
INTERNATIONAL JOURNAL OF CURRENT RESEARCH IN BIOLOGY AND MEDICINE

ISSN: 2455-944X

www.darshanpublishers.comVolume 4, Issue 11 - 2019

Original Research Article

DOI: <http://dx.doi.org/10.22192/ijcrbm.2019.04.11.003>

Haematinic Effect of Aqueous Leaf Extracts of *Ficus exasperata* and *Jatropha curcas* on Anaemic Wistar Rats

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Abstract

This study evaluated the haematinic potentials of the aqueous leaf extracts of *Ficus exasperata* (FEAE) and *Jatropha curcas* (JCAE) administered separately and to establish a possible pharmacological interaction when co-administered. Anaemia was induced by oral administration of chloramphenicol (50 mg/kg). Treatment was carried out once daily for 7 days after which the rats were bled for determination of PCV, Hb and WBC count. Chloramphenicol induced a significant ($p < 0.05$) decrease PCV and Hb indicating anaemia and also resulted to a significant increase in WBC count. Aqueous leaves extracts of *Ficus exasperata* and *Jatropha curcas* produced significant ($p < 0.05$) increase in PCV and Hb with a corresponding decrease in WBC after 7 days of oral administration to anaemic rats. The anti- anaemic effect observed with co-administration of the extracts was however, significantly ($p < 0.05$) more than either of the extract administered alone. Conclusively, the extracts of *Ficus exasperata* and *Jatropha curcas* exhibits additive haematinic effect when co-administered. This observation could be useful in the management of anaemia.

Keywords: *Ficus exasperata*, *Jatropha curcas*, Haematinic, Anaemic, Wistar rats

1.0 Introduction

Anaemia constitutes a serious health problem in many tropical countries because of the prevalence of malaria and other parasitic infections (Dacie and Lewis, 1994). In anaemia there is decreased level of circulating haemoglobin, less than 13 g/dl in male and 12 g/dl in females (Okochi *et al.*, 2003). In the tropics, due to endemicity of malaria, between 10 to 20% of the

population presents less than 10 g/dl of Hb (Diallo *et al.*, 2008). Children are more vulnerable.

Through the ages man has learnt to take advantage of the many resources placed at his disposal by nature to meet his essential needs in all fields. As important reserves and sources of abundance, natural resources are indispensable for socio-economic development. According to Gbile (1986), the diversity of the flora in Africa partly explains the strength of traditional

medicine. This refers to the use of plants in the treatment or amelioration of diseases within an organized system. A good number of medicinal plants are traditionally employed to alleviate anaemia. Some of these plants include *Telfeira occidentalis*, *Combretum dolichopetalum*, *Psorospermum ferbrifugum*, *Jatropha curcas*, *Flacourtia flavescens* and *Brillantasia nitens*, *Ficus exasperata* (Alada, 2000; Dina *et al.*, 2006). This study was carried out to validate the haematinic effect of *Telfeira occidentalis* and *Jatropha curcas* when administered to rats separately and also to establish a possible pharmacological interaction when the two are co-administered.

Ficus exasperata is commonly known as “sand paper” tree because of the abrasive nature of the leaf surfaces. It is known by various local names in Nigeria such as “Baure” in Hausa, “Ewe Ipin” in Yoruba and “Asisa” in Ibo. The plant is confined to West Africa; occurring in all kinds of vegetation particularly in secondary forest re-growth (Gbile *et al.*, 2008). It is one of the largest genres in the angiosperms with over 800 species of woody trees, shrubs, vines, epiphytes and hemi-epiphytes belonging to the family Moraceae. The viscid non-milky sap is used for treating sores, eye problems and stomach ache in traditional Ivory Coast medicinal systems (Burkill, 2012). The sap is equally used to stop bleeding during birth while the infusion of the bark is used to hasten birth in cattle in Ghana (Abbiw, 2013). Other uses of the plant includes pain relief, stimulant, leprosy cure, birth control, treating typhoid fever, anti-ulcer agent, anti-hypertensive agent, anti-fungal agent, among other uses (Hallen, 2013).

Jatropha curcas (Family Euphorbiaceae) is a drought resistant shrub which is widely grown in Central and South America, South-east Asia, India and Africa. *J. curcas* plant has been initially considered a traditional herb in many parts of the world (Gubitz *et al.*, 1999). It has gained importance in Malaysia, but as a source of seed oil for bio-fuel production. Traditionally, different parts of *J. curcas* have been used in treatment of different forms of infection. The leaves decoction is used as antiseptic substance during birth, the root decoction is used to treat sexually transmitted diseases and the seed is used to treat skin diseases (Gubitz *et al.*, 1999; Joubert *et al.*, 1984).

2.0 Materials and Methods

2.1 Materials

Chemicals and drugs

All chemicals used in this study were of analytical grade and were purchased from Sigma Chemical Co. Ltd (USA) through a local vendor. Ferrous gluconate was purchased from a local pharmacy shop.

