International Journal of Advanced Research in Medicine

E-ISSN: 2706-9575
P-ISSN: 2706-9567
IJARM 2025; 7(2): 06-11
www.medicinepaper.net
Received: 12-02-2025
Accepted: 15-03-2025

Mikailu Suleiman
Department of Pharmacognosy and Phytotherapy, Faculty of Pharmaceutical Sciences, University of Port Harcourt, Choba, Rivers State, Nigeria

Doris Nnena Ajibo
Department of Pharmacognosy and Phytotherapy, Faculty of Pharmaceutical Sciences, University of Port Harcourt, Choba, Rivers State, Nigeria

Corresponding Author:
Mikailu Suleiman
Department of Pharmacognosy and Phytotherapy, Faculty of Pharmaceutical Sciences, University of Port Harcourt, Choba, Rivers State, Nigeria

Evaluation of the anti-fibroid activity of a herbal powder on monosodium glutamate-induced uterine fibroid in Wister rats

Mikailu Suleiman and Doris Nnena Ajibo

DOI: https://www.doi.org/10.22271/27069567.2025.v7.i2a.614

Abstract
Introduction: The threat posed by uterine fibroid on women is on the rise especially in African and African-American women. This study therefore aimed at evaluating the antifibroid effect of a Herbal powder in wistar rats.
Methods: Herbal product was purchase from kubys global concept as off label product. Phytochemical screening was conducted on the power using standard methods. The powder was assessed for acute toxicity in rats. Monosodium glutamate was administered to rats for 30 days to induce uterine fibroid and then treated with Herbal powder at 400mg/kg, 800mg/kg and 1200mg/kg for thirty days. Danazol was used as standard drug at 200mg/kg. The weight ratio of the uterus to the weight of the rats. The estradiol, albumin, liver enzymes, kidney and total protein were assessed using standard kits after the rats were sacrificed.
Results: Phytochemical screening revealed the presence of carbohydrate triterpenoids, tannins, anthraquinone glycosides, and alkaloids. Acute toxicity showed Median Lethal Dose (LD50) of 5000mg/kg. The weight ratio of the uterus decreased at 400mg/kg.
Conclusion: The Herbal powder is safe at 5000mg/kg and also effective at 400mg/kg. Biochemical analysis shows reduced level of estradiol and albumin as wells total protein. The study therefore supports its use in treating uterine fibroid.

Keywords: Wister rats, treating uterine fibroid, anti-fibroid activity, herbal powder

Introduction
Uterine fibroid also known as leiomyomas are non-cancerous growths that occurs in the uterus. Although they are composed of the same smooth muscle fibres as the uterine wall (myometrium), they are much denser than normal myometrium. Uterine fibroids are usually round. They are monoclonal tumours of uterine smooth muscle, thus originating from the myometrium (Kim and Sefton 2012) [6]. They are composed of large amounts of extracellular matrix (ECM) containing collagen, fibronectin and proteoglycans). They often appear during child bearing years. They are discrete, rounded, firm, white to pale pink, benign myometrial tumours composed mostly of smooth muscle with varying amounts of fibrous connective tissues (Pernoll *et al* 2001) [13]. Very Large Uterine fibroid are usually associated with pelvic discomfort, respiratory failure, urinary symptoms, and constipation (Oelsner *et al* 2003) [12]. They are benign clonal neoplasms that contain an increased amount of extracellular collagen, elastin and are surrounded by a thin pseudo-capsule. They may enlarge to cause significant distortion of the uterine surface or cavity (Stewart, 2017) [14].
They are probably of unicellular origin and their growth rate is influenced by oestrogen, growth hormone, and progesterone (Hashimoto *et al*, 1994) [4]. The use of oestrogen agonists is associated with an increased incidence of fibroid tumours, and growth hormone appears to act synergistically with estradiol in affecting the growth of fibroid tumours. Conversely, progesterone appears to inhibit their growth (Chala *et al.*, 2005) [1]. Uterine fibroids are described based on their anatomical locations within the uterus which include Pedunculated fibroids, Intramural fibroids, Subserosal fibroids, Submucosal fibroids.
First line management of uterine fibroids usually involves symptomatic treatment of heavy menstrual bleeding (HMB), with the use of inexpensive non-steroidal anti-inflammatory drugs (NSAIDs and anti-fibrinolytic agents including tranxenamic acid or contraceptive steroids including levonorgestrel intrauterine system (mirena).

