

Effects of Aqueous Extract of *Mangifera indica* L. (Mango) Stem Bark on Haematological Parameters of Normal Albino Rats

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Abstract: The effects of crude aqueous extract of *Mangifera indica* (Mango) stem bark on body weight and haematological parameters in normal albino rats were investigated. Albino rats of both sexes weighing between 75 g and 125 g were used. At least 14 mL of the test aqueous extract of the plant was administered to each rat in the group for a period of 14 days. Observations showed that the extract of the medicinal plant have some effects on the haematopoietic system manifested by a positive increase in the levels of PCV (haematocrit), erythrocyte, leukocyte, platelet counts and lymphocytes, while the haemoglobin (Hb) and neutrophil levels were decreased. The test plant also caused an increase in the weights of the rats. Therefore, it is not possible that its use can advance any adverse effects on haematological parameters.

Key words: Aqueous extract, haematology, *Mangifera indica*, albino rats

Introduction

For thousands of years, people have looked to natural means of healing. Hebrew physicians in Bible times, used remedies such as oil, balsam, wine and poultices (Isa 1: 6; Jer46: 11; LK10: 34; 2Kings20: 7). In developing countries of the world, most of the people depend on herbal medical care (Ekpe *et al.*, 1990). In most parts of Rivers State of Nigeria, traditional medicine has been claimed to be vital in preventing and curing various diseases, thereby playing an important role in the health services of the state especially among the low socio-economic class. These herbs are orally administered or can be applied onto the skin surface as ointment. Extracts of root, stem, bark and leaves of some medicinal plants have been shown to have activities against most dreaded pathogenic organisms like the bacteria, fungi etc (Bannerman *et al.*, 1975; Madunagu *et al.*, 1990; Khan *et al.*, 1980; Singh and Pattak, 1994), while some others are cytotoxic (Russel *et al.*, 1997; Prohp and Alaiya, 2003; Prohp and Maduemezia, 2004; Prohp *et al.*, 2004; Prohp *et al.*, 2006a; Prohp *et al.*, 2006b). Also, some other still serve as liver tonic (Crescent bloo.com.1998).

The popularity of traditional medicine is due to the belief that some diseases only respond to traditional treatment (Bannerman *et al.*, 1975). The claim that some plants have therapeutic action and are used for the treatment of myriads of pathological conditions has aroused my curiosity and choice of this commonly used Medicinal plant (*M. indica*) in the Niger Delta area of Nigeria (Ogoni area in particular), in attempt to cure diseases such as malaria, fever, dysentery, etc. There are many of these plants not yet identified and properly classified scientifically (Watts *et al.*, 1997).

Mangifera indica L. (Mango) tree which is believed to be a native of Asia, is a member of the Anacardiaceae family ([http:// 216. 239. 59. 104/ DAVMWSKLW24J: en. wikipedia.org/wiki/mango](http://216.239.59.104/DAVMWSKLW24J:en.wikipedia.org/wiki/mango)). It is grown widely in different parts of Africa, especially in the southern part of Nigeria. *Mangifera indica* is used medicinally to treat ailments such as asthma, cough, diarrhea, dysentery, leucorrhoea, jaundice, pains and malaria (Agoha, 1981; Madunagu *et al.*, 1990). *Mangifera indica* contain alkaloids and glycosides which are of great importance pharmacologically (Madunagu *et al.*, 1990; Ross and Brain, 1977). This conferred on *Mangifera indica*, its medicinal ability. Therefore this study is designed to investigate the possible effects of aqueous extract of the medicinal plant, under study on some haematological parameters of normal albino rats. This is with the view to properly classify the herb as safe for use, for curing diseases and devoid of some complications.

Materials and Methods

Collection of medicinal plant: *Mangifera indica* stem bark was obtained freshly from a farm in Nyogor Beeri (Ogoni), Rivers State of Nigeria, for preparation of the extract.

Experimental animals: The animals used in the study were albino rats (Sprague Dawley) weighing between 75 g and 125 g, of both sexes, obtained and maintained at the Animal House of the Department of Biochemistry, University of Port Harcourt. They were kept in rat cages and all rats were fed with grower's mash and allowed free access to clean fresh water in bottles *ad libitum* throughout the duration of the study.

