Nigerian Journal of Pharmaceutical Sciences
Vol. 24, No1, 2025, ISSN: 0189-823X

QUALITY ASSESSMENT OF SELECTED ANTIMALARIAL HERBAL DRUGS

***Abdulrahman, S. A., Awwalu, S., Usman, M. A. and Muhammad, M. K**

Department of Pharmaceutical and Medicinal Chemistry, Ahmadu Bello University, Zaria, Nigeria

***Author for correspondence**: +2348035784873, Safinatsani95@gmail.com

ABSTRACT

The use of herbal medicinal products for the treatment and prevention of diseases has a long tradition worldwide and it has played an important role in the health care of numerous divergent societies, ranging from developing countries in Asia and Africa to western developed nations Herbal medicinal products are readily available and are not regulated and as such, serious safety concerns might be associated with these herbal medicines. This study was aimed at evaluating the physico-chemical and phytochemicals of some selected antimalarial herbal products marketed within Zaria metropolis. The physico-chemical analysis was carried out using standard analytical method reported by Trease and Evans. The result of physicochemical analysis shows that only 25 % of the samples passed the uniformity test. Phytochemical screening was conducted according to the standard procedures and the result revealed the presence of alkaloids, flavonoids, cardiac glycosides, saponins, terpenoids and tannins in 75, 100, 92, 96, 80 and 100 % respectively in the samples. Some (25 %) of the samples passed the weight uniformity test as none of these samples deviated from the mean weight by more than 7.5%. This indicates that good manufacturing practice was not adhered to during the packaging of these antimalarial herbal products. Also, all the samples were found to have phytochemicals required for antimalarial activity however, only few (25 %) of them is safe for consumption as per their weight variation studies. Thus, implying that there will be no consistency in dosing with these products and therefore, the therapeutic effect needed may not be achieved.

Keywords: EQ-VAS, EQ-5D-5L, HRQoL, Nigeria, Quality of life, T2DM, WPAI

INTRODUCTION

Herbal medicines include herbs, herbal materials, herbal preparations and finished herbal products that contain, as active ingredients, parts of plants, other plant materials or combinations. In some countries herbal medicines may contain, by tradition, natural organic or inorganic active ingredients that are not of plant origin (WHO, 2007). The world is experiencing a significant shift from the use of orthodox medicines to herbal medicinal products globally, and this trend is similarly observed in Nigeria, where many rural communities use herbal remedies as an important component of primary healthcare, and in some cases, it is the only accessible health care (Osuide, 2002). Herbal medicinal products have been wrongly perceived by the public to have relatively low risk as they are obtained from natural sources (Jordan *et al.,* 2010). Studies have reported serious safety issue associated with the consumption of these products (Ernst, 2002). Therefore, the quality control of crude drugs and herbal formulations is of paramount importance in justifying their quality, safety and acceptability in modern system of medicine. This study is aimed at determining the physico-chemical and phytochemical compositions of some antimalarial herbal products.

METHODS

Sampling of antimalarial herbal products

Twenty-four antimalarial herbal products were sampled for this study. The selected samples were from pharmaceutical shops. The samples were assigned codes A1 to A24 and their label information were recorded.

Physicochemical analysis of the antihypertensive herbal samples

Physicochemical parameters such as weight uniformity of the samples were recorded. Moisture content, extractable substances and ash values were determined in triplicate using standard methods (WHO, 2011b).

Phytochemical analysis of antihypertensive herbal products

Extraction method

Ten grams of each solid herbal sample was macerated in methanol for three days. The solution was then filtered and the filtrate was then used to test for the presence of alkaloids, flavonoids, cardiac glycosides, carbohydrates, saponins, terpenoids and tannins using standard procedures (Trease and Evans, 2009).

RESULTS

Antimalarial Herbal Samples within Zaria metropolis

Survey of antimalarial herbal products marketed within Zaria metropolis revealed a total of Twenty-four (24) products (Table 1).

Phytochemicals in the Antimalarial Herbal Samples

The results of the phytochemical screening of the samples are presented in table 2

DISCUSSION

Majority (95 %) of the herbal medicinal products surveyed are indigenous and none of them are certify by National Agency for Food and Drug (NAFDAC) (Table 1). Hence, need for regulatory bodies, particularly NAFDAC to ensure that the herbal products marketed in Nigeria are well regulated.

Twenty-five (25%) of the samples passed the weight uniformity test as none of these samples deviated from the mean weight by more than 7.5% (Table 2). This indicates that good manufacturing practice was not adhered to during the packaging of these antimalarial herbal products. Thus, implying that there will be no consistency in dosing with these products and therefore, the therapeutic effect needed may not be achieved.

