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# Wound healing potentials of *Aloe vera* (L.) Burm. leaf gel on devastated stem barks of *Gongronema latifolium* Benth.

**Felicia W. Nmom, Mercy G. Ajuru* and Chimamkpa. W. Worlu**

*Department of Plant Science and Biotechnology, Faculty of Science, Rivers State University, Nkpolu-Oroworukwo, P. M. B. 5080, Rivers State, Nigeria*

## ABSTRACT

This paper examined the efficacy of *Aloe vera* gel as a wound healing agent on devastated stem barks of *Gongronema latifolium* caused by garden snail pests: *Helix aspersa* and *Rumunia decollata*. The healing and sealing of wounds makes topical *Aloe* as an important product for assistance in the healing of cuts, scrapes and even skin ulcers which may be due to synergistic action between the biologically active ingredients present in the *Aloe vera* leaf gel. Raw mucilaginous gel (100%) used in this study was obtained from the leaves and applied topically twice daily on the affected plant parts for seven (7) consecutive days. The result showed that the plants receiving *A. vera* gel had a significant improvement in the symptom, compared with the non-*Aloe vera* plant (control). Also, the gel initiated the growth of new branches to continue the life of the plants, and it is thought to mimic the healing function of Quince Seed Mucilage (QSM) as a healing agent. In conclusion, *A. vera* leaf gel extract has the potential to satisfy all the requirements of an ideal dressing material in that it provides an environment at the surface of the wound in which healing take place at the maximum rate. The use of *A. vera* preparations is encouraged in the traditional medicinal system to promote wound healing**.** Also, the cultivation of *G. latifolium* should be maximized in order to conserve it being an endangered plant species.

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*** E-mail:** ajurumercygospel@yahoo.com

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## 1. INTRODUCTION

Treatment of wounds is very essential in nature, because, wounds or lesions could alter the physiological stability of an organism in its basic biological activities. In this context, treatment of wound is with natural or organic substance which plays a crucial role as complementary medicine. Various studies have reported that *A. vera* has useful pharmaceutical effects on wound healing [1]. It is reported that *A. vera* contains at least 140 substances; not less than 70 essential nutrients, wealth of vitamins, minerals enzymes, proteins, phytosterols amino acids.

*Aloe vera* is a plant that belongs to Asphodelaceae family and thrives well in warm and arid regions. The leaves are long and triangular with two external membranes which are green and leathery, containing a compact, gelatinous mass with a translucent pearly aspect [2-4]. Aloe plants contain hydroxyanthracene and chromone derivatives and mucilaginous liquid gel [5-8].

The importance of the presence of mucilage tissue at the centre of its leaves is of great inexhaustible value. Due to the advancement of modern techniques for wound healing on one hand, and the tendency to use healing potencies of medicinal herbs as a complementary medicine on the other hand, the drive for the use of *A. vera* gel for wound healing therapeutics has availed us to discover the reason why the Egyptians used aloe and Quince seed mucilage for healing of various kinds. *A. vera* works with the stimulating power of growth factors which act as signaling molecules between cells and bind specific receptors on the surface of their target cells. The nutritional components of Aloe are equally distributed between the pulp and the cortex of the leaf [9]. Most (96%) of the plant is water and rest is active ingredients like essential oil, amino

acids, minerals, vitamins, enzymes and glycoprotein's [10].

*Gongrenema latifolium* is a wide spread tropical rainforest plant commonly used for its medicinal purposes in West Africa, such as Nigeria, Ghana, Sierra – Leone, Senegal, Cote voire etc. It is found to occur in deciduous and secondary forests, mangroves and undisturbed roadside forest from sea level up to 900m altitude [11].

It belongs to Asclepiadaceae family; a climbing shrub with broad heart-shaped leaves which have a characteristic sharp bitter and slightly sweet taste, especially when eaten fresh in Nigeria, it is variously identified based on the people's culture and language; thus, it is known as Utazi – Ibo; Arokeke – Yoruba; Utasi-Efikllbibio; Otaji-Ikwerre etc.

[12] indicated its medicinal potency when an infusion or decoction of any part of the plant is made; can be used for the treatment of digestive problems, like loss of appetite dyspepsia, colic, stomach ache, constipation, dysentery, intestinal worms. They also reported that it lowers high blood sugar level by working on the pancreas, by implication *diabetes mellitus*; and also lowers high blood pressure (HBP); cleanses the womb after child birth, relieves and cures lower abdominal pains. It prevents liver damage associated with alcoholism and viral hepatitis.

Due to the numerous medicinal values and daily demands of *G. latifolium,* it is cultivated as a home garden plant. And as a garden plant it is also attacked by garden snail pests such as *Helix aspersa* and *Rumunia decollata* which feed on both the barks and leaves, tender and old; and leaves the plant wounded and devastated with lesions.

*R. decollata* is a long and roughly cone shaped garden snail which grows to approximately 40mm in length and upon reaching maturity, grinds or chips off the end of its shell by moving its body roughly against hard surfaces; so that the shell takes on a decollate shape tapering to a blunt end. *R. decollata* belongs to subulinidae family and predates on *H. aspersa*.

*H. aspersa* is also a garden snail pest. It belongs to the family Helicidae. It is a common brown garden snail which is air-breathing; a terrestrial pulmonate gastropod mollusc. *Helix* and *Rumunia* are both garden snail pests that feed on vegetables and consequently on the plant itself.

