

Potential Haemopoietic Effects of *Dacryodes Edulis* Seeds Extract in Wistar Rats

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Abstract: Haemopoietic effects of crude methanolic extract of *Dacryodes edulis* (*D. edulis*) seeds was investigated in Wistar rats. Wistar rats (n=28), were grouped into 4 of 7 rats per group, labeled A-D. Groups A-C were orally administered with graded-doses of the extract (A=100, B=200 and C=300) mg/kg bodyweight respectively daily for 30 days. Group D served as control. Blood samples (2.0 ml) were collected from each rat through the retro orbital plexus of the median canthus into K3-EDTA containers for haematological analysis. The results revealed significantly decreased mean Hemoglobin (Hb) [g/dl]: (A=11.2±1.2, B=11.9±1.9, C=10.8±1.0), Haematocrit (Hct) [L/L]: (A=0.32±0.02, B=0.33±0.03, C=0.31±0.04) and significantly increased mean Total WBC (TWBC) [$\times 10^9/l$]: (A=6.55±0.2, B=7.73±0.43, C=8.10±0.35) and platelets [$\times 10^9/l$]: (A=961.67±11.2, B=988.55±23.8, C=1009.35±15.3) compared to control (Hb=15.4±1.3g/dl, Hct=0.43±0.03L/L, TWBC=4.85±0.15 $\times 10^9/l$, Platelet=570.25±10.1 $\times 10^9/l$, (P=0.05). This study revealed decreased Hb and Hct and increased TWBC and platelets after oral administration of graded-doses of *D. edulis* seeds extract in Wistar rats.

Keywords: Haemopoietic, *Dacryodes edulis*, Graded-doses, Oral, Wistar rats.

1. INTRODUCTION

Dacryodes edulis (*D. edulis*) is a fruit tree native to Africa (African pear) belonging to *burserace* family and has two variants, *Dacryodes edulis vary* and *Dacryodes parvicarpa*. It is an evergreen tree which grows up to a height of 8cm - 15cm and 18 - 40 meters in the forest, but not exceeding 12 meters in plantations [1]. It has relatively short trunk and a deep dense crown, the bark is pale gray and rough with droplets of resin [2]. It has a wide range distribution on the African continent, growing from Sierra Leone to Angola along Atlantic, planted in the Southern Nigeria, Cameroon, Democratic Republic of Congo, Central African Republic, Cote d'ivoire, Gabon, Ghana, Liberia [3]. The leaves are compound with 5 - 8 pairs of leaflets. The flowers are yellow and about 5mm across. The fruit is an ellipsoidal drupe which varies in length from 4 - 12cm. The tree flowers at the beginning of rainy season and bears fruit during five months after flowering [3]. *D. edulis* is rich in nutrients such as lipids, vitamins and proteins [2]. The plant has long been used in the traditional medicine for the treatment of various ailments such as wound, skin diseases, dysentery and fever [4]. The extract has been found to show biological activities such as anti microbial, anti oxidant and anti sickle cell anaemia [5]. *D. edulis* contains a wide range of bioactive compounds such as alkaloids, terpenes, flavonoids, tannins, thiamine and saponins [4]. Some studies have also recorded the presence of anti-nutrients in the plant. The high tannins content in *Dacryodes edulis* samples implies severe nutritional challenge to animals or humans due to its affinity for certain digestive enzymes and proline-rich proteins in the saliva as well as its interaction with protein [6]. The oxalate content of *Dacryodes edulis* seed is high in comparison to those reported for legumes and is in same range as those for spinach, beet leaves, tea and lower than that of cocoa [7].

Hematological variables which include Hemoglobin, Hematocrit, Leucocyte count (total and differential), Platelet, Red Blood Cell, Reticulocyte and Absolute indices plays important role in the diagnosis, prognosis and classification of some

diseases. Much hematological effects have not been recorded on *D. Edulis* and it is believed that during usage of this crude extract as herbal remedy, that it may be either stimulating the bone marrow to produce more blood cells or it may be suppressing the bone marrow to cause anemia. As a result of the numerous medicinal properties and uses and because of the paucity of haematological information towards the crude seed extract of *D. edulis* in the science literature, it becomes necessary to investigate the haemopoietic activity of *Dacryodes edulis* seeds extract in Wistar rats.

