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"Unveiling the Wound Healing and Hypoglycemic Effects of *Garcinia cambogia* (L.) Roxb. in Streptozotocin-Induced Diabetes in Albino Wister Rats"

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KEYWORDS

Garcinia cambogia, Hydro ethanol extract, Diabetes management, Wound healing, Antioxidant activity, Pancreatic islets, Dosage optimization.

ABSTRACT:
Garcinia cambogia (L.) Roxb (G. cambogia), known as Malabar tamarind, has garnered attention for its purported health benefits, particularly in weight loss and metabolism regulation. However, its potential in managing diabetes and wound healing remains underexplored. This study investigated varying doses of G. cambogia hydroethanol extract on parameters related to diabetes management, wound healing, and tissue integrity. Results showed significant variations in body weight among treatment groups, with Gliclazide treatment resulting in notable reductions. G. cambogia extract effectively reduced serum glucose and triglyceride levels in diabetic rats, indicating its potential for managing diabetes. Additionally, it positively impacted antioxidant activity and pancreatic islet morphology, suggesting benefits in mitigating oxidative stress and preserving pancreatic β-cell architecture. Moreover, oral administration of G. cambogia extract accelerated wound healing by reducing wound contraction and epithelialization time, while also enhancing wound breaking strength. Scratch assay results demonstrated its potential in enhancing cell migration and wound closure. However, the highest dose showed a potential plateau or decline in efficacy, highlightingthe importance of dosage optimization in wound healing interventions. Overall, the findings underscore the therapeutic potential of G. cambogia in promoting wound healing, tissue integrity, and diabetes management, with implications for developing effective treatment strategies for diabetic complications.

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INTRODUCTION

Diabetes mellitus(DM)poses a significant public health challenge in India, fueled by urbanization, sedentary lifestyles, and genetic predisposition. With 77 million adults affected in 2019, this number is projected to reach 101.2 million by 2030 (International Diabetes Federation, 2019). DM's burden extends beyond health, leading to complications such as cardio vascular diseases, kidney failure, and impaired wound healing, while imposing significant economic strain [1,2]. Unique features of DM in India inclued earlier onset and occurrence at lower BMI levels compared to Western populations, with a high prevalence in both urban and rural areas and among tribal populations [2,3]. The skin serves as a critical barrier, ensuring homeostasis and protection from external factors [4,5]. In diabetic patients, wound healing is delayed due to impaired processes like hemostasis, inflammation, proliferation, and remodeling [6,7]. While synthetic drugs are employed for wound management, their side effects complicate treatment [8]. Medicinal plants offer promising alternatives, with phytoconstituents that promote antioxidant effects, angiogenesis, and modulation of inflammatory cytokines, making them cost-effective with fewer side effects[9,10,11].

Garcinia cambogia, or Malabar tamarind, has long been used in traditional medicine for its diverse therapeutic properties. Its bioactive compound, hydroxycitric acid (HCA), is known for its antioxidant [12], antimicrobial [13], anti-inflammatory [14], anti-diabetic [15], and anti-obesity [16] effects. Traditionally, it has been used in Ayurveda for digestive ailments [17] and is a common culinary ingredient[18]. Experimental evidence further supports its wound healing potential in laboratory and animal models [19], emphasizing its role as a therapeutic agent in diabetic wound management.

This study aimed to evaluate the efficacy of *G. cambogia* fruit extract in managing diabetes and promoting wound healing. Given the rising global prevalence of diabetes and its complications, the findings provide insights into alternative therapies, highlighting the extract's potential to address unmet medical needs in diabetic care.

MATERIALS AND METHODS

Preparation of Garcinia cambogia Fruit Extract

G. cambogia fruits were collected from Sorakoppa village, Bagalkot, Karnataka, India, and authenticated at the Department of Botany, Basaveshwar Science College, Bagalkot. A voucher specimen (HSKCOP-01/04-22) was archived. The fruits were cleaned, air-dried, and ground into coarse powder. Extraction was performed using cold maceration in a 50:50water-ethanol solution. The solvent was separated and evaporated, and the extract was lyophilized to yield 56.58 g of dark green solid, stored under refrigeration for anti-diabetic evaluations.

Evaluation of Anti-Diabetic Effects of G. cambogia in Streptozotocin-Induced Diabetes

Albino Wistar rats (180–250 g) were housed under controlled conditions and provided a standard pellet diet and water. Diabetes was induced by intraperitoneal injection of streptozotocin (45 $mgkg^{-1}$bw) in citrate buffer (pH 4.5) after overnight fasting. The diabetic rats were divided into six groups (n=6): normal control, diabetic control, standard drug (gliclazide), and three groupstreated with 100, 200, and 300 $mgkg^{-1}$of *G. cambogia* extract for 21 days. Blood glucose levels were measured on days 0, 7, 14, and 21, with biochemical parameters and pancreatic histopathology analyzed on the final day. Parameters assessed included body weight, lipid profiles, serum antioxidant levels, and pancreatic histology.

