Sprouting and growth of orange jasmine (*Murraya paniculata* L.) as influenced by type of hormone and concentration

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Abstract
Orange jasmine is an evergreen ornamental shrub widely used in landscaping design, it belongs to the family Rutaceae and is native to South Asia, Southeast Asia and Australia. However it is difficult to propagate and this affect the rate of its survival during propagation. An experiment to determine the growth and aesthetic characteristics of *Murraya paniculata* L as influenced by type of hormone and concentration was carried out in the horticultural nursery, Department of Crop Production, Federal University of Technology, Minna, Niger State, Nigeria. Treatments consists of hormone type (Indole-3-Acetic Acid (IAA) and Indole-3-Butyric Acid (IBA)) at 4 different concentrations (0, 1000, 2000, 3000 mg/l). The experiment was a 2 x 4 factorial in a Completely Randomized Design (CRD) with three replications. Data collected on growth and flowering parameters were subjected to Analysis of variance [ANOVA] using Genstat 12.0 version and treatment means were separated using the least significant difference (LSD) at ($p \leq 0.05$). Sprouting commenced 20 days after planting (DAP) for cuttings dipped in both IAA and IBA hormones, highest number of leaves was recorded for cutting dipped in IAA (17.25) and those dipped in IBA had the least (15.55). Stem cuttings dipped in 1000 mg/l concentration had optimum plant height, highest number of sprouts, and broadest leaf area. The stem girth of cuttings dipped in 1000 ml is thicker than those dipped in other concentrations. It could therefore be concluded that using IAA at 1000 ml hormone concentration is optimum for good performance of *Murraya paniculata*.

Keywords: *Murraya paniculata*, propagation, hormone and ornamental plant

Introduction

Murraya paniculata commonly known as orange jasmine, china box or mock orange, is a species of shrub or small tree in the family Rutaceae and is native to South Asia, Southeast Asia and Australia (Bayer, *et al.*, 2009). It has smooth bark, pinnate leaves with up to seven egg-shaped to elliptical leaflets, fragrant white or cream-coloured flowers and oval, orange-red berries containing hairy seeds (Mabberley, 2016). The flowers are fragrant and are arranged in loose groups, each flower on a pedicel1 of 1.5 mm long and the fruit is an oval shaped. (Zich *et al.*, 2024). *Murraya paniculata* is a widely cultivated an ornamental tree or as a hedge plant because of its hardiness and wide range of soil tolerance. It produces small fragrant flower clusters which attract bees and small birds throughout the year. (Gilman and Edward, 2024)
Orange jasmine is commonly propagated by its seeds and sometimes softwood cutting could be used but with low rooting success. Growth regulators have been widely reported to enhance rooting and propagation processes in plants. Therefore, influence of varying concentrations of IAA and IBA growth regulators on propagation of *Murraya paniculata* for mass production of its seedlings was evaluated.

Materials and methods

This research was conducted at the Horticultural Nursery, Department of Crop production, Federal University of Technology, Gidan Kwano Minna, Niger State. This location lies on the $9^0\ 36^0\ 50^0$N and longitude $6^0\ 33^0$ and 25^0E and altitude of 200-300 m above sea level in the southern guinea savannah zone of Nigeria. The distribution of average temperature in Minna is 22 ^{0}C in wet season and about 33 ^{0}C to 41^{0}C to dry season (February-April)

Cuttings of *Murraya paniculata* were collected from a well-established parent plant within the campus of

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Federal University of Technology, Minna. *Murraya* stem cuttings were cut into uniform length (15 cm) and the leaf lamina was trimmed with secateurs. Polyethylene pots of (15cm x 18 cm) were filled with 2 kg of topsoil/pot. *Murraya* cuttings were planted in the pot after treatment with Indole acetic acid and Indole butyric acid at 3 cm dipped into the topsoil. All necessary agronomic practices were carried out.

Data collected on the following parameters, days to first sprouting, number of leaves, number of nodes, Leaf area, number of flowers, and root dry weight were subjected to analysis of variance (ANOVA) using the Genstat 12.0 version and treatment means separated using the least significant difference (LSD) at ($p \leq 0.05$).

Results and discussion

Effect of hormone type and concentration on days to sprouting of orange jasmine was significant ($p \leq 0.05$). Cuttings dipped in IAA and IBA solutions commenced sprouting on the same day (20 days after planting (DAP). Stem cuttings of Jasmine orange dipped in IAA had (18) sprouted cuttings while those in IBA had (16 sprouted cuttings) at 30 days after planting (Table 1). Hormone concentration also influenced the number of sprouted cuttings as those dipped in 3000 mg/l hormone solution had highest sprouted (18) cuttings, cfollowed (17.5) by those cuttings without hormone (control), then those in 2000 mg/l solution had the least (16.7) number of sprouted cuttings. Effect of hormone type and concentration interaction significantly influenced ($p \leq 0.05$) the number of sprouts of orange jasmine (Table 1).

