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Vikas Mandloi
Department of Horticulture, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya, Pradesh, India

Rajesh Lekhi
Department of Horticulture, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya, Pradesh, India

Devendra Vishvkarma
Department of Horticulture, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya, Pradesh, India

Amit Sharma
Department of Horticulture, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya, Pradesh, India

Correspondence
Vikas Mandloi
Department of Horticulture, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, Madhya, Pradesh, India

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Response of naphthalene acetic acid and colour poly wrappers on callusing, rooting and survival of air Layering of guava (*Psidium Guajava* L.) cv. Gwalior 27.

Vikas Mandloi, Rajesh Lekhi, Devendra Vishvkarma and Amit Sharma

Abstract
The experiment was carried out to "Effect of different concentrations of NAA (foliar spray) and different colour poly wrappers on air-layering of guava (*Psidium guajava* L.) cv. Gwalior 27" during the season of *Kharif* 2016-17 at the Horticulture nursery, Department of Horticulture, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, (M.P.). Results revealed that significantly maximum rooting such as callus formation (0.44cm), number of primary roots per layer (7.46) and secondary roots per layer (9.55) and rooting percentage (61.12%), survival percentage (47.31%) and growth studies i.e. number of shoots per layer (2.17), number of leaves per layer (4.13) and length of air layer (5.49 cm) in air layers of guava was recorded with the application of 125 ppm NAA (N_4). Black poly wrapper (W_2) exhibited significantly maximum callus formation (0.39cm), number of primary roots per layer (6.57) and secondary roots per layer (9.21) and rooting percentage (54.79%), survival percentage (43.75%) number of shoots per layer (2.04), number of leaves per layer (4.19) and length of air layer (6.31 cm) at 60 days after layering. These parameter was also significantly maximum under the treatment combination of N_4W_2 (NAA @ 125 ppm + Black poly wrapper) over the N_1W_1 (NAA @ 50 ppm + White poly wrapper).

Keywords: Guava, NAA, poly wrapper and air layering

Introduction
Guava (*Psidium guajava* L.), is one of the most popular fruits grown in tropical, sub-tropical and some parts of arid regions of India. It is also a cheap and very rich source of vitamin-C, carbohydrate, iron, fat and contains a fair amount of calcium and phosphorus as well. These qualities make guava an important and one of the most popular fruits of India. Guava fruits are rich in pectin content, hence it is extensively used in preparation of jelly. Besides, its diabetic value, the fruit also is used in preparing cheese, butter, paste, juice, juice concentrate, powder, canned slice/shell, nectar, puree and ice cream. India is the leading producer of guava in the world. Total area and production of guava in India is about 262 thousand hectares and 3648 thousand MT, respectively and productivity of guava is 13.92 MT/ha. Madhya Pradesh ranks second in productivity with 17.27 MT/ha and it is grown 30.31 thousand hectares and produce 523.75 thousand MT. (Anonymous, 2017) [1].

Air- layring is an easy method of propagation of this crop. Auxins particularly IBA and NAA have been reported to induce rooting in many of the plant species with varied success. The response of different growth substances to percent success varied from species to species with changing physiological and environmental conditions. Most of the workers have reported IBA and NAA as better growth regulators than others for inducing rooting in cuttings and air-layring due to their stable nature. Air layering was reported to have given good results (Hartmann and Kester, 1972) [3]. Air layering with the help of growth substances is more efficacious and is the best method of vegetative propagation of guava as reported by Mujumdar and Mukherjee (1968) [4]. Plastic materials are also widely used in the horticultural industry *viz*. in glass house propagation of cuttings, for mass propagation in bud grafting and air layering. Polythene was discovered by scientist in the United Kingdom in 1933 and

polythene sheet are now available in different gauges and color. Polythene wrapper has properties which in some aspects make in similar to the outer skin of plants. It is water proof, transmits light and allows gaseous exchange of oxygen and carbon-dioxide and low transmission of water vapour.

Keeping in view an experiment was conducted to identify the best concentration of the growth regulators and colour of poly wrapper which can induce better rooting in air-layers and can improve the survival of guava after detachment.