Wound Healing Potential of G. cambogia in Incision and Excision Wound Models

Albino Wistar rats (180–250 g) were housed under controlled laboratory conditions with a standard diet and water. Institutional Animal Ethics Committee approval was obtained (IAEC/HSKCOP/May 2022/MM22). For excision wound models, groups included a control group treated with a 5% ointment base, a standard group treated with 1% w/w Soframycin, and three groups treated with100,200,and 300 $mgkg^{-1}$of *G. cambogia* extract. Incision wound models were treated with 300 $mgkg^{-1}$extract.

Excision wounds (500 mm^2) were created under ketamine anesthesia (100 mg kg^{-1}bw) following standard protocols. Wound healing progression was evaluated on days 3,6,9,12,15,18,and21by

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Measuring wound contraction and epithelialization time. Parameters such as inflammation, tissue regeneration, and rate of wound closure were assessed to compare *G. cambogia*'s efficacy with standard treatments.

Rate of Wound Contraction and Epithelialization Time

Wound contraction was evaluated by calculating the percentage reduction in the initial wound size, following the method described by Muthusamy *et al.* [20]. A scratch was created on a confluent monolayer of cells, and images were captured at 0 hours and after 24 hours of incubation at 37°C and 5% CO_2. Wound closure was assessed visually and through software analysis, monitoring new epithelial tissue formation.

Formula for wound closure percentage:

$$\%\ \text{of wound closure} = \frac{\text{Wound area on day '0'} - \text{Wound area o}}{\text{Wound area on day '0'}}$$

(Contraction)

Epithelialization time was measured as the duration from the injury to the complete shedding of the eschar without residual raw wound areas.

Incision Wound Healing Study

Incision wound healing was evaluated in Wistar rats (n=6 per group) treated with different doses of *G. cambogia* extract. Group-I served as the control (5% ointment base), Group-II received standard Soframycin (1% w/w), and Groups III-V received *G. cambogia* extract at 100, 200, and 300 $mgkg^{-1}$, respectively. Under ketamine hydrochloride anesthesia (100 $mgkg^{-1}$), two 6 cm-long dorsal incisions weremade and sutured at 1 cm intervals. Sutures were removed on the 8th day, and the treatment continued.

Wound Breaking Strength

Wound breaking strength was measured onthe 15th day after incision,following the method of Shottu*et al.* [21]. Gradual weight was applied to one side of the wound until it separated from the incision line. The average tensile strength of the bilateral incisions was recorded for each animal.

Wound Contraction

Wound contraction was measured daily using a vernier caliper, with percentages calculated based on initial wound size. The progression of wound healing was monitored through regular observations, showing significant improvements in groups treated with *G. cambogia* extract compared to the control and standard treatment groups.

Statistical analysis

The results were expressed as mean ± standard error of the mean (SEM) and were subjected to statistical analysis using one-way analysis of variance (ANOVA), followed by Tukey's test for making multiple comparisons. Statistical significance was determined at $p < 0.05$.

RESULTS AND DISCUSSION

Effect on Body Weight in Diabetic Rats

The Normal-Saline group maintained stable body weight throughout the study, while the Diabetic Control group exhibited significant weight loss by the 28th day(Table1). Treatment with *G. cambogia* extract at 100, 200, and 300 mg kg^{-1} demonstrated varying effects. The100$mgkg^{-1}$ doses how edanotable increase inbodyweightondays21and28, where as higher doses (200 and 300 mg kg^{-1}) led to fluctuations. These findings align with previous studies on *Cissampelosowariensis* and *Rhizophora mucronata*, which demonstrated significant weight improvements in diabetic rats [28,29]. In contrast, extracts from Korean medicinal plants exhibited negligible effects on body weight, highlighting species-specific differences in therapeutic responses [30].

Effecton Serum Glucose Levels

The Diabetic Control group maintained persistently high serum glucose levels (Table 2). In contrast, treatment with *G. cambogia* (100, 200, and300 mg kg^{-1}) resulted in significant reductions in glucose levels from the 3rd to the 28th day, with all doses showing statistically significant differences compared to the Diabetic Control group. However, gliclazide-treated rats exhibited inconsistent glucose regulation. These results are consistent with previous findings on *Randiadumetorum*, *Caesalpiniapulcherrima*, and *Gymnemasylvestre*, which also demonstrated hypoglycemic activity in diabetic

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models [24,25]. Similarly, studies on *Crassocephalumcrepidioides* and *Bauhinia forficata* have reported dose- and time-dependent glucose-lowering effects [26,27].

EffectonLipid Profile

Diabetic rats exhibited elevated cholesterol and triglyceride levels compared to controls. Treatment with *G.cambogia*(100,200,and300mgkg^{-1}) significantly reduced cholesterol (Table 3) and triglyceride levels (Table4),with the most pronounced effects observed at 200 and 300 mg kg^{-1} doses. These findings are in agreement with previous research on *Ziziphus vulgaris*, *Hibiscus sabdariffa*, and *Vernonia amygdalina*, which also demonstrated lipid-lowering properties [31,32,33]. Notably, Kim *etal.*[30]reported variable resultsin lipid regulation with *C. unshiu*, emphasizing the influence of plant species and dosage on outcomes.