Animals

Adult Wistar rats of either sex weighing 120–200g were used for this study. They were kept in stainless steel cages under standard laboratory conditions. They were maintained on clean water and standard rodent feed.

2.2 Methods

Plant Collection and Identification

The leaves of *Ficus exasperata* and *Jatropha curcas* were collected from a natural habitat in Okpella Area of Edo State, Nigeria. The plants were validated at the Herbarium Unit of Federal University, Lokoja.

Preparation of Extracts

The leaves of *Ficus exasperata* and *Jatropha curcas* were dried under shade for seven (7) days and pulverized separately using an electric blender. Extraction was carried-out by soaking one thousand-five hundred (1500) gram of each of the pulverized leaves in distilled water separately for 48 h. The resulting mixtures were filtered using Whatmann filter paper (Size No1) and the extracts were concentrated using free-dryer. The extracts of *Ficus exasperata* and *Jatropha curcas* will henceforth be referred to as FEAE and JCAE respectively.

Acute Toxicity Study

The oral median lethal dose (LD50) of the extracts was determined in rats according to the method of Lorke, 1983.

Induction of Anaemia

Haematological parameters were initially determined for untreated rats according to established method (Baker *et al.*, 1998). Anaemia was induced by orally

administration of chloramphenicol (50 mg/kg) for 2 weeks in four groups and each contains five rats. The Anaemia was confirmed by the markedly low PCV compared to untreated rats.

Anti- anaemic Screening

Four (4) non- anaemic rats and twenty (20) anaemic rats were used in this study. The non – anaemic rats served as control and received distilled water (Group 1). The 20 anaemic rats were divided into 5 groups of 4 rats each (groups 2- 6). Group 2 served as anaemic control, group 3 served as positive control (reference drug) and received ferrous gluconate (900 mg/kg) while groups 4- 6 received 200 mg/kg FEAE, 200 mg/kg JCAE and 100 mg/kg FEAE+ 100mg/kg JCAE respectively. Treatment was carried out once daily for 7 days. All the treated animals were fed with water and pellets for a week. Animals were bled for determination of PCV, Hb, WBC parameters (Baker *et al.*, 1998) before and after administration of the extracts and reference drug.

Statistical Analysis

Data were expressed as mean standard error of mean (SEM). Statistical comparisons were performed by one-way ANOVA, followed by Tukey- Kramer multiple comparisons test and student-Newman-Keuls multiple comparisons test and the values were

considered statistically significant when p-value is less than 0.05 ($p < 0.05$)

3.0 Results

3.1 Acute Toxicity

The results of acute toxicity studies showed no mortality or physical signs of toxicity up to a dose of 5000 mg/kg of aqueous extracts of *Ficus exasperata* and *Jatropha curcas*. The oral LD₅₀ of each of the extracts was then taken to be > 5000 mg/kg.

3.2 Effect of the Aqueous Leaf Extracts of *Ficus exasperata* and *Jatropha Curcas* on Haematological Parameters

The effect of the administration of Aqueous Leaf Extracts of *Ficus exasperata* and *Jatropha curcas* on haematological parameters of chloramphenicol-induced anaemia in Wistar rats is shown in tables 1-3. The Aqueous leaf extracts of *Ficus exasperata* and *Jatropha curcas* produced significant ($p < 0.05$) increase in PCV and Hb with a corresponding ($p < 0.05$) decrease in WBC after 7 days of oral administration to anaemic rats comparable to the control. The effects of the extracts were comparable with each other. However, co-administration of the extracts produced an additive effect as evident in the increase in PCV, Hb and a decrease in WBC count This observed additive effect was comparable to that of the reference drug- ferrous gluconate.

Table 1: Effect of the Administration of Aqueous Leaf Extracts of *Ficus exasperata* and *Jatropha curcas* on Packed Cell Volume (%) of Chloramphenicol- induced Anaemia in Wistar Rats

Treatment	Pre- treatment	Post- treatment
Non anaemic control (1ml dist. H ₂ O)	-	45.22 ± 6.43 ^b
Anaemic control (1ml dist. H ₂ O)	17.26±2.23	16.44±2.33 ^a
Ferrous gluconate (900 mg/kg)	16.56±1.15	30.12±3.18 ^{ab}
FEAE (200 mg/kg)	16.18±1.18	21.23±2.38 ^a
JCAE (200 mg/kg)	17.28±1.14	21.05±2.14 ^a
FEAE (100mg/kg) + JCAE (100 mg/kg)	18.20±2.98	34.66±3.21 ^{ab}

Data are presented as mean ± SD, n=5), (-) not treated. Mean values with different alphabets as superscripts down the column are significantly different at $P < 0.05$

Table 2: Effect of the Administration of Aqueous Leaf Extracts of *Ficus exasperata* and *Jatropha curcas* on Haemoglobin (g/dl) of Chloramphenicol- induced Anaemia in Wistar Rats

