

Anthropogenic Ecological Threat on *Ficus platyphylla* (Gamji) in Dungung, Kanke, Plateau State (Northcentral Nigeria): Ethnobotany Significance and Survival

*¹Kopplamma Nenchini Bala, ¹Tokshidung Gerji Yilji, ²Chindab Godwin Goden, ¹Chioma Bertha Ehis-Eriakha and ³Ngbede Emmanuel Ochoyo

¹Department of Biology and Forensic Science, Faculty of Science, Admiralty University of Nigeria, Ibusa, Delta State, Nigeria.

²Department of Sustainable Education, College of ECE/PED, Federal University of Education Pankshin, Plateau State, Nigeria.

³Department of Microbiology, Faculty of Science, Wesley University, Ondo State, Nigeria.

*Corresponding authors' email: nenchinik@gmail.com Phone: +2347030555779

ABSTRACT

This study investigated the ecological threats and ethnomedicinal value of *Ficus platyphylla* (Gamji) in Dungung, Kanke Local Government Area, Plateau State, where the species faces imminent local extinction. The research mapped surviving trees using stratified random sampling, quantified human-driven pressures across nine stations, and validated traditional therapeutic uses via phytochemical screening. Statistical analysis revealed a significant positive relationship between human disturbance, distance, and species abundance ($r = 0.72$), ($p < 0.05$), with the highest tree counts recorded at distant locations like Tingnen and Gele. Palace recorded zero count while Jjag, Gonung, Gwalke, Lungpye, Kagu and Tambal trees abundance range from 1-3 respectively. For the laboratory component, fresh bark and leaves were processed using cold maceration in 70% methanol. Qualitative and quantitative screenings confirmed the presence of vital secondary metabolites including alkaloids, flavonoids, tannins, saponins, and glycosides along with a strong antioxidant potential evidenced by Total Phenolic Content (TPC) and Total Flavonoid Content (TFC). These findings scientifically validate the traditional use of *F. platyphylla* in Dungung for treating epilepsy, psychosis, and inflammatory conditions. With these extreme anthropogenic pressures on this biologically important plant species, immediate intervention is necessary. To prevent total local extinction, the study recommends adopting sustainable agroforestry practices and enacting local conservation laws to strictly prohibit further human infractions on *Ficus platyphylla*.

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INTRODUCTION

The etymology of the Dungung community is fundamentally tied to the historical abundance of *Ficus platyphylla* (Yilwada, 2025). In the native Ngas language, the toponym is derived from "dung" (abundant) and "gung" (*Ficus platyphylla*), translating literally to "The Place of Many Gamji Trees". Known as the broad-leaved fig, *F. platyphylla* Delile (family Moraceae) represents a flagship woody species within the Guinea and Sudan Savannah belts of West Africa. While historically functioning as a key provider of biodiversity services and regional healthcare assets since the early 1900s, wild populations stand on the verge of local extinction in 2026 due to accelerating human stress. This rapid decline compromises the conservation of indigenous biological heritage, directly violating the United Nations Sustainable Development Goals (SDGs, 2015; Adeboye *et al.*, 2025)

Ecologically, *F. platyphylla* serves as a critical keystone resource. Unlike standard seasonal savannah flora, its asynchronous production of multi-tiered syconia (fruits) maintains a steady, year-round trophic hub for local avian, chiropteran, and insect frugivores (Sawadogo *et al.*, 2024). Physically, its extensive, deep-reaching root system secures the fragile, rolling topography of Kanke LGA against severe topsoil erosion during torrential storms, while optimizing subterranean water recharge by elevating structural soil porosity (Oyakhromen and Akpan, 2024). Furthermore, its

massive, broad-leaf canopy mitigates extreme ambient microclimate fluctuations, creating fertile understory microenvironments suitable for shade-loving plants and vital soil microorganisms (Lema *et al.*, 2025).