## 2. MATERIAL AND METHODS

This study was conducted in a household garden located at No. 9, Dr. Lawrence ucheguo Lane by Kent Street, Akwaka, Rumuodomanya, Port Harcourt, Rivers State of Nigeria.

Four (4) stands of *G. latifolium*, growing wildly in the forest were obtained by cutting of mature stems with their regular nodes. They were cultivated in the area of study. They survived and flourished. At five (5) weeks of age, the garden snails invaded them, ate up the barks, leaving the stem whitish and exposed with distorted leaves. The plant stands became traumatized since photosynthetic tissues were affected by the attack, as shown in Figure 1 below:


**Figure 1.** The growing plant stands of *G. latifolium* (A and B).
Arrow pointing to the devastated and whitish stems of the plant

In order to initiate wound healing, mature and full size leaves of *A. vera* were collected, washed and the rinds were removed. A. vera raw mucilaginous gel was obtained mechanically from the parenchyma tissue in the center of the leaves. The undiluted (100%) gel was applied topically twice daily on the affected plant parts for seven (7) consecutive days.

The plant species identity as *A. vera and G. latifolium* were confirmed in the Department of Plant Science and Biotechnology. Voucher specimens of the plants were deposited in the Departmental herbarium for future evidence.

The pest were also readily hand-picked throughout the day into the night since they are

more active in the night and wet times. This picking continued until the end of the research work. Three out of the four stands were treated while one was left as control, untreated. Observation was very intensive from morning into the nights.

## 3. RESULTS AND DISCUSSION

The results of the present study clearly indicate that *A. vera* not only accelerates wound healing in man and animals, but also in plants. Although the wound healing properties of *A. vera* and some other species of *Aloe* have been reported frequently in recent years [5,6,13,14,15,16], The present study is the first study to evaluate the efficacy of aloe vera used both topically and systemically for the treatment of devastated stem barks in *G. latifolium, a*s it is seen in Figure 2. The plants began to recover their barks at 17-22 days after treatment. Recovery was very slow and sluggish. New branches sprouted from the basal nodes and developed leaves. The older leaves which were distorted recovered.

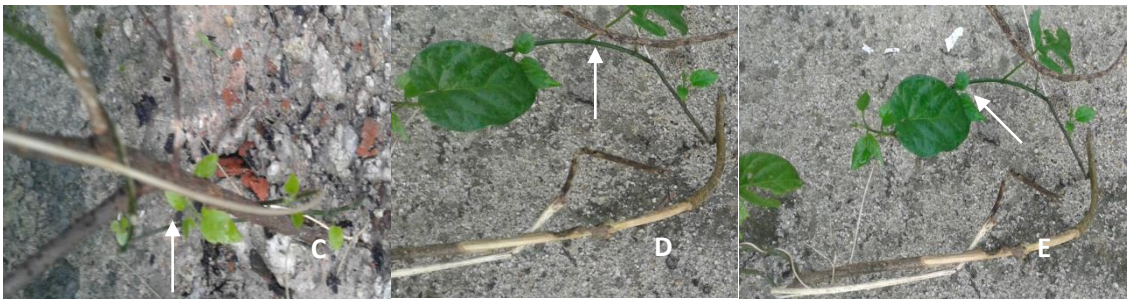


**Figure 2.** Recovered Stem Bark of *G. latifolium* after application of Aloe leaf gel and development of fresh leaves as indicated with an arrow (C, D and E).

The result also showed that the lesioned plant parts were healed as *Aloe* initiated the growth of new branches to continue the life of the plants. The process of the healing showed that *Aloe vera* gel has the efficacy in initiating the formation of new tissues. Through Biosynthesis, fibroblasts was able to produce new collagens which has a key role in the healing process, and its deposition helps the wounds to gain tensile strength during repair [17]. Also it has been reported that matrix metalloproteinase-1(MMP-1) which is involved in the degradation of the extracellular matrix, has some role in tissue remodeling [18].

The paramount cellular signaling events and cellular matrix activities in the healing process may have been controlled by various factors such as Epidermal Growth Factors (EGFs) contained in the Aloe. It could also be these factors that impact its healing power in animals. The fibroblast in the epidermis of the newly formed barks and leaves may have also synthesized the extracellular matrix; and a work cambium may also have arisen in the peripheral layers of the callus.

In essence, the plants recovered and resumed photosynthetic activities, revitalizing the plant to normally. The control plant withered completely.

## 4. CONCLUSION

The present study showed wound healing ability of topical *A. vera* and as an important product for assistance in the healing of cuts, scrapes, etc which may be due to synergistic action between the biologically active ingredients present in the *A. vera* leaf gel. Conclusively, the leaf extract of *A. vera* leaf gel has the potential of an ideal dressing material since it provides an environment at the surface of the wound in which healing take place at the maximum rate and a concrete reason for its use to promote wound healing. The cultivation of *G. latifolium* is also encouraged due to its medicinal and nutritive value and for the purpose of conservation to avoid it being extinct

## AUTHOR CONTRIBUTIONS

FWM designed the study and wrote the first draft of the manuscript; MGA and CWW managed the analysis and literature searches. All authors read and approved the final manuscript.

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