Materials and Methods

The experiment was carried out to "Effect of different concentrations of NAA (foliar spray) and different colour poly wrappers on air-layering of guava (*Psidium guajava* L.) cv. Gwalior 27" during the season of *Kharif* 2016-17 at the Horticulture nursery, Department of Horticulture, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior, (M.P.). The experimental material for the present investigation was comprised of 12 treatment combinations *viz*., foliar sprays of four levels of NAA i.e. 50, 75, 100 and 125 ppm and three levels of poly wrappers i.e. white, black and blue were used at the time of layering and were replicated three times in Asymmetrical Factorial Randomized Complete Block Design. On the selected branches a ring bark of about 2.0 cm size is removed by budding knife just below the bud without injuring the under lying woody xylem portion. The as par treatment NAA solution was applied uniformly on all sides of the upper cut of the ring with camel hair brush. After application of growth regulators cut portions were covered with rooting media containing a mixture of farm yard manure and field soil in 1:1 ratio and wrapped with three colours polythene film (400 gauze) and tied with sutli. The air layers were detached by making a sharp cut with secateurs just below the cut after 65 days of operation. Then polythene cover was removed after dipping them in water for avoiding injury to the roots, and immediately air layers were planted in polythene bags. The observation on callus formation (mm), number of primary roots per layer, number of secondary roots per layer, rooting percentage, survival percentage after planting, number of shoots per layer, number of leaves per layer, and length of air layer (cm) were observed. Observations were recorded on the basis of five random competitive layers and plants selected in each treatment separately for root and shoot characteristics at 30 and 60 days after layering and planting in polybag respectively and were evaluated as per standard procedure. The data were statistically analyses to find out overall total variability present in the material by following procedure as suggested by Panse and Sukhatme (1985) [5].

Results and Discussion

It is evident from data in Table 1, callus formation of air layers guava at the time of detachment was significantly influenced due to various levels of NAA and colour poly wrappers. It was increased as the concentrations were increased from 50 to 125 ppm of NAA and colour poly wrappers were found to be significantly increased. The significantly maximum 0.44 cm callus formation was recorded in the treatment NAA 125 ppm (N_3) followed by NAA 100 ppm (N_2) (0.38 cm). However, the lowest 0.20 cm callus formation was found in NAA 50 ppm (N_1). These findings are in agreement with the findings of Shrivastava (2000) and Tomar (2011) [14].

The significantly maximum 0.39 cm callus formation was recorded under treatment W_2 (Black poly wrapper), while, minimum callus formation (0.27 cm) was recorded in treatment W_1 (White poly wrapper).

Interaction of levels of NAA and colour polywrappers N_4W_2 (NAA @ 125 ppm + Black poly wrapper) was recorded significantly maximum 0.52 cm callus formation, followed by N_3W_2 (NAA @ 100 ppm + Black poly wrapper) 0.46 cm and N_4W_3 (NAA @ 125 ppm + Blue poly wrapper) 0.44 cm as compared to other treatments. While, the minimum 0.16 cm callus formation were recorded in the treatment combination of N_1W_1 (NAA @ 50 ppm + White poly wrapper). It was affected due to the hormone application and accumulation of chemical substances present in layer part of stem (i.e. 15000ppm IBA) which stimulated the meristem, divided quickly and produced roots. It also may be due to the rhizocarpic the effective agent in initiating root formation which was mobilized by the application of synthetic hormones. These findings are in agreement with the findings of Singh (2001) [12].

The significantly maximum 4.81 and 7.46 primary roots per layer were recorded in treatment N_4 (NAA @ 125 ppm) (Table 1) followed by N_3 (NAA @ 100 ppm) 4.26 and 5.89 at 30 and 60 days after layering, respectively. While, it was recorded minimum 2.85 and 4.33 primary roots per layer at 30 and 60 days after layering, respectively. These findings are in agreement with the findings of Tomar *et al*. (1999a) [13], Tomar (2011) [14], Patel *et al*. (2012) [6] and Singh and Pathak (2012) [12].

Black poly wrapper (W_2) was significantly superior and was recorded maximum 4.90 and 6.57 primary roots per layer as compared to white poly wrapper (W_1) (3.03 and 4.82 primary roots per layer) at 30 and 60 days after layering, respectively.

