Journal of e-Science Letters
Original Research Article | ISSN 3041-5454

Impact of Aspartame and Phytochemical Composition of *Sacoglottis gabonensis* extracts on Growth Performance in Male Swiss Mice

Aruchi, Wekhe-Emenike, Adetutu Olubunmi Obulor*, and Eme Efioanwan Orlu

Department of Animal and Environmental Biology, Rivers State University, P.M.B. 5080, Nkpolu-Oroworukwo, Port Harcourt, Rivers State, Nigeria

ABSTRACT

Background: *Aspartame may affect metabolism, while Sacoglottis gabonensis phytochemicals can either support or hinder growth depending on the duration of exposure. This study evaluated the impact of aspartame and S. gabonensis on growth performance in male mice. Ninety male mice were assigned to six groups (A-F, n= 15). Group A (control), B (aspartame @ 50mg/kg/bw/day), C (50mg/kg/bw/day of aspartame + 250mg/kg/bw/day of S. gabonensis. ethanolic leaf extract), D (50mg/kg/bw/day of aspartame + 250mg/kg/bw/day of S. gabonensis ethanolic bark extract), E (50mg/kg/bw/day of aspartame + 250mg/kg/bw/day of a combination of bark and leaf extract), and F (50mg/kg/bw/day of aspartame + 500mg/kg/bw/day of a combination of bark and leaf extract.) Each group received the treatment through oral gavage for 12 weeks. Phytochemical analysis of the extract was done using standard procedures. Body weights of the mice were taken twice a week. Data from phytochemical analysis and body weights were subjected to statistical analysis using SAS 9.4. Results revealed that bark extracts contained higher levels of tannins (269.21 mg/kg) and phytates (2410.5 mg/kg), while leaf extracts were richer in flavonoids (2.86%) and alkaloids (7.32%), indicating distinct bioactive and antinutritional profiles. Moreover, no significant difference in weight gain @ weeks 1-4, suggesting short-term adaptation to phytochemicals. At weeks 4-8, group D and F significantly reduced weight gain compared to group B, whereas group C exhibited intermediate gains, likely due to bioactive flavonoids and alkaloids. At weeks 8-12, prolonged exposure to bark-rich (group D) or 500mg/kg/bw/day treatments (group F) resulted in negative or unstable weight gains, while the group A and group B maintained more stable growth trajectories. However, these differences were statistically significant at weeks 5-8 and weeks 8-12 ($p < 0.05$). S. gabonensis bark is rich in tannins and phytates, and leaves are richer in flavonoids and alkaloids. While short-term intake did not affect growth, long-term consumption—especially of bark extracts—reduced weight gain. Leaf extracts supported moderate growth, suggesting they are more suitable for growth performance than bark extracts, whose prolonged use requires caution.*

Keywords: *Antinutritional factors, Aspartame, Bark extract, Growth performance, Leaf extract, Phytochemicals*

1. INTRODUCTION

Plant-based bioactive compounds have long been recognized for their nutritional, medicinal, and pharmacological properties. These compounds, largely categorized as secondary metabolites—including tannins, flavonoids, alkaloids, saponins, and phytates—play important roles in modulating physiological functions, antioxidant activity, and metabolic health [1, 2]. While many of these metabolites exert beneficial biological effects, some phytochemicals, particularly tannins, phytates, and oxalates, can function as antinutritional factors by reducing protein digestibility and mineral bioavailability, thereby influencing growth and development in animals [3,4].

The phytochemical composition of medicinal plants varies considerably among different plant parts. Notably, the bark and leaves often differ in their concentrations of bioactive compounds, with bark typically containing higher levels of tannins and phytates, while leaves are generally richer in flavonoids, alkaloids, and related compounds [5,6,7]. These compositional differences suggest that extracts from different plant parts may exert distinct effects on growth, metabolism, and overall physiological performance.

Understanding how these phytochemicals influence growth is therefore critical, particularly given their dual role as both beneficial bioactive agents and potential antinutritional factors. Evaluating the phytochemical profiles of bark and leaf extracts alongside their effects on body-weight changes in experimental animals can provide insight into their safety, efficacy, and appropriate dietary inclusion levels. Such information is valuable for the development of functional feeds, nutraceuticals, and plant-based therapeutic interventions.