Table1:*Effectof G.cambogia on body weight of diabetic rats*

Treatments	Body weight (g)					
	0thday	3rdday	7thday	14thday	21stday	28thday
Normal-Saline	226.2±1.15	219.7±1.03	225.7±1.12	226.71±2.42	231.00±1.29	234.30±2.10
Diabetic Control	230.2±2.95	221.7±2.73	224.7±2.18	219.70±2.79^{a}	219.00±4.19^{a}	220.10±1.10^{a}
Gliclazide60(mgkg^{-1}, p.o.)	241.8±2.37	232.3±5.60	227.3±2.01	218.00±2.28*	211.50±4.55*	214.70±8.12*
GC100(mgkg^{-1},p.o.)	243.7±2.11	224.8±6.94	238.7±2.62	232.30±2.94*	243.00±3.53**	253.30±4.15*
GC200(mgkg^{-1}, p.o.)	234.7±2.65	213.7±5.97	214.5±1.75	227.30±3.69	225.00±2.07*	234.30±7.15*
GC300(mgkg^{-1}, p.o.)	225.2±2.97	206.5±4.34	216.3±1.35	213.50±2.82	223.70±2.28*	238.50±5.01**

All values were presented as a mean ± SEM, n=6. Treatment was done for 28 days. The data were statistically analyzed using one way ANOVA, followed byDunnet's test by comparing all treated groups against control. The minimum value of $p<0.05$ was considered as significant. *$p<0.05$, **$p<0.01$, ***$p<0.001$ as compared with control group and $^{a}p<0.001$as compared with normal group. *Garcinia cambogia* -GC.

Table2: Effect of *G. Cambogia* on serum glucose level of diabetic rats

Treatments	Serum glucose (mg/dL)					
	0thday	3rdday	7thday	14thday	21stday	28thday
Normal-Saline	135.12±1.13	132.18±1.13	162.16±1.12	163.31±1.31	155.24±1.12	162.21±1.02
Diabetic Control	135.21±1.17	95.23±1.12^{a}	85.27±1.18^{a}	88.71±1.05^{a}	86.99±1.15^{a}	98.43±1.08^{a}
Gliclazide 60(mgkg^{-1},p.o.)	102.10±2.55	163.20±1.83	163.60±1.36***	172.50±1.06***	173.40±1.78***	175.80±1.23^{a}***
GC100(mgkg^{-1}, p.o.)	86.57±1.77	159.50±1.64	140.90±1.62***	138.60±1.07***	126.80±1.17***	102.50±1.20***
GC200(mgkg^{-1}, p.o.)	84.91±1.37	151.20±2.42	145.30±1.04*	147.70±1.95**	138.40±1.74**	125.70±1.35***
GC300(mgkg^{-1}, p.o.)	99.17±1.01	153.60±1.54	142.60±1.55**	134.60±2.42**	122.60±0.97**	119.90±1.51***

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All values were presented as a mean ± SEM, n=6. Treatment was done for 28 days. The data were statistically analyzed using one way ANOVA, followed by Dunnet's test by comparing all treated groups against control. The minimum value of $p<0.05$ was considered assignificant.*$p<0.05$,**$p<0.01$,***$p<0.001$as compared with control group and [a]$p<0.001$as compared with normal group. *Garcinia cambogia* -GC. Diabetic ratsgroupsG_3–received standard drug–Gliclazide (60 $mgkg^{-1}$bodyweight),while other groups of diabeticrats received GC (100, 200 & 400 $mgkg^{-1}$body weight)

Table3: Effect of *G. cambogia* on serum total cholesterol level of diabetic rats

Treatments	Serum total cholesterol(mg/dL)					
	0^{th}day	3^{rd}day	7^{th}day	14^{th}day	21^{st}day	28^{th}day
Normal-Saline	121.17±1.11	127.11±1.745	123.11 ±1.31	121.21±1.18	128.28±1.29	131.11±1.29
Diabetic Control	112.87±1.22	149.91±1.71[a]	149.16 ±1.26[a]	159.55±1.25 A	171.46±1.03[a]	187.88±1.27[a]
Gliclazide 60 ($mgkg^{-1}$,p.o.)	109.83±1.48	134.50±1.13	148.60 ±1.50	143.90±1.83	144.10±1.60*	150.80±1.81*
GC100($mgkg^{-1}$, p.o.)	121.41±1.06	131.40±1.53	122.00±1.46**	114.90±1.77***	111.90±1.41***	95.52±1.04***
GC200($mgkg^{-1}$, p.o.)	119.12±1.85	133.90±1.62	133.30±1.55*	121.20±1.13*	115.90±1.52**	104.80±1.48***
GC300($mgkg^{-1}$, p.o.)	117.31±186	133.40±1.86	121.80±1.30*	127.70±4.26**	112.80±1.67***	108.60±1.05***