2. MATERIALS AND METHODS

2.1 Collection of plant materials:

The plant materials of *D. edulis* were obtained from its natural habitat and authenticated by the Department of Plant Science and Biotechnology, University of Nigeria Nsukka and a voucher specimen (18258/HNC) were kept in the herbarium for future reference.

2.2 Animal housing:

Wistar rats (n=28) were purchased and housed in the Animal House of College of Medicine, University of Nigeria Enugu Campus. They were allowed to acclimatize for two weeks and fed with commercially available rat feed and have access to water feed *ad libitum*.

2.3 Preparation of extract:

One hundred (100) grams of the powder from the grinded shade dried seeds of *D. edulis* was extracted exhaustively with methanol and the mixture sieved. The remaining methanol in the extract was evaporated to get the concentrated crude extract which was reconstituted with 3% *Dimethylsulphoxide (DMSO)* and stored in the refrigerator until needed.

2.4 Experimental design:

Wistar rats (n=28) were divided into 4 groups of 7 rats per group, labeled A-D. Groups A-C were orally administered with graded-doses of the crude extract (A=100, B=200, and C=300) mg/kg bodyweight) once daily for 30 days. Group D served as control and did not receive the crude extract but was orally administered with *DMSO* as vehicle since *DMSO* was used to dissolve the crude extract.

2.5 Sample collection:

On Day 31, 2.0ml of blood samples were collected from each rat through the retro-orbital plexus of the median canthus of the eyes with capillary tube into *K3- EDTA* anticoagulant containers for the analysis of Hemoglobin, Hematocrit, Total White Blood Cell, Platelet count and Blood film examinations using standard operative procedures as described by Dacie and Lewis [8].

2.6 Statistical analysis:

The Statistical Package for Social Science (SPSS) computer software version 18 was used for data analysis. The results of the tests were analyzed using student's t-test at 95% confidence interval with $P= 0.05$ been considered as significant.

3. RESULTS AND DISCUSSION

3.1 Results:

The results of this study were expressed in table 1 which shows the mean and standard deviation of some hematological variables of Wistar rats treated with graded-doses of seed extract of *D. edulis* and control. The results revealed significantly decreased mean Hemoglobin (Hb) [g/dl]: (A=11.2±1.2, B=11.9±1.9, C=10.8±1.0), mean Haematocrit (Hct) [L/L]: (A=0.32±0.02, B=0.33±0.03, C=0.31±0.04) and significantly increased mean Total WBC (TWBC) [$\times 10^9/l$]: (A=6.55±0.2, B=7.73±0.43, C=8.10±0.35) and mean platelets [$\times 10^9/l$]: (A=961.67±11.2, B=988.55±23.8, C=1009.35±15.3) when compared with control (Hb=15.4±1.3g/dl, Hct=0.43±0.03L/L, TWBC=4.85±0.15 $\times 10^9/l$, Platelet=570.25±10.1 $\times 10^9/l$, (P=0.05). Blood films showed mild to moderate leucocytosis (lymphocytosis) in the treated groups while the red blood cells appear normocytic and normochromic in both treated and control groups.

TABLE 1: Mean and standard deviation (Mean \pm SD) of some hematological parameters of rats treated with graded doses of seed extract of *D. edulis* and control group

	Group A	Group B	Group C	Group D
	100mg/kg b.wt	200mg/kg b.wt	400mg/kg b.wt	Control (3% DMSO)
Haemoglobin g/dl	11.2 \pm 1.2 *	11.9 \pm 1.9 *	10.8 \pm 1.0 *	15.4 \pm 1.3
Hematocrit L/L	0.32 \pm 0.02 *	0.33 \pm 0.03 *	0.31 \pm 0.04 *	0.43 \pm 0.03
TWBC x10 ⁹ /L	6.55 \pm 0.2 *	7.73 \pm 0.43 *	8.10 \pm 0.35 *	4.85 \pm 0.15
Platelet x10 ⁹ /L	961.67 \pm 11.2 *	988.55 \pm 23.8 *	1009.35 \pm 15.3*	570.25 \pm 10.1