Table 1: Effect of hormone type and concentration on days to sprouting and height of orange jasmine

			Height (cm)					
Hormone	Concentration (mg/l)	DFS	20 dap	22 dap	24 dap	26dap	28dap	30dap
IAA	0	20	5.00	7.33	10.00	12.51	14.67	16.00
	1000	20	3.67	6.67	9.67	12.00	15.00	18.33
	2000	20	3.33	5.00	8.00	10.67	12.67	16.33
	3000	20	4.67	6.67	9.67	13.00	16.00	17.33
IBA	0	20	4.67	5.67	8.33	10.33	13.67	14.00
	1000	20	2.00	4.67	7.67	9.67	13.00	17.01
	2000	20	3.00	6.33	9.00	11.33	14.33	16.32
	3000	20	3.33	5.67	8.00	11.67	14.33	16.33
- —			1.58	2.62	3.75	4.75	5.95	6.81
LSD ($p \leq 0.05$) (H)			0.79	0.52	0.53	1.62	1.09	1.09
LSD ($p \leq 0.05$) (C)			1.02	1.21	0.75	0.87	1.08	1.04

Key; DFS- Days to First Sprouting, DAP - Days After Planting, IAA - Indole Acetic Acid, IBA - Indole Butyric Acid, LSD- Least Significant Difference

The type of hormone used had no significant effect on the number of leaves of Jasmine orange (Table 2). Hormone concentration influenced the number of leaves as those treated with 1000 mg/l solution has the highest number of leaves followed by those that were not soaked (control) while that in 3000 mg/l solution had the least number of leaves.

Type of hormone and concentration interaction significantly ($p \leq 0.05$) influenced number of leaves of orange jasmine (Table 2). Ramets from cuttings dipped in 1000 mg/l concentration had highest number of leaves (20.43 and 17.27), followed by those dipped in 2000 mg/l had 17.39 and 15.53 leaves and then those without hormone.

Table 2: Effect of type of hormone and concentration on number of leaves of orange jasmine

		Weeks After Planting (WAP)				
Hormone	Concentration (mg/l)	2	4	6	8	10
IAA	0	12.59	7.53	18.92	15.15	16.21
	1000	10.63	5.64	17.14	13.06	20.43
	2000	11.66	6.26	13.81	13.54	17.39
	3000	8.52	3.83	16.01	10.84	14.50
IBA	0	10.96	4.56	23.01	12.85	15.96
	1000	10.27	5.40	16.13	12.39	17.27
	2000	10.52	4.74	15.60	12.52	15.53
	3000	7.31	3.23	14.21	8.76	12.63
LSD ($p \leq 0.05$) (H*C)		0.66	0.95	1.65	4.17	5.65
LSD ($p \leq 0.05$) (H)		0.16	1.38	0.83	2.95	1.88
LSD ($p \leq 0.05$) (C)		0.11	0.46	0.58	2.08	2.82

Keys: WAP - Weeks After Planting, IAA - Indole Acetic Acid, IBA - Indole Butyric Acid

LSD- Least Significant Difference

The result obtained in (Table 3) shows that at ($p \leq 0.05$) the number of sprouts was only significant at eight (8) weeks of the research work. Hormone concentration on stem cuttings was not significant except at 2 WAP and 10 WAP (Table 3). Lowest number of node was recorded with stem cuttings that were dipped in 3000 mg/l hormone solution.

The result of the interactive effect of hormone type and concentration significantly influenced ($p \leq 0.05$) the number of sprouts of orange jasmine (Table 6). Cuttings dipped in 1000 mg/l had seedlings with the highest number of sprouts (7.51 and 6.85) for both IAA and IBA hormones, followed by those dipped in 3000 mg/l (5.73 and 5.48) and 2000 ml (4.83 and 4.48) respectively. Cuttings from control treatment had the lowest number of sprouts (3.91 and 3.02

Table 3: Effect of type of hormone and concentration on number of sprouts/cutting of orange jasmine

