EFFECTS OF ALOE-VERA LEAF EXTRACT AND HONEY ON ESTABLISHMENT OF STEM-CUTTINGS OF BITTER LEAF (*Vernonia amygdalina)* ON SANDY-LOAM SOIL AND SEASONED SAWDUST.

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Abstract: Essential plant extracts like Aloe vera contain plant hormones, which can be utilized to promote and encourage the growth of different plant species. Honey can be used as a natural alternative for rooting hormone powder to induce or influence the rooting of plants. The present study was conducted to identify the effects of Aloe vera leaf extract and honey on establishment of stem- cuttings of *Vernonia amygdalina*. Stem-cuttings were treated with either Aloe vera leaf extract or honey and propagated in either seasoned sawdust medium or sandy-loam soil medium while some were not treated (control experiment) for rooting establishment. Rooting percentage (%), number of roots, and length of roots were recorded as plant traits. 100% rooting were achieved in stem-cuttings treated with aloe Vera leaf extract and the control experiment in the sawdust medium. The highest numbers of roots (25) and longest root (15.8cm) was observed in cuttings treated with aloe Vera leaf extract. The lowest number of root (10) in cutting treated with aloe vera leaf extract was higher than the lowest (1) in the control experiment. Both honey and aloe vera leaf extract could not achieve rooting in sandy-loam soil medium. Stem cutting in sawdust medium performed better than cutting in sandy-loam soil medium. In this experiment honey had no positive influence on rooting establishment. Therefore, a natural rooting substance such as aloe vera leaf extract can be recommended as an alternative for the establishment of stem-cuttings.

Keywords: Aloe vera, Honey, Hormone, Medium, Propagation, Rooting, Sawdust, Stem-cutting.

Introduction

Vernonia amygdalina is a shrub plant of great medicinal value; it is grown widely in Africa where it is consumed as vegetable. It has gained wide application in the treatment and management of many diseases and the leaves are used for herbal medicine. It is a good choice for further discovery because of considerable toxicity associated to the plant (Ifeoluwa *et al.*, 2017).

Vernonia amygdalina is a common shrub or tree that grows in tropical Africa. It belongs to the Asteraceae family and popularly called African Bitter Leaf in Africa 'Ewuro' in Yoruba, 'Etidot' in Ibibio, 'Onugh' in Igbo, 'Ituna' in Tiv, 'Ilo' in Igala, 'Oriwo' in Edo, Chusardoki in Hausa, 'Growa' in Amharic and 'Omubilizi' in south-western Uganda (Akpaso *et al.*, 2011). The plant has a bitter taste when consumed and some rural dwellers add it to wine for the treatment of pain and malaria.

Propagation of this herb is usually through stem cutting of mature plant by farmers; however, it does not produce seed in normal circumstances (Yeap *et al.*, 2010). Because synthetic rooting hormones such as indole-3-acetic acid (IAA) and indole-3-butyric acid (IBA) are now becoming expensive and hard to get, there is a demand to propagate cuttings with alternative rooting hormones that stimulate rooting (Dunsin *et al.*, 2016). The high cost and difficulty in accessing synthetic hormones (IBA and NAA) by local farmers in Nigeria has necessitated researches in the use of alternative hormones like coconut water and tetracycline (Okunola, 2016), honey, willow tea, aspirin, moringa extract and saliva (Carusetta, 2014) and Aloe vera extract (Pandey and Singh, 2016; Mirihagalla and Fernando, 2020)

Essential plant extracts like Aloe vera contain plant hormones, which can be utilized to promote and encourage the growth of different plant species (Hamouda *et al., 2012*). Honey can be used as a natural alternative for rooting hormone powder to induce or influence the rooting of plants (Gangwar, 2016). Therefore this study was aimed at accessing the effects of *Aloe vera* extract and Honey on establishment of stem-cuttings of Bitter leaf (*Vernonia amygdalina)* using sandy-loam soil and seasoned sawdust.

Materials and Methods

The experiments were carried out from May to October 2022 in the Plant house of the department of Plant science and Biotechnology, Faculty of Natural Sciences, Prince Abubakar Audu University Anyigba, Nigeria. Anyigba is a town in Dekina Local Government Area in Kogi State located between latitudes 7°15'N-7°29'N and longitudes 7°11'E – 7°32'E With an average altitude of 385 meters above sea level

The stem-cuttings were taken from different vigorous and healthy *Vernonia amygdalina* trees in staff quarter's area of the university early in the morning into a bowl filled with water to keeping them fresh. Cuttings of 15cm with at least 3 buds and at least one (1) leaf were prepared using sterilized secateurs to prevent the xylem from being crushed and infection. These cuttings were propagated in four (4) locally made wooden propagators kept in the plant house of the department of Plant Science and Biotechnology to maintain relative humidity. They were positioned to receive adequate light for photosynthesis.