Interaction effects of different levels of NAA and colour poly wrappers, the treatment combination of N_4W_2 (NAA @ 125 ppm + Black poly wrapper) was recorded significantly maximum 6.0 and 8.55 primary roots per layer followed by N_3W_2 (NAA @ 100 ppm + Black poly wrapper) (5.64 and 7.54) and N_4W_3 (NAA @ 125 ppm + Blue poly wrapper) (4.48 and 7.23) at 30 and 60 days after layering, respectively. While, the minimum 2.17 and 3.88 primary roots per layer were recorded in the treatment combination of N_1W_1 (NAA @ 50 ppm + White poly wrapper) at 30 and 60 days after layering, respectively. This may be due to decomposed organic material improve soil fertility by increasing soil aeration, water holding capacity and water infiltration and lower surface crusting resulted in maximum root growth. These findings are in agreement with the findings of Singh (2001) [12] and Yeboah *et al*. (2014) [16].

The treatment N_4 (NAA @ 125 ppm) was recorded significantly maximum 6.47 and 9.55 secondary roots per layer followed by N_3 (NAA @ 100 ppm) 5.94 and 8.56 at 30 and 60 days after layering, respectively and which were at par with each other at 30 days after layering. While, it was recorded minimum 5.08 and 6.38 secondary roots per layer at 30 and 60 days after layering, respectively (Table 1). These findings are in agreement with the findings of Tomar *et al*. (1999a) [12], Tomar (2011) [14], Patel *et al*. (2012) [6] and Singh and Pathak (2012) [12].

Black poly wrapper (W_2) was significantly superior and was recorded maximum 6.59 and 6.21 secondary roots per layer as compared to white poly wrapper (W_1) (5.20 and 7.01 secondary roots per layer) at 30 and 60 days after layering, respectively.

The treatment combination of N_4W_2 (NAA @ 125 ppm + Black poly wrapper) was recorded maximum 7.81 and 10.85 secondary roots per layer followed by N_3W_2 (NAA @ 100

ppm + Black poly wrapper) (6.90 and 9.84) and N_4W_3 (NAA @ 125 ppm + Blue poly wrapper) (5.84 and 9.38) at 30 and 60 days after layering, respectively. While, the minimum 4.71 and 5.51 secondary roots per layer were recorded in the treatment combination of N_1W_1 (NAA @ 50 ppm + White poly wrapper) at 30 and 60 days after layering, respectively. This may be due to decomposed organic material improve soil fertility by increasing soil aeration, water holding capacity and water infiltration and lower surface crusting resulted in maximum root growth. These findings are in agreement with the findings of Singh (2001) [12] and Yeboah *et al*. (2014) [16].

As regards to concentrations of NAA, treatment N_4 (NAA 125 ppm) was significantly superior and recorded highest 61.12% rooting (Table 1) followed by N_3 (NAA 100 ppm) (51.53%) as compared to other treatment, while, it was observed lowest 35.39% rooting in the treatment NAA 50 ppm (N_1). Similar findings were also reported by Shrivastava (2000), Tomar (2011) [11], Singh and Pathak (2012) [12] and Raut *et al*. (2015) [8].

Significantly highest 54.79% rooting was observed under the treatment W_2 (Black poly wrapper) and lowest 42.64% rooting in the treatment W_1 (white poly wrapper). Black polythene significantly increased the percentage of rooting in minimum period in comparison to other treatment. It can be use successfully to hold moisture with rooting media around the part to be rooted and the same time covered by layered area to protect against damage as well as keeping the portion from becoming too hard. Similar findings were also reported by Patel *et al*. (1989) [6], Baghel (1989) [2] and Verma and Patel (2004) [6].

Amongst interaction of both the factor, the treatment combination of N_4W_2 (NAA @ 125 ppm + Black poly wrapper) was recorded significantly highest 65.63% rooting followed by N_3W_2 (NAA @ 100 ppm + Black poly wrapper) (60.97%) and N_4W_3 (NAA @ 125 ppm + Blue poly wrapper) (58.07%), while, the lowest 30.57% rooting was recorded in the treatment combination of N_1W_1 (NAA @ 50 ppm + White poly wrapper). This may be due to increased level of growth promoting substances, available nutrients with the application 125 ppm NAA. Similar findings were also reported by Sen *et al*. (1972) [9] and Yeboah *et al*. (2014) [16].