Levonorgestrel intrauterine system is only suitable for patients in whom the uterine cavity is not distorted by the fibroids (Wrona *et al.,* 2017) [16]. Hormonal treatment is another line which include combined oral contraceptives, oral injectible progestogens, progestogen-releasing intrauterine system, gonadotropin-releasing hormones, antiprogesterons and aromatase inhibitors. Current management strategies involve mainly surgical interventions, but the choice of treatment is guided by the patient's age and the desire to preserve fertility or avoid 'radical' surgery such as hysterectomy (Neis *et al.,* 2016) [11]. Other surgical and non-surgical approaches include myomectomy by hysterectomy, myomectomy by laparoscopy or laparotomy, uterine artery embolization (UAE) and other interventions performed under radiologic or ultrasound guidance (Donnez & Dolmans, 2016) [2].

Among other alternative therapies, herbal treatments for fibroids are used in several medical traditions and countries (Liu *et al.,* 2009) [7]. For example, in China the use of traditional Chinese herbal medicines for treating uterine fibroids is a common clinical practice. According to the theory of Chinese medicine, practitioners recognise uterine fibroids as a condition of imbalance between yin and yang in the body (in allopathic terms: disturbances of the endocrine system and blood circulation). Therefore, herbal preparations are prescribed by practitioners based on the patients symptoms and observation of the tongue and pulse. Clinical studies from the Chinese literature show that Chinese herbal preparations might relieve symptoms and shrink the fibroid tumours without significant adverse effects (Liu *et al.,* 2009) [7]. However, there are huge variations in the herbal preparations used, which will depend on the practitioners themselves and on the individualised treatment of different women. The purpose of this study is to investigate the efficacy of a herbal preparation that a vendor is claiming to have antifibroid effect by shrink or dissolving fibroid.

Materials and Methods

Plant Material

The herbal product was purchase from kubys global concept as off label product with a claim of grains of *Sorghum bicolor* and *Rauwolfia vomitoria* as the main constituent of the herbal powder.

Experimental Animals

Healthy nonpregnant Wistar rats with weight range of 90-140g were selected for this experiment. They were obtained from the animal house of Department of Pharmacology, Faculty of Pharmaceutical Sciences and University of Port Harcourt. The rats were fed with standard feed (Premier Feed Mills, Rivers State) and water. The rats were properly housed in clean labelled uniform cages and allowed to acclimatise for one week before commencement of the experiment.

Determination of Acute Toxicity

Acute toxicity test was done to determine the LD50 (lethal dose that kills 50% of the test population) of the herbal product according to Lorke, (1983).

Phase 1: Nine healthy Wister rats were selected and divided into three groups. Each group were administered different doses (10mg/kg, 100mg/kg and 1000mg/kg) of the herbal product. The animals were observed for 24 hours for signs of toxicity as well as mortality.

Phase 2: Another nine healthy Wister rats were selected and divided into three groups. Each group of animals were administered higher doses of 1,600mg/kg, 2,900mg/kg and 5,000mg/kg of the herbal product. The animals were observed for 24 hours for signs of toxicity as well as mortality.

The LD50 was calculated using the formula:

$LD50 = \sqrt{D0 \times D100}$

D0 = Highest dose that gave no mortality.

D100 = Lowest dose that produced mortality.

Induction of Uterine Leiomyoma

According to Mikailu and Noela, (2025) [10], Nonpregnant female Wister rats were treated with monosodium glutamate (MSG) at 1,000mg/kg for 30 days in an attempt to induce the development of uterine leiomyoma. Two rats were selected randomly, sacrificed and dissected and the uterus examined to confirm the presence of uterine leiomyoma. Induced rats were placed into five groups (A - E) with ten per group.

