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Full Length Research Paper

A growth regulator for the propagation of *Lippia multiflora* Moldenke, a herbal for the management of mild hypertension in Ghana

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A growth regulator containing 0.43% of Naphylacetric acid was applied to the propagation stocks (apical meristem, root and stem cuttings) of *Lippia multiflora* Moldenke using different soil media. The result shows that the applied growth regulator enhanced the germination of the root cuttings more than the other propagation stocks. The germination and sustainability of the root cuttings on transplanting onto the field can be attributed to the presence of endogenous phytohormones that were initially present in the root tips and might have been triggered on applying the growth regulator as compared to the other propagating stocks.

Key words: Propagation, phytochormone, growth regulator.

INTRODUCTION

Lippia multiflora Moldenke, which belongs to the family Verbenaceae is a robust woody perennial plant, and grows up to 3.66 m high bearing large oblong-lanceolate bluish-green leaves. Its aromatic flowers are small and whitish. The herbal plant is used in the Congo as a conventional tea decoction and in Ghana, it is used for the treatment of arterial hypertension.

Yaakov et al. (2002) extracted the following major compounds from the leaf extract of the plant: limonene (16.6%), β-caryophyllene (5.3%), trans- β-farnesene (16%), caryophyllene oxide (22.5%) and farnesol (16.95%). Herbal extract of the plant has a lot of biological activities, including: antimalarial, antimicrobial, anti-inflammatory and other pharmacological effects. A lot of pharmacological studies have been performed using the herbal extract of the plant. The hypertensive, muscle relaxant and vascular properties of the aqueous extract of *L. multiflora* have been investigated (Noamesi, 1977; Noamesi et al., 1985a, b).

The psychopharmacological properties of crude extract (infusion) from dried leaves and the essential oil obtained by hydrodistillation of the dried leaves of *L. multiflora* have been studied on rats behavior and reported by Abena et al. (2001, 1998). The results confirmed the tranquillizer and analgesic activities of the plant and revealed that the crude extract could be more muscle relaxant and the essential oil, analgesic (Abena et al., 2001).

Valentin et al. (1995) also recorded that the essential oil of the plant prepared by hydrodistillation of the leaves and stalks and tested for antimalarial activity on *in vitro* cultures of *Plasmodium falciparum*, inhibited growth mainly at the trophozoite-schizont stage, indicating a potential effect on the first nuclear division of the parasite.

As stated by Bassole et al. (2003), the essential oil extracted from the dried leaves of three plants species (*Cymbopogon proximus*, *L. multiflora* and *Ocimum canum*), exhibited larvicidal and viscidal activities against the eggs of *Anopheles gambiae*. From their records, *L. multiflora* showed the highest activity against *A. gambiae* eggs and *Anopheles aegyptiaca* larvae.

Oladimeji et al. (2000), tested the essential oil of the leaves of *L. multiflora* against bodylice, headlice and scabies' mites. The 'knockdown' times of the bodylice and headlice on applying the oil extract of the plant were comparatively shorter than using benzyl benzoate and Delvap Super. The lethal effect of the oil on headlice increased when applied in an enclosed system that prevented volatilization of the oil while allowing maximum contact of the vapour with the headlice. A 20% v/v

preparation of *Lippia* oil applied to scabietic subjects for 5 consecutive days gave 100% cure as compared to 87.5% cure by benzyl benzoate preparation of the same concentration.

Using the oil of *L. multiflora* produced by conventional hydrodistillation, the analgesic, antipyretic and anti-inflammatory activities in rats and mice were analyzed (Abena et al., 2003). At the doses 2, 4 and 8 ml/kg, the essential oil of *L. multiflora* showed significant dose-dependent analgesic effect on acetic acid-induced writhing in mice.

The antimicrobial activities of hexane, dichloromethane and methanol extracts of *L. multiflora* have all been reported. The results show the hexane extract to be the most active, while the methanol extract exhibited no antimicrobial activity. A carvacrol isolated from the hexane fraction showed tremendous antimicrobial activity. The results confirm the traditional uses of *L. multiflora* in the treatment of disease conditions resulting from microbes (Kunle et al., 2003). The essential oils were the most sensitive against gram-negative bacteria (Bassole et al., 2003).

From the numerated uses of the plant, *L. multiflora* is used in Ghanaian herbals for the management of mild hypertension. The plant is over-harvested and there is the need for its sustainability. This calls for the use of all available measures, including the use of growth regulators to boost the plant's growth or propagation.

Growth regulators

The growth and development of a plant is controlled and integrated by phytohormones. As stated by Martin (1987), phytohormones play significant role in promoting and inhibiting plant growth. Phytohormones have two sources; endogenous and exogenous. Endogenous phytohormones are those naturally produced by the plants and the exogenous phytohormones are synthetic in nature. Examples of synthetic phytohormones are Cultar, Triadimefon, AMO – 1618, α – naphthalene acetic acid (2,4 –D), 2,4,5-trichlorophenoxy acetic acid (2,4,5-T), Cycocel (CCC), 6-Benzyl amine purine (BAP) and "IAT Soil Treat". These are exogenously applied to promote direct morphogenesis in tissues and organs. Treatments to the plant species with Triadimefon result in the development of roots, thickening and greening of leaves, reducing leaf enlargement and preventing flowering (Buchenauer and Rehner, 1981).

The acquisition of *L. multiflora* leaves as raw materials from the wild have become a problem to many researchers, herbalists and students because of the rampant bushfires in the savanna ecotype and again, as a result of over-harvesting. Therefore, this investigation aims at the *in situ* or domestic propagation of *L. multiflora* Moldenke using a growth regulator to boost rapid propagation of the plant.