It is evident from the results (Table 2) that the survival percentage gradually increased in concentrations of NAA N_1 to N_4. Treatment N_4 (NAA 125 ppm) was recorded highest 47.31% survival followed by N_3 (NAA 100 ppm) (40.74%) as compared to other treatment, while, it was observed lowest 33.52% survival in the treatment NAA 50 ppm (N_1) at 60 days after planting of air-layering. These findings are in agreement with the findings of Tomar *et al*. (1999a), Shrivastava (2000), Tomar (2011) [14], Patel *et al*. (2012) [6], Singh and Pathak (2012) [11] and Raut *et al*. (2015) [8].

Significantly highest 43.75% survival was observed under the treatment W_2 (Black poly wrapper) and lowest 37.10% survival in the treatment W_1 (white poly wrapper) at 60 days after planting of air-layering. Similar findings were also reported by Patel *et al*. (1989) [6] and Baghel (1989) [2] reported that this beneficial response obtained by black polythene may be due to effect of etiolation.

Amongst interaction of both the factor, the treatment combination of N_4W_2 (NAA @ 125 ppm + Black poly wrapper) was recorded significantly highest 50.93% survival followed by N_3W_2 (NAA @ 100 ppm + Black poly wrapper) (46.30%) and N_4W_3 (NAA @ 125 ppm + Blue poly wrapper) (46.17%), while, the lowest 32.30% survival was recorded in the treatment combination of N_1W_1 (NAA @ 50 ppm + White poly wrapper) at 60 days after planting of air-layering. This may be due to increased level of growth promoting substances, available nutrients with the application 15000 ppm IBA. Similar findings were also reported by Sen *et al*. (1972) [9], Singh (2001) [12] and Yeboah *et al*. (2014) [16].

Number of shoots per layer increased with increased period of growth. Among concentrations of NAA, treatment N_4 (NAA 125 ppm) was recorded maximum 1.96 and 2.17 shoots per layer followed by N_3 (NAA 100 ppm) (1.80 and 1.96 shoots) as compared to other treatment, while, it was observed lowest 1.30 and 1.62 shoots in the treatment NAA 50 ppm (N_1) at 30 and 60 days after planting of air-layering, respectively (Table 4.2). These findings are in agreement with the findings of Tomar *et al*. (1999a) [11] and Patel *et al*. (2012) [6].

As regards to colour poly wrappers, significantly maximum 1.88 and 2.04 shoots per layer was observed under the treatment W_2 (Black poly wrapper) and lowest 1.46 and 1.73 shoots per layer in the treatment W_1 (white poly wrapper) at 30 and 60 days after planting of air-layering, respectively.

The treatment combination of N_4W_2 (NAA @ 125 ppm + Black poly wrapper) was recorded significantly maximum 2.16 and 2.26 shoots per layer followed by N_3W_2 (NAA @ 100 ppm + Black poly wrapper) (2.02 and 2.26) and N_4W_3 (NAA @ 125 ppm + Blue poly wrapper) (1.92 and 2.22) at 30 and 60 days after planting of air-layering, respectively. While, the minimum 0.98 and 1.47 shoots per layer were recorded in the treatment combination of N_1W_1 (NAA @ 50 ppm + White poly wrapper) at 30 and 60 days after planting of air-layering, respectively. This may be due to increased level of growth promoting substances, available nutrients with the application 125 ppm NAA.

Number of leaves per layer increased with increased period of growth. Among concentrations of NAA, treatment N_4 (NAA 125 ppm) was recorded maximum 3.86 and 4.13 leaves per layer followed by N_3 (NAA 100 ppm) (3.63 and 4.0 leaves) as compared to other treatment, while, it was observed lowest 2.87 and 3.25 leaves in the treatment NAA 50 ppm (N_1) at 30 and 60 days after planting of air-layering, respectively (Table 4.2). Similar findings were also reported by Tomar *et al*. (1999a) [14], Tomar (2011) [14], Patel *et al*. (2012) [6] and Raut *et al*. (2015) [8].

As regards to colour poly wrappers, significantly maximum 3.81 and 4.19 leaves per layer was observed under the treatment W_2 (Black poly wrapper) and lowest 3.11 and 3.38 leaves per layers in the treatment W_1 (white poly wrapper) at 30 and 60 days after planting of air-layering, respectively.

