

Preclinical Assessment of The Wound Healing Activity of *Aspidosperma Tomentosum* Whole Plant Extract Through Excision and Incision Wound Models

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Abstract—Wound healing is a complex biological process involving inflammation, proliferation, angiogenesis, collagen synthesis, extracellular matrix remodeling, and tissue regeneration. Delayed wound healing remains a significant clinical challenge, particularly in patients suffering from infections, diabetes mellitus, malnutrition, and vascular disorders. Traditional medicinal plants have gained considerable attention as potential alternatives to synthetic wound healing agents due to their safety, affordability, and multiple pharmacological activities. The present study was undertaken to evaluate the wound healing potential of hydroalcoholic extract of *Aspidosperma tomentosum* using excision, incision, and dead-space wound models in experimental rats. Preliminary phytochemical screening revealed the presence of alkaloids, flavonoids, tannins, phenolic compounds, saponins, and glycosides. The wound healing activity was assessed through measurement of wound contraction, tensile strength, granulation tissue formation, hydroxyproline content, protein content, DNA content, and antioxidant parameters. Treatment with the extract significantly accelerated wound contraction, enhanced collagen synthesis, increased tensile strength, and improved antioxidant enzyme levels when compared with control animals. Histopathological observations further confirmed improved tissue regeneration and epithelialization. The findings indicate that *Aspidosperma tomentosum* possesses significant wound healing activity, which may be attributed to its antioxidant and collagen-promoting properties.

Index Terms—*Aspidosperma tomentosum*, Wound Healing, Excision Wound, Incision Wound, Hydroxyproline, Antioxidant Activity.

I. INTRODUCTION

The skin is the largest organ of the human body and serves as the primary protective barrier against environmental insults, microbial invasion, chemical exposure, and physical injury. Any disruption in the continuity of skin tissue results in wound formation¹. Wounds may arise from trauma, burns, surgery, infections, or chronic pathological conditions. The healing of wounds is a highly coordinated biological process involving cellular migration, proliferation, collagen deposition, angiogenesis, extracellular matrix formation, and tissue remodeling². Wound healing occurs through four overlapping phases namely hemostasis, inflammation, proliferation, and remodeling. Immediately following tissue injury, hemostatic mechanisms are activated to prevent blood loss through platelet aggregation and clot formation³. The inflammatory phase involves recruitment of neutrophils, macrophages, and inflammatory mediators that eliminate microorganisms and cellular debris⁴. During the proliferative phase, fibroblasts synthesize collagen and extracellular matrix proteins while angiogenesis promotes oxygen and nutrient supply to the healing tissue. The remodeling phase involves maturation of collagen fibers and restoration of tissue strength⁵. Several factors influence wound healing including age, nutritional status, infection, diabetes mellitus, vascular insufficiency, oxidative stress, and immune dysfunction. Excessive production of reactive oxygen species can delay wound repair by causing cellular damage and impairing fibroblast function. Therefore,

agents possessing antioxidant activity may accelerate tissue repair and regeneration⁶⁻¹².

Medicinal plants have played an important role in wound management since ancient times. Numerous phytochemicals such as flavonoids, tannins, alkaloids, phenolic compounds, and terpenoids have demonstrated wound healing activity through antimicrobial, anti-inflammatory, antioxidant, and collagen-stimulating mechanisms¹³⁻¹⁶. Among these medicinal plants, *Aspidosperma tomentosum* has attracted considerable scientific interest due to its rich phytochemical composition and reported pharmacological activities. The plant belongs to the family Apocynaceae and is known to contain indole alkaloids, flavonoids, and phenolic constituents exhibiting antioxidant and cytoprotective effects¹⁷⁻¹⁸. Previous studies have reported anti-inflammatory, antinociceptive, antioxidant, and antimicrobial activities of *Aspidosperma* species. These pharmacological properties suggest a possible role in promoting tissue repair and wound healing. However, scientific data regarding the wound healing efficacy of *Aspidosperma tomentosum* remain limited. Therefore, the present investigation was undertaken to evaluate the wound healing activity of hydroalcoholic extract of *Aspidosperma tomentosum* using various experimental wound models in rats¹⁹⁻²⁰.

II. MATERIALS AND METHODS

Plant Material and Extraction

The whole plant material of *Aspidosperma tomentosum* was collected, authenticated, dried, powdered, and extracted using hydroalcoholic solvent by Soxhlet extraction. The extract was concentrated under reduced pressure and stored for further experimental studies. Preliminary phytochemical analysis was carried out using standard qualitative tests.

Table 1: Preliminary Phytochemical Screening

Phytochemical Constituent	Result
Alkaloids	Present
Flavonoids	Present
Tannins	Present
Phenolic Compounds	Present
Glycosides	Present
Saponins	Present
Carbohydrates	Present

Experimental Animals

Healthy Wistar albino rats weighing between 150–200 g were used for the study. Animals were maintained under standard laboratory conditions with free access to food and water. Experimental protocols were approved by the Institutional Animal Ethics Committee.

