Original Research Article

ASSESSMENT OF THE IMPACT OF AQUEOUS EXTRACT OF *Solanum aethiopicum* ON THE HAEMATOLOGICAL PROFILE AND BLOOD FILM OF WISTAR RAT

ABSTRACT

Aim: The effect of *Solanum aethiopicum* SA on the ~~blood film and~~ haematological profile of Wistar rats was investigated in this study.

Methodology: After acclimation for two weeks, a total of 24 Wistar rats were randomly assigned to groups A through D. Group A served as the control, while groups B, C, and D were given aqueous extracts of SA at doses of 75 mg/kg ~~body weight~~, 150 mg/kg ~~body weight~~, and 225 mg/kg per body weight, respectively, every 48 hours for 60 days. After the exposure period, a final evaluation and sacrifice of the remaining rats was performed. Blood sample collection was necessary for hemological analysis.

Result: A haematological study of Wistar rats that had been gavaged with SA revealed a considerable increase in their white blood cell and lymphocyte counts. Additionally, the platelet range and plateletcrit range increased, whereas the monocyte, granulocyte, and hematocrit ranges decreased. Red blood cells, mean corpuscular volume, mean corpuscular heamoglobin concentration, red blood cell distribution, and red blood cell distribution width standard deviation were not significantly different (p>0.05) between treatment and control rats. Blood film micrograph results confirm the little increase in white blood cells and lymphocytes, the adequate number and size of erythrocytes, and the absence of parasites in both the control and treated groups of rats.

Conclusion: The current study have demonstrated that the leaves of *Solanum aethiopicum* support rats' defense better. It has the potential to be a source of haematinics, which are extremely beneficial in the management of anemia or iron deficiency issues. These plant extracts may one day be utilized to control and treat those who have been exposed to harmful substances as well as to treat anemia-related disorders.

***Keywords**: blood film, haematology, full blood count, wistar rats, Solanum aethiopicum.*

1. INTRODUCTION

Solanum aethiopicum is a complicated species with four unique morphological groupings that were formerly considered separate species (Polignano et al., 2010). It additionally qualifies as a hypervariable species since it has several forms and kinds that differ morphologically, as well as hundreds of local variants (Lester, 2010). S. aethiopicum is divided into four separate groupings based on its application. Gilo, Shum, Kumba, and Aculeatum are the four groupings (Lester, 2010). The Gilo group produces various ranged shaped edible fruits (varying from a circularly depressed form to an oblong outline); the Kumba group has a strong principal stem with enormous hairless leaves that is able to be harvested as a green vegetable, and subsequently produces huge edible fruits. The Shum family is a brief, much-branched species with little hairless leaves and branches that are widely plucked as an attractive green vegetable, but the small (1.5 cm across) highly unpleasant fruits are not edible (Plazas et al., 2014). The plant is often grown as an ornamental plant.

Comment [O1]: Delete blood film. The haematological indices has already captured it.

Comment [O2]: Is this an abbreviation? If so, put in parenthesis

Comment [O3]: indices

Comment [O4]: include weight and sex

Comment [O5]: distributed into four groups (A-D)

Comment [O6]: which rats remained, do you have other ones aside the 4 groups?

Comment [O7]: Done or carried out

Comment [O8]: Haematological?

Comment [O9]: Be specific. What analysis and method?

Comment [O10]: Include values in the haematological result, this is a scientific paper

Comment [O11]: Remove and go straight to the result

Comment [O12]: Meaning?

Comment [O13]: Check grammar

Comment [O14]: How? There is no sufficient evidence from the statement above in the result section of the abstract

Comment [O15]: When? Please remove

Comment [O16]: What type of substance or exposure? Just make reference to its blood promoting potentials

Comment [O17]: Italicize all through the write up

It has a greater concentration of anthocyanin, phenols, glycoalkaloids (solasodine), and amide proteins. The presence of glycoalkaloids accounts for its bitterness. Patients with liver problems and/or diabetes benefit from eggplant's therapeutic characteristics (Agoreyo et al., 2012). However, due to the plant's association with the Solanaceae (nightshade) family, the fruit was once thought to be exceedingly poisonous. Solanum species (eggplants) are members of the Solanaceae family and the genus Solanum. The plant is an economically significant vegetable that is widely produced throughout the world's tropical regions (Agoreyo et al., 2012). Solanaceae is a flowering plant family comprised of about 75 genera and 2000 species. This includes herbaceous plants, but the fruit of Solanum species is a berry, and the seeds have a larger endosperm, and they are mostly produced for food and medicine (Das et al., 2013). Solanum aethiopicum's low soluble carbohydrate content has the capacity to limit glucose absorption into the bloodstream, hence managing blood sugar levels, making it an excellent dietary alternative for diabetics (Polignano et al., 2010).

Comment [O18]: Include other local names

Comment [O19]: italics

S. aethiopicum juvenile fruits are eaten fresh or cooked as vegetables in stews. The leaves and shoots are prepared in the same way that vegetables are. They are collected from the same plants as the fruit or from distinct leafy cultivars. The fruits of bitter cultivars are used as medicine in several African countries. The roots and fruits can be used as a carminative and sedative, as well as to treat colic and high blood pressure; a sedative to treat uterine issues; an alcoholic extract of the leaves can be used as a sedative, anti-emetic, and to treat tetanus after abortion; as well as crushed and macerated fruits can be used as an enema. In south-eastern Nigeria, the Igbo tribe traditionally greet visitors by offering fruits. S. aethiopicum is occasionally grown as an ornamental plant. Some cultivars are used as rootstock for tomatoes and eggplant on occasion.