The treatment combination of N_4W_2 (NAA @ 125 ppm + Black poly wrapper) was recorded significantly maximum 4.13 and 4.54 leaves per layer followed by N_3W_2 (NAA @ 100 ppm + Black poly wrapper) (3.97 and 4.38 leaves) and N_4W_3 (NAA @ 125 ppm + Blue poly wrapper) (3.93 and 4.26 leaves) at 30 and 60 days after planting of air-layering, respectively. While, the minimum 2.47 and 3.04 leaves per layer were recorded in the treatment combination of N_1W_1 (NAA @ 50 ppm + White poly wrapper) at 30 and 60 days after planting of air-layering, respectively. This can be attributed due to increased level of growth promoting substance, accumulation of photosynthates metabolites and better water absorption.

Length of air layer increased with increased period of growth. Among concentrations of NAA, treatment N_4 (NAA 125 ppm) was recorded maximum 4.89 and 5.49 cm length of air layer followed by N_3 (NAA 100ppm) (4.23 and 5.15 cm) as compared to other treatment, while, it was observed lowest 3.08 and 4.20 cm in the treatment NAA 50 ppm (N_1) at 30 and

60 days after planting of air-layering, respectively and which were at par with each other at 60 days after planting of air-layering (Table 4.2). These findings are in agreement with the findings of Tomar *et al*. (1999a) [13], Tomar (2011) [14], Patel *et al*. (2012) [6] and Raut *et al*. (2015) [8].

As regards to colour poly wrappers, significantly maximum 5.53 and 6.31 cm length of air layer was observed under the treatment W_2 (Black poly wrapper) and lowest 2.45 and 3.37 cm length of air layer in the treatment W_1 (white poly wrapper) at 30 and 60 days after planting of air-layering, respectively.

Table 1: Effect of different concentrations of NAA and colour poly wrappers on callusing, rooting and rooting per cent in air layers of guava

Treat. Symb.	Treatment	Callus formation (cm)	Number of primary roots per layer		Number of secondary roots per layer		Rooting percentage
			30 Days	60 Days	30 Days	60 Days	
N_1	NAA @ 50 ppm	0.20	2.85	4.33	5.08	6.38	35.39
N_2	NAA @ 75 ppm	0.30	3.32	4.78	5.39	7.29	46.74
N_3	NAA @ 100 ppm	0.38	4.26	5.89	5.94	8.56	51.53
N_4	NAA @ 125 ppm	0.44	4.81	7.46	6.47	9.55	61.12
	SEm±	0.003	0.12	0.02	0.19	0.01	0.40
	CD at 5% level	0.010	0.36	0.06	0.58	0.04	1.14
W_1	White poly wrapper	0.27	3.03	4.82	5.20	7.01	42.64
W_2	Black poly wrapper	0.39	4.90	6.57	6.59	9.21	54.79
W_3	Blue poly wrapper	0.33	3.51	5.45	5.37	7.62	48.66
	SEm±	0.003	0.11	0.02	0.17	0.01	0.35
	CD at 5% level	0.008	0.32	0.05	0.51	0.03	0.99
N_1W_1	NAA @ 50 ppm + White poly wrapper	0.16	2.17	3.88	4.71	5.51	30.57
N_1W_2	NAA @ 50 ppm + Black poly wrapper	0.24	3.81	5.03	5.64	7.55	42.00
N_1W_3	NAA @ 50 ppm + Blue poly wrapper	0.21	2.58	4.06	4.89	6.08	33.60
N_2W_1	NAA @ 75 ppm + White poly wrapper	0.25	2.67	4.30	4.98	6.30	37.93
N_2W_2	NAA @ 75 ppm + Black poly wrapper	0.35	4.14	5.48	6.01	8.58	53.47
N_2W_3	NAA @ 75 ppm + Blue poly wrapper	0.29	3.13	4.58	5.19	7.00	48.83
N_3W_1	NAA @ 100 ppm + White poly wrapper	0.31	3.30	4.81	5.35	7.81	45.30
N_3W_2	NAA @ 100 ppm + Black poly wrapper	0.46	5.64	7.54	6.90	9.84	60.97
N_3W_3	NAA @ 100 ppm + Blue poly wrapper	0.38	3.83	5.63	5.56	8.01	51.23
N_4W_1	NAA @ 125 ppm + White poly wrapper	0.37	3.97	6.30	5.75	8.41	56.77
N_4W_2	NAA @ 125 ppm + Black poly wrapper	0.52	6.00	8.55	7.81	10.85	65.63
N_4W_3	NAA @ 125 ppm + Blue poly wrapper	0.44	4.48	7.23	5.84	9.38	58.07
	S.Em±	0.006	0.21	0.03	0.34	0.02	0.70
	CD at 5% level	0.017	N.S.	0.10	N.S.	0.07	1.97