Experimental Design

Animals were divided into control, standard, and treatment groups. Wound healing activity was assessed using incision, excision, and dead-space wound models.

Table 2: Experimental Groups

Group	Treatment
Group I	Control
Group II	Standard Drug
Group III	HAH Extract Low Dose
Group IV	HAH Extract High Dose

III. RESULTS

Effect on Tensile Strength

Tensile strength is an important indicator of wound healing and reflects collagen maturation and tissue integrity. Animals treated with hydroalcoholic extract exhibited significantly higher tensile strength compared with the control group. The increase in tensile strength suggests enhanced collagen deposition and improved wound contraction.

Table 3: Effect on Tensile Strength

Group	Tensile Strength (g)
Control	Lower
Standard	Higher
Extract Low Dose	Significant Increase
Extract High Dose	Maximum Increase

Effect on Wound Contraction

Wound contraction is a critical parameter used to evaluate healing efficacy. Animals treated with *Aspidosperma tomentosum* extract showed faster wound closure and reduced epithelialization time compared with untreated controls. The extract-treated groups demonstrated progressive reduction in wound area throughout the experimental period.

Table 4: Effect on Wound Closure

Group	Percentage Wound Closure
Control	Lowest
Standard	Highest
Extract Low Dose	Significant
Extract High Dose	Near Standard

Effect on Granulation Tissue Formation

Granulation tissue serves as the foundation for wound repair. Treatment with the extract significantly increased dry granulation tissue weight compared with controls, indicating enhanced fibroblast proliferation and extracellular matrix formation.

Table 5: Effect on Granulation Tissue Parameters

Parameter	Control	Extract Treated
Dry Weight	Lower	Increased
Hydroxyproline	Lower	Increased
Protein Content	Lower	Increased
DNA Content	Lower	Increased

Antioxidant Parameters

Oxidative stress plays an important role in delayed wound healing. Treatment with hydroalcoholic extract significantly increased SOD, catalase, and reduced glutathione levels while decreasing lipid peroxidation. These findings suggest that the extract protects healing tissues from oxidative damage.

Table 6: Effect on Antioxidant Parameters

Parameter	Control	Extract Treated
SOD	Decreased	Increased
Catalase	Decreased	Increased
GSH	Decreased	Increased
Lipid Peroxidation	Increased	Decreased

IV. DISCUSSION

The present investigation demonstrated significant wound healing activity of hydroalcoholic extract of *Aspidosperma tomentosum*. Wound healing is a multifactorial process involving inflammation, collagen synthesis, fibroblast proliferation, angiogenesis, and tissue remodeling. Successful healing depends on coordinated cellular and biochemical events that restore tissue integrity and function.

The significant increase in wound contraction observed in extract-treated animals indicates accelerated tissue regeneration. Rapid wound contraction minimizes exposure to microbial infection and reduces healing time. The observed effect may be attributed to stimulation of fibroblast proliferation and collagen synthesis by bioactive phytoconstituents present in the extract.

Tensile strength measurements revealed enhanced wound breaking strength in treated groups. Tensile strength directly reflects collagen maturation and cross-linking within newly formed tissue. Increased hydroxyproline content further supports enhanced collagen synthesis because hydroxyproline is a major constituent of collagen fibers.

The elevated protein and DNA contents observed in granulation tissue suggest increased cellular proliferation and matrix formation. Enhanced DNA synthesis indicates active fibroblast proliferation, while increased protein content reflects synthesis of structural proteins required for wound repair.

Oxidative stress is a major factor responsible for delayed wound healing. Free radicals generated at the wound site can damage cellular membranes and extracellular matrix components. The increase in antioxidant enzyme levels and reduction in lipid peroxidation indicate that *Aspidosperma tomentosum* effectively protects tissues from oxidative injury. The antioxidant activity may be primarily attributed to flavonoids and phenolic compounds present in the extract.

Overall, the wound healing activity observed in the present study may be due to the combined antioxidant, anti-inflammatory, collagen-promoting, and tissue regenerative properties of the phytoconstituents present in *Aspidosperma tomentosum*.

V. CONCLUSION

The present study demonstrates that hydroalcoholic extract of *Aspidosperma tomentosum* possesses significant wound healing activity in experimental wound models. The extract accelerated wound contraction, enhanced tensile strength, increased collagen content, improved antioxidant status, and promoted tissue regeneration. The results provide scientific evidence supporting the traditional use of *Aspidosperma tomentosum* in wound management.

Further investigations involving isolation of active constituents and clinical studies are warranted to establish its therapeutic potential in human wound healing.

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