From an ethnomedicinal standpoint, Dungung has long functioned as a regional herbal repository. Local traditional healers utilize *F. platyphylla* stem barks to manage complex central nervous system ailments, including epilepsy and psychosis. Empirical pharmacological studies indicate that its high saponin and flavonoid profiles induce meaningful depressant and sedative actions on the central nervous system (Ganiyu *et al.*, 2023; Ibrahim *et al.*, 2025). Leaf decoctions are applied to alleviate symptoms of rheumatoid arthritis and general malaise via cyclooxygenase (COX) enzyme inhibition, behaving similarly to modern non-steroidal anti-inflammatory drugs (Lema *et al.*, 2025). Additionally, the specialized latex is used to treat gastrointestinal parasitic infestations, whereas boiled leaf preparations provide therapeutic actions for respiratory complications, including tuberculosis and persistent coughs (Ibrahim *et al.*, 2025). Sawadogo *et al.* (2024) reported 14 African *F.* species are on the list of threatened species in the red list of IUCN. Despite these threats, no conservation strategy is taken towards the genus *Ficus* in Africa. It becomes urgent to take conservation measures to ensure the long-term viability of this keystone species. That would require an integrated and collaborative

approach involving both local communities and environmental management authorities.

This research seeks to reveal and document the critical importance of *Ficus platyphylla* while highlighting the acute anthropogenic threats facing the species in Nigeria, with a specific focus on the Dungung community, Kanke LGA Plateau State. By mapping the decline of the species, the result of this research provided a scientific and cultural basis for urgent conservation interventions to prevent the total loss of this "living food security, pharmacy and environment restoration tree.

MATERIALS AND METHODS

Study Area and Sampling Survey of *Ficus platyphylla*

Dungung is located on the following coordinates; N 9°20' 20¹¹ and E 9° 35' 6¹¹ in Kanke Local Government Area (LGA) of

Plateau State, in Ampang East District. It holds the distinction of being the largest community by population in Ampang East district. A stratified random sampling strategy was implemented across the study area. Trees abundance within the Dungung community was recorded according to the appropriate sampling method used above. Transect configurations and standardized measuring tapes were used to assess spatial distance intervals between individuals and quantify structural girth dynamics. 2km intervals was recorded between the *Ficus platyphylla* trees. The survey mapped the remaining clusters of these trees in neighboring areas including Jijak, Karpang, Gonung, Tingnen, Gele. Kagu. Tambal. Gwalke, lungpye and Tele all within the community to ascertain survival and diversity of *Ficus platyphylla*



Figure 1: *Ficus platyphylla* Tree. Source; Scamperdale gallery

Plant Material Collection and Identification

Fresh leaves and stem bark were sampled from confirmed wild specimens in Dungung. Taxonomic authentication was verified by Prof. O. A.T. Namo at the Plant Science Department, University of Jos, Nigeria where a voucher specimen was deposited for reference. Plant tissues were thoroughly washed with distilled water, shade-dried at ambient room temperature for 14 to 21 days, and mechanically pulverized into uniform powders (Adeboye *et al.*, 2025). Cold maceration was carried out using 200 g of processed powder immersed in 70% aqueous methanol at a 1:5 (w/v) ratio for 72 hours under constant agitation. The resultant mixtures were processed through Whatman No. 1 filters and concentrated to dryness using a vacuum rotary evaporator at 40°C before being stored at 4°C (Lema *et al.*, 2025).

Phytochemical Screening

Qualitative Screens

Crude extracts were assessed using standard procedures to detect secondary metabolites, including alkaloids, flavonoids, tannins, saponins, glycosides, steroids, terpenoids, and total phenolics (Ganiyu *et al.*, 2023; Ibrahim *et al.*, 2025). Total phenolics were identified via ferric chloride colorimetric conversions.

Quantitative Analysis (TPC/TFC)

Total Phenolic Content (TPC) was quantified using the Folin–Ciocalteu reagent method, with absorbance recorded at 765 nm using gallic acid as the standard (Shemishere *et al.*, 2023; Lema *et al.*, 2025). Total Flavonoid Content (TFC) was estimated using the aluminum chloride colorimetric protocol at 510 nm, evaluated against a quercetin standard curve (Lema *et al.*, 2025).