In parallel, dietary palatability and taste perception play an important role in feed intake and growth outcomes. Humans naturally prefer sweet flavors, which enhance appetite; however, excessive intake of sugar-rich diets has been linked to obesity, diabetes mellitus, hypertension, and cardiovascular

Citation: Aruchi, Wekhe-Emenike, Adetutu Olubunmi Obulor, and Eme Efioanwan Orlu (2026). Impact of Aspartame and Phytochemical Composition of *Sacoglottis gabonensis* extracts on Growth Performance in Male Swiss Mice. *Journal of e-Science Letters.*
DOI: https://doi.org/10.51470/eSL.2026.7.2.18

Received: 07 February 2026
Revised: 13 March 2026
Accepted: 08 April 2026
Available: May 09 2026

Corresponding Authors: **Adetutu Olubunmi Obulor**
Email: **godwin.obulor1@ust.edu.ng**

disorders. To address these health concerns, artificial or non-nutritive sweeteners such as aspartame, saccharin, and acesulfame-K have been widely introduced as sugar substitutes. These sweeteners possess significantly greater sweetening intensity than sucrose and are commonly incorporated into diet beverages and food products [8]

Beyond human consumption, non-nutritive sweeteners like aspartame are increasingly used in animal feed studies to improve palatability or to evaluate metabolic interactions. Although aspartame is considered non-caloric, emerging evidence suggests that it may influence gut microbiota composition and metabolic signaling pathways, potentially interacting with other dietary constituents such as plant-derived phytochemicals [9,10]. This highlights the importance of assessing the combined effects of phytochemicals and feed additives on growth and metabolism.

One plant of particular interest is the bitter bark cherry tree, *Sacoglottis gabonensis*, a member of the family Humiriaceae found in the tropical rainforest regions of Africa and America. In several rural communities in Nigeria, the stem bark of *S. gabonensis* is traditionally added to freshly tapped palm wine obtained from *Raphia* species (especially *Raphia vinifera* P. Beauv) and oil palm (*Elaeis guineensis* Jacq.). The bark extract is believed to prolong the shelf life of palm wine and has also been used traditionally to treat various ailments, with reported protective effects against toxin-induced cellular damage [11].

Previous experimental studies support some of these traditional claims. [12] reported significant reductions in liver injury biomarkers, improvements in oxidative stress markers, and increased hepatocyte numbers in animals co-administered *S. gabonensis*. Furthermore, [13] observed no alterations in gestation length or behavioral changes during the gravid period in animals administered *S. gabonensis* extracts.

Despite these findings, there remains limited empirical evidence linking the whole-plant phytochemical profiles of *S. gabonensis* bark and leaves to growth performance in experimental animals, particularly over extended feeding durations. A comprehensive evaluation that incorporates both bark and leaf extracts across short-, medium-, and long-term feeding phases is therefore necessary to elucidate the time-dependent effects of these phytochemicals on growth. Additionally, incorporating aspartame into treatment groups reflects real-world dietary scenarios in which plant products are consumed alongside additives, enabling the assessment of potential synergistic or antagonistic interactions that may influence growth and physiological outcomes.

2.0 Experimental location

The experiment was carried out in the animal house of the Department of Animal and Environmental Biology, Rivers State University, Port Harcourt. (Coordinates 4° 48'14''N 6 59' 12''E).

3.0 Objectives

1. To analyze vital phytochemical components (tannins, flavonoids, alkaloids, saponins, phytates, oxalates, phenols, and HCN) in bark and leaf extracts of *S.gabonensis*.

2. To evaluate the effect of these extracts, in combination with aspartame, on body-weight gain during early (weeks 1–4), intermediate (weeks 5–8), and late (weeks 9–12) feeding phases.

3. To Compare the relative impact of bark, leaf, and combined bark–leaf extracts on body weight relative to positive (aspartame only) and negative (no aspartame or *S.gabonensis* extracts) controls.

4.0 Materials and Methods

4.1 Experimental animals and Management

Ninety mature male mice were used in the study. The mice were housed individually in cages under standard conditions. They were provided with clean water and rodent pellets *ad libitum*. All experiments were conducted according to the Institutional Animal Care Protocols at the Rivers State University, Port Harcourt, Nigeria, and followed guidelines for the ethical treatment of experimental animals.

