 days after treatment. Significantly higher success per cent of cuttings (62.84%) obtained with treatment T_2 (250 ppm IBA). Moreover, highest plants survival per cent in the field (95.04%) with treatment T_8 (IBA 750 ppm+ NAA 100 ppm) followed by T_4, T_7 and T_3. Maximum net realization (Rs. 89180) and BCR (1.31) was obtained with treatment T_2 (IBA 250 ppm).

Keywords: IBA, NAA, hormones, little gourd, root, net realization

Introduction
Little gourd, *Coccinia grandis* L. Voigt [Syn. C. Indica Wight and Arn, C. cordifolia L. Cong.] belongs to the family Cucurbitaceae. It is commonly known as 'Kundru' in Hindi and 'Ivy Gourd' in English. Little gourd is mostly termed as poor man's vegetable. This minor cucurbit has unique medicinal value of controlling diabetes, bronchitis, skin disorders and it checks fever. Little gourd also has anti-inflammatory and antioxidant activities. It is rich in carotene {Saikia and Phookan (2018) [7]}. In recent time, Little gourd is gaining the status of an important vegetable crop in India as well as Gujarat, because of increasing consumer awareness about its significant nutraceutical value. Little gourd requires a warm and humid climate with temperature ranging from 25-35°C and average rainfall of 1500-2500 mm. The crop is planted in round the year in Gujarat and the soil and climatic condition of the state is very much suitable for the cultivation of Little gourd. It is a hardy crop and has a very high fruit bearing capacity.

Little gourd is vegetative propagated. Therefore, plants derived from a single clone are genetically identical and phenotypically uniform, and also homogenity is maintained through clonal propagation. Lack of proper method of propagation and too less success rate in traditional methods due to that at the time of planting scarcity of planting material in the market. In this experiment find out effect of hormones and their combinations rate of success and survival of little gourd propagation.

Material and methods
The present experiment was conducted during the Year- 2014 to 2018 at the Model Nursery, Krishi Vigyan Kendra, Navsari Agricultural University, Navsari. A Complete Randomized Design (CRD) was used for experimentation, having three replications. Semi hard wood cuttings with three buds were taken from mature stems of the current season's growth. The experiment was performed in the month of July- August cuttings of uniform length (5 to 6 inches). The experiment with 9 treatments, which cuttings were dipped in different IBA concentrations of 0 ppm -control, 250, 500, 750 and 1000 ppm as well as combination of different levels of IBA with NAA 100 ppm with for 5 seconds and then planted in plug trays (60 plugs) with media of Cocopeat and Vermicompost in combination of 1:1. Cuttings were (60 plugs) with media of Cocopeat and Vermicompost in combination of 1:1. Cuttings were

planted in polyhouse. The data regarding plant survival percentage (%), number of days to sprout, Plant height (cm), No. of branches/cutting, number of roots per cutting, root length (cm) and survival % of plants in the field were recorded timely.

Results and discussion

Analysis of variance of the data showed that different types and concentrations of auxins applied to Little gourd cuttings resulted in significant differences at $P < 0.05$ for all variables measured for rooting and shoot sprouting, namely percent survival of cuttings, height of cuttings, number of branches per cutting, number of roots per cuttings, root length/cutting. Furthermore, a mean CRD for showed that the degree of responses of cuttings to form roots and shoots as well as shoot growth were different depending upon the types and concentrations of auxin applied.

Number of days taken for sprouting, rate of success (%) and survival in the field (%) of little gourd cuttings

The data presented in Table-1 show that different concentrations of IBA and its combinations with NAA had no significant effect on days taken for sprouting in cuttings was observed. Wahab *et al.* (2001) [10] and Mitra and Bose (1990) [6] also reported that there is no effect of IBA application on number of days to bud sprout. Bud sprouting may be due to the stored food materials (carbohydrates) in the cuttings.

The rate of success of cuttings was found significantly highest in treatment T_3, which is at par with treatment T_4 and T_2. The results are in accordance with that of Marshall and Warring (1985) [5] and Siddiqui and Hussain (2007) [8]. The survival of the cuttings treated with high concentrations of IBA may be directly linked with the capacity of the growth regulator to stimulate the generation of adventitious roots. The adventitious roots absorb mineral nutrients from the soil, which helps in the survival of the cuttings. Evidence for the involvement of IBA, in lateral root or adventitious root development was reported in rice by Wang *et al.* (2003) [11]. Chhun *et al.* (2004) [1] observed that IBA was also able to induce adventitious roots or lateral roots.