Soil Parameters

Soils in Dungung are within crystalline basement complex of the Jos Plateau. The soils are influenced by weathered rocks and topography resulting to its parameters; soil texture, chemical, physical and biological properties.

Statistical Tool

Statistical processing was carried out using Pearson's correlation coefficient (r) to analyze the spatial relationship between population abundance and human settlement distance intervals, with significance set at $P < 0.05$. The software used was Microsoft Excel, R (Version 2408), and IBM SPSS (Version 29.0).

RESULTS AND DISCUSSION

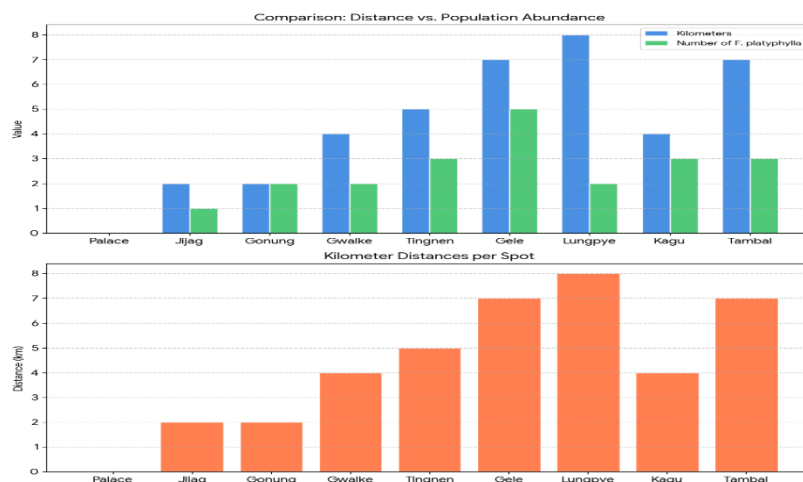
Spatial Distribution and Population Abundance

Field measurements revealed that *F. platyphylla* has been heavily depleted near urbanized zones, with wild specimens appearing primarily after 2 km intervals (Table 1 & Figure 1). Mature specimens are completely absent from the core settlement area (Palace), with surviving individuals generally occurring at scattered points (Figure 2).

The bar chart and the line graph showed increased in distance at Gele, Tingnen, Kagu and Tambal correspond to rise in the number of *F. platyphylla*, (5,3,3,3), though lungpye the furthest with two due to human disturbance. Palace, Gunung, Jijag and Gwalke with close and moderate distance (0-2km) insignificantly affect their population but anthropogenic activities affect their abundance. The line graph established *F. platyphylla* abundance has significant relationship with distance

Table 1: Showing Population Abundance with Kilometers

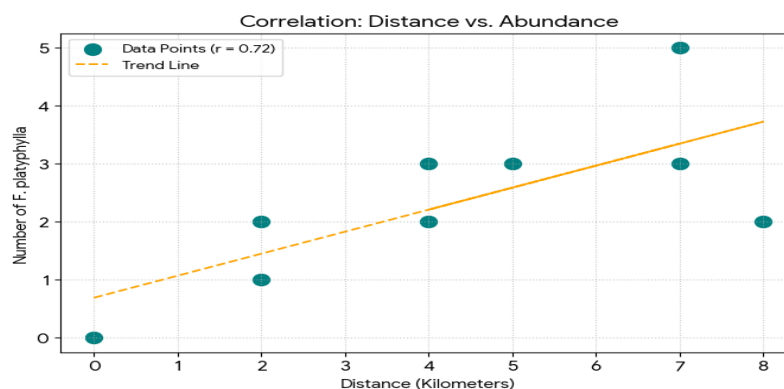
Spots Name	palace	Jijag	Gonung	Gwalke	Tingnen	Gele	Lungpye	Kagu	Tambal
Kilometers	0	2	2	4	5	7	8	4	7
Number of <i>F.platyphylla</i>	0	1	2	2	3	5	2	3	3

**Figure 1 Showing Bar Graph Comparing Distance versus Population Abundance and Distance per Spot**

Correlation: Distance increases (Gele and Tingnen), there was corresponding rise in the number of *F. platyphylla*, though this dips at the furthest point with two species (Lungpye).