All values were presented as a mean ± SEM, n=6. Treatment was done for 28 days. The data were statistically analyzed using one way ANOVA, followed byDunnet's test by comparing all treated groups against control. The minimum value of $p<0.05$ was considered assignificant.*$p<0.05$,**$p<0.01$,***$p<0.001$as compared with control group and [a]$p<0.001$as compared with normal group. *Garcinia cambogia* -GC. Diabetic ratsgroupsG_3–received standard drug–Gliclazide (60 mg/kg body weight), while other groups of diabetic rats received GC (100, 200 & 400 $mgkg^{-1}$body weight)

Table4: Effect of *G.cambogia* on serum triglycerides level of diabetic rats

Treatments	Serum triglycerides (mg/dL)					
	0^{th}day	3^{rd}day	7^{th}day	14^{th}day	21^{st}day	28^{th}day
Normal saline	95.14±1.16	93.07±1.29	91.87±1.69	96.64±1.83	99.48±1.30	96.30±1.29
Diabetic Control	95.34±1.12	124.07±1.16[a]	132.87±1.19[a]	135.64±1.18[a]	135.48±1.15[a]	133.30±1.11[a]
Gliclazide 60 ($mgkg^{-1}$,p.o.)	95.65±1.26	121.10±1.15	129.90±1.18	131.70±1.27	143.30±1.12*	152.50±1.81*
GC 100($mgkg^{-1}$, p.o.)	92.75±1.49	125.70±1.71	110.90±1.18***	104.30±1.67***	99.48±1.20***	94.38±1.57***
GC200($mgkg^{-1}$, p.o.)	94.78±1.18	125.10±1.29	120.60±1.28*	114.80±1.18**	106.00±1.17***	100.10±1.15***

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GC300(mgkg^{-1}, p.o.)	93.14±1.76	125.20±1.16	112.30±1.34**	109.10±1.31***	100.50±1.19***	97.09±1.39***

All values were presented as a mean ± SEM, n=6. Treatment was done for 28 days. The data were statistically analyzed using one way ANOVA, followed byDunnet's test by comparing all treated groups against control. The minimum value of $p<0.05$ was considered as significant. *$p<0.05$, **$p<0.01$, ***$p<0.001$ as compared with control group and $^{a}p<0.001$ascompared with normal group. Diabetic rats groups G_3 – received standard drug –Gliclazide (60 mgkg^{-1}body weight), while other groups of diabetic rats received GC (100, 200 & 400 mg/kg body)

Effect on Antioxidant Activity

Diabetic rats exhibited reduced antioxidant activity, characterized by lower GSH levels and impaired CAT and SOD activity (Table 5). Treatment with *G. cambogia* significantly improved antioxidant activity and GSH levels in a dose-dependent manner, particularly at 200 and 300 mg kg^{-1}. These results are consistent with findings from studies on *Gymnemasylvestre* and *Bacopa monnieri*, which demonstrated improvements in antioxidant defenses in diabetic models [34,35]. Similarly, other medicinal plants such as *Punicagranatum* and *Aegle marmelos* have been shown to enhance antioxidant enzyme activities [36,37].

Histopathological Analysis of Pancreas

Microscopic examination revealed severe pancreatic islet damage in diabetic rats(Figure1B). However, *G. cambogia*-treated groups demonstrated β-cell regeneration and reduced vacuolation (Figure 1D, 1E, 1F), indicating protective effects against diabetes-induced pancreatic damage. These results align with studies on *Spondiasmombin* and *Vincarosea*, whichalso showed β-cell regenerative effects [38,39]. Conversely, *Aloevera* exhibited limited protective effects in diabetic models, highlighting variability in pancreatic recovery across different plant species [40].

Wound Healing Activity of *Garcinia cambogia*

Excision Wound Healing

Wound contraction and epithelialization times were significantly improved in *G. cambogia*-treated groups compared to controls (Table 6, Figure 2). At doses of 100, 200, and 300 mg kg^{-1}, wound contraction rates on day 21 were 93.96%, 93.60%, and 96.77%, respectively. Epithelialization times were reduced to 19.43, 19.87, and 21.83 days compared to 24.83 days in controls(Table7,Figure3).Soframycin-treated wounds exhibited the fastest healing (17.50 days). Thesef indings align with research on *Lantana camara* and *Teucrium polium* honey, which also promoted faster epithelialization and wound contraction [41,42]. Additionally, the dose-dependent trend observed here is consistent with studies on *Curcuma amada*, which demonstrated optimal wound healing at moderate doses [43].