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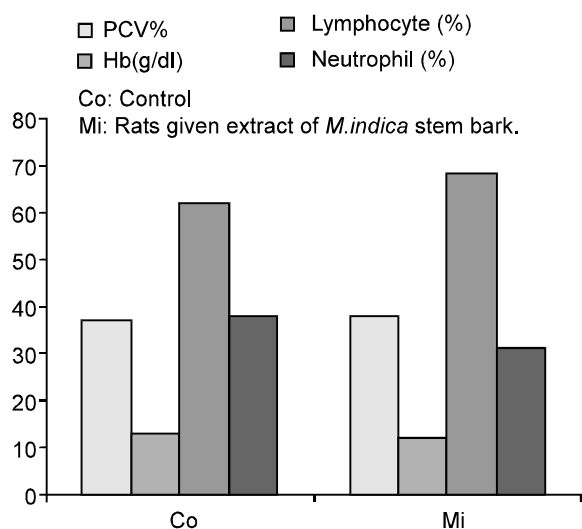


Fig. 1: Changes in PCV, Hb, and White cell differentials of rats given extract of *M. indica* stem bark

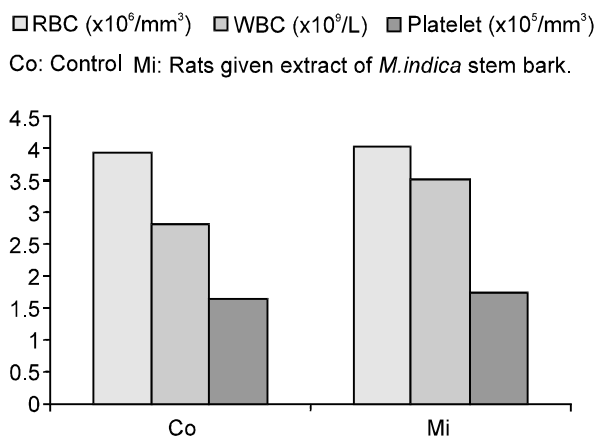


Fig. 2: Changes in RBC, total WBC and platelet counts of rats given extract of *M. indica* stem bark

Preparation and administration of the crude extract of the medicinal plant: The stem bark of *Mangifera indica* was cut into smaller pieces and dried in a Corsair heating oven (Ovi-350). The dried sample was pulverized using mortar and pestle. The resulting powder material was used in the extraction process. Extraction was carried out by the methods of Harboone (1972), Ekpe *et al.* (1990) and Uhegbu *et al.* (2005) using distilled water as the solvent. 20 g of powdered sample of the herb was extracted by soaking in 180 mL of distilled water in a beaker, stirred for about 6 minutes and left overnight. Thereafter, the solution was filtered using filter paper (Whatman No. A-1) to remove cellulose fibers and extract stored in a refrigerator at 4°C. 1 mL of the extract was administered daily to each of the designated rats using stomach canula for 14 days. The control group received clean water instead of the extract.

Phytochemical screening: The phytochemical analysis of aqueous extract of *Mangifera indica* has been reported to contain Tanins, Phlobatanins, Cardiac glycosides, Saponin and Polyphenol (Madunagu *et al.*, 1990).

Design of the study groups: Fourteen rats divided into two groups of seven rats per group were used in the study. Thus:

- Group 1: control (given clean water)
- Group II: Rats given extract of *M. indica*

Weight assessment: The weight of each rat was monitored daily as an index of the physical status of the animals over the period of study using compression spring balance (BAW-660-M).

Technique for obtaining blood: At the end of the experiments (14 days), each rat was anaesthetized with chloroform and sacrificed by cutting through the jugular vein. The blood pooled from each rat in a group was collected into heparinized bottles for hematological studies.

Determination of haematological parameters: Determination of Packed Cell Volume (PCV) was carried out using the Haematocrit method as described by Schalm *et al.* (1975), Dacie and Lewis (1991). Haemoglobin concentration was determined using the cyanomethaemoglobin method (Jain, 1986). The total White Blood Cells (WBC), White blood cell differentials, Red Blood Cell (RBC) and the platelet counts were estimated using the improved Neubauer counting chamber (Jain, 1986; Dacie and Lewis, 1991).

Results

The results of the study are presented in Fig. 1-3. Fig. 1 showed levels of haemoglobin (Hb) and PCV of rats given extract of *Mangifera indica* stem bark, as compared to that of the control. It showed a slight increase in PCV and a slight decrease in Hb. The value obtained for RBC (Fig. 2) also agreed with the reported trend for PCV above. The rats in group II that were given extract of *Mangifera indica* stem bark recorded an increase in the total WBC level in contrast to the control rats (group 1) that were given water. There was also an increase in the number of platelets for rats in group II as compared to those of the control group. The white cell differential counts (Fig. 1) showed an increase in Lymphocytes for the group II rats that were given extract of *Mangifera indica* stem bark. A reverse trend was seen in neutrophils.