4.2 Experimental design

Ninety mice were distributed into six groups (A-F), consisting of fifteen mice per group. Group A was the control while Group B was administered aspartame at 50mg/kg/bw/day. Group C was administered 50mg/kg/bw/day of aspartame along with 250mg/kg/bw/day of ethanolic leaf extract of *Sacoglottis gabonensis*. Group D was administered 50mg/kg/bw/day of aspartame + 250mg/kg/bw/day of ethanolic bark extract of *S. gabonensis*. Group E was administered 50mg/kg/bw/day of aspartame + 250mg/kg/bw/day of bark and leaf extract, while group F was administered 50mg/kg/bw/day of aspartame + 500mg/kg/bw/day of bark and leaf extract. Each group received the treatment through oral gavage for 12 weeks.

4.3 Preparation of extracts

The leaves were washed, air-dried, and milled into powder. Ethanolic extract of the *Sacoglottis gabonensis* leaves and bark was obtained by suspending 100 g of powdered sample in 500 ml of methanol at room temperature with continuous shaking for 24 hours. The extracts were then filtered through cotton wool and concentrated under 60°C pressure using a rotary evaporator. They were transferred into sterile containers and freeze-dried and redissolved in normal saline at the respective doses and used for the study.

4.3 Phytochemical analysis

Phytochemical constituents of *Sacoglottis gabonensis* extracts were determined using standard methods as described by [14,15]. Alkaloids, flavonoids, saponins, phenols, oxalate, phylate, and tannins were the phytochemicals examined.

4.4 Body weight analysis

From the commencement of the experiment, the weights of the mice were taken twice a week using a digital weighing balance and recorded to the nearest 0.01g.

4.5 Statistical analysis

All statistical data were presented as mean ± SEM and analyzed using Statistical Analyses System SAS 9.4 (SAS institute, Cary North Carolina, USA) with a one-way analysis of variance test followed by Tukey Multiple Comparison Test, at the significance of $p < 0.05$.

5.0 Results

Table 5.1: Phytochemical analysis of Sacoglottis gabonensis Bark and Leaf

Sample	Tannin	Phytate	Flavonoid	Phenol	Oxalate	Alkaloid	Saponin	HCN
	(mg/kg)	(mg/kg)	(%)	(mg/kg)	(mg/100g)	(%)	(%)	(mg/kg)
Bark	269.21±0.275[a]	2410.5±6.717[a]	1.21±0.187[b]	0.04±0.002	0.67±0.007[b]	3.81±0.067[b]	3.67±0.113	0.25±0.003[b]
Leaf	39.64±3.160[b]	1.19±0.017[b]	2.86±0.049[a]	0.03±0.001	1.53±0.042[a]	7.32±0.544[a]	3.78±0.243	0.29±0.031[a]

The phytochemical composition of the bark and leaf extract of *S.gabonensis* is presented in Table 5.1. The bark contained significantly higher levels of tannins (269.21±0.275 mg/kg) and phytate (2410.5±6.717 mg/kg) compared to the leaf, which recorded 39.64±3.160 mg/kg and 1.185±0.017 mg/kg, respectively ($p < 0.05$). However, the leaf sample exhibited significantly higher flavonoid (2.86±0.049%) and alkaloid (7.32±0.544%) contents than the bark, which had 1.205±0.187% flavonoids and 3.805±0.067% alkaloids. Oxalate concentration was also significantly greater in the leaf (1.53±0.042 mg/100 g) than in the bark (0.67±0.007 mg/100 g). No significant difference was observed in the phenolic content of both samples, with values of 0.04±0.002 mg/kg for the bark and 0.03±0.001 mg/kg for the leaf. Saponin levels were comparable in both samples, having 3.67±0.113% in the bark extract and 3.78±0.243% in the leaf. Hydrogen cyanide (HCN) content was significantly higher in the leaf (0.29 ±0.31mg/kg) than in the bark (0.25±0.003 mg/kg).

Table 5.2: Comparison of Total Weight Gain (TWG) of Swiss Mice after Treatment with Aspartame and Sacoglottis gabonensis for Weeks 1-4

Treatment	Total Weight Gain (TWG) (g)			
	TWG (Wk 1-2)	TWG (Wk 2-3)	TWG (Wk 3-4)	TWG (Wk 1-4)
	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
A	1.70±0.26	2.67±0.83	-0.26±0.33	4.11±1.17
B	2.89±1.19	2.83±0.91	0.52±0.41	6.23±1.42
C	2.03±0.37	3.37±1.20	0.25±0.59	5.66±1.44
D	1.75±0.84	1.50±0.62	2.38±1.24	5.63±1.49
E	1.71±0.31	4.75±0.47	0.20±0.10	6.66±0.35
F	2.38±0.16	1.52±0.60	1.14±0.27	5.04±0.81
Test Statistics: F-Ratio	0.55	2.28	2.36	0.57
P-value	0.7326[ns]	0.1119[ns]	0.1039[ns]	0.7186[ns]