Table5:Effect of *G.cambogia* on serum antioxidant level of diabetic rats

Treatments	Antioxidanta ctivity			
	Lipid peroxidation (nmoles/mgof protein)	GSH (nmoles/mgof protein)	CAT (μ moles/mg of protein)	SOD (IU/mgofprotein)
Normal saline	91.34±1.17	131.01±1.28	0.11525±0.002673	113.14±2.22
Diabetic Control	85.34±1.21	90.07±1.41	0.09585±0.003021^{c}	96.64±2.31^{a}
Gliclazide 60 (mgkg^{-1}, p.o.)	95.65±1.41	121.10±1.01	0.03632±0.005173*	131.70±1.27*

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GC100(mgkg^{-1},p.o.)	92.75±1.22	125.70±1.61	0.07229±0.001871	104.30±1.17***
GC200(mgkg^{-1}, p.o.)	94.78±1.61	125.10±1.61	0.09827±0.01241*	114.80±1.28**
GC300(mgkg^{-1}, p.o.)	93.14±1.41	125.20±1.21	0.1427±0.02929***	109.10±1.31***

All values were presented as a mean ± SEM, n=6. Treatment was done for 28 days. The data were statistically analyzed using one way ANOVA, followed byDunnet's test by comparing alltreated groups against control. The minimum value of $p<0.05$ was considered assignificant.*$p<0.05$,**$p<0.01$,***$p<0.001$as compared with control group and $^{a}p<0.001$ $^{c}p<0.05$ as compared with normal group. Diabetic rats groups G_3– received standard drug –Gliclazide (60 mgkg^{-1}body weight),while other groups of diabetic rats received GC (100, 200 & 400 mgkg^{-1} body)

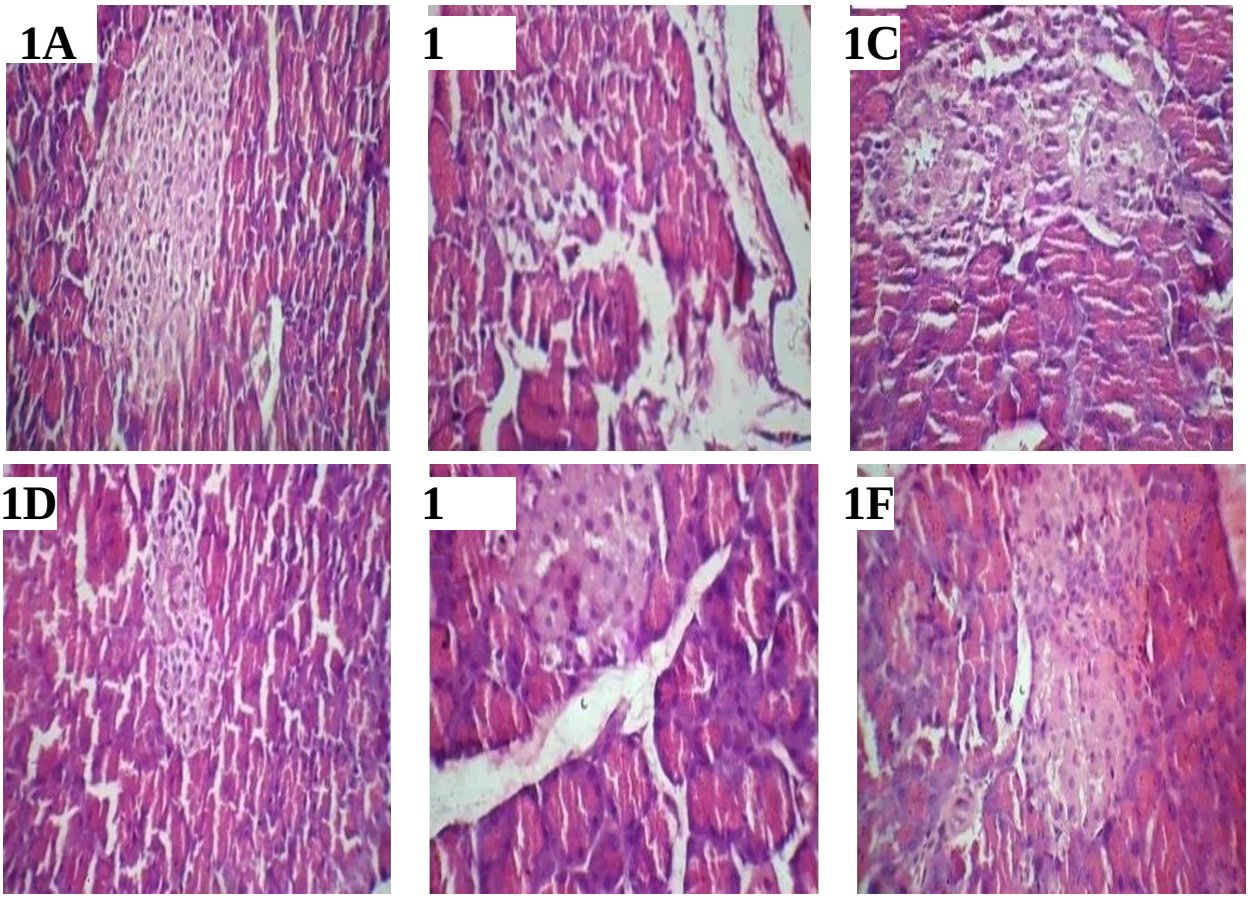

Figure 1.1A: Pancreatic islet of rat showing intact cluster of β-cells and architecture, 1B: Diabetic STZ control group animals showed destruction of pancreatic islets of β-cells, degranulation and severe vacuolation, 1C: Pancreatic islet of Gliclazide treated diabetic rat showing apparently reduced degranulation architecture, 1D, 1E, 1F: GC-treated with100, 200 and 300 mg/kg treated diabetic rat showing regeneration of the β-cells and reduction in the vacuolation caused by administration of STZ.