Table 2: Effect of different concentrations of NAA and colour poly wrappers on survival per cent and growth parameters in air layers of guava

Treat. Symb.	Treatment	Survival percentage	No. of shoots/ layer		No. of leaves/ layer		Length of air layer (cm)	
			30 Days	60 Days	30 Days	60 Days	30 Days	60 Days
N_1	NAA @ 50 ppm	33.52	1.30	1.62	2.87	3.25	3.08	4.20
N_2	NAA @ 75 ppm	38.36	1.61	1.79	3.56	3.94	3.78	4.36
N_3	NAA @ 100 ppm	40.74	1.80	1.96	3.63	4.00	4.23	5.15
N_4	NAA @ 125 ppm	47.31	1.96	2.17	3.86	4.13	4.89	5.49
	S.Em±	0.48	0.01	0.01	0.006	0.03	0.07	0.12
	CD at 5% level	1.43	0.03	0.03	0.017	0.10	0.22	0.38
W_1	White poly wrapper	37.10	1.46	1.73	3.11	3.38	2.45	3.37
W_2	Black poly wrapper	43.75	1.88	2.04	3.81	4.19	5.53	6.31
W_3	Blue poly wrapper	39.10	1.66	1.89	3.52	3.91	4.00	4.72
	S.Em±	0.42	0.01	0.01	0.005	0.03	0.06	0.11
	CD at 5% level	1.23	0.03	0.03	0.015	0.09	0.19	0.33
N_1W_1	NAA @ 50 ppm + White poly wrapper	32.30	0.98	1.47	2.47	3.04	1.09	1.91
N_1W_2	NAA @ 50 ppm + Black poly wrapper	35.13	1.57	1.80	3.36	3.56	4.82	5.98
N_1W_3	NAA @ 50 ppm + Blue poly wrapper	33.13	1.33	1.58	2.80	3.16	3.32	4.72
N_2W_1	NAA @ 75 ppm + White poly wrapper	34.90	1.47	1.69	3.23	3.46	2.56	3.36
N_2W_2	NAA @ 75 ppm + Black poly wrapper	42.77	1.77	1.91	3.81	4.29	5.19	5.89
N_2W_3	NAA @ 75 ppm + Blue poly wrapper	37.40	1.58	1.79	3.63	4.07	3.60	3.82
N_3W_1	NAA @ 100 ppm + White poly wrapper	36.50	1.58	1.71	3.27	3.46	2.85	3.94
N_3W_2	NAA @ 100 ppm + Black poly wrapper	46.30	2.02	2.20	3.97	4.38	5.79	6.56
N_3W_3	NAA @ 100 ppm + Blue poly wrapper	39.57	1.80	1.98	3.69	4.16	4.05	4.95
N_4W_1	NAA @ 125 ppm + White poly wrapper	44.70	1.81	2.05	3.47	3.57	3.31	4.27
N_4W_2	NAA @ 125 ppm + Black poly wrapper	50.93	2.16	2.26	4.13	4.54	6.32	6.81
N_4W_3	NAA @ 125 ppm + Blue poly wrapper	46.17	1.92	2.22	3.93	4.26	5.05	5.40
	S.Em±	0.73	0.02	0.02	0.01	0.06	0.12	0.22
	CD at 5% level	2.47	0.06	0.06	0.03	0.18	0.38	0.66

The treatment combination of N_4W_2 (NAA @ 125 ppm + Black poly wrapper) was recorded significantly maximum 6.32 and 6.81 cm length of air layer followed by N_3W_2 (NAA @ 100 ppm + Black poly wrapper) (5.79 and 6.56 cm) and

N_4W_3 (NAA @ 125 ppm + Blue poly wrapper) (5.05 and 5.40 cm) at 30 and 60 days after planting of air-layering, respectively and treatments N_4W_2 and N_3W_2 were at par with each other at 60 days after planting of air-layering. While, the minimum 1.09 and 1.91 cm length of air layer were recorded in the treatment combination of N_1W_1 (NAA @ 50 ppm + White poly wrapper) at 30 and 60 days after planting of air-layering, respectively. This might be due to the development of more sprouts length, more meristamatic activity and better performance.

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