Distance Range: The spots cover 0km to 8km, providing a clear look at how the population is distributed geographically. Figure 2 showed a statistically significant positive relationship between geographic distance from the settlement

and species abundance ($r = 0.72$, $t = 0.28$, $P < 0.05$) (Figure 2). This confirms that tree density increases significantly in remote locations where human interference is reduced (F1 & Table 1). However, a drop in abundance was observed at the furthest station, Lungpye (2 trees at 8 km), due to high targeted human disturbance in that area.

**Figure 2: Showing Correlation Relationship of Distance and *Ficus platyphylla* Abundance**

The line graph depicts trend of species abundance from 0-5 with significant relationship to distance

Soil Analysis

Dungung soils is characterized with granitic soils, which reflect heavily weathered crystalline basement complex of the broader rocky terrain region, but specially located within a landscape dominated by historic terraced topography.

Edaphic Parameters

Soil characterization across the sampling zones confirmed that the substrate originates from the heavily weathered crystalline basement complex of the Jos Plateau, dominated by historic terraced topography.

Physical Characteristics

Soil texture is classified as sandy loam to sandy clay loam, showing high surface sand fractions and slight clay accumulation in lower horizons. The underlying non-porous biotite granite contributes to a weak sub-angular blocky structure that exhibits low infiltration rates and high surface runoff. It is well-drained on hill terracing but easily compacted on flatter terrains.

Chemical Characteristics

Driven by acidic granitic parent material, the soils are strongly to slightly acidic, ranging from pH 4.9 - 6.2. Soil organic matter is low to moderate (0.49% – 1.6%), depleting

rapidly. Macronutrients are highly deficient, with Nitrogen hitting very low levels (< 0.05%) and Available Phosphorus constrained between 3.4 and 5.7 mg/kg due to acidic fixation. Exchangeable Potassium remains low to moderate (0.18 – 0.25 cmol/kg), matching low Cation Exchange Capacity (CEC) values of 2.5 – 3.5 cmol/kg. This baseline soil profile shows that edaphic factors are not the primary cause of the species' decline, pointing instead to humans.

Table 2: Despite regulations on indiscriminate falling of trees, yet economic value and pressures recently has led to illegal harvesting where sustainability is ignored for immediate profit.

Ficus platyphylla population was determined to be at the verge of extinction locally, nationally and globally as obtained by GPS and transect stratified mapping and measurement.

Table 2: Showing Matrix of Dominant Anthropogenic Stressors Affecting *F. platyphylla*

Threat Factor	Primary Driver	Ecological Impact
Girdling	High medicinal demand	Physiological collapse (Phloem death)
Fodder Lopping	Pastoralism in dry season	Reproductive failure (No seeds)
Ringing/Burning	Agricultural expansion	Immediate habitat loss
Chemical Timbering	Demand for rot-resistant wood	Loss of keystone genetic stock

Phytochemical Composition

These are the major secondary metabolite classes consistently detected in *Ficus platyphylla* extracts (leaves) and across solvents. Table 3 revealed the rich metabolites present in *F. platyphylla* such as flavonoids, phenols, tanins, saponins, alkaloids and steroids/sterols with their nature and role in

ethnomedicine. This confirmed to the empirical studies reported by Ibrahim *et al.* (2025). Table 4 showed the phytochemical quantification in descending order; flavonoids, tannins, glycosides, saponins, and Volatile oils & steroids (23.5%, 16.74%, 2.50%, 1.02%) and present Qualitative level only

Table 3: Showing Primary Secondary Metabolites

Metabolite	Nature of Metabolite	Metabolite role	source
Flavonoids	polyphenolics	antioxidant, antimicrobial, and enzyme-modulating activity	leaves
Phenols	simple phenolic compounds and polyphenolic derivatives	strong antioxidants and antimicrobial agents	leaves
Tannins	phenolic polymers	antibacterial/antioxidant	leaves
Saponins	glycosides with surfactant properties	Cholesterol-lowering and immune effects.	leaves
Alkaloids	nitrogen-containing bases	neurologic and antimicrobial effects	leaves
Steroids / Sterols	phytosterol-like structures	membrane stabilization and potential hormone-like activities	leaves
Glycosides	general sugar-linked bioactives	Cardio-protective or antimicrobial roles	leaves
Volatile oils / Terpenoids	aromatic and bioactive isoprenoid	antifungal and anti-inflammatory properties	leaves