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Table6: Effect of *Garcinia cambogia* on excision wound contraction in rats.

Treated group	Percentage of excision wound contraction (%)						
	3rdday	6thday	9thday	12thday	15thday	18thday	21stday
Control	15.12±2.35	21.43±2.71	41.16±2.183	46.25±2.368	57.36±2.270	63.39±2.333	70.76±1.27
Soframycin	23.10±1.26***	49.57±2.33***	6445±1.366***	72.78±1.423***	83.20±1.629***	93.35±1.19***	93.35±0.123***
GC(100 $mgkg^{-1}$)	16.11±1.28	28.64±2.70	35.95±4.13*	58.19±3.221***	72.69±2.23***	82.52±2.17***	93.96±1.194***
GC (200 $mgkg^{-1}$)	23.14±0.33	33.76±1.99**	52.65±3.56***	73.00±1.449***	82.62±1.35***	94.17±0.355***	96.60±0.185***
GC (300 $mgkg^{-1}$)	14.66±1.64	36.74±2.10	54.29±3.23***	65.98±2.278***	72.60±1.424***	87.98±1.449***	99.77±1.14***

All the values are expressed as mean ±SEM, n=6,*p<0.05, **p<0.01, ***p<0.001(One way Analysis of Variance [ANOVA]followed by multiple comparison Tukey's test) as compared to control group. *Garcinia cambogia -GC.*

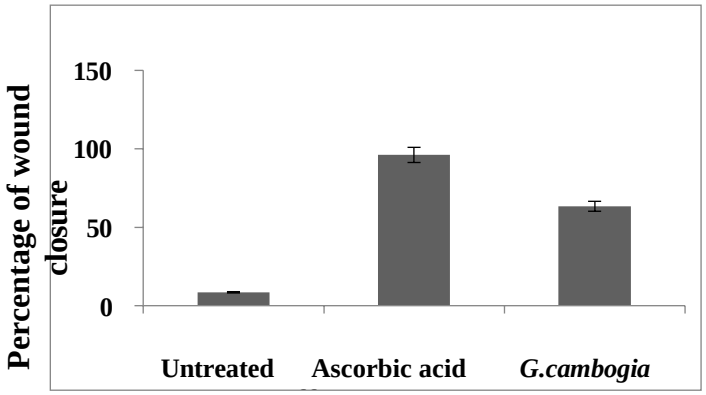

Figure 2. Comparative analysis of the percentage of wound closure observed in a scratch assay across different treatment conditions. Values are the means of three independent experiments displayed as ±Std deviation (n=6).

Macroscopic assessment showed noticeable improvements in wound closure over 21 days in the *G. cambogia*-treated groups. Wounds in these groups exhibited faster healing than the untreated control, with the300 $mgkg^{-1}$dosedemonstratingthemostsignificant contraction, comparable to Soframycin treatment. By day 21, wounds in the treated groups showed minimal scarring and faster epithelialization, supporting the potential efficacy of *G.cambogia* extracts in wound healing(Figure3).Similar effects were reported for *Mallotusoppositifolius* and

Table7: Effect of *G.cambogia,*on epithelialization time in rats.

Treated group	Epithelialization time in days
Control	24.83±1.403
Soframycin	17.50±1.223***
GC(100$mgkg^{-1}$)	19.43±1.200***
GC(200$mgkg^{-1}$)	19.87±1.357***
GC(300$mgkg^{-1}$)	21.83±1.203**

All the values are expressed as mean ± SEM, n=6, *p<0.05, **p<0.01, ***p<0.001 (One way Analysis of Variance [ANOVA] followed by multiple comparison Tukey's test) as compared to control group. (Garcinia cambogia-GC)

