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RESEARCH ARTICLE

ALTERATION OF HAEMATOLOGICAL INDICES ON ADMINISTRATION OF ETHANOL LEAF AND ROOT EXTRACTS OF SIDA ACUTA IN ALBINO WISTAR RATS

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ABSTRACT

This study was conducted to assess the effect of ethanol leaf and root extracts of *Sida acuta* on the haematological parameters of albino wistar rats. Twenty eight (28) wistar rats were randomly selected, divided into four equal groups for the study. Group 1 which served as control was fed with normal rat feed and water. Group 2 received 50mg/kg of ethanol leaf extract of *Sida acuta*, group 3 received 50mg/kg of ethanol root extract while group 4 received 25mg/kg each of both leaf and root extracts of *Sida acuta*. All administrations were done orally and the study lasted for 21 days after which standard analytical method was used for the haematological assay. The result indicated a significant ($P<0.05$) reduction in RBC count, WBC count, platelet count, haemoglobin concentration, and PCV while MCV (μm^3) showed a significant ($P< 0.05$) increase in treatment groups compared to control. The result showed no significant difference ($P> 0.05$) in RBC, platelet, PCV, MCV, MCHC and MCH when both extracts were given together compared to control. In conclusion therefore, *Sida acuta* leaf and root extracts may induce anemia, suppress immunity and have thrombocytopenia tendencies.

INTRODUCTION

The importance of roots and herbs in health care delivery cannot be over-emphasized. According to World Health Organization (WHO) (WHO, 2001) 60% of the world's population depends on traditional medicine and 80% of the population in developing countries depends almost entirely on traditional medicine practices and herbal medicines for their primary health care needs (Abdel-Azim *et al*, 2011; Zhang and Moller, 2000). The reasons for this, especially in developing nations, includes ease and cost of assessing orthodox medicine as well as cost of procuring prescribed medications (Chan, 2003). *Sida acuta* is a small, erect perennial shrub which grows abundantly on cultivated fields, waste areas, roadsides and open clearing in Nigeria (Akobundu and Agyagwa, 1998). It is native to Central America but has spread throughout the tropics and sub-tropics in the Pacific, Asia and Africa (Holm *et al* 1977; Parsons and Cuthbertson, 1992). *Sida acuta* is commonly called broom grass, broom weeds and common wire weed. In Nigeria, it is known as "Udo" in Igbo, "Iyeye" in Yoruba and "Nsukere" in Efik. Several phytochemical screenings resulted in the isolation of various compounds from *S. acuta* involving alkaloids and Steroidal compounds (Cao and Qi, 1993; Dinan *et al*, 2001). The main alkaloids are Cryptolepine and its derivatives such as quindoline, quindolinone, Cryptolepinone and 11-methoxyquindoline (Jang *et al*, 2013). The major steroids of the plant are ecdysterone, beta-sistosterol, stigmaterol, ampesterol. Phenolic compounds such as evofolin-A and B, scopoletin, vomifoliol, loholid and 4-ketopinoresinol have also been isolated (Jang *et al*, 2013). The micronutrient and anti-oxidative potential of the leaf extract has also been documented (Rami *et al*, 2014, Nwankpa *et al*, 2015). The medicinal and health-care importance of *S. acuta* have been documented. Leaf extract of *S. acuta* was reported to have anti-inflammatory and analgelsic activities (Mridha *et al*, 2009; Oboh and Onwukaeme, 2005); anti-ulcer activity (Malairajan *et al*, 2006); Wound-healing activity (Akilandeswari *et al*, 2010; Adetutu *et al*, 2011) and anti-oxidant activity (Palaksha *et al*, 2016). Ramachandran and Nair (1981) reported the use of leaf juice of *Sida acuta* to stop vomiting and gastric disorders among the Indians. The fresh root of *Sida acuta* is chewed for treatment of dysentery (Holdsworth, 1974) while Sreedevi *et al* (2009) reported the hepatoprotective effect of its root extract. The entire plant of *Sida acuta* has anti-plasmodial activity (Karou *et al*, 2003; Banzouzi *et al*, 2004); anti-bacteria activity (Rajakaruna *et al*, 2002; Karou *et al*, 2005; Karou *et al*, 2006); antifertility potentials (Prakash *et al*, 1987; Londonkar *et al*, 2009)

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Table 1. Effect of ethanol leaf and root extracts of *Sida acuta* on RBC, WBC and platelet counts

