

Gravimetric Quantification of the Traditional “Handful” of *Landolphia Owariensis* Bark Powder

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Abstract: *Background:* Traditional herbal preparations are often administered using empirical measures, such as a handful of powder or a volume of decoction. Although these practices are rooted in endogenous knowledge, the lack of precise quantification may limit preparation reproducibility and complicate their translation into preclinical studies. *Objective:* This study aimed to quantify gravimetrically the traditional portion of *Landolphia owariensis* P. Beauv. (Apocynaceae) liana bark powder and establish a quantitative correspondence between this empirical measure and the traditionally prepared aqueous formulation. *Methods:* Thirty portions of powder corresponding to the traditional measure were weighed individually. Descriptive statistics included the mean, standard deviation, coefficient of variation, range, and 95% confidence interval. Data from the aqueous preparation were then used to estimate, by proportional calculation, the amounts of powder and dry residue corresponding to the reported preparation volumes. *Results:* The 30 weighings yielded a total mass of 443.2 g, with individual values ranging from 13.6 to 16.1 g. The mean mass per portion was 14.77 ± 0.63 g, with a coefficient of variation of 4.28% and a 95% confidence interval of 14.54–15.01 g. Preparation of 1,500 mL using 88.2 g of powder yielded 22.5 g of dry residue, corresponding to an apparent yield of 25.51%. By proportional calculation, a 250-mL fraction prepared using 14.7 g of powder corresponds to approximately 3.75 g of estimated dry residue. *Conclusion:* This approach converts a traditional manual measure into a measurable mass that can be used to describe and reproduce a herbal preparation. It represents a preliminary methodological step toward standardizing traditional quantities used in preclinical research. Dry-residue quantities estimated by proportional calculation must be distinguished from direct measurements.

Keywords: *Landolphia owariensis*; pharmacognosy; endogenous knowledge; handful; traditional preparation; standardization; ethnopharmacology.

1. Introduction

Medicinal plants play an important role in traditional healthcare, particularly in contexts where therapeutic knowledge is transmitted within families and communities. Their use relies on endogenous knowledge concerning plant identification, the parts used, preparation procedures, and modes of administration. However, scientific documentation of these practices can face a fundamental difficulty: the quantities of plant material used are often expressed through customary measures, such as a handful, pinch, glass, or calabash, whose mass or volume is not always precisely defined.

This difficulty is particularly important when a traditional preparation is investigated pharmacognostically or pharmacologically. The reproducibility of a herbal preparation depends, among other factors, on determining the amount of raw material used, the volume of preparation obtained, and the quantity actually administered. When a dose is expressed only through a manual measure such as a handful of powder, reproducing it by another preparer or in another laboratory may be uncertain. Differences in quantity may complicate comparisons between experiments and limit traceability of experimental conditions.

This issue is especially relevant to preclinical studies. Translating a traditional use into an experimental protocol requires sufficiently precise descriptions of plant-material quantities and preparation conditions to make the experiment reproducible. An unquantified traditional dose

can make it difficult to establish a correspondence between the preparation used in traditional practice and that administered to laboratory animals. It can also complicate interpretation of pharmacological and toxicological results, particularly when experimental doses are expressed as mass of plant material or extract per kilogram of body weight. Gravimetric quantification does not, by itself, solve every standardization problem, but it is a necessary first step toward making an empirically defined quantity explicit.

In this context, *Landolphia owariensis* P. Beauv. (Apocynaceae), a liana whose bark is used in the traditional preparation investigated for the management of haemorrhoidal episodes, provides a relevant example. In the documented family recipe, the amount of bark powder is measured using a handful. Although this unit has practical meaning for the preparer, it must be translated into a measurable mass to describe preparation conditions more precisely. Quantifying this traditional portion should therefore be considered a preliminary step toward reproducing the recipe experimentally, rather than independent evidence of therapeutic efficacy.

The research question was: to what extent can a traditional portion of *Landolphia owariensis* P. Beauv. (Apocynaceae) bark powder, defined as a handful, be quantified gravimetrically and related quantitatively to the amounts of powder and dry residue associated with the traditionally prepared aqueous formulation? This question requires both measuring the mass of repeated portions prepared according to the documented practice and examining the quantitative

relationship between the amount of powder used, the volume of preparation obtained, and the reported mass of dry residue.