Most of the samples (87.5%) had moisture content (Table 4.6) within the 8% NAFDAC acceptable limit (NAFDAC SOP, 2000). The low moisture content of the samples is desirable for higher drug stability (Chandel *et al*., 2011), Excess water in herbal materials promotes microbial growth, the presence of fungus and insects, and degradation after hydrolysis (WHO, 2011). Uba *et al.* (2016) reported that the moisture content of herbal drugs within the acceptable limit. Another study reported 50% of the herbal products analyzed were within the NAFDAC acceptable limit (Abba *et al.* (2010).

Table 1: Label information of the herbal antimalarial samples

Code	Dosage Form	Place/Address of Manufacturer	NAFDAC Reg. NO.	Batch Number	Expiry Date
A1	Powder	Kano State	NIL		2023
A2	Tea bag	Zhejang Yiwu	NIL	XH-096	
A3	Powder	Kano State	NIL		2024
A4	Tea bag	El-Maikano	NIL	004	2024
A5	Powder	Kano State	NIL		2024
A6	Powder	Nigeria	NIL	2738960	
A7	Powder	Kano State	NIL		2024
A8	Powder	Kano State	NIL		2023
A9	Powder	Kano State	NIL		2025
A10	Powder	Kano State	NIL		
A11	Tea bag	Kano State	NIL		2024
A12	Powder	Kano State	NIL		2024
A13	Powder	Kano State	NIL		
A14	Powder	Sokoto State	NIL	024	2023
A15	Powder	Katsina State	NIL		2023
A16	Powder	Kano State	NIL		2023
A17	Powder	Kano State	NIL		2023
A18	Powder	Kano State	NIL		2023
A19	Powder	Kano State	NIL	2444593	2024
A20	Powder	Kano State	NIL		2024
A21	Powder	Kano State	NIL		
A22	Tea bag	Lagos State	NIL		
A23	Powder	Kano State	NIL		2023
A24	Powder	Kano State	NIL		2023

None of the antimalarial herbal samples passed the NAFDAC requirements as shown above

The total ash value for the samples reveals that 20% of the analyzed samples were above the 14% maximum acceptable limit (EP, 2007). The high total ash value observed in this study might be an indication of the presence of inorganic constituents and very low value of acid insoluble ash denotes the presence of negligible amount of siliceous matter (Grover *et al.,* 2014). Akintelu *et al.,* (2018), reported the total ash values of some selected antimalarial herbal drugs within the acceptable limit.

Table 2: Weight uniformity of the antimalarial herbal samples

S/N	Code	Mean weight (g) ± SEM	Mean weight variation (%) range	Number of Samples that deviated by ≥ 7.5 %
1	A1	6.05 ± 0.28	0.39 - 31.48	15*
2	A2	2.20 ± 0.10	0.04 - 4.76	0
3	A3	3.66 ± 0.07	3.09 - 14.80	4*
4	A4	3.58± 0.45	0.01 - 0.09	0
5	A5	7.98 ± 0.14	0.01 - 17.67	2
6	A6	4.52 ± 0.20	0.02 - 26.75	5*
7	A7	7.26 ± 0.18	0.29 - 46.90	2
8	A8	6.07 ± 0.19	1.11 - 17.84	6*
9	A9	5.04 ± 0.16	0.00 - 30.46	4*
10	A10	5.39 ± 0.16	0.09 - 30.44	7*
11	A11	3.17 ± 0.36	0.14 - 6.32	0
12	A12	5.15 ± 0.24	6.23 - 41.25	8*
13	A13	6.65 ± 0.09	1.26 - 9.27	2
14	A14	5.92 ± 0.35	5.40 - 69.07	0
15	A15	5.68 ± 0.15	0.61 - 25.95	4*
16	A16	7.02 ± 0.17	0.30 - 13.42	2
17	A17	4.50 ± 0.17	0.91 – 39.79	9*
18	A18	6.66 ± 0.18	0.00 - 22.25	2
19	A19	4.89 ± 0.27	0.72 - 40.89	14*
20	A20	6.02 ± 0.25	2.18 - 69.08	4*
21	A21	6.33 ± 0.21	0.14 - 29.95	5*
22	A22	2.32 ± 0.02	0.38 - 8.86	0
23	A23	5.85 ± 0.15	0.08 - 26.75	0
24	A24	5.46 ± 0.17	0.55 - 36.23	4*

British Pharmacopoeia acceptance limit: No more than two of the powders or granules should differ from the average weight by 7.5 % (BP, 2009).