Group	RBC ($x10^6/\mu L$)	WBC ($10^3/\mu L$)	Platelet ($10^3/\mu L$)
Group 1 (control)	11.09 ± 0.21	11.42 ± 3.22	8.70 ± 6.65
Group 2 (leaf extract)	7.49 ± 0.69a	8.92 ± 4.16a	6.97 ± 5.53a
Group 3 (root extract)	8.72 ± 0.93a	9.65 ± 5.99a	7.05 ± 5.29a
Group 4 (leaf + root extracts)	10.36 ± 0.35	10.12 ± 6.19a	8.35 ± 8.16

Values are mean of four determinations ± SD. n = 7. a = significantly different from control ($P < 0.05$)
RBC = Red Blood Cell; WBC = White Blood Cell.

Table 2. Effect of ethanol leaf and root extracts of *Sida acuta* on PCV, HB, MCV, MCHC and MCH

Group	PCV (%)	Hb(g/dl)	MCV (μm3)	MCHC(g/dl)	MCH (pg)
Group 1 (control)	49.50 ± 0.5	12.30 ± 0.23	45.77 ± 2.53	0.25 ± 0.05	2.48 ± 0.05
Group 2 (leaf extract)	39.75 ± 1.2a	10.68 ± 0.51a	53.49 ± 5.82a	0.27 ± 0.01	2.69 ± 0.16
Group 3 (root extract)	40.25 ± 2.8a	11.13 ± 0.34a	54.63 ± 6.12a	0.24 ± 0.04	2.36 ± 0.09
Group 4 (leaf + root extracts)	47.25 ± 0.9	11.23 ± 0.71a	45.68 ± 2.13	0.24 ± 0.01	2.43 ± 0.12

Values are mean of four determinations ± SD. n = 7. a = significantly different from control ($P < 0.05$)
PCV = Packed Cell Volume; Hb = Haemoglobin; MCV = Mean Corpuscular Volume; MCH = Mean corpuscular haemoglobin; MCHC = Mean Corpuscular Haemoglobin Concentration;

and has shown potency against venereal diseases (Barrett 1994; Coee and Anderson, 1996). Haematology refers to the study of the numbers and morphology of the cellular elements of blood – the red cells (erythrocytes), white cells (leucocytes), and the platelets (thrombocytes) and the use of these results in the diagnosis and monitoring of diseases (Merck Manual, 2012). Haematological parameters are good indicators of the physiological status of animals (Khan and Zafar, 2005). They are useful indices that can be employed to assess the toxic potentials of plant extracts in living systems (Sunmonu and Oloyede, 2010). These parameters are effective diagnostic tools for blood-related disorders such as anemia, immunodeficiencies, infections and thrombocytopenia. Anemia is associated with low level of RBC and Haemoglobin, infections are associated with poor immunity and low level of WBC while thrombocytopenia is linked with low level of platelet (Guyton and Hall, 2010; Sembulingan and Sembulingan, 2010). In Nigeria, *Sida acuta* is used in herbal medicine to treat dysentery, malaria, vomiting and other gastrointestinal disorders with little or no knowledge of their possible side effects on haematological parameters. This study therefore was conducted to examine the effect of ethanol leaf and root extracts of *Sida acuta* on the haematological parameters in albino wistar rats.

MATERIALS AND METHODS

Sida acuta was locally collected at Obibi in Awo-Omamma, Oru-East Local Government Area of Imo State, Nigeria. The Plant Science was authenticated at the department of plant and biotechnology of Imo State University Owerri, Nigeria. The plant was thoroughly washed, air-dried under room temperature for 28 days and the leaves were separated from the roots. It was pulverized using an electric blender. 300grams of the powdered leaves was macerated with 600ml of 95% absolute ethanol; same weight of the root was macerated with 700ml of 95% absolute ethanol both for 48hrs. Extraction and filtration was done and the extract was concentrated by evaporation using rotatory evaporator RE52.