Group A was no treatment group.

Group B was treated with a standard drug (danazol 100mg/kg) for 30 days

Group C, D and E were treated with 400, 800, and 1,200 mg/kg respectively of the herbal powder for 30 days.

Determination of Uterine/Body Weight Ratio

Weight of animals were determined before induction. After the 30-day treatment period, animals were weighed, before they were sacrificed and dissected to obtain the intact uterus. The uterus was observed, weighed and the uterine/body weight ratio determined.

Determination of Plasma Estradiol Concentration

After the 30-day treatment period, bloods from the sacrificed rats were collected into plain tubes and allowed to stay undisturbed for 45 minutes. The clotted samples were spanned at 3000 rpm for 15 minutes in a centrifuge. Plasma obtained from the samples were transferred into sample tubes and labelled. Plasma estradiol concentration was determined using Accubind ELISA microwells (Monobind Inc. CA 92630. USA).

Determination of Plasma Total Protein and Albumin Concentration

After the 30-day treatment period, bloods from the sacrificed rats were collected into plain tubes and allowed to stay undisturbed for 45minutes. The clotted samples were spanned at 3000 rpm for 15minutes in a centrifuge. Serum obtained from the samples were transferred into sample tubes and labelled. Plasma total protein concentration was determined using spectrum test kit. 20microlitre of sample was added to 1ml of reagent, mixed, incubated for 10 minutes at room temperature and the absorbance measured using a spectrophotometer at 546nm. Plasma albumin concentration was determined using spectrum test kit. 10 microlitre of sample was added to 1ml of reagent, mixed, incubated for 5minutes at 20-25°C and the absorbance measured using a spectrophotometer at 623nm. Alanine Transaminase (ALT), Aspartate Transaminase (AST),

Alkaline Phosphatase (ALP), Bilirubin, Gamma-Glutamyl Transferase (GGT), and kidney parameters (creatinine and urea) were determined using Accubind ELISA microwells (Monobind Inc. CA 92630 USA (Kim & Park, 2018) [5].

Statistical analysis

Data were expressed as mean ± standard error of mean and represented in bar charts. The significance was established by student's t-test student's t-test with P=0.05.