The phytochemical screening of the samples revealed the presence of alkaloids, flavonoids, cardiac glycosides, saponins, terpenoids and tannins in 75, 100, 92, 96, 80 and 100% respectively in the samples (table 4). The presence of phytochemicals in plants is linked with their uses for treating different ailments and having a potential of providing useful drugs for human use (Kunle *et al.,* 2011). Alkaloids, Saponins, phenols, steroids, flavonoids, terpenoids, cardiac glycosides, tannins and coumarin were some of the antimalarial active phytochemicals identified in some antimalarial products and plants commonly used in the treatment of malaria (Abdillah *et al.,* 2015; Kaur and Aurora, 2015; Bankole *et al.,* 2016; Akintelu *et al.,* 2018; Omagha *et al.,* 2020; Uzor, 2020; Abdullahi *et al.,* 2022). Phytochemical constituents, such as steroids, flavonoids, and other components, might act as antimalarial agents not only by directly attacking parasites but also by indirectly modulating the immune system of the host (Plirat *et al.,* 2022). The availability of these bioactive compounds indicates that the selected antimalarial herbal drugs have some medicinal properties.

Table 3: Moisture content of the antimalarial herbal samples

S/N	Samples	Mean moisture (%) ± SEM
1	A1	5.83 ± 0.167
2	A2	4.67 ± 0.33
3	A3	5.83 ± 0.33
4	A4	6.67 ± 0.33
5	A5	6.00 ± 0.29
6	A6	6.33 ± 0.17
7	A7	6.00 ± 0.29
8	A8	10.17 ± 0.33*
9	A9	5.50 ± 0.29
10	A10	15.17 ± 0.44*
11	A11	5.17 ± 0.67
12	A12	7.33 ±0.17
13	A13	6.00 ± 0.76
14	A14	6.00 ± 0.29
15	A15	4.17 ± 0.17
16	A16	4.67 ± 0.33
17	A17	4.17 ± 0.17
18	A18	5.33 ± 0.17
19	A19	5.33 ± 0.33
20	A20	5.50 ± 0.29
21	A21	7.17 ± 0.33
22	A22	7.17 ± 0.17
23	A23	14.67 ± 0.33*
24	A24	7.50 ± 0.57

NAFDAC limit: ≤ 8% (NAFDAC SOP, 2000)
*Significantly ($p < 0.05$) higher than NAFDAC limit

Table 4: Total ash of the antimalarial herbal samples

S/N	Samples	Mean total ash (%) ± SEM
1	A1	11.68 ± 0.06
2	A2	6.10 ± 0.58
3	A3	11.13 ± 2.05
4	A4	11.72 ± 0. 33
5	A5	17.27 ± 0.27*
6	A6	14.78 ± 0.11
7	A7	15.83 ± 0.64
8	A8	17.15 ± 0.17*
9	A9	9.97 ± 0.47
10	A10	13.78 ± 0.16
11	A11	12.02 ± 1.13
12	A12	14.57 ±0.31
13	A13	11.62 ± 0.27
14	A14	14.82 ± 0.07
15	A15	24.07 ± 2.21*

16	A16	25.22 ± 0. 07*
17	A17	10.33 ± 0.09
18	A18	12.47 ± 0.06
19	A19	11.12 ± 0.29
20	A20	14.72 ± 0.36
21	A21	9.77 ± 0.47
22	A22	9.35 ± 0.10
23	A23	22.62 ± 0.08*
24	A24	11.02 ± 0.20

European Pharmacopoeia limit: ≤ 14% (EP, 2023)
* Significantly ($p < 0.05$) higher than European Pharmacopoeia limit

Table 5: Phytochemical constituents of the antimalarial herbal samples

S/N	Code	Flavonoids	Saponins	Tannins	Alkaloids	Cardiac glycosides	Terpenoids
1	A1	+	+	+	+	+	+
2	A2	+	+	+	+	+	+
3	A3	+	+	+	+	+	+
4	A4	+	+	+	+	+	-
5	A5	+	+	+	+	+	-
6	A6	+	+	+	+	+	+
7	A7	+	+	+	+	+	+
8	A8	+	+	+	-	+	+
9	A9	+	+	+	+	+	+
10	A10	+	+	+	+	+	+
11	A11	+	-	+	+	+	+
12	A12	+	+	+	-	+	+
13	A13	+	+	+	+	+	-
14	A14	+	+	+	-	+	+
15	A15	+	+	+	+	+	+
16	A16	+	+	+	+	+	+
17	A17	+	+	+	+	+	+
18	A18	+	+	+	-	+	+
19	A19	+	+	+	+	+	-
20	A20	+	+	+	+	+	+
21	A21	+	+	+	+	+	+
22	A22	+	+	+	+	-	+
23	A23	+	+	+	-	-	-
24	A24	+	+	+	-	+	+

+ = present, - = absent

CONCLUSION

All the samples were found to have phytochemicals required for antimalarial activity however, they are not of good quality as only 44% of the herbal sample passed the physicochemical analysis.