**Significance Level: *=p<0.05; ns= no significant difference among the groups. (p>0.05), WK= Week*

The effects of the different treatments on total weight gain (TWG) over the experimental period are presented in Table 2. During weeks 1–2, TWG ranged from 1.70±0.26 g in the negative control to 2.89±1.19 g in the positive control, with no significant differences observed among treatments ($F = 0.55$, $p = 0.7326$). Similarly, weight gain during weeks 2–3 showed no significant variation ($F = 2.28$, $p = 0.1119$), although group E recorded a relatively higher mean gain (4.75±0.47 g) compared to other treatments. In weeks 3–4, changes in weight gain were generally low across all groups, with the negative control showing a slight weight loss (–0.26 ±0.33g); however, these differences were not statistically significant ($F = 2.36$, $p = 0.1039$). Overall total weight gain from weeks 1–4 ranged from 4.11±1.17 g in the negative control (A) to 6.66±0.35 g in group E, but no significant differences were observed among treatments ($F = 0.57$, $p = 0.7186$).

Table 5.3: Comparison of Total Weight Gain (TWG) of Swiss Mice after Treatment with Aspartame and Sacoglottis gabonensis for Weeks 4-8

Treatment	**Total Weight Gain (TWG) (g)**					
	TWG (Wks 4-5)	**TWG (Wks 5-6)**	**TWG (Wks 6-7)**	**TWG (Wks 7-8)**	**TWG (Wks 4-8)**	**TWG (Wks 1-8)**
	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
A	0.120±0.896	1.287±0.330	-0.300±1.319[b]	0.300±0.554[ab]	1.407±0.997[ab]	10.547±0.271[ab]
B	0.817±0.839	0.393±0.892	3.283±0.397[a]	4.283±0.260[a]	8.777±0.984[a]	16.787±0.098[a]
C	0.236±0.882	0.527±0.929	1.997±0.443[ab]	0.893±0.693[ab]	3.653±1.261[ab]	11.507±2.058[ab]
D	0.913±0.490	-0.743±1.068	0.087±0.667[b]	0.480±1.686[ab]	0.737±2.121[b]	7.157±1.751[b]
E	0.583±0.049	-0.290±0.260	-0.600±0.839[b]	0.223±0.441[ab]	-0.083±0.574[b]	7.640±2.585[ab]
F	-0.270±1.046	0.420±0.525	0.837±0.179[ab]	-2.057±1.641[b]	-1.070±2.816[b]	6.570±2.926[b]
Test Statistics: F-Ratio	0.340	0.914	4.117	3.810	4.710	3.926
P-value	0.8791[ns]	0.5041[ns]	0.0207*	0.0268*	0.0130**	0.0243*

**SEM: Standard error; TWG: Total Weight Gain. Within Parameter, means ±SE with different superscripts are significantly different (p<0.05). Significance Level: *=p<0.05; **=p<0.01; ns=Not Significant (p>0.05).*

The effects of the treatments on total weight gain (TWG) during weeks 4–8 are summarized in Table 5.3. Weight gain during weeks 4–5 and 5–6 did not differ significantly among treatments ($F = 0.340$, $p = 0.8791$; $F = 0.914$, $p = 0.5041$, respectively). However, significant ($p < 0.05$) differences were observed during weeks 6–7, where the positive control (group B) recorded the highest weight gain (3.28±0.397 g), which was significantly greater than those in group D, 0.397±0.667) and group E, 0.600±0.839 g. A similar trend was noted during weeks 7–8, with group B showing a significantly ($p < 0.05$) higher TWG (4.28±0.26 g) compared to group F, -2.057±1.64g.

Cumulative weight gain from weeks 4–8 differed significantly among groups ($F = 4.710$, $p = 0.0130$), with group B, exhibiting the highest gain (8.78±0.984 g), while group D, E and F recorded lower or negative gains. Over the entire experimental period (weeks 1–8), total weight gain also varied significantly ($F = 3.926$, $p = 0.0243$), with the positive control showing the greatest overall gain (16.79±0.098g). In contrast, animals co-administered aspartame and bark extract alone or in combinations (groups D, E, F), demonstrated reduced growth performance.