Fig. 3 illustrates the pattern of weight changes among the rats in groups I and II. Seven animals (rats) making up the control group were not given extract of *M. indica*

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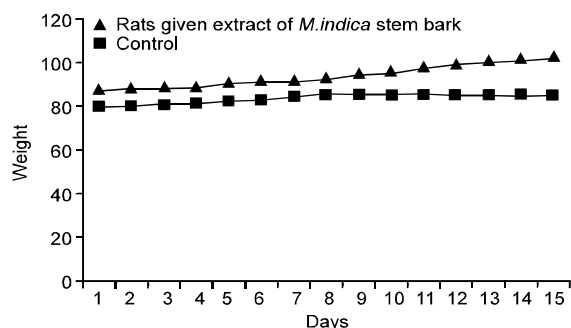


Fig. 3: Mean body weight of rats (g) given extract of *M. indica* stem bark (n = 7)

and they showed a weight gain of about 2.04% as compared to the weights of rats in group II given the extract with weight gain of about 5.75% at the end of the study period (14 days).

Discussion

As observed, the extract of *Mangifera indica* stem bark had some positive effect on the haemopoietic system of the test rats. This was manifested by an increase in red blood cell, packed cell volume (PCV or haematocrit), total white blood cell and platelet counts following administration of the medicinal plant extract to the rats. The percentage PCV increased slightly from 37% for the control rats to 38% for the group II rats which were given the plant extract. The raised haematocrit is an indication of haemoconcentration which may be due to increased RBC mass (<http://www.gpnotebook.co.uk/medwebpage.cfm>). Though, administration of the plant extract slightly decreased the level of haemoglobin from 13.0g/dl for the control to 12.0g/dl for the rats given the plant extract. The value obtained for RBC count (3.90×10^6 cells) for the control animals increased slightly to 4.00×10^6 cells for the rats given the medicinal plant extract. An increase of $3.5 \times 210^9/L$ was recorded for WBC of group II rats as against WBC of the control rats with value of $2.8 \times 10^9/L$, while the value obtained for the platelet count of animals given the plant extract was 1.74×10^5 cells as compared to the control animals with 1.65×10^5 cells. The higher values of RBC and associated parameters are suggestive of polycythemia (American Diabetes Association, 2000). Therefore the extract of *Mangifera indica* may not have had any adverse effect on the bone marrow, kidney and haemoglobin metabolism, since the value of red blood cells are not greatly affected (Young and Maciejewski, 1997).

Also the value of Lymphocytes for the group II animals which were given the plant extract increased to 68% from 62% recorded for the control rats. This may go a long way to suggesting that extract of *Mangifera indica* stem bark must have influenced the defense mechanism of the test rats. So the continuous exposure of the body systems of animals to this medicinal products (herbs)

may cause lymphocytosis, which may then account for the use of this plant for medicinal purposes (Keenwe and Bekalo, 1996).

There is a positive effect of *Mangifera indica* extract on the weight status of the test rats. The weights of rats given the plant extract remained higher (87g-102g) in contrast to those rats not given the plant extract, 80g-85g (that is, control group) at the end of the 14 days. This showed that the physical status of the rats were better. So the plant extract did not impose any acute fluid loss, proteolysis and lipolysis on the test rats and therefore the rats had no great loss in body weight (Alberti and Zimmet, 1998). Conclusively, extract of *Mangifera indica* stem bark possesses medicinal properties (Madunagu *et al.*, 1990). This suggests that it is not possible that its use can advance any adverse complications on haematological parameters of the body.

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References

- Agoha, R.C., 1981. Medicinal plants of Nigeria: offset Drukkerij faculteit der wisckunde en Natuurwetens chappen, Nijmegen, Netherlands.
- Alberti, K.G.M.M. and P.Z. Zimmet, 1998. Definition, Diagnosis and classification of Diabetes Mellitus and its complications part 1: Disguises and classification of Diabetes Mellitus provisional Report of WHO consultations. *Diabet. Med.*, 15: 539-553.
- American Diabetes Association, 2000. Nutrition Recommendation and principles for people with diabetes mellitus, clinical practice recommendations. *Diabet. Care*, 23: 543-6.
- Bannerman, R.H.A., V.D. Ummina and U. Koko, 1975. Indigenous system of medicine in India. In: *Alternative Approaches to Meeting basic Health needs in developing countries*, WHO, Geneva, pp: 84-19.
- Dacie, J.V. and S.M. Lewis, 1991. *Practical haematology* 7th Ed ELBS with Churchill Livingstone, England, pp: 37-85.
- Ekpe, E.D., R.V.B. Eban and B.E. Madunagu, 1990. Antimicrobial activity of four medicinal plants on pathogenic Bacteria and phytopathogenic fungi. *West Af. J. Biol. Appl'd Chem.*, 35: 2-5.
- Harboone, J.B., 1972. *Phytochemical methods: A Guide to Modern Techniques on plant Analysis*. Chapman and Hall, New-York.
- Jain, N.C., 1986. *Schalm's Veterinary Hematology* 4th Edn. Lea and fabiger, Philadelphia, pp: 564-572.
- Keenwe, M. and I. Bekalo, 1996. *Ethno Veterinary Medicine in Kenya, a field manual of practical animal health case practices*. Published by ITK and IIRR, Nairobi.