However, significantly higher percent survival in the field with treatment T_8, which is at par with treatment T_4, T_7 and T_5.

Table 1: Effect of IBA and its combinations with NAA on days taken for sprouting (Days) rate of success (%) and survival in the field (%) of little gourd cuttings.

Treatment	Days taken for sprouting (Days)	Rate of Success (%)	Survival in field (%)
T_1	9.57	42.3800	77.48
T_2	7.26	62.8378	84.37
T_3	7.21	62.6689	92.30
T_4	7.83	61.6933	94.59
T_5	8.30	51.0289	92.07
T_6	10.08	54.3178	91.59
T_7	9.87	45.0056	93.85
T_8	10.43	41.2500	95.04
T_9	10.63	47.6100	91.48
S.Em.±	0.1825	3.7823	1.3778
C.D. at 5 %	0.5423	11.3399	4.1309
YxT			
SEm±	0.2641	1.7062	1.5350
C.D. at 5 %	NS	4.8563	NS
C.V. %	5.07	5.68	2.94

Plant Height 30, 45, 60 and 75 days after treatment

In order to study of plant height significantly varies with different treatments involving with different levels of IBA and their combinations with NAA. In all, 9 treatments tested and results presented in Table 2. In case of plant height 30, 60 and 75 days after treatment significantly higher with treatment T_3 (IBA 500 ppm) is the best relevant to highest growth of plants (plant height) 30, 60 and 75 days after planting. IBA-derived auxin also appears to play a role in compensated cell enlargement (CCE), a phenomenon that allows for increased cell expansion to occur when cell numbers are limited in order to achieve a 'normal' organ size in plants (Elizabeth, 2018) [2].

Table 2: Effect of IBA and its combinations with NAA on plant height of little gourd cuttings 30, 45, 60 and 75 days after treatment.

Treatment	Plant height (cm) 30 DAT	Plant height (cm) 45 DAT	Plant height (cm) 60 DAT	Plant height (cm) 75 DAT
T_1	25.07	33.59	43.73	47.18
T_2	31.94	39.89	49.17	55.78
T_3	34.81	50.94	60.28	65.66
T_4	33.05	53.25	56.50	62.28
T_5	31.62	43.51	52.73	60.86
T_6	33.79	43.95	54.93	59.06
T_7	28.58	49.05	55.06	61.06
T_8	25.33	41.72	49.22	58.58
T_9	26.45	47.11	52.51	60.28
S.Em.±	0.3935	0.72	0.72	0.6356
C.D. at 5 %	1.1692	2.14	2.13	1.8885
YxT				
SEm±	0.7114	1.0793	1.2304	1.0630
C.D. at 5 %	2.0249	3.0719	3.5022	3.0255
C.V. %	4.30	4.14	4.00	3.21

Number of branches 30, 45, 60 and 75 days after treatment

From the reference of data given in Table 3, it is clear that number of branches was directly affected by the different concentrations of IBA and their combination with NAA. It is found that the maximum number of branches recorded 30, 45, 60 and 75 days after treatment with IBA 1000 ppm (T_5) gave significantly higher number of branches followed by treatment T_3 (500ppm) and T_8 (IBA 750 ppm + 100ppm NAA). Yusnita *et al.* (2018) and Stefancic *et al.* (2005) [9] reported that IBA has significantly influenced the number of branches per shoot. It is a fact that IBA directly affects the number of root and root growth and indirectly affects shoot length, which may result in a high number of branches per shoot.

Table 3: Effect of IBA and its combinations with NAA on number branches of little gourd cuttings 30, 45, 60 and 75 days after treatment

Treatment	No. of branches 30 DAT	No. of branches 45 DAT	No. of branches 60 DAT	No. of branches 75 DAT
T_1	1.55	1.91	2.12	2.33
T_2	1.63	2.60	2.66	3.12
T_3	2.11	3.12	3.25	3.81
T_4	2.13	2.45	2.91	3.37
T_5	2.58	3.62	3.84	4.11
T_6	2.57	2.96	3.37	3.80
T_7	2.40	3.08	3.38	3.66
T_8	2.57	3.07	3.27	3.64
T_9	2.18	2.48	2.69	3.18
S.Em.±	0.0582	0.0925	0.0533	0.0574
C.D. at 5 %	0.1729	0.2748	0.1584	0.1706
YxT				
SEm±	0.0847	0.1182	0.0940	0.0777
C.D. at 5 %	0.2411	0.3363	0.2675	0.2212
C.V. %	6.48	7.35	5.54	4.22