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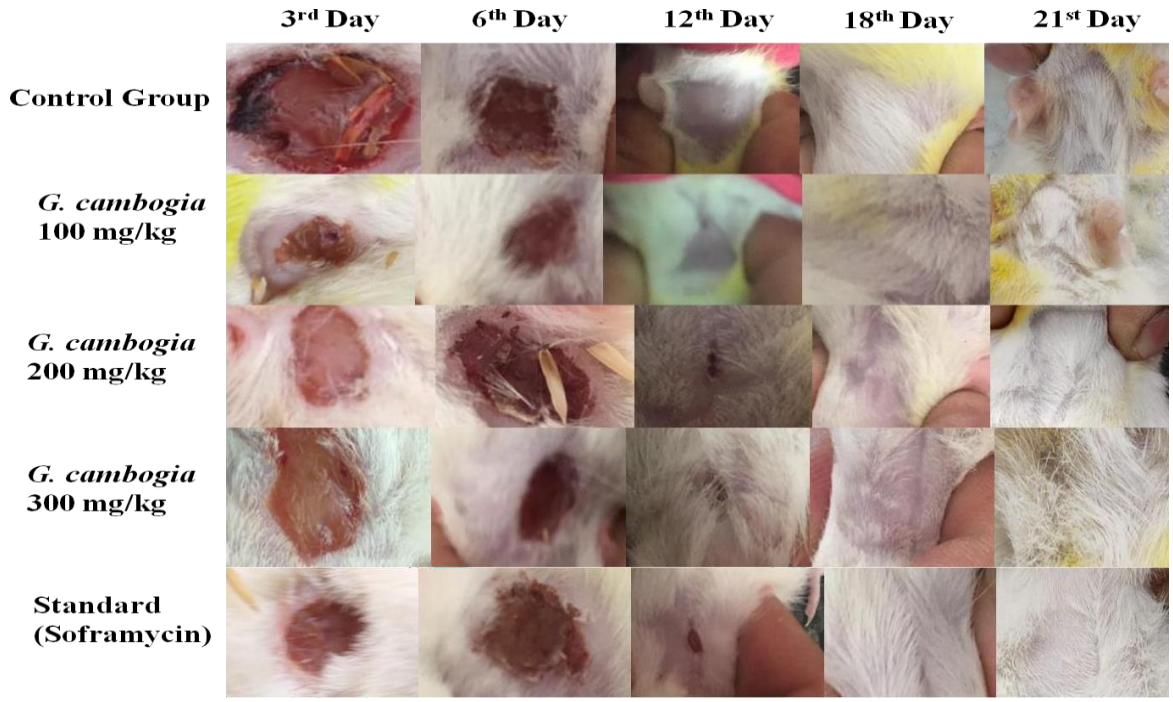

Figure 3. Macroscopic assessment of wound healing in rats undergone skin excision and treated with *G. cambogia* extracts at doses of 100 mg/kg, 200 mg/kg, and 300 mg/kg, in comparison to untreated control and a standard treatment (Soframycin). Representative images illustrating the progression of wound closure at days 3, 6, 12, 18, and 21 are provided.

Momordica charantia, which enhanced wound contraction rates [44]. Additionally, *Garcinia gummi-gutta*, a related species, was also found to improve wound healing, reinforcing the therapeutic potential of *Garcinia* species in this domain [19].

Incision Wound Healing

Breaking strength of incision wounds increased significantly in *G. cambogia*-treated groups (Table 8). On the 10th day, breaking strength was highest in the300mgkg^{-1}group(698.8g),followedby 200 mg kg^{-1} (561.0 g) and 100 mg kg^{-1} (413.3 g). Soframycin-treated wounds exhibited the highest breaking strength (603.3 g). This increased tissue integrity aligns with reports on *Calotropis gigantea* and chitosan-based wound dressings, which enhanced tissue repair and strength [46,47].

Wound Contraction

Soframycin-treated wounds showed the fastest contraction rates(93.25%by day10,Table9,Figure4). *G. cambogia* (100 and 200 mg kg^{-1}) improved contraction rates compared to controls, but the300mg kg^{-1} dose showed a plateau in efficacy. This trend corresponds with studies on polyherbal formulations containing *Aloe vera* and *Azadirachtaindica*, where wound contraction peaked at moderate doses [48]. The observed reduction in epithelialization time with *G. cambogia* aligns with previous studies on *Curcuma amada* and lavender extracts, both of which accelerated epithelial cell proliferation [43,44]. However, the slight increase in epithelialization time at the highest dose suggests the need for dosage optimization to prevent potential adverse effects.

The wound healing properties of *G. cambogia* may be attributed to its anti-inflammatory and antioxidant activities, as enhanced wound contraction and tissue regeneration were observed. Similar findings have been reported in studies on *Calotropis gigantea* and polyherbal extracts, which exhibited enhanced wound healing through modulation of oxidative stress and inflammatory pathways [45]. The plateau effect at higher doses reinforces the importance of optimizing treatment regimens to achieve maximum therapeutic benefits without diminishing returns.

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Table8:Effectof*G.cambogia*,onwoundbreaking strength in rats

Treated group	Wound breaking strength (Grams)	
	7thDay	10thDay
Control	257.3±4.341	362.8±2.48
Soframycin	574.8±1.117***	663.3±1.64***
GC (100 $mgkg^{-1}$)	421.5±2.20	413.3±5.263***
GC (200 $mgkg^{-1}$)	477.8±2.19***	561.0±1.49***
GC (300 $mgkg^{-1}$)	506.8±5.33*	698.8±5.35***

All the values are expressed as mean±SEM,n=6, *p<0.05, **p<0.01, ***p<0.001 (One way Analysis of Variance [ANOVA] followed by multiple comparison Tukey's test) as compared to control group. (Garcinia cambogia-GC)

Table9:Effectof*G.cambogia*onincision wound contraction in rats.