Results

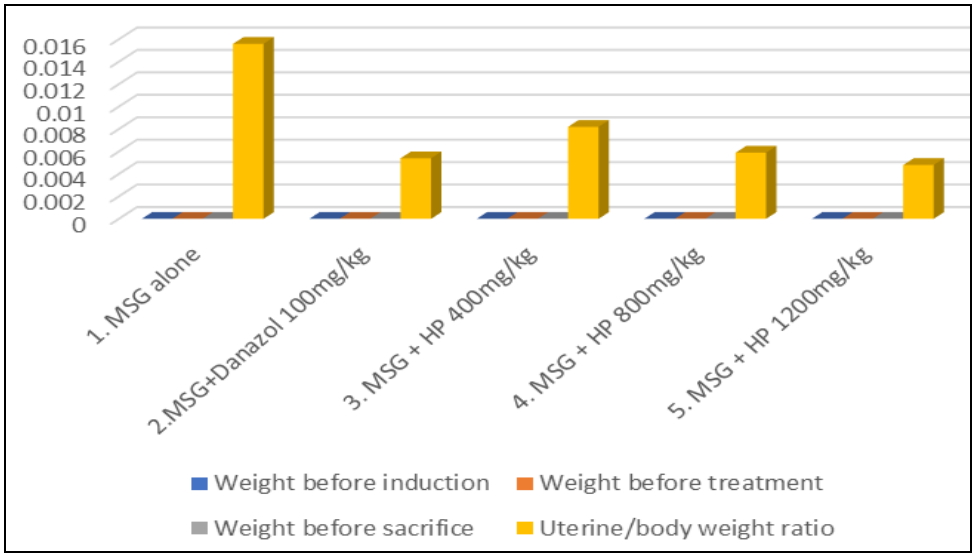

Fig 1: Body weight and uterine body ratio of the treated groups

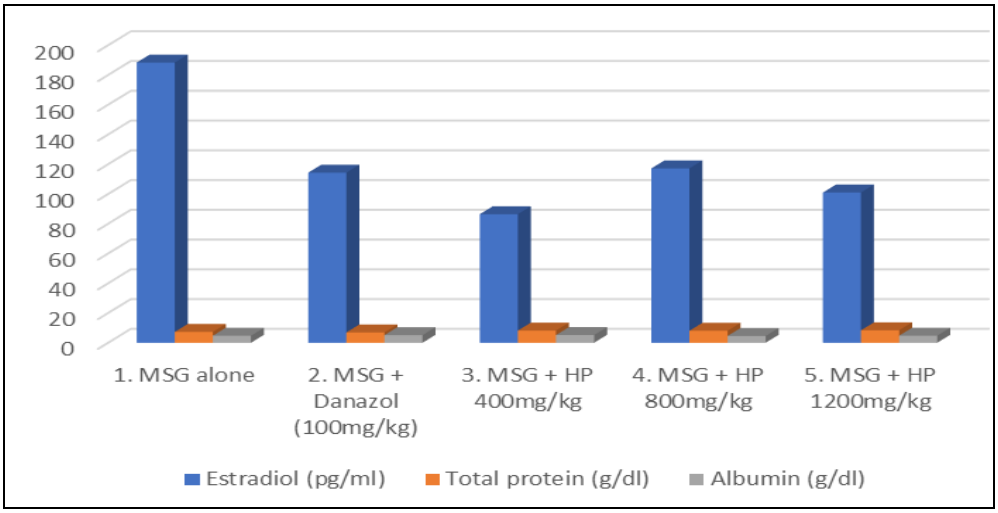

Fig 2: Estradiol, total protein and albumin levels of the treated groups

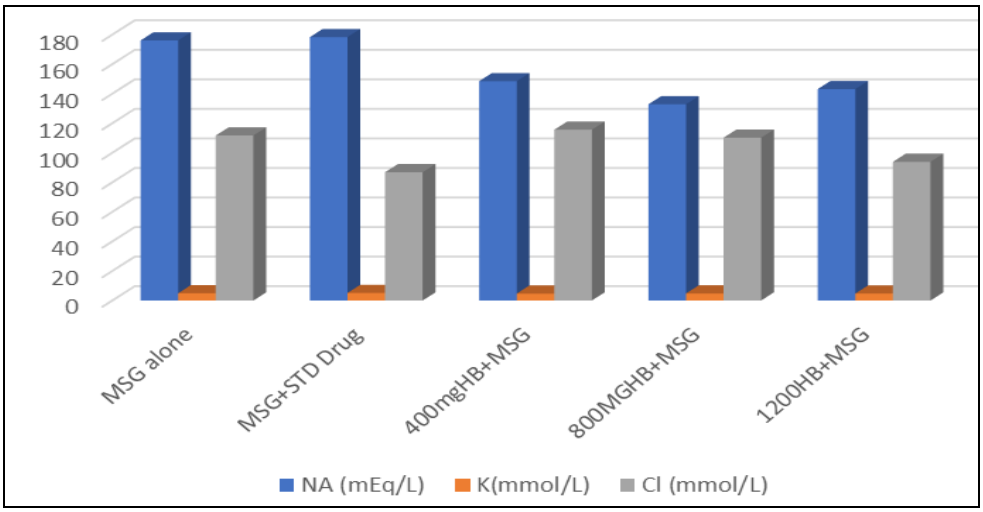

Fig 3: Electrolyte levels of the treated groups

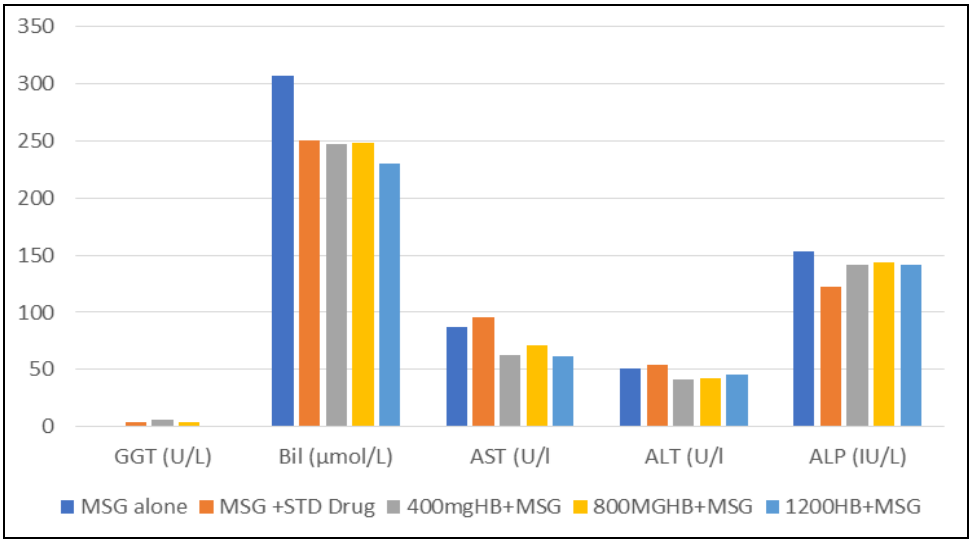

Fig 4: Liver enzyme level of the treated groups

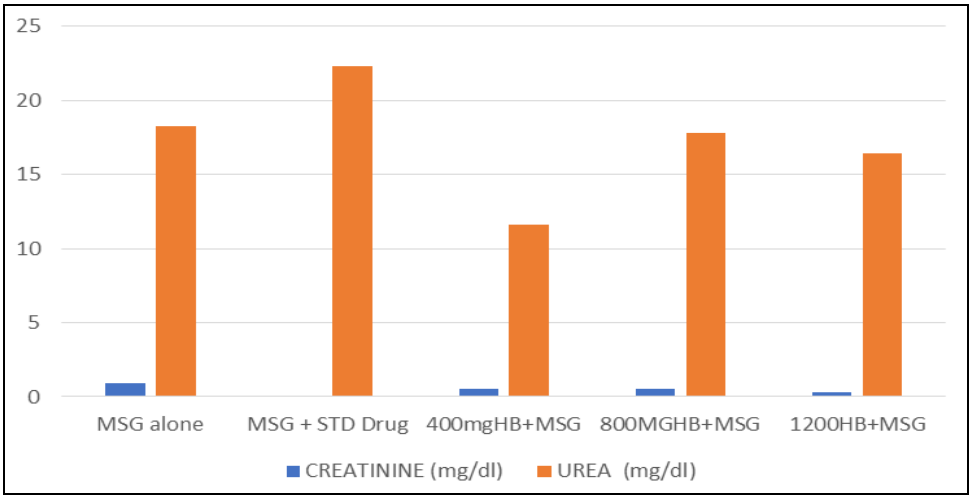

Fig 5: Kidney parameters of the treated groups

Table 1: Acute toxicity

	Dose (mg/kg)	Number of animals	Number of deaths
Phase 1	10	3	0
	100	3	0
	1000	3	0
Phase 2	1600	3	0
	2900	3	0
	5000	3	0

LD50=5000mg/kg

Discussions

The phytochemical constituents and antimitotic potential of the herbal powder was reported in our earlier studies (Mikailu & Nkeiru, 2024) [9]. The current study investigated the herbal powder in animal model. Acute toxicity studies are designed to determine the dose that will produce mortality or serious toxicological effects when given once or over a few administrations for a period of 24 hours (Erhirhie *et al.*, 2018) [3]. It is used to determine the median lethal dose (Dose that kills 50% of the animals exposed). From the result in Table 1, there was no recorded mortality in both phase one and phase two of the test. Also, no sign of toxicity was observed, however, a slight decrease in body temperature was observed but this may not be associated with the herbal product as the animals were starved overnight with only water before the test. The LD_{50} was calculated to be 5,000mg/kg. An LD_{50} of 5,000mg/kg indicates that the herbal product is relatively safe.