Treatment	Pre- treatment	Post- treatment
Non anaemic control (1ml dist. H ₂ O)	-	12.66 ± 1.99 ^b
Anaemic control (1ml dist. H ₂ O)	7.22±0.55	7.42±9.71 ^a
Ferrous gluconate (900 mg/kg)	6.38±0.79	9.54±2.23 ^{ab}
FEAE (200 mg/kg)	6.41±0.92	9.41±1.21 ^{ab}
JCAE (200 mg/kg)	6.86±0.67	9.23±1.43 ^{ab}
FEAE (100mg/kg) + JCAE (100 mg/kg)	7.33±0.41	12.93±2.10 ^b

Data are presented as mean ± SD, n=5), (-) not treated. Mean values with different alphabets as superscripts down the column are significantly different at $P<0.05$

Table 3: Effect of the Administration of Aqueous Leaf Extracts of *Ficus exasperata* and *Jatropha curcas* on White Blood Count ($\times 10^3/\text{mm}^3$) of Chloramphenicol- induced Anaemia in Wistar Rats

Treatment	Pre- treatment	Post- treatment
Non anaemic control (1ml dist. H ₂ O)	-	4.38±0.81 ^a
Anaemic control (1ml dist. H ₂ O)	6.22±0.54	6.01±0.22 ^b
Ferrous gluconate (900 mg/kg)	6.78±0.92	4.31±0.17 ^a
FEAE (200 mg/kg)	7.21±0.33	4.29±0.32 ^a
JCAE (200 mg/kg)	7.11±0.72	4.21±0.49 ^a
FEAE (100mg/kg) + JCAE (100 mg/kg)	7.44±0.46	4.11±0.38 ^a

Data are presented as mean ± SD, n=5), (-) not treated. Mean values with different alphabets as superscripts down the column are significantly different at $P<0.05$

4.0 Discussion

Anaemia is a disease characterised by a reduction in the concentration of haemoglobin, circulating red blood cell and pack cell volume per unit of the peripheral blood below the normal for the age and sex of the patient (Aguwa, 1996; Oma, 1991). The prevalence of anaemia is high in children with a high risk of placental malaria infection (Muriel and Jean-Yves, 1998). Anaemia impairs normal development in children and it constitutes a major public health

problem in young children in the developing countries with wide social and economic implications (Montalembek and Girot, 1996). Blood parasites, bacterial infections, viral infections, drugs/chemical agents and metabolic diseases may result in destruction of red blood cells leading to haemolytic anaemia (Ramzi *et al.*, 1994). Through the ages man has learnt to take advantage of the many resources placed at his disposal by nature to meet his essential needs in all fields.

The diversity of the flora in Africa partly explains the strength of traditional medicine. Many herbs have been used locally for the management of anaemia (Osafanme *et al.*, 2019). Two of such plants are *Ficus exasperata* and *Jatropha curcas*. Therefore, this study was undertaken to validate the haematinic potentials of the aqueous leaf extracts of the plants administered separately and a possible beneficial effect when administered concurrently in chloramphenicol-induced anaemic rats.

The main function of the RBC is the transportation of oxygen in to the tissues of the body. At such, any pathological or physiological condition that affects the RBC alters its function and this may be detrimental to the body. Results of this study indicated that the extracts individually produced an increase in PVC and Hb level of anaemic rats. More so, their co-administration produced an additive increase in PVC and Hb level. These corroborated previous studies which have shown that such increase in PCV and haemoglobin level of rats after treatment with extracts were obvious indices for recovery from anaemia (Saeed and Sabir, 2003). The extracts of both plants administered separately and concurrently resulted in fall in the WBC values which might be expected recognizing that chloramphenicol which was used to induce anaemia is noted as a high risk drug which obviously affects the immune system of the experimental rodents leading to a fall in WBC. Prolonged administration of the extract beyond 7 days might restore the WBC. This is in agreement with the report that full recovery of experimental animals from biochemical effects of plant extracts could be achieved by chronic administration of the extracts (Adebajo *et al.*, 2006; Bumah *et al.*, 2005).

The speedy and progressive recovery of anaemic rats responding to treatment of *F. exasperata* and *Jatropha curcas* may be due to increased erythropoiesis. The present results, coupled with earlier studies on the extracts suggest that these plant may be used for the treatment of anaemia individually or co-administered. However, the mechanism of action by which these plants produced its effect on increasing RBC, Hb and PCV in experimental animals needs to be investigated.

5.0 Conclusion

Conclusively, the extracts of *Ficus exasperata* and *Jatropha curcas* exhibits additive haematinic effect when co-administered. This observation could be useful in the management of anaemia.

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How to cite this article:

Momoh T. B, Hassan A. O, Olorunnado G.B, Idakwoji P.A. (2019). Haematinic Effect of Aqueous Leaf Extracts of *Ficus exasperata* and *Jatropha curcas* on Anaemic Wistar Rats. *Int. J. Curr. Res. Biol. Med.* 4(11): 19-24.

DOI: <http://dx.doi.org/10.22192/ijcrbm.2019.04.11.003>