Key: *: P=0.05 (Statistically significant compared to control); b. wt: body weight

3.2 Discussion:

This present study revealed that Hemoglobin (Hb) and Hematocrit (Hct) of all the treated groups were decreased significantly when compared with the control (P=0.05), while the Total White Blood Cell (TWBC) and platelet count of all the treated groups increased significantly when compared with the control (P=0.05). The blood film showed mild to moderate leucocytosis with lymphocyte as the predominant leucocyte in all the treated groups while the red blood cells appear normocytic and normochromic in both the treated and control groups. *D. edulis* has long been used in the traditional medicine of some African countries to treat various ailments such as wound, skin diseases, dysentery and fever [4]. The extracts and secondary metabolites have been found to show biological activities such as antimicrobial, antioxidant and anti sickle cell anemia [4]. *D. edulis* has been shown to exhibit a wide range of antifungal and anti-plasmodial activity. The presence of compounds like alkaloids, saponins, flavonoids, and glycosides may be the source of the anti-plasmodial activity exhibited by this plant. This corroborates the use of *C. edulis* as anti-malarial in Cameroonian folk medicine [9]. This result pattern indicates that some of the phytochemical constituents of the crude methanolic seed extract of *D.edulis* especially tannin may have stimulatory effect on the bone marrow for leucocyte and platelet production [4]. Other phytochemical constituents of *D.edulis* which may likely affect the hematological parameters include flavonoid (an antioxidant and free radical scavenger), saponin, alkaloids and thiamine [10]. Previous studies have shown that *D.edulis* is rich in nutrients such as lipids, vitamins and proteins. The plant has long been used in the traditional medicine for the treatment of various ailments such as wound, skin diseases, dysentery and fever [4]. Earlier researchers also reported that this extract possesses biological activities such as anti microbial [11], anti oxidant and anti sickle cell anaemia. The decrease in Hb and Hct in the present study shows that in addition to the anti-nutrients contained by the plant seed extract which might affect digestion, the plant also has sub-lethal effect on the bone marrow, leading to decreased synthesis and ultimately anaemia. The present study also demonstrated the leucocytic activity of the crude seed extract which might likely be the anti microbial property as earlier reported by Okwu [11]. All the observed changes in the study were concentration-dependent with the effect being more pronounced with increasing concentration of the extract. The increase in platelet count with increasing concentration of the extract can be employed in cases of defective hemostasis and in platelet deficient patients, especially at the concentration of about 400 mg/kg body weight. The blood film showed mild to moderate leucocytosis with lymphocyte as the predominant leucocyte, probably due to needs of more cells as soldiers of the body, for body's defense mechanism to neutralize toxins. Despite the observed decrease in hemoglobin and hematocrit, the red blood cells still appear normocytic and normochromic in both the treated and control groups. This could be attributed to the short duration of the study.

4. CONCLUSION

This present study has demonstrated that ingestion of the crude methanolic seed extract of *D.edulis* possibly exerts a sub-lethal effect on the bone marrow, thereby leading to anaemia, and most probably to leucocytosis and thrombocytosis, as shown by the significant decrease in Hb and Hct and significant increase in TWBC and Platelet in the treated rats compared with the control. Regardless of the medically beneficial effect that might have been previously observed during the use of *D.edulis* as a medicinal plant, adequate care should be taken in administering the seed extracts, since it has been shown to also alter some haematological variables. Further studies, however, needs to be carried out in order to characterize the seed extracts and hence, find out the active components.

ACKNOWLEDGMENT

The authors wish to acknowledge the staff of the Plant Science and Biotechnology Department of University of Nigeria Nsukka, and the Animal House of College of Medicine University of Nigeria Enugu Campus for their valuable contribution to the success of the study.

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