The uterine to body weight ratio (UBR) of the rats tells about the weight of the uterine in relation to the total weight of the rat. The HP doses exhibited to a significant dose dependent reduction in UBR of the tested rats when compared to the untreated group. The high UBR observed in the untreated group signifies the presence of fibroid. The weights of the animals increased significantly during the 30 days induction period. Fibroids and weight gain usually go hand in hand. This is because fibroids are tissues, as they grow, they usually increase the overall body weight. There was minimal weight gain during the treatment period. The UBR significantly decreased in a dose dependent manner down the groups treated with the HP. The decrease in the UBR indicates that the herbal product was effective in the

treatment of the induced fibroids. A decrease in the UBR was also observed in the group treated with the standard drug (Danazol 100mg/kg).

Estradiol is a class of steroids that controls developmemt and maintenance of female sex characteristics. High estradiol is indicated in diseases such as ovarian cyst or tumors, polycystic ovarian syndrome and obesity in women (William, 2016) [15]. The normal reference range in female rat is 5-80 pg/ml. From the result in Figure 2, it is obvious that all the groups showed an estradiol concentration higher than the prescribed range. Consequently, the HP doses (400, 800, and 1200 mg/kg) exhibited estradiol that is significantly lower than the MS alone.

Plasma total proteins- normal range of protein in rat is 5.0-7.5 g/dl. The hyperproteinemia observed in the treatment of groups in Figure 3 is indicative of thick blood or hyperviscousity syndrome in myeleoma. The standard drug showed a protein level of within the normal range. This therefore did not support the reduction that was observed in UBR in Figure 1.

Albumin is the major serum protein in the plasma. It maintains the plasma colloidal osmotic pressure, binds and solubilizes many compounds such as calcium and bilirubin. Hyperalbuminemia is if little diagnostic significance. Hypoalbuminemia is very common in many diseases. From the study, all the treatment groups and the untreated control (MS alone) group are above the normal range (2.1-4.6 g/dl).This could be inferred that both the disease (fibroid) and the agents (Danazol and the HP) had little or no effect on the serum concentration of albumin as all groups had similar serum albumin concentrations.

The electrolyte level of the tested groups showed that potassium and chloride have no effect on the induced fibroid due to insignificant difference in the values of the various groups in Figure 3. However, sodium showed some remarkable reduction that is not dose dependent in the HB treated group when compared to MSG alone in the Figure 3. The hyponatremia doesn't have relationship with the reduction in the UBR and estradiol that was observed these groups. Possible explanation could have been if the rats were bleeding but bleeding was not observed in the rats. This implied that the reduction could be from the effect of the component of the HP that was administered.

GGT all the treatment groups have a higher value than the control group (MSG alone). Although a trace of decrease in GGT was observed in HP as seen in Figure 4. This suggest reduced liver enzyme activity. The bilirubin level of the groups was low as compared to the standard range (0.2-0.7umol/L). However, bilirubin is a bye product of red blood cell breakdown, indicating an antioxidant deficiency in the rats. The AST values are with the normal range. This implies that the AST was not affected by the induction and the treatment of the fibroids in the rats. The ALT is also with the normal range of (13-56) which also suggest non-interference by the induction and treatment in the rats. The ALP is also within the normal range as described by Loeb & Quimby, (1999) [8]. The creatinine and the urea of all the groups fall with the normal range except the creatinine of MSG alone which exceed 0.7 mg/dl.