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- Khan, M.R., G. Nddaalio, M.H. Nkunja, H. Weever and A.N. Sawhney, 1980. Studies on the African Medicinal plants part 1. Preliminary screening of medicinal plant for antifungal activity. *Plant Med. Suppl.*, 40: 91-92.
- Madunagu, B.E., R.U.B. Eban and E.D. Ekpe, 1990. Antibacterial and Antifungal Activity of some medicinal plants of Akwa Ibom state. *West Af. J. Biol. Appl'd Chem.*, 35: 25-30.
- Prohp, T.P., E.S. Osifo, A.O. Madusha, J.O. Erebor, H.O. Okpala and C.A. Oyinbo, 2006b. Effects of aqueous extract of extra-cotyledonous deposits of pride of Barbados (*caesalpina pulcherrima*) on some blood electrolytes and urea levels in rabbits. *Pak. J. Nutr.*, 5: 239-241.
- Prohp, T.P. and H.T. Alaiya, 2003. Some functional properties and anti-nutritional factors of extra-cotyledonous deposits of pride of Barbados (*Caesalpina pulcherrima*). Proceedings (15th Annual conference of BSN held in AAU, Ekpoma, 2002), pp: 40-45.
- Prohp, T.P. and C. Maduemezia, 2004. Carbohydrate, ash and moisture contents of extra-cotyledonous deposits of pride of Barbados (*Caesalpina pulcherrima*). *Nig. J. Agri. Sci. Forestry*, 1: 195-2004.
- Prohp, T.P., E.A. Mendie, A.O. Madusha, S.C. Uzoaru, A. Aigbiremolen and P.C. Onyebuagu, 2004. Cyanide contents of pride of Barbados (*Caesalpina pulcherrima*) grown in different parts of Nigeria. *J. Med. Lab. Sci.*, 13: 29-32.
- Prohp, T.P., I.G. Ihimire, A.O. Madusha, H.O. Okpala, J.O. Erebor and C.A. Oyinbo, 2006a. Some anti-nutritional and mineral contents of extra-cotyledonous deposits of pride of Barbados (*C. pulcherrima*). *Park. J. Nutr.*, 5: 114-116.
- Ross, M.S.T. and K.R. Brain, 1977. An Introduction to phytopharmacy, Pitman Medical publishing company, Tunbridge wells, kent., pp: 17-49.
- Russel, B.A., J.N. Hardin, L. Grand and A. Traser, 1997. Poisonous plants of North Carolina, *caesalpina spp* (pride of Barbados). Department of Horticultural science. North Carolina state University (on line) <http://www.ces.nesyl.edu/depts>.
- Schalm, O.W., N.C. Jain and E.J. Carroll, 1975. Veterinary Haematology, 3rd Edn. Lea and Fabiger, Philadelphia.
- Singh, K.V. and Pattak, 1994. Effects of leaf extract of some higher plants on spore germination of *Usilago Maydis* and *U. nuda*. *Fitoterapia*, 55: 318-320.
- Uhegbu, F.O., I. Elekwa and C. Ukoha, 2005. Comparative Efficacy of crude Aqueous Extract of *Mangifera indica*, carica papaya and sulphadoxine pyrimethamine on the mice infested with malaria parasite in vivo, *Global J. Pure Appl'd Sci.*, pp: 399-401.
- Watts, N.B., S.S. Gebhart, R.V. Clark and L.S. Philips, 1997. Post operative management of diabetes mellitus: steady state glucose control with bedside algorithm for insulin adjustment. *Diabet. Care*, 10: 722-728.
- Young, N.S. and J. Meciejewski, 1997. The path Physiology of Acquired A plastic anemia. *New Eng. J. Med.*, 336: 1365.