The value of this approach is methodological. Repeated measurements make it possible to estimate the mean mass, dispersion, and range of the portions, while preparation data can be used to establish a quantitative correspondence between traditional units and mass units used in experimental research. This approach helps improve recipe documentation, facilitate reproduction in future work, and make the transition from practical knowledge to a documented experimental protocol more transparent. However, it does not mean that the mean mass obtained constitutes a universal therapeutic dose: it remains specific to the documented recipe and the conditions under which the measurements were made.

The overall objective of this study was to quantitatively characterize the traditional portion of *Landolphia owariensis* P. Beauv. bark powder used in a family recipe, with a view to improving the reproducibility of its preparation and its description in preclinical research. Specifically, the study aimed to determine the mean mass of the traditional portion from 30 weighings, characterize the dispersion of the observed masses, and establish, from the available data, a quantitative correspondence between the amount of powder, the volume of aqueous preparation, and the reported mass of dry residue.

This study is therefore part of a preliminary pharmacognostic standardization approach intended to make a traditional preparation unit measurable and documentable while preserving the context in which it is used.

2. Materials and Methods

2.1 Study design

This was a descriptive experimental study intended to quantify an endogenous preparation practice. The empirical unit investigated was the “handful” of liana bark powder used in the documented family recipe. The study was neither a population-based ethnobotanical survey nor a clinical study.

2.2 Collection site, plant material, and identification

The bark of *Landolphia owariensis* P. Beauv. (Apocynaceae) was obtained from Djibosso, in the Department of Kani, Côte d'Ivoire. Before collection, the plant was observed in its environment and photographed to document its liana growth habit, immediate surroundings, and visible vegetative characteristics. The plant material used in this series of studies was identified and registered under herbarium number 147, as reported in subsequent studies involving the same original material. Original field photographs were retained for traceability.

2.3 Preparation of the herbal material

After collection, the bark was separated from the liana, cut into pieces, and dried. The dry pieces were ground and

reduced to powder using a mortar. The resulting powder was homogenized before gravimetric measurements. This sequence—collection, fragmentation, drying, grinding, and pulverization—was intended to reproduce the form of the herbal material used in the documented family recipe while allowing it to be handled and weighed.

2.4 Reproduction of the traditional measure

The traditional measure consisted of a manually collected portion of powder (a “handful”), as used in the documented family recipe. To assess reproducibility using the same procedure, the collection operation was repeated 30 times under identical experimental conditions. After each collection, the powder portion was transferred to a weighing container and its mass was determined using an electronic balance. The balance was tared before each measurement, and individual values were recorded for analysis.

2.5 Aqueous preparation and determination of dry-residue mass

A separate aqueous preparation was made using 88.2 g of powder in a total volume of 1,500 mL, corresponding to six nominal 250-mL fractions. After preparation and filtration, the filtrate was dried and yielded 22.5 g of dry residue. The 22.5-g mass was measured for the entire batch. Values reported for a 250-mL fraction and for 125 mL are proportional estimates from this batch, not independent measurements performed on each fraction. The previously published recipe describes traditional administration of 250 mL per day; therefore, the present analysis uses the total daily volume of 250 mL as the comparison unit, without presenting division into two doses as a general feature applicable to all practices.

2.6 Calculation of gravimetric and volumetric equivalents

Equivalents were calculated proportionally from the entire batch: 88.2 g of powder for 1,500 mL, and 22.5 g of dry residue obtained after drying the filtrate. A nominal 250-mL fraction therefore represents 14.7 g of powder used and an estimated 3.75 g of dry residue; a 125-mL fraction represents 7.35 g and 1.875 g, respectively. These dry-residue values are arithmetic estimates based on uniform allocation of the batch, not yields measured separately for each portion. Conversion to mg/kg/day was not retained as a main result because it depends on a hypothetical body weight and could be misinterpreted as a therapeutic recommendation.