Table 5.4: Comparisons of Total Weight Gain (TWG) of Swiss Mice after Treatment with Aspartame and Saccoglottis gabonensis for Weeks 8-12

Treatment	TWG (Wk 8-9)	TWG (Wk 9-10)	TWG (Wk 10-11)	TWG (Wk 11-12)	TWG (Wk 8-12)	TWG (Wk 1-12)
	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE	Mean ± SE
A	-0.38±0.33^{ab}	0.58±0.53^{abc}	2.27±0.55^{b}	1.16±0.65^{ab}	3.63±0.88^{a}	16.02±1.91^{a}
B	-0.50±0.77^{ab}	0.02±0.64^{abc}	-0.15±0.51^{ab}	2.00±0.93^{ab}	1.37±1.19^{ab}	9.41±1.22^{b}
C	-2.26±0.16^{b}	1.93±0.10^{ab}	-2.54±0.15^{a}	3.12±0.26^{a}	0.26±0.27^{ab}	11.58±0.18^{ab}
D	0.38±2.10^{ab}	-1.71±1.48^{c}	-0.24±0.26^{a}	0.96±0.30^{ab}	-0.61±0.71^{b}	7.88±1.09^{b}
E	2.71±0.27^{a}	-1.36±0.28^{bc}	-0.46±0.93^{a}	0.36±0.41^{b}	1.25±0.61^{ab}	8.31±0.54^{b}
F	-1.92±0.29^{b}	2.53±0.21^{a}	-1.17±0.35^{a}	0.79±0.45^{ab}	0.22±0.32^{ab}	7.03±0.69^{b}
F-Ratio	3.631	5.832	9.087	3.317	4.031	9.313
P-value	0.0312*	0.0059**	0.0009***	0.0412*	0.0223*	0.0008***

*Abbreviations: SE: Standard error of mean; TWG: Total Weight Gain. Within Parameter, means ± SE with different superscripts is significantly different (p<0.05). Significance Level: *=p<0.05; **=p<0.01; ***=p<0.001. Superscript with the same alphabet showed non-significant difference, while Superscripts with different alphabet showed significant difference*

The effects of the different treatments on total weight gain (TWG) from weeks 8–12 are presented in Table 5.4. Significant differences in weight gain were observed during all weekly intervals assessed. During weeks 8–9, TWG differed significantly among treatments (F = 3.631, p = 0.0312), with group E recording the highest weight gain (2.71 ±0.27g), while group C and group F showed significant weight losses. In weeks 9–10, significant variation was also observed (F = 5.832, p = 0.0059), as the group F exhibited the greatest weight gain (2.53±0.21 g), whereas the group D (-1.71±1.48) and E(-1.36±0.28 g) recorded significant weight reductions.

During weeks 10–11, treatment effects were highly significant (F = 9.087, p = 0.0009), with the negative control showing a significant weight gain (2.27±0.55 g), while most treated groups experienced weight loss. Similarly, TWG during weeks 11–12 differed significantly among treatments (F = 3.317, p = 0.0412), with group C, recording the highest gain (3.12±0.26 g). Cumulative weight gain from weeks 8–12 showed significant differences (F = 4.031, p = 0.0223), where the negative control exhibited the highest overall gain (3.63±0.88 g), while the bark-treated group (D) recorded a net weight loss (–0.61±0.71 g).

6.0 DISCUSSION

6.1. Phytochemical analysis of Bark and Leaf extract of *S.gabonensis*

The phytochemical analysis of the plant materials revealed distinct profiles between bark and leaf samples (Table 5.1). The bark contained notably high tannin and phytate levels, whereas the leaf was richer in flavonoids, alkaloids, and oxalates. Both parts also contained saponins and HCN. These secondary metabolites are known to influence nutrient utilization, metabolic responses, and growth outcomes in animals depending on their concentration and exposure duration.

Tannins and phytates are classic anti-nutritional factors, capable of forming complexes with dietary proteins and minerals that reduce digestibility, nutrient absorption, and feed efficiency. Tannins may precipitate proteins and inhibit digestive enzymes, while phytates chelate essential minerals like calcium and iron, limiting their bioavailability. The significantly higher tannin and phytate contents in the bark suggest a stronger anti-nutritional potential, as these compounds are known to reduce mineral bioavailability by forming insoluble complexes [16]. However, their presence also implies possible therapeutic benefits, since tannins possess antimicrobial, anti-inflammatory, and antioxidant properties. This indicates that the bark may be more suitable for medicinal applications than for direct nutritional use without processing.