REFERENCES

Abdillah, S., Tambunan, R. M., Yunahara, F., Sandhiutami, N. and Dewi, R. M. (2015). Phytochemical Screening and Antimalarial Activity of Some Plants Traditionally Used in Indonesia. *Asian Pacific Journal of Tropical Disease,* 5(6):454-457. DOI: 10.1016/52222-1808(15)60814-3.

Abdullahi M. N., Alonge E., Muhammad S. and Mahmud M. D. (2022). Phytochemical, Physiocochemical and Elemental Analyses of Some Antimalarial Herbal Concoctions Prepared In Kaduna Metropolis. *Science World Journal,* 17(1):1-5.

Akintelu, S. A., Ajayi, S. O., Abiola, B. E. and Olabemiwo, O. M. (2018). Physicochemical and Phytochemical Studies of Some Selected Antimalarial Herbal Drugs Used in Southwest Nigeria. *Illorin journal of science,* 5(1):63-78. DOI; 10.54908/iljs/2018.05.01.005.

Bankole, A. E., Adekunle, A. A., Sowemimo, A. A. Umebesei, C. E., Abiodun, O. and Gbotosho, G. O. (2016). Phytochemical Screening and In vivo Antimalarial Activity of Extracts from

Du, Y., Wolf, I. K., Zhuang, W., Bodemann, S., Knoss, W. and Knopf, H. (2014). Use of Herbal Medicinal Products among Children and Adolescents in Germany. *BMC Complementary and Alternative Medicine,* 14(218):1-13.

Dubey, N. K., Kumar, R. and Tripathi, P. (2004). Global Promotion of Herbal Medicine: India's Opportunity. *Current Science,* 86(1):37-41.

EU (2017). Herbal Medicinal Products. https://ec.europa.eu/health/human-use/herbal-medicine_en. Retrieved 24/09/2021

Harborne, J. B. (1973). Phytochemical Methods. 2nd Ed. Chapman & Hall. London.

Karunyadev, S., Arun, N. and Surekha, V. (2009). Screening of phytochemical compounds, antioxidant and antimicrobial activity of *Aleo vera* and *Arkaa*. *Biotechnology Advances*, 9: 38-48.

Kaur, R. and Arora, S. (2015.) "Alkaloids-Important Therapeutic Secondary Metabolites of Plant Origin," *Journal of Critical Reviews*, 2(3): 1-8.

Kunle, F. O., Egharevba, O. H. and Ochogbu, A. P. (2012). Standardization Of Herbal Medicines - A review. *International Journal of Biodiversity and Conservation*, 4(3):101-112. DOI: https://doi.org/10.5897/IJBC11.163.

Omagha, R., Idowu, E. T., Alimba, C. G., Otubanjo, A. O., Agbaje, E. O. and Ajaegbu, H. C. N. (2020). Physicochemical and Phytochemical Screening of Six commonly used in the Treatment of Malaria in Nigeria. *Journal of Phytomedicine and Therapeutics*, 19(2). DOI: https://doi.org/10.4314/jopat.v19i2.6.

Plirat, W., Chaniad, P., Phuwajaroanpong, A., Septama, A. W. and Punsawad, C. (2022). Phytochemical, Antimalarial, and Acute Oral Toxicity Properties of Selected Crude Extracts of Prabchompoothaweep Remedy in Plasmodium berghei-Infected Mice. *Tropical medicine and Infectious Diseases, 7*(12), 395. DOI: 10.3390/tropicalmed7120395.

Shinde, V. M., Dhalwal, K., Potdar**1**, M. and Mahadik, K. R. (2009). Application of Quality Control Principles to Herbal Drugs. *International Journal of Phytomedicine,* 1:4-8. DOI: http://dx.doi.org 10.5138/ijpm.2009.0975.0185.05786.

Soforowa, A. (1993). Phytochemical Screening of Medicinal Plants and Traditional Medicine in Africa. Spectrum Books Ltd. Ibadan, Nigeria. Pp 128-233.

Trease, K., and Evans, W. C. (1996). Text Book of Pharmacognosy, 14th edition, Balliere, Tindall, London, pp 251-293.

WHO (2002). General Guidelines for Methodologies on Research and Evaluation of Traditional Medicine. World Health Organisation, Geneva.