2.7 Data analysis

The 30 gravimetric measurements were summarized using the arithmetic mean, standard deviation, minimum and maximum values, and range. The 95% confidence interval for the mean was calculated from the distribution of measurements using Student's *t*-distribution with 29 degrees of freedom. The apparent dry-residue yield was expressed as the ratio of dry-residue mass to the mass of powder used, multiplied by 100. Equivalents for the administration volumes were obtained proportionally from the total

preparation volume. A body weight of 50 kg was used only as a reference for quantitative expression, not as a therapeutic prescription.

The calculations used the following formulas: mean, $\bar{x} = \sum x_i/n$; sample variance, $s^2 = \sum (x_i - \bar{x})^2/(n - 1)$; standard deviation, $s = \sqrt{s^2}$; standard error, $SE = s/\sqrt{n}$; coefficient of variation, $CV (\%) = (s/\bar{x}) \times 100$; 95% confidence interval, $\bar{x} \pm t_{0.975,29} \times SE$. Apparent extraction yield was calculated as $R (\%) = (\text{dry-residue mass} / \text{mass of powder used}) \times 100$. Volume conversions were calculated proportionally, considering six 250-mL portions in the 1,500 mL prepared and two 125-mL portions per daily volume.

2.8 Use of generative artificial intelligence

A generative artificial intelligence tool (ChatGPT, OpenAI, 2026) was used for language improvement, scientific structuring, and translation of the manuscript. It was not

used to generate experimental data, results, or photographs, or to replace the authors' scientific judgment. The authors remain responsible for verifying facts, calculations, references, interpretations, and the final version.

3. Results and Discussion

3.1 Documentation of the plant material and its preparation

The documentary and experimental sequence followed the material from the plant observed at the collection site through the harvested liana, bark fragments, mechanical reduction, and powdered herbal material used for weighing. Original photographs provide visual traceability of the plant material and its preparation. Figures 1 and 2 document the plant and its foliage, while Figures 3–7 illustrate successive preparation steps and gravimetric handling.



Figure 1: *Landolphia owariensis* P. Beauv. observed in its natural habitat at the Djibrosso collection site before harvesting. Original field photograph (2017).



Figure 2: *Landolphia owariensis* liana and foliage observed at the Djibrosso site. Original photograph by the author (2017).



Figure 3: Leaves of *Landolphia owariensis* P. Beauv. documented during characterization of the plant material. Original photograph



Figure 4: Macroscopic appearance of liana segments before bark preparation. Original photograph.



Figure 5: Preparation and fragmentation of the liana material after collection. Original photograph



Figure 6: Dried bark fragments during mechanical reduction using a mortar. Original photograph



Figure 7: Liana bark powder during gravimetric weighing. The photograph illustrates the weighing procedure and does not, by itself, constitute a measurement of the mass of a handful. Original photograph.

3.2 Gravimetric translation of the traditional measure

The 30 repetitions of the traditional measure had a total mass of 443.2 g. Individual values ranged from 13.6 to 16.1 g. The mean was 14.773 g (standard deviation: 0.632 g), or 14.77 ± 0.63 g after rounding. The coefficient of variation calculated from the individual data was 4.28%. The 95% confidence interval for the mean was 14.54–15.01 g, and the range was 2.5 g. Under the conditions of this study, the

“handful” can therefore be represented, operationally and only for the documented recipe, by approximately 14.77 g of bark powder (Tables 1 and 2).

Table 1: Individual masses of the 30 portions of *Landolphia owariensis* bark powder.

Portion	Mass (g)	Portion	Mass (g)	Portion	Mass (g)
1	14,5	11	15,9	21	15,1
2	16,1	12	14,0	22	14,8
3	14,7	13	14,9	23	15,5
4	14,4	14	15,0	24	13,6
5	14,0	15	14,9	25	14,1
6	14,6	16	13,9	26	14,8
7	15,9	17	14,2	27	14,8
8	15,0	18	15,3	28	14,5
9	14,9	19	15,8	29	14,1
10	14,4	20	15,0	30	14,5

Table 2: Descriptive parameters for the gravimetric translation of the traditional measure.