The wooden propagators were labeled A, B, C and D, propagators A and B were filled with seasoned sawdust while C and D were filled with Sandy-loam soil. Ten (10) cuttings were treated with honey and ten (10) with Aloe Vera extract by dipping the base in the treatments for several seconds before propagating in the sawdust compartments and replicated in the soil compartments. There were ten (10) untreated (control) in each compartment.

The honey was obtained in its raw form from a local dealer in Abocho, Dekina Local Government area, Kogi State. The Aloe Vera extract was from succulent leaves of Aloe Vera that were cut using kitchen knife and pressed manually with hand.

The compartments were watered lightly using water sprayer after propagating and watering was done regularly to keep the medium wet but not soaked. Data collected eight (8) weeks after propagation were number of rooted cuttings, total number of roots, and length of longest root of cuttings and were presented in figures and plates.

Results and Discussion

The effect of aloe vera leaf extract (ALE) and honey on rooting percentage

The result presented in Figure 1 indicated that untreated cuttings (control) and cuttings treated with Aloe vera leaf extract (ALE) had 100% rooting in seasoned sawdust medium while cuttings treated with honey had 45% rooting in seasoned sawdust medium. But in sandy-loam medium, cuttings treated with ALE and honey failed to root and only 10% rooting was achieved in the control experiment. ALE had no positive influence on rooting percentage while honey seemed to have a negative influence on rooting percentage. Mirihagalla and Fernando (2020) in an experiment on effect of Aloe vera Gel for Inducing Rooting of Stem Cuttings and Air layering of Plants reported Aloe Vera has no definite effect when considering survival rates during five weeks and doesn't have any significant effect on rooting of *Coleus* softwood.

The 100% rooting achieved in the control experiment in sawdust media and 10% in sandy-loam media showed that *Vernonia amygdalina* can easily root by itself if the appropriate media is used. The performance was better in seasoned sawdust medium probably because of factors such as aeration and moisture content since Li *et al.* (2019) reported that soil aeration can promote root growth. Similarly, according to Mehmood *et al.* (2013) growing media is another important factor in propagation studies because rooting performances depends on the types of medium used.

The negative effect of honey on rooting in this experiment can be attributed to suspected factors such as quality, viscous and sticky nature of honey which probably created barrier between cut surface and the medium for nutrient uptake.

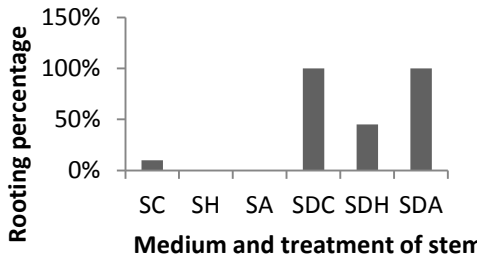

Figure 1: Rooting percentage of stem-cuttings of *Vernonia amygdalina* at 8 weeks after propagation, in which SC = Untreated cuttings in sandy-loam soil, SH = Honey treated cuttings in sandy-loam soil, SA = Aloe Vera leaf extract treated cuttings in sandy-loam soil, SDC = Untreated cuttings in seasoned sawdust, SDH = Honey treated cuttings in seasoned sawdust, SDA = Aloe vera leaf extract treated cuttings in seasoned sawdust.

The effect of aloe vera leaf extract (ALE) and honey on number of roots

The result presented in Figure 2 indicated that cuttings treated with ALE had the highest number of roots 25 roots, followed by untreated (control) with 24 roots and cuttings treated with honey with 12 roots in seasoned sawdust medium. There was progressive increase in the lowest number of roots as untreated cuttings (control) had 1 root, cuttings treated with honey had 3 roots and cuttings treated with ALE had 10 roots. This might be a slight indication that the use of honey and Aleo vera might probably have a positive influence on the number of roots in *Vernonia amygdalina.* Though Aloe vera might not be needed to initiate rooting of this plant, it seems to encourage rooting of the plant. This observation is in agreement with Hamouda *et al.* (2012) who reported that Aloe vera can be utilized to promote and encourage the growth of different plant species. Sahu *et al.* (2013) reported that "*Aloe Vera* which is rich in growth hormones like gibberellins and salicylic acid Promotes Vegetative growth. The pictures of rooted cuttings of *Vernonia amygdalina* are presented in plates 1 and 2