Table 4: Showing Available Quantitative Phytochemicals

Phytochemical	Available %
Flavonoids	23.5%
Tannins	16.74%
Saponins	1.02%.
Glycosides	2.50%.
Volatile oils & steroids	Qualitatively present

Values vary by plant parts (leaves and bark), solvent used, extraction method, and measurement technique.

Discussion

The findings of this study confirmed *Ficus platyphylla* is a critical endanger species under severe human pressure in Dungung, Kanke Local Government Area (LGA) of Plateau State (Northcentral Nigeria). The significant positive correlation between tree abundance and distance from the core settlement demonstrates a clear spatial retreat of the species away from human activity centers. Highly populated central zones like the Palace showed complete extirpation, whereas remote forest stations such as Gele support larger numbers of surviving individuals.

This pattern of decline matches regional assessments across West Africa, which rank agricultural clearing, herbalbark harvesting and urban expansion as major threats to wild *Ficus* populations (Sawadogo *et al.*, 2024). In Dungung, high demand for open farmland and bark harvesting for had led farmers to systematically eliminate large *F. platyphylla* trees using trunk ringing and localized fires to clear the canopy for

grain monocropping (guinea corn, sorghum, and maize) to reduce canopy "shade stress". This pressure is worsened by logging for the construction industry. The tree's specialized latex contains natural biocides that make the timber highly resistant to wood beetles, termites, and fungal decay. As a result, builders frequently target these slow-growing trees for roof framing and external structures, which depletes the primary seed sources required for natural forest regeneration. Environmental pressures from intensive livestock grazing along migration corridors further compound this vulnerability. Pastoralists often cut off high branches to use the green foliage as emergency livestock fodder during the severe dry seasons. This continuous lopping disrupts the tree's reproductive cycles, preventing the development of syconia. Without these fruits, specialized pollinator populations are broken, and local populations of birds and bats—the primary seed dispersers—are forced to abandon the area, breaking vital ecological loops (Sawadogo *et al.*, 2024)

The pharmacological value of *F. platyphylla* is closely linked to its rich phytochemical profile. The quantitative findings confirm high concentrations of flavonoids (23.5%) and tannins (16.74%), which support traditional medical uses for managing neurological and inflammatory disorders (Lema et al., 2025). Bioactive flavonoids and saponins have been shown to exert depressive effects on the central nervous system, providing a clear scientific basis for the traditional use of bark extracts to manage epilepsy and psychosis in rural communities (Ibrahim et al., 2025). Furthermore, phenolic compounds display strong antimicrobial properties. Recent research confirms that these extracts are effective against clinical bacterial isolates, including *Pseudomonas aeruginosa* and *Klebsiella pneumoniae*, by neutralizing key bacterial proteins, notably driven by constituents like heptadecyl ester dichloroacetic acid (Lema et al., 2025).

However, recent toxicological evaluations highlight the need for caution in traditional practice. While acute exposure to high oral doses is generally well tolerated, prolonged or excessive dependent use of crude extracts can cause damage to renal tissues (Adeboye et al., 2025). This risk underlines the importance of standardizing traditional doses to ensure patient safety.

CONCLUSION

The *Ficus platyphylla* is a pillar of Northcentral Nigeria's natural and cultural heritage. In Dungung, the loss of these trees would signify not just an environmental decline, but a collapse of affordable local healthcare. Conservation efforts must transit from passive protection to active cultivation. Encouraging "agroforestry" where Gamji trees are integrated into farm plots, and training traditional healers in "strip-harvesting" (removing bark in vertical strips rather than circles), are essential steps to ensure the Gamji remains a fixture of the Nigerian savannah for generations to come.

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