Parameter	Value
Number of portions	30
Total mass	443,2 g
Minimum mass	13,6 g
Maximum mass	16,1 g
Moyenne $\pm$ écart-type	14,77 $\pm$ 0,63 g
Intervalle de confiance à 95 % de la moyenne	14,54–15,01 g
Range	2,5 g

3.3 Correspondence with the aqueous preparation and actual administration

The total 1,500-mL batch was prepared using 88.2 g of powder and yielded 22.5 g of dry residue after the filtrate was dried, corresponding to an apparent yield of 25.51% ($22.5/88.2 \times 100$). By proportional allocation, a nominal 250-mL fraction represents 14.7 g of powder used and an estimated 3.75 g of dry residue. A 125-mL fraction would represent 7.35 g of powder and an estimated 1.875 g of dry residue. These values are estimates calculated from the total batch; they are not independent assays of each fraction. The previous publication on anti-haemorrhoidal activity describes a different experimental protocol. The extract masses reported in the two studies should therefore not be compared directly without harmonizing extraction conditions. The equivalents presented here are descriptive and do not constitute a therapeutic recommendation.

Table 3: Calculated correspondences between the powder used, preparation volume, and estimated dry residue

Parameter	Value
Powder / 1,500 mL	88,2 g
Dry residue / 1,500 mL	22,5 g
Apparent dry-residue yield	25,51 %
Équivalent en poudre / 250 mL	14,7 g
Extrait sec / 250 mL	3,75 g
Équivalent en poudre / 125 mL (une prise)	7,35 g
Extrait sec / 125 mL (une prise)	1,875 g (estimé)

3.4 Interpretation of the gravimetric translation

The main finding of this study is that an endogenous unit, the “handful,” can be translated into a measurable mass suitable for use in scientific protocols. The mean of 14.77 ± 0.63 g indicates that, for the particular powder and manual procedure investigated, the measure showed limited dispersion around a central value. This information is useful because a dose expressed only through a manual unit is

difficult to reproduce exactly between operators or experimental studies.

3.5 Variability and limits to generalization

The observed range of 13.6–16.1 g, or 2.5 g, also shows that a handful is not a universal metrological unit. Its mass may vary according to hand morphology, the amount grasped, compaction, particle-size distribution, and moisture content. The value of 14.77 g should therefore be considered an operational equivalent specific to the documented recipe and experimental conditions, rather than a general definition of a handful of *L. owariensis* powder.

3.6 Pharmacognostic traceability

The pharmacognostic value of this approach also lies in the traceability of the plant material. The photographs document continuity between the plant in its collection environment and the processed plant material. This documentation complements conventional approaches to botanical identification and pharmacognostic quality control. For *L. owariensis* P. Beauv. (Apocynaceae), botanical databases confirm its occurrence in tropical African environments and forest-associated formations [5, 6].

3.7 Relationship to previous studies

Previous studies on *L. owariensis* have addressed pharmacognostic quality control, phytochemistry, toxicity, and experimental anti-haemorrhoidal activity. The study by Fofana et al. [3] and the article published in IJSR in 2021 [4] concerned preparations and experimental objectives different from the present series of weighings. In particular, the extraction conditions and reported extract masses should not be considered interchangeable without harmonizing the protocols. The specific contribution of the present study is the repeated quantification of a manually collected portion of powder and the transparent description of equivalents calculated from a separate aqueous batch.

3.8 Scope of the calculated equivalents

The calculated correspondence between the handful and preparation volume provides a quantitative description of the recipe investigated. A nominal 250-mL fraction corresponds to approximately 14.7 g of powder used and 3.75 g of estimated dry residue based on the total batch. Dividing this volume into two 125-mL portions is arithmetically possible, but it should only be reported as a traditional administration practice if confirmed by a separate direct source. No therapeutic dose or validated dosage equivalence can be inferred from these calculations alone.

3.9 Study limitations and perspectives

The study concerns a documented family recipe and a defined manual procedure; its findings therefore cannot be extrapolated to all communities or users of *L. owariensis*. The number of operators was not designed to investigate interindividual variability, and the effects of particle size, moisture, and compaction were not assessed separately. Further work could compare several operators, batches of

herbal material, drying conditions, and particle-size classes. Such experiments would help distinguish variability attributable to the plant powder from variability related to the act of collecting a portion.