Flavonoids and alkaloids, often abundant in plant leaves, are associated with antioxidant, anti-inflammatory, and gut-modulating effects, which under some conditions may support health and metabolic resilience in animals.

The leaf's higher flavonoid and alkaloid contents imply a greater antioxidant and bioactive potential, supporting its possible use in managing oxidative stress and in pharmaceutical formulations. Flavonoids are associated with anti-cancer, cardioprotective, and anti-inflammatory effects, while alkaloids often exhibit strong biological activities such as analgesic and antimicrobial effects. This suggests that the leaf may have broader therapeutic relevance than the bark.

The presence of oxalates and saponins can reduce nutrient uptake and, at sufficient concentrations, impair lipid and micronutrient metabolism. The elevated oxalate content in the leaf indicates a potential risk for reduced calcium absorption and kidney stone formation if consumed excessively, highlighting the need for moderate consumption or processing. Similarly, the significantly higher hydrogen cyanide (HCN) level in the leaf, although still low, raises toxicological concerns, emphasizing that proper processing is essential before consumption.

The comparable saponin levels in both samples suggest similar contributions to cholesterol-lowering, immune-modulating, and antimicrobial effects. The lack of a significant difference in phenolic content indicates that both plant parts contribute similarly to phenol-related antioxidant activity.

6.2: Early Exposure and Weight Trends.

During the initial phase (weeks 1–4), there were no significant differences in total weight gain among treatment groups despite the varying phytochemical exposures. This may reflect a transient adaptive period where animals acclimate to both aspartame and phytochemical intake. Non-nutritive sweeteners like aspartame at recommended doses often do not significantly alter weight gain or food intake in rodents [13], though metabolic effects can vary with study design and diet composition. Importantly, animals exposed to a combination of plant extracts and aspartame may experience early modulation of appetite or energy metabolism that does not immediately manifest as weight differences but can influence longer-term growth trends.

Additionally, some phytochemicals at low exposure levels may not exert substantial anti-nutrient effects initially, and adaptive changes in digestive enzyme activity or gut microbiota might temporarily buffer impacts on nutrient absorption.

6.3: Emerging Differences in Growth Response. During the intermediate phase (weeks 5–8), significant differences in weight gain emerged, particularly with the positive control (aspartame only) showing higher gains relative to groups receiving bark (group D) and combined bark–leaf treatments (groups E &F). Since aspartame itself is non-caloric, its influence on weight gain may be modulated by intake behavior and accompanying metabolic responses rather than direct nutrient contributions.

Some evidence suggests that aspartame can influence metabolic parameters and feeding behavior, potentially altering energy balance over time, though effects vary across studies [17,18,19,20].

In contrast, higher antinutrient contents in the bark and combinations containing bark may have progressively interfered with nutrient digestibility and growth. Prolonged exposure to tannins and phytates is linked to reduced protein and mineral utilization, which can impair growth performance, especially in monogastric animals without effective detoxification mechanisms [10,21]. The weak weight gains in bark-rich groups suggest that inhibitory effects on digestion and metabolism can outweigh any potential antioxidant benefits of flavonoids or alkaloids in the leaf during sustained intake.

6.4: Late Phase and Cumulative Effects. In the last phase (weeks 9-12), weight gain patterns diverged further. The negative control (water only) exhibited the most consistent positive gains, while several treated groups showed net losses or minimal increases. These outcomes indicate that chronic exposure to plant extracts combined with aspartame may exert cumulative metabolic stress or nutrient limitation. Long-term intake of antinutrients can exacerbate reductions in amino acid and mineral absorption, slow metabolic efficiency, and reduce growth performance.[16].

Despite aspartame's generally neutral weight effects at recommended doses in some models, extended consumption can influence feeding behavior and metabolic regulation, particularly when combined with compounds that alter gut function or nutrient availability. For example, prenatal or early life aspartame exposure has been linked to long-term metabolic changes and altered nutrient utilization patterns, suggesting potential interactions between non-nutritive sweeteners and other dietary components [17, 22].