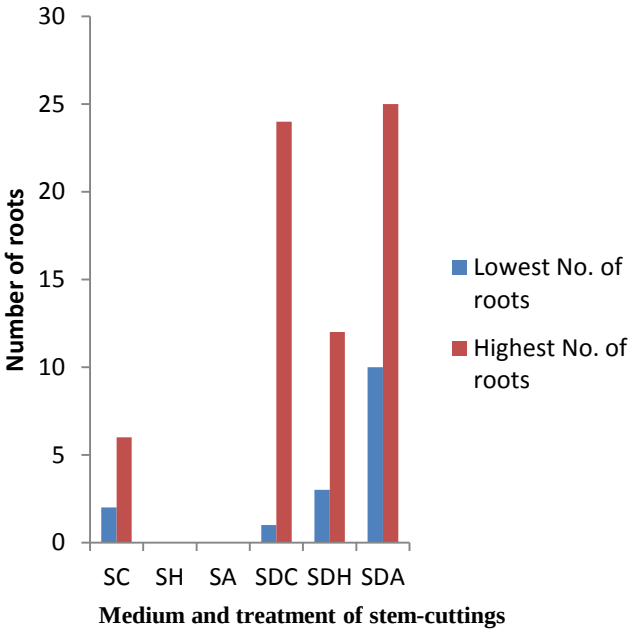

Figure 2: Numbers of roots of stem-cuttings of *Vernonia amygdalina* at 8 weeks after propagation in which SC = Untreated cuttings in sandy-loam soil, SH = Honey treated cuttings in sandy-loam soil, SA = Aloe Vera leaf extract treated cuttings in sandy-loam soil, SDC = Untreated cuttings in seasoned sawdust, SDH = Honey treated cuttings in seasoned sawdust, SDA = Aloe vera leaf extract treated cuttings in seasoned sawdust.

Plate1A: Rooted stem cuttings of *Vernonia amygdalina* treated Honey in sawdust medium

Plate1B: Rooted stem cuttings of *Vernonia amygdalina* treated Aloe vera leaf extract in sawdust medium

Plate2A: Rooted stem cuttings (control) of *Vernonia amygdalina* from sawdust medium

Plate 2B: Rooted stem cuttings (control) of *Vernonia Armygdalina* from Loamy soil

The effect of aloe vera leaf extract (ALE) and honey on length of roots

The result presented in Figure 3 indicated difference in length of roots of cuttings treated ALE, honey and control. The longest root (15.8cm) were obtained in cuttings treated with ALE followed by control experiment (13.4cm) and the lowest by cuttings treated with honey (10.9cm). The results on root length just like number of roots shows the positive influence of ALE on rooting establishment of *Vernonia amygdalina*.. There are reports that support positive influence of aloe vera on rooting of cuttings for instance Uddin *et al.* (2020) reported that Aloe Vera gel treatment showed the longest root length (12.9cm) compared to IBA (10.9cm) and control experiment (5.2cm). El-Sherif (2017) also observed that root length increase due to application of aloe Vera gel and reported that Aloe Vera contains IAA which could be the alternative root hormone.

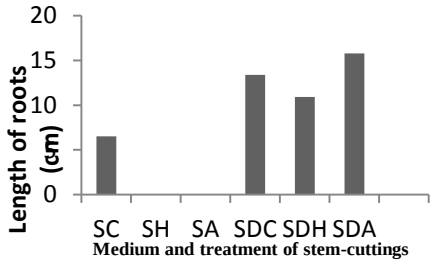

Figure 3: length of longest roots of stem-cuttings of *Vernonia amygdalina* at 8 weeks after propagation in which SC = Untreated cuttings in sandy-loam soil, SH = Honey treated cuttings in sandy-loam soil, SA = Aloe Vera leaf extract treated cuttings in sandy-loam soil, SDC = Untreated cuttings in seasoned sawdust, SDH = Honey treated cuttings in seasoned sawdust, SDA = Aloe vera leaf extract treated cuttings in seasoned sawdust.

Conclusion

According to the results of this study Aloe Vera leaf Extract is better than honey in positively influencing rooting establishment of stem-cuttings of *Vernonia amygdalina*. The use of sawdust as rooting medium is more successful than sandy-loam soil and can therefore be recommended for rooting of stem-cuttings of plants. The choice of a good rooting medium is very important in any research work on rooting establishment.

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Conflicts of interest

There is no conflict of interest.

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