3.10 Contribution to documenting endogenous knowledge

From the perspective of valuing endogenous knowledge, the proposed approach retains traditional practice as its starting point and introduces quantitative measurement without attributing population-level representativeness that it does not possess. The combination of traditional knowledge, plant-material traceability, and gravimetric measurement offers a pragmatic way to bring a documented traditional preparation closer to the reproducibility requirements of pharmacognostic research.

4. Conclusion

The “handful” of *Landolphia owariensis* P. Beauv. liana bark powder investigated in this study was quantified through repeated weighing. The 30 measurements yielded a mean of 14.77 ± 0.63 g, with values ranging from 13.6 to 16.1 g, a coefficient of variation of 4.28%, and a 95% confidence interval of 14.54–15.01 g. The aqueous batch prepared using 88.2 g of powder in 1,500 mL yielded 22.5 g of dry residue, corresponding to an apparent yield of 25.51%. The value of 3.75 g for 250 mL is a proportional estimate of dry residue, not an independent measurement for each portion. Thus, approximately 14.77 g is an operational gravimetric equivalent for the handful studied, not a universal unit or a validated therapeutic dose. Further work should assess reproducibility across operators, powder batches, and preparation conditions.

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Conflicts of Interest

The authors declare no conflicts of interest.

Author Contributions

FOFANA Yaya: study conception, collection and preparation of plant material, gravimetric measurements, data analysis, interpretation of results, manuscript drafting and revision. DROGON Emanuel: contribution to observation and morphological description of *Landolphia owariensis* (Apocynaceae), interpretation of morphological characteristics, and critical revision of the manuscript. ADICO N’dri Marcelline: contribution to observation and botanical description of *Landolphia owariensis*, interpretation of botanical characteristics, and critical revision of the manuscript. All authors read and approved the final manuscript.

Consent

Not applicable. The study did not involve human participants or personally identifiable information.

Ethical Approval

Not applicable. This manuscript documents and gravimetrically characterizes plant material and a traditional preparation; no human or animal experimentation was conducted in this study.

Data Availability

The data supporting the findings of this study are presented in the manuscript. Additional raw gravimetric records are available from the corresponding author upon reasonable request.

References

- [1] Asante-Kwatia, E., Mensah, A. Y., Baidoo, M. F., & Asomaning, G. A. (2019). Quality control standardization of the leaves and root of *Landolphia owariensis* (Apocynaceae). *Journal of Phytopharmacology*, 8(4), 185–191. <https://doi.org/10.31254/phyto.2019.8407>
- [2] Dally, L. I., Fofana, Y., Kablan, A. L. C., & Lia, A. J. (2020). Evaluation of the acute toxicity of liana bark of *Landolphia owariensis* P. Beauv. (Apocynaceae). *International Journal of Research - Granthaalayah*, 8(4), 167–172. <https://doi.org/10.29121/granthaalayah.v8.i4.2020.22>
- [3] Fofana, Y., Dally, L. I., Kablan, A. L. C., & Lia, A. J. (2020a). Phytochemical screening and subacute toxicity assessment of decoction of liana bark of *Landolphia owariensis* P. Beauv. (Apocynaceae) in Wistar rats. *International Journal of Research - Granthaalayah*, 8(1), 266–276. <https://doi.org/10.29121/granthaalayah.v8.i1.2020.281>
- [4] Fofana, Y., Goze, N. B., Fofie, Y., Dally, L. I., Kone, B. D., & Kablan, A. L. C. (2021). Anti-haemorrhoidal activity of the decoction of liana bark from *Landolphia owariensis* P. Beauv. (Apocynaceae). *International Journal of Science and Research*, 10(6), 522–530. <https://doi.org/10.21275/SR21523182832>
- [5] Royal Botanic Gardens, Kew. (2026). *Landolphia owariensis* P. Beauv. Plants of the World Online. Retrieved October 4, 2026, from <https://powo.science.kew.org/>
- [6] World Flora Online. (2026). *Landolphia owariensis* P. Beauv. World Flora Online. Retrieved October 4, 2026, from <https://www.worldfloraonline.org/>