Twenty eight wistar rats were randomly selected and used for the study. The animals were randomly divided into four groups: 1, 2, 3 and 4 and were acclimatized for 7 days under standard environment at a temperature of 22 – 25^{O}C, 12hrs light and 12hrs dark cycle before commencement of administration. Each group of the animals consists of 7 rats. *Sida acuta* extracts were orally administered to the rats using oral gastric tube inserted through their mouth. The extracts were administered for 21 days. Group 1 (Control Group) was fed with normal rat feed and water without extracts. Group 2 received 50mg/kg of ethanol leaf extract of *Sida* acuta. Group 3 received 50mg/kg of ethanol root extract while group 4 was given 25mg/kg each of both leaf and root extracts of *Sida acuta*. Blood samples of the rats were collected on the 21st day of administration by cardiac puncture. The blood samples were put in EDTA bottles. Haematological analysis was done using the method of Ochei and Kolhatkar, 2007. The data generated from this study was entered, cleaned and coded in excel sheets. Student's t-test and ANOVA were used to analyze the data using SPSS/IBM version 21 to ascertain the level of significance at $P < 0.05$.

RESULTS

The results are presented in tables. The effect of ethanol leaf and root extracts of *Sida acuta* on RBC, WBC and platelet are shown in table 1. The result showed a significant reduction ($P< 0.05$) in RBC, WBC and Platelets in group 2 and 3 compared to the control while group 4 showed an insignificant ($P>0.05$) reduction compared to the control. Table 2 showed the effect of the extracts on PCV, Hb, MCV, MCHC and MCH. There was a significant ($P<0.05$) decrease in PCV, Hb and MCV in group 2 and 3 compared to the control. The values of MCHC and MCH were not significant ($P>0.05$) compared to the control.

DISCUSSION

Haematological parameters are useful indices that can be employed to assess the toxic potentials of plant extracts in living systems (Sunmonu and Oloyede, 2010). Investigation of haematological parameters represents a useful process in the diagnosis of many diseases as well as investigation of the extent of damage to the blood (Onyeyili *et al,* 1991). This is relevant since blood constituents change in relation to the physiological condition of the animal. For normal functioning of the body of an organism, it must keep its blood composition and constituents under natural conditions (Rodriques and Mcneil, 1992). The present study showed that ethanol leaf and root extracts of *Sida acuta* demonstrated a significant reduction in the values of the haematological parameters

investigated as compared to the control group. Leaf and root extracts of *Sida acuta* caused statistically significant ($P < 0.05$) reduction in RBC, WBC and platelet counts. Mixture of leaf and root extracts also significantly reduced WBC count but has no significant effect on RBC and Platelet counts (Table 1). The reduction in all the blood cell counts on administration of leaf and root extracts of *Sida acuta* shows that this plant may have phytochemicals that could adversely affect or suppress the haematopoietic system or may possess active agents capable of causing lysis of blood cells. Reports by Oladunmoye (2006) Oze *et al,* (2010) and Nwankpa *et al,* (2018) have shown that extracts of *Acalypha wilkisiana, Alstonia boonei* and *Dennettia tripetala* possess alkaloids and saponins which are tissue damaging phytochemicals particularly of the liver and kidney may have affected the synthesis of red blood cell. The reduction in WBC count as observed from the result reveals that *Sida acuta* has immune suppressive properties considering the crucial roles of WBC in defending the body against infections and tissue damages. *Sida acuta* therefore should not be used when there is need to boost immunity. Immune boosters are recommended to strengthen and harmonize degenerative body systems to fight invading agents such as bacteria and viruses (Al-Mamary, 2002 and Bendich, 1993).

The decrease in PCV and Haemoglobin concentration may be due to the negative impact of the extract on erythropoiesis. Erythropoietin, which is the hormone synthesized in the kidney to stimulate the production of red blood cell in the bone marrow may have been suppressed by the seeming effect of the extract on the kidney (Devlin, 2006). It may also be associated with destruction and lysis of red blood cell due to the interaction of the secondary metabolites with red blood cell (Nwankpa *et al,* 2014). Oxygen-carrying capacity of the blood and the amount of oxygen delivered to the tissues could be adversely affected following administration of *Sida acuta* extract considering the important role of RBC and haemoglobin in oxygen delivery to the tissues. This therefore strongly suggests that *Sida acuta* may have the potentials to induce anemia. Reduction in platelet count portrays the extract as having thrombocytopenia tendencies and may not be unconnected to the defective haematopoietic system. MCV, MCHC and MCH reduction must be the direct consequence of deficient RBC and haemoglobin following extract administration.

Conclusion

Sida acuta leaf and root extracts cause significant reduction in the values of haematological parameters. This strongly suggests that these extracts may have immunosuppressive properties, thrombocytopenia tendencies and potentials to induce anemia. Thus, the populace should exert caution on the use of the plant extracts in the treatment of dysentery and other infections.

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