Number of roots 30, 45, 60 and 75 days after treatment

The data on rooting response of cuttings to different levels of IBA and their combinations with NAA presented in Table varies in individual year and in pooled analysis. In table 4 observed that cuttings treated with treatment T_5 (IBA 1000 ppm) produced significantly maximum number of roots in cutting 30, 45, 60 and 75 days after treatment. IBA-derived auxin has strong roles in various aspects of root development, including regulation of root apical meristem size, root hair elongation, lateral root development, and formation of adventitious roots (Elizabeth, 2018). [2]

Table 4: Effect of IBA and its combinations with NAA on number roots of little gourd cuttings 30, 45, 60 and 75 days after treatment

Treatment	No. of roots 30 DAT	No. of roots 45 DAT	No. of roots 60 DAT	No. of roots 75 DAT
T_1	2.31	3.33	3.91	4.35
T_2	3.20	4.01	4.87	5.25
T_3	4.86	5.52	6.27	6.79
T_4	4.23	4.88	5.70	6.01
T_5	4.98	5.71	6.26	7.26
T_6	4.12	5.07	6.12	6.29
T_7	4.14	5.58	5.83	6.22
T_8	4.61	5.48	5.88	6.52
T_9	4.31	5.06	5.87	6.49
S.Em.±	0.0604	0.0817	0.1007	0.0472
C.D. at 5 %	0.1795	0.2428	0.2992	0.1402
YxT				
SEm±	0.0950	0.1483	0.1345	0.0875
C.D. at 5 %	0.2705	0.4222	0.3828	0.2489
C.V. %	3.99	4.99	4.22	2.69

Root length (cm) 30, 45, 60 and 75 days after treatment

Effect on length of roots per cutting to different levels of IBA and their combinations with NAA is presented in Table 5. It is recorded that significantly maximum length of roots per cutting with treatment T_3 (IBA 500 ppm) 30, 45, 60 and 75 days after treatment. Auxin affects the positioning of the root hair outgrowth site and promotes root hair elongation (Honkanen and Dolan, 2016) [3].

Table 5: Effect of IBA and its combinations with NAA on root length of little gourd cuttings 30, 45, 60 and 75 days after treatment

Treatment	Length of roots (cm) 30 DAT	Length of roots (cm) 45 DAT	Length of roots (cm) 60 DAT	Length of roots (cm) 75 DAT
T_1	4.48	5.17	5.68	5.81
T_2	6.00	6.55	6.79	7.01
T_3	6.53	6.84	7.09	7.35
T_4	5.63	6.42	6.63	6.88
T_5	5.90	6.40	6.70	6.98
T_6	6.03	6.77	6.88	7.11

T_7	5.72	6.18	6.50	6.77
T_8	5.44	5.92	6.46	6.77
T_9	6.22	6.54	6.82	7.20
S.Em.±	0.063	0.063	0.0551	0.054
C.D. at 5 %	0.1872	0.1872	0.1637	0.1604
YxT				
SEm±	0.0951	0.1043	0.0899	0.0839
C.D. at 5 %	0.2708	0.2967	0.2558	0.2387
C.V. %	2.80	2.98	2.44	2.19

Table 6. Economics little gourd propagation with different levels of IBA and their combinations

Different levels of IBA and their combinations with NAA were presented in Table 6. Looking to the economics of the experiment maximum net realization (Rs. 89180) and BCR (1.31) was obtained with treatment T_2 (IBA 250 ppm) followed by treatment T_3 (IBA 500 ppm) and T_4 (IBA 750 ppm) which net realization Rs. 88255 and Rs. 85080 as well as BCR 1.29 and 1.23 respectively.

Table 6: Economics

Treatments	Total cuttings success ($500m^2$)	Treatment cost (Rs./$500m^2$)	Variable cost of inputs (Rs./$500m^2$)	Fixed cost (Rs./$500m^2$)	Total expenditure (Rs./$500m^2$)	Gross income (Rs./$500m^2$)	Net income (Rs./$500m^2$)	Benefit cost ratio
T_1	11230	0	58920	8500	67420	105950	38530	0.57
T_2	16460	500	58920	8500	67920	157100	89180	1.31
T_3	16738	1000	58920	8500	68420	156675	88255	1.29
T_4	16588	1500	58920	8500	68920	154000	85080	1.23
T_5	13453	2000	58920	8500	69420	127575	58155	0.84
T_6	14303	625	58920	8500	68045	135800	67755	1.00
T_7	11993	1125	58920	8500	68545	112525	43980	0.64
T_8	11088	1625	58920	8500	69045	103125	34080	0.49
T_9	12603	2125	58920	8500	69545	119025	49480	0.71