Conclusion

The herbal powder posed to be safe and also showed reduction of the size of the uterine and level of estradiol that are suspected to be responsible for the growth of fibroid. The kidney and liver are unaffected by the fibroid and the herbal powder according to the results obtained from the study.

Conflict of Interest

Authors declare no conflict of interest.

Acknowledgement

Authors are grateful to Mr. Robinson Ohanador of the Department of Biochemistry for his immense support during the course of the biochemical analysis

References

1. Chalas E, Constantino JP, Wickerham DL, Wolmark N, Lewis GC, Bergman C. Benign gynecologic conditions among participants in the Breast Cancer Prevention Trial. Am J Obstet Gynecol. 2005;192:1230-1237.
2. Donnez J, Dolmans MM. Uterine fibroid management: from the present to the future. Hum Reprod Update. 2016;22(6):665-686. https://doi.org/10.1093/humupd/dmw023
3. Erhirhie EO, Ihekwereme CP, Ilodigwe EE. Advances in acute toxicity testing: Strengths, weaknesses and regulatory acceptance. Interdiscip Toxicol. 2018;11(1):5-12. https://doi.org/10.2478/intox-2018-0001
4. Hashimoto K, Azuma C, Kamiura S, Kimura T, Nobunaga T, Kanai T. Clonal determination of uterine leiomyomas by analysing differential inactivation of the X-chromosome-linked phosphoglycerokinase gene. Gynecol Obstet Invest. 1995;40:204-208.
5. Kim H, Park J. Biochemical parameters in animal studies: an overview of methods. Biomed Res Methods. 2018;32(5):221-230.
6. Kim J, Sefton EC. The role of progesterone signalling in the pathogenesis of uterine leiomyoma. Mol Cell Endocrinol J. 2012;358:223-231.
7. Liu JP, Yang H, Xia Y, Cardini F. Herbal preparations for uterine fibroids. Cochrane Database Syst Rev. 2009;(2):CD005292. https://doi.org/10.1002/14651858.CD005292.pub2
8. Loeb WF, Quimby FW. The clinical chemistry of laboratory animals. 2nd Ed. Philadelphia: Taylor & Francis USA, 1999.
9. Mikailu S, Nkeiru CN. Antimitotic and free radical scavenging properties of a herbal preparation used in the treatment of fibroid. Int J Herb Med. 2024;12(6):34-39.
10. Mikailu S, Joy NI. Phytochemical and cytotoxic evaluation of the fruits of *Rauwolfia vomitoria* Afzel. (Apocynaceae). J Cancer Tumor Int. 2025;15(1):60-66.
11. Neis KJ, Zubke W, Fehr M, Römer T, Tamussino K, Nothacker M. Hysterectomy for benign uterine disease. Dtsch Arztebl Int. 2016;113(14):242-249. https://doi.org/10.3238/arztebl.2016.0242
12. Oelsner G, Elizur SE, Frenkel Y, Carp H. Giant uterine tumours: two cases with different clinical presentations. J Obstet Gynecol. 2003;1015(pt 2):1088-1091.
13. Pernoll ML. Benson and Pernoll's handbook of obstetrics and gynaecology. New York: McGraw Hill, 2001.
14. Stewart EA, Cookson CL, Gandolfo RA, Rath SR. Epidemiology of uterine fibroids: A systematic review. Int J Obstet Gynecol. 2017;124(10):1501-1512.

15. Williams S. Bioactive lipids. In: An introduction to biological membranes. 2nd Ed. Elsevier, 2016, p. 453-479.
16. Wrona W, Stępniak A, Czuczwar P. The role of levonorgestrel intrauterine systems in the treatment of symptomatic fibroids. Prz Menopauzalny. 2017;16(4):129-132. https://doi.org/10.5114/pm.2017.72758

How to Cite This Article
Suleiman M, Ajibo DN. Evaluation of the anti-fibroid activity of a herbal powder on monosodium glutamate-induced uterine fibroid in Wister rats. International Journal of Advanced Research in Medicine. 2025;7(2):06-11.