In summary, the data suggest that phytochemical composition and duration of exposure play key roles in shaping growth responses in the presence of aspartame. Early stability (weeks 1-4) in weight gain may reflect initial acclimation to dietary constituents. However, at weeks 5-8, inhibitory effects of antinutrients likely began to outweigh any beneficial roles of flavonoids or gut support effects, especially given the sustained exposure. The late phase (weeks 9-12) reveals that a prolonged combination of certain plant extracts with aspartame may impair nutritional status more profoundly than aspartame alone, resulting in attenuated or negative weight gains.

Conclusion

S. gabonensis bark and leaves have different phytochemical compositions: the bark is rich in tannins and phytates, while the leaves contain more flavonoids, alkaloids, and oxalates. Short-term exposure (weeks 1-4) to the extracts did not significantly affect weight gain. However, prolonged exposure (weeks 5-8), especially to bark extracts, led to reduced weight gain due to cumulative antinutritional effects, whereas leaf extracts supported moderate growth, likely from beneficial bioactive compounds. The control group showed more stable growth overall. These results indicate that growth outcomes depend on both phytochemical balance and duration of intake, with bark extracts requiring caution due to growth-suppressing antinutrients, while leaf extracts may be more suitable for promoting growth and health. These findings indicate that the balance between antinutritional and bioactive phytochemicals, as well as the duration of exposure, critically influences growth outcomes.

However, caution should be taken in the consumption of the bark extracts since high concentrations of tannins and phytates in bark can suppress growth over long-term feeding, while the Leaves, being rich in flavonoids and alkaloids, can provide antioxidant and metabolic support. They may be preferentially used in diets aimed at promoting growth and health.

References

1. Iboroma, M., Orlu, E.E., Ebere, N. & Obulor, A.O. (2018). Androgenic and Antioxidant activity of *Stelleria media* on rats following sub-chronic exposure to Dichlorvos. IOSR Journal of Pharmacy and Biological Sciences, 13(6), 38-46. DOI: 10.9790/3008-1306013846.
2. Pawase, P.A., Goswami, C., Shams, R., Pandey, V.K., Tripathi, A., Rustagi, S. & Darshan, G. (2024). A conceptual review on classification, extraction, bioactive potential and role of phytochemicals in human health. Future Foods, 9, 100313, https://doi.org/10.1016/j.fufo.2024.100313.
3. Gilani, G. S., Xiao, C. W., & Cockell, K. A. (2012). Impact of Antinutritional Factors in Food Proteins on the Digestibility of Protein and the Bioavailability of Amino Acids and on Protein Quality. *British Journal of Nutrition*, *108*(S2), S315–S332. doi:10.1017/S0007114512002371.
4. Samtiya, M., Aluko, R.E. & Dhewa, T. Plant food anti-nutritional factors and their reduction strategies: an overview. *Food Prod Process and Nutr* **2**, 6 (2020). https://doi.org/10.1186/s43014-020-0020-5.
5. Russo, D., Miglionico, R., Carmosino, M., Bisaccia, F., Andrade, P. B., Valentão, P., Milella, L., & Armentano, M. F. (2018). A Comparative Study on Phytochemical Profiles and Biological Activities of Sclerocarya birrea (A.Rich.) Hochst Leaf and Bark Extracts. *International journal of molecular sciences*, *19*(1), 186. https://doi.org/10.3390/ijms19010186
6. Nisca, A. & Tanase, C. (2025). Approaches to Extracting Bioactive Compounds from Bark of Various Plants: A Brief Review. *Plants*, 14(18): 2929. https://doi.org/10.3390/plants14182929
7. Nwali, O.N., Idoko, A., Okolie, J.E., Ezeh, E., Ugwudike, P.O., Rita, O.N., Ezenwali, M.O., Odo, I.A., Ani, P.N. & Okolie, S.O. (2018). Comparative analysis of the phytochemical compositions of leaf, stembark and root of *Azadirachta indica* (Neem). Universal Journal of Pharmaceutical Research, 3(5): 42-46. https://doi.org/10.22270/ujpr.v3i5.201
8. Marinovich, M., Galli, C.L., Bosetti, C., Gallus, S. & La Vecchia, C. (2013). Aspartame, low-calorie sweeteners and disease: regulatory safety and epidemiological issues. Food and chemical toxicology. 1;60:109-15.
9. Ruiz-Ojeda, F. J., Plaza-Díaz, J., Sáez-Lara, M. J. & Gil, A. (2019). Effects of Sweeteners on the Gut Microbiota: A Review of Experimental Studies and Clinical Trials. *Advances in nutrition (Bethesda, Md.)*, *10*(suppl_1), S31–S48. https://doi.org/10.1093/advances/nmy037.
10. Pluske, J.R. (2013). Feed- and feed additives-related aspects of gut health and development in weanling pigs. *J Animal Sci Biotechnol* 4, 1. https://doi.org/10.1186/2049-1891-4-1.
11. Wekhe-Emenike, A., Orlu, E.E. & Obulor, A.O. (2025). Mitigating Property of *Sacoglottis gabonensis Ethanolic* Extract on Spermatogenesis of Swiss Mice Following Chronic Exposure to Aspartame. International Journal of Research and Scientific Innovation. 7(10), 3958-3963. DOI: https://dx.doi.org/10.51244/IJRSI.2025.1210000342.
12. Wekhe-Emenike, A., Orlu, E.E. & Obulor, A.O. (2022). Duration Dependent Impact of Aspartame and *Sacoglottis gabonensis* on the Liver of Swiss Mice. Journal of Advances in Biology & Biotechnology, 25 (4), 39-49.