MATERIALS AND METHODS

Study area

Plant stocks were collected from the environs of Ayikuma and Agomenda about 15 km and 20 km, respectively, from Dodowa in the Ga – Adangbe District of the Greater-Accra Region, Ghana. Ayikuma and Agomenda fall within the dry equatorial coastal savanna type. The main rainy season occurs in the months of May/June with the minor season occurring in October. The mean annual rainfall stands at 111.1 mm. The average annual temperature of the area is around 30°C.

Planting stock

The propagation stocks were made up of stem cuttings (basal end – close to the ground), apical meristems and root cuttings of matured plants and were collected from the wild. These stocks were kept in dark perforated polythene bags to avoid desiccation and the direct rays of the sun.

Propagation medium

Propagation bags made up of 10 x 15cm were filled with normal soil, black soil plus normal soil and normal soil mixed with poultry manure. Soil samples were sieved in order to remove debris and unwanted materials. In all, four hundred and eighty (480) replicates of soil were prepared and well-watered for the first three days before planting. The planting packages were as follows: 120 replicates each for stem cuttings, apical meristems and root cuttings. Another 120 replicates containing normal soil were set aside as the control.

Soil drenching

Ten grams of the growth regulator containing 0.43% of Naphylacetric acid was added to 300 ml of tap water and used to water the replicates every three days.

RESULT

The tables generated below show the outcome on applying the growth regulator to the stem cuttings, apical meristem and root cuttings of the parent plants obtained from the wild.

As observed in Table 1.75% of the root cuttings sprouted as against 27.5% by the stem cuttings and 22.5% also by the apical meristem. 37% of the stem cuttings that sprouted within two weeks died as compared to those of the apical meristem (25%) and root cuttings (22.5%) (Table 1). The highest number of not sprouting occurred in the apical meristem with the least occurring in the root cuttings as recorded in Table 1.

From Table 2. 85% of the root cuttings sprouted while 32.5% was recorded for the stem cuttings and 22.5% for the apical meristem. The highest percentage of the propagation material that sprouted but died within two weeks was recorded in the apical meristem while the least percentage was also with the root cuttings (Table

Table 1. Propagation stock planted in normal soil (Control).

Propagation material	Sprouted (%)	Sprouted but died within the first two weeks (%)	No sprouting (%)
Root cuttings	75	22.5	2.5
Stem cuttings	27.5	37.5	35
Apical meristem	22.5	25	52.5

Table 2. Propagation stock planted in black soil mixed with normal soil.

Propagation material	Sprouted (%)	Sprouted but died within the first two weeks (%)	No sprouting (%)
Root cuttings	85	12.5	2.5
Stem cuttings	32.5	35	32.5
Apical meristem	22.5	30	47.5

Table 3. Propagation stock planted in normal soil with the application of the growth regulator.

Propagation material	Sprouted (%)	Sprouted but died within the first two weeks (%)	No sprouting (%)
Root cuttings	95	5	0
Stem cuttings	30	20	20
Apical meristem	50	25	25

Table 4. Propagation stock planted in normal soil with added manure.

Propagation material	Sprouted (%)	Sprouted but died within the first two weeks (%)	No sprouting (%)
Root cuttings	75	17.5	7.5
Stem cuttings	25	22.5	27.5
Apical meristem	32.5	12.5	55

2). Finally Table 2 shows that 47.5% of the apical meristem did not sprout as against 2.5% of the root cuttings.

The Table 2 shows that the highest percentage of 95 was recorded for the root cuttings and for this time round the sprouting of the apical meristem outwitted that of the stem cuttings. The least dying of the sprouted propagation materials was recorded in the root cuttings (5%) while the highest was observed in the apical meristem (Table 3).

A look at Table 4 indicates that 75% of the propagation material (root cuttings) sprouted as against 32.5% and 25% for the apical meristem and stem cuttings, respectively. The least death of the sprouted planted stock occurred in apical meristem with the highest also occurring in stem cuttings (Table 4).

The germinated stocks obtained from the root cuttings, stem cuttings and apical meristem were transplanted onto the field. It was only the stock from the root cuttings that survived as captured in plate 1- 3.

DISCUSSION

The growth and development of a plant is usually attributed to the presence of phytohormones. In Table 3, the application of the growth regulator really enhanced the germination of the rooting cuttings as compared to the other stocks. The stem cuttings also performed better than the apical meristem as reflected in the tables. This is supported by Martin (1987) and Buchenauer and Rehner (1981) argument that phytohormones play significant role in promoting and inhibiting plant growth.

The sustainability of the root cuttings on transplanting onto the field can be attributed to the distribution and the initial existence of endogenous phytohormones coupled with the addition of the exogenous hormones (growth regulator) applied as compared to the other planting stocks.

The low germination recorded in the apical meristem in the normal soil mixed with manure might be due to the generation of heat, resulting from the decomposition of

Plate 1. A field technician examining an up-rooted *Lippia* plant.

Plate 2. A forest of young *Lippia* plants.

Plate 3. A plantation of *L. multiflora* raised from the root cuttings.

the organic manure.

Conclusion

From the above discussions, the additions of growth regulators enhance the development of roots in plants. Therefore, the idea of using plant growth hormones or exogenous phytohormones should be encouraged to help raise endangered tree species in the plant nurseries.

RECOMMENDATION

The author strongly recommends the use of growth regulators or other propagating hormones in raising *L. multiflora* and other plant species, like *Cryptolepis sanguinolenta* and *Mondia whitei* which are depleting very fast from the wild as a result of over-harvesting for the preparation of herbal products.

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