		Weeks After Planting (WAP)				
Hormone	Concentration (mg/l)	2	4	6	8	10
Keys: WAP - Weeks After Planting, IAA - Indole Acetic Acid, IBA - Indole Butyric Acid						
IAA	0	2.57	2.62	2.71	2.81	3.91
	1000	2.64	2.71	3.85	5.95	7.51
	2000	2.01	2.15	2.80	3.71	4.83
	3000	2.07	3.00	4.13	4.83	5.73
IBA	0	2.00	2.01	2.11	2.28	3.02
	1000	2.27	3.43	4.56	5.51	6.85
	2000	2.00	2.64	3.14	3.94	4.48
	3000	2.03	2.33	3.83	4.83	5.48
LSD ($p \leq 0.05$) (H*C)		1.57	2.67	3.84	4.58	5.03
LSD ($p \leq 0.05$) (H)		5.51	1.11	1.30	1.82	2.85
LSD ($p \leq 0.05$) (SC)		3.89	0.79	0.92	1.82	2.01

Cuttings dipped in IAA hormone had broader leaves compared to those cuttings dipped in IBA throughout the research period.
Hormone concentration also influenced leaf area of orange jasmine, cuttings dipped in 1000 mg/l had the broadest leaves, followed by those dipped in 2000 mg/l and then those that were dipped in hormone (control) had the least leaf area.

The result of the interactive effect of hormone type and concentration significantly ($p \leq 0.05$) influenced leaf area of orange jasmine (Table 4).

Table 4: Effects of type of hormone and concentration on leaf area (cm^2) of orange jasmine

		Weeks after planting				
Hormone	Concentration (mg/l)	2	4	6	8	10
IAA	0	4.34	4.54	4.71	4.93	4.20
	1000	8.32	8.51	8.82	8.84	8.89
	2000	5.18	5.32	5.71	5.85	5.90
	3000	2.49	2.59	2.75	2.89	3.30
IBA	0	4.09	4.20	4.31	4.52	4.80
	1000	5.92	5.97	6.61	6.70	6.80
	2000	5.24	5.81	6.01	6.13	6.40
	3000	3.06	3.16	3.25	2.98	3.40
LSD ($p \leq 0.05$) (H*C)		3.03	3.03	3.04	3.32	3.61
LSD ($p \leq 0.05$) (H)		1.14	0.94	0.74	0.62	0.32
LSD ($p \leq 0.05$) (C)		1.51	1.51	1.52	1.52	1.51

Keys: WAP - Weeks After Planting, IAA - Indole Acetic Acid, IBA - Indole Butyric Acid

LSD- Least Significant Difference

Discussion

The result of this study showed that the use of indole acetic acid (IAA) and indole butyric acid (IBA) had significant effect ($p \leq 0.05$) on the number of sprouts, number of leaves, number of nodes, plant height, stem girth and leaf area of orange jasmine plant. The use of IAA had more effect on the growth of orange jasmine than IBA, this can be attributed to the fact that IAA promotes growth and flowering response of orange jasmine, it is utilized in minimum quantity. The highest number of sprouts and number of leaves were produced by orange jasmine plants with IAA hormone. This is in agreement with **(Jha *et al.*, 2022)** findings who investigated the effects of IAA on shoot growth and flowering of orange jasmine and found that IAA application promoted shoot growth and flowering. The tallest plant and highest number of sprouts produced by *Murraya paniculata* plants with IAA hormone could be attributed to the growth promoting ability of IAA hormone **(Jha *et al.*, 2022)** also reported similar findings in *Murraya paniculata* plants with the application of IAA.

The IAA hormone produced the thickest stem and widest leaf area of *Murraya paniculata* plants throughout the period of the study. The use of different rates of hormone concentration significantly ($p \leq 0.05$) affected the number of sprouts, number of leaves, number of nodes, plant height, stem girth, and leaf area. Although, hormone concentration at 1000 mg/l produced the best result for optimal growth of *Murraya paniculata* in both IAA and IBA followed by 2000 mg/l and 3000 mg/l. The tallest plant and widest stem produced in orange jasmine plants with 1000 ml hormone concentration could be due to the higher amount of auxin present in the concentration.

The control plants produced the lowest number of sprouts, number of leaves, number of nodes, plant height, stem girth, and leaf area throughout the period of evaluation due to lack of hormone application. The interaction effect of IAA and different rate of concentrations on number of sprouts, number of leaves, number of nodes, plant height, stem girth, and leaf area was found significant ($p \leq 0.05$). However, *Murraya paniculata* plants with IAA hormone at 1000 mg/l concentration produced the highest growth characteristics throughout the period of research.

Conclusion

This study concluded that indole-3-acetic acid at 1000 mg/l enhanced sprouting and growth of orange jasmine than indole-3-butyric acid. Therefore, application of indole-3-acetic acid at 1000 mg/l is recommended for propagation of *Murraya paniculata.*

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