Annexure-I

S.no.	Item	T1	T2	T3	T4	T5	T6	T7	T8	T9
1	Planting material	25000	25000	25000	25000	25000	25000	25000	25000	25000
2	Hired labour	17800	17800	17800	17800	17800	17800	17800	17800	17800
3	Cocopeat	3250	3250	3250	3250	3250	3250	3250	3250	3250
4	Vermicompost	2475	2475	2475	2475	2475	2475	2475	2475	2475
5	Insecticide	1500	1500	1500	1500	1500	1500	1500	1500	1500
6	Plug tray cost	5040	5040	5040	5040	5040	5040	5040	5040	5040
7	Depriciation	0	0	0	0	0	0	0	0	0
8	Interest on working capital@7% of 1 to 7	3855	3855	3855	3855	3855	3855	3855	3855	3855
9	Common cost (1 to 8)	58920	58920	58920	58920	58920	58920	58920	58920	58920
10	Treatment cost	0	500	1000	1500	2000	625	1125	1625	2125
11	Cost A (9+10)	58920	59420	59920	60420	60920	59545	60045	60545	61045
12	Total plants survival	10595	15710	15668	15400	12758	13580	11253	10313	11903
13	Price- Rs./kg	10	10	10	10	10	10	10	10	10
14	Gross income (12*13)	105950	157100	156675	154000	127575	135800	112525	103125	119025
15	Fixed cost B (Rental value of owned land 6.25% of 9)	8500	8500	8500	8500	8500	8500	8500	8500	8500
16	Total cost B (11+15)	67420	67920	68420	68920	69420	68045	68545	69045	69545
17	Net income (14-16)	38530	89180	88255	85080	58155	67755	43980	34080	49480
18	Returns per rupee (17/16)	0.57	1.31	1.29	1.23	0.84	1.00	0.64	0.49	0.71

References

1. Chhun T, Taketa S, Tsurumi S, Ichii M. Different behaviour of indole-3-acetic acid and indole-3-butyric acid in stimulating lateral root development in rice (*Oryza sativa* L.). Plant growth regulation. 2004; 43:135-143.
2. Elizabeth M, Frick, Lucia C, Strader. Roles for IBA-derived auxin in plant development. J of Exp. Botany. 2018; 69(2):169-177.
3. Honkanen S, Dolan L. Growth regulation in tip-growing cells that develop on the epidermis. Cur. Opinion in Plant Bio. 2016; 34:77-83.
4. Jan I, Sajid M, Rab A, Iqbal A, Khan O, Jamal Y, Ahmad N, Ali A, Shakoorand M, Shah ST. Effect of various concentrations of Indole butyric acid (IBA) on olive cuttings. Mitt Eilungen Klosterneuburg. 2015; 65:49-55.
5. Marshall KF, Warring G. Effect of number of roots on survival percentage and shoot development in cuttings. Plant Cell Physiol. Culture. 1985; 16:563-569.
6. Mitra SK, Bose TK. Fruits, tropical and sub-tropical, Naya Prakash Calcutta, 1990.
7. Saikia J, Phookan DB. Evaluation of Ivy gourd (*Coccinia grandis* L. Voigt) genotypes in N.E. region of India. Int. J of Agri. Sci. 2018; 10(6):5642-5644.
8. Siddiqui MI, Hussain SA. Effect of indole butyric acid and types of cuttings on root initiation of Ficus hawaii. Sarhad J Agric. 2007; 23(4):919-925.
9. Stefancic M, Stampar F, Osterc G. Influence of IAA and IBA on root development and quality of Prunus 'GiSelA 5' leafy cuttings. Hort Science. 2005; 40:2052-2055.
10. Wahab F, Nabi G, Nawab AM, Shah M. Rooting response of semi-hardwood cuttings of guava (*Psidium*

guajava L.) to various concentrations of different auxins. Online J Biol. Sci. 2001; 1:184-187.
11. Wang S, Taketa S, Ichii M, Xu L, Xia K, Zhou X. Lateral root formation in rice (*Oryza sativa* L.): differential effects of indole- 3-acetic acid and indole-3-butyric acid. Plant growth regulation. 2003; 41:41-47.
12. Yusnita, Jamaludin, Agustiansyah, Hapsoro D. A Combination of IBA and NAA Resulted in Better Rooting and Shoot Sprouting than Single Auxin on Malay Apple [*Syzygium malaccense* (L.) Merr. & Perry] Stem Cuttings. AGRIVITA J of Agril. Sci. 2018; 40(1):80-90.