Treated group	Percentage of incision of wound contraction				
	2nday	4thday	6thday	8thday	10thday
Control	12.75±0.625	38.25±0.828	62.75±1.136	72.00±2.225	85.00±1.176
Soframycin	24.25±0.814***	58.45±0.442***	78.00±1.114***	91.71±0.217***	93.25±0.133***
GC(100$mgkg^{-1}$)	18.21±1.316*	41.32±1.538**	71.42±1.225***	77.72±0.711***	91.75±0.161***
GC(200$mgkg^{-1}$)	15.25±0.444*	55.10±0.713***	73.12±0.113***	87.15±1.329***	93.75±0.118***
GC(300$mgkg^{-1}$)	16.10±1.376*	66.15±1.217***	78.10±1.112	90.10±0.812***	95.00±1.239

Allthevaluesareexpressedasmean±SEM,n=6,*p<0.05,**p<0.01,***p<0.001(OnewayAnalysisofVariance [ANOVA] followed by multiple comparison Tukey's test) as compared to control group. (Garcinia cambogia-GC)

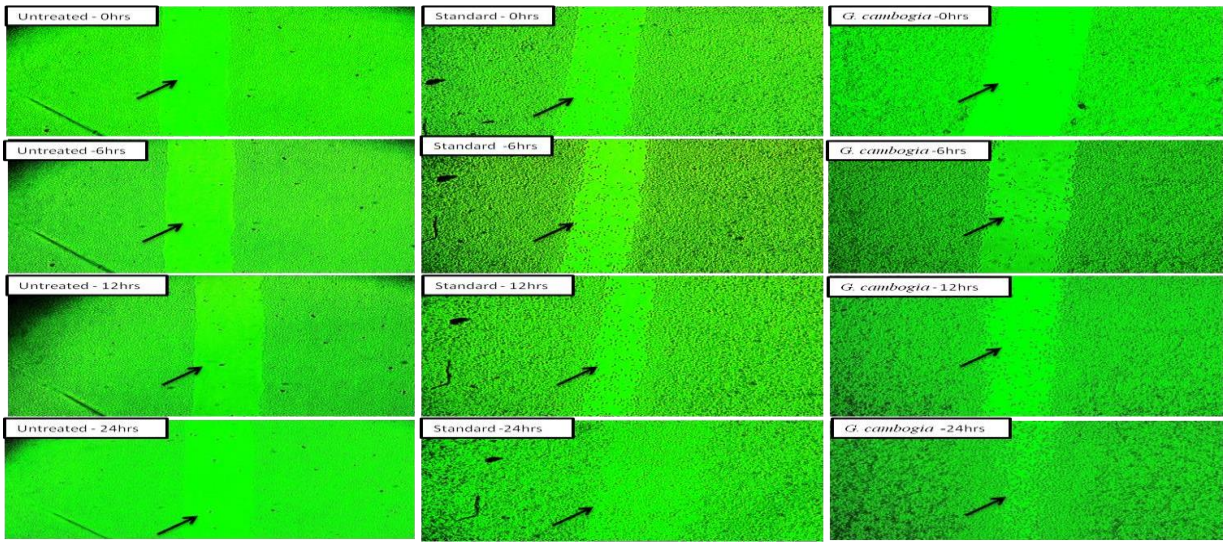

Figure4.Scratchassayanalysisof cellmigration.Imagesweretakenat0, 6, 12, and24hoursforuntreated, standard, and G. cambogia treated cells, with arrows indicating areas lacking cells.

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CONCLUSION

The study aims to comprehensively evaluate the therapeutic potential of *Garcinia cambogia* in the management of diabetes and enhancement of wound healing. The findings illustrate its significant impact on metabolic parameters in diabetic rats, particularly its ability to lower serum glucose and triglyceride levels. Additionally, *G. cambogia* demonstrated notable lipid-lowering effects, especially at higher doses, highlighting its potential in addressing diabetes-related dyslipidemia. The antioxidant properties of *G. cambogia* were also evident, as its administration improved antioxidant activity and increased glutathione levels, indicating its effectiveness in reducing oxidative stress associated with diabetes. Microscopic analysis further revealed its protective effects on pancreatic islet cells, showcasing its role in preserving β-cell structure and mitigating damage caused by diabetes. Regarding wound healing, the study showed that oral administration of *G. cambogia* promoted faster wound closure and epithelialization, emphasizing its therapeutic potentialin tissue repair. Furthermore, its ability to enhance cell migration supports its role in tissue regeneration. These findings present strong evidence for the dual benefits of *G. cambogia* in managing diabetes and aiding wound healing. However, the results also highlight the critical need for optimal dosing to maximize benefits while minimizing adverse effects. Future research is essential to further explore the mechanisms underlying the therapeutic effects of *G. cambogia* and assess its applicability in clinical settings.

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