13. Wekhe-Emenike, A., Obulor, A.O., West, J.O. & Orlu, R.C. (2024). Investigation on the Effect of Sacoglottis gabonensis on Blood Glucose, Body Weight and Behavioural Changes of Mice Exposed to Non-nutritive Sweeteners during Gestation. Asian Journal of Research in Zoology 7 (4), 65-70. DOI: https://doi.org/10.9734/ajriz/2024/v7i4170.
14. Alamzeb, M., Khan, M.R., Ali, S., Shah, S.Q., & Mamoon, U.R. (2013). Antimicrobial properties of extracts and compounds isolated from *Berberis jaeschkeana, Bangladesh J Pharmacol*., 8(2): 107-109. https://doi.org/10.3329/bjp.v8i2.13551, Accessed: 19.01.2018.
15. Talukdar, A., & Chaudhary, B. (2010). Phytochemical Screening of ethanolic extracts of Rubia Cordiofolia. Pharm. Biol. Sci., 1(4): 530-536.
16. Mihrete, Y. (2019). Review on Mineral Malabsorption and Reducing Technologies. *International Journal of Neurologic Physical Therapy*, *5*(1), 25-30. https://doi.org/10.11648/j.ijnpt.20190501.15
17. Toigo, E. P., Huffell, A. P., Mota, C. S., Bertolini, D., Pettenuzzo, L. F., & Dalmaz, C. (2015). Metabolic and feeding behavior alterations provoked by prenatal exposure to aspartame. *Appetite*, *87*, 168–174. https://doi.org/10.1016/j.appet.2014.12.213
18. Fowler S. P. G. (2016). Low-calorie sweetener use and energy balance: Results from experimental studies in animals, and large-scale prospective studies in humans. *Physiology & behavior*, *164*(Pt B), 517–523. https://doi.org/10.1016/j.physbeh.2016.04.047.
19. Santos, N. C., de Araujo, L. M., De Luca Canto, G., Guerra, E. N. S., Coelho, M. S., & Borin, M. F. (2018). Metabolic effects of aspartame in adulthood: A systematic review and meta-analysis of randomized clinical trials. *Critical reviews in food science and nutrition*, *58*(12), 2068–2081. https://doi.org/10.1080/10408398.2017.1304358.
20. Ragi, M.E.E., El-Haber, R., El-Masri, F. & Obeid, O.A. (2022). The effect of aspartame and sucralose intake on body weight measures and blood metabolites: role of their form (solid and/or liquid) of ingestion. *British Journal of Nutrition, 128,* 352–360 doi:10.1017/S0007114521003238.
21. Hassan, Z.M., Manyelo, T.G., Selaledi, L. & Mabelebele, M. (2020). The effects of tannins in monogastric animals with special reference to alternative feed ingredients. *Molecules, 25*(20), 4680. https://doi.org/10.3390/molecules25204680.
22. Araújo, J. R., Martel, F. & Keating, E. (2014). Exposure to non-nutritive sweeteners during pregnancy and lactation: Impact in programming of metabolic diseases in the progeny later in life. *Reproductive toxicology (Elmsford, N.Y.)*, *49*, 196–201. https://doi.org/10.1016/j.reprotox.2014.09.007