Comment [O20]: italics

Comment [O21]: italics

S. aethiopicum is one of the plants sought for due to its availability and cost. As a result, S. aethiopicum has a wide range of applications in ayurvedic medicine. Concurrently, another pertinent scientific concern is the adverse effects of S. aethiopicum. Interestingly, no study documented the detrimental potentials of OG after a thorough literature search, although other studies reported promising outcomes in the application of S. aethiopicum in therapeutic medicine. Keeping in mind that herb usage can have a variety of consequences A few research have indicated that S. aethiopicum fruit extracts exhibit anti-inflammatory, lipid-lowering, hypotensive, antibacterial, and anticancer effects (Tyagi et al., 2020). However, no investigations on the effects of this vegetable's aqueous extract on hematological parameters have been conducted to our understanding.The goal of this study is to see how an aqueous extract of *S. aethiopicum* affects the hematological profile and blood film of Wistar rats.

Comment [O22]: italics

Comment [O23]: italics

Comment [O24]: Meaning?

Comment [O25]: Recast, statement is hanging

Comment [O26]: italics

Comment [O27]: how sure? Rather, say that there is dearth of information

Comment [O28]: aim

Comment [O29]: recast!

2. MATERIAL AND METHODS

2.1 Collection, identification and preparation of *Solanum aethiopicum* leaf extract

Fresh leaves of *Solanum aethiopicum* (African garden eggplant) were purchased from Effurun Market in Effurun, Delta state in January, 2021; the taxonomic identity of the plant was confirmed at the Department of Plant Biology and Biotechnology, Faculty of Life Science, University of Benin, Benin City, Edo State, Nigeria.

The purchased leaves were air-dried to crispiness in the laboratory (prevailing room temperature of 30 ± 2°C) for two weeks. The dried materials were reduced to coarse form using a pestle and mortar and further pulverized to very fine particles using Viking Exclusive Joncod pulverizing machine (Model: YLH2M2 - 4). The crude aqueous extract was prepared by decoction; in which 50 g of the leave powder extracted with 500 mls of distilled water (via maceration) for 48 hrs. The mixture was decanted and filtered using sterile whatman paper No 1. The filterate was evaporated to dryness using a freeze dryer and reconstituted in distilled water to appropriate concentrations.

Comment [O30]: Recast. Check grammar

Comment [O31]: Check spelling

2.2 Experimental setup

Male wistar rats (6-7 weeks old) weighing within the range of 100 g to 150 g were obtained from the Anatomy Department, University of Benin, Nigeria. The rats were distributed randomly into four groups of six animals each for group A to D and allowed to acclimatized for 2 weeks. During acclimatization, the animals were housed in wooden cages with wire mess covers and fed with standard rodent chow (Bendel Livestock Feeds Limited, Ewu, Edo state, Nigeria) and given distilled water ad labium. After acclimatization, the rats were given different treatment protocol: Group A which was the Control (CTR) was given distilled water; Group B, C and D rats were gavaged 75 mg/kg b/w (EGG 1),150 mg/kg b/w (EGG 2), 225 mg/kg b/w (EGG 3) of aqueous extract of SM for 60 consecutive days (once every 48 hour) respectively. The rats were maintained in laboratory conditions; and had access to drinking water and standard rodent chow (Bendel Livestock Feeds, Ewu, Edo state, Nigeria®) *ad libitum*.

At the end of exposure period, survivors were fasted overnight and sacrificed under slight Anesthesia; then blood Blood was collected from the inferior vena cava of the rats with plain 5 ml sterilized syringe into a vial containing 0.5 m EDTA for haematological analysis under a light anaesthesia. The blood sample was gently homogenised to ensure proper mixing of the blood with the anticoagulant, before taking it to the laboratory.

2.3 Laboratory analysis

In the laboratory, hematological analysis was carried out using Sysmx KX-21N automated machine (Sysmx corporation kobe, Japan) following the manufacturer's instructions. Briefly the sample was mixed and placed in contact with the sample probe for aspiration, when the buzzer sounds twice "beep, beep" and when the LCD screen displays ANALYZING, the sample was removed. Following this, the unit executed automatic analysis, and the result was displayed on the LCD screen and printed out.

2.4 Data Analysis

All statistical analyses were conducted with Statistical Package for Social Scientists (SPSS) and Microsoft Excel computer software. Data are presented as mean±SE (n=5). One-way ANOVA was used to determine the differences among various groups. When the corresponding F test for differences among the treated group means was significant pair wise, comparisons between treated groups and corresponding negative control were determined using multiple comparison procedure of the Dunnett post-hoc test and differences were considered significant at $p<0.05$ levels of significance.

3. RESULT AND DISCUSSION

The results of the haematological studies is as shown in table 1. There were no significant difference increase in white blood cells (WBC), especially lymphocytes (LYM) in group of rats administered leaf extract of SA. While the reverse was the case in red blood cells (RBC), hemoglobin (HGB) mean platelet volume (MPV), red cell distribution width (RDW-SD), and mean corpuscular hemoglobin (MCH) as there were no significant difference reduction in their value when compared to the control. Platelet (PLT) was significantly higher in treated group when compared to the control, while the reverse was the trend for Plateletcrite (PCT), mean platelet volume and platelet distribution width when compared with control.

Table 1: Hematological profile of male wistar rats administered crude aqueous extract of SA leaves

	CTR	EGG 1	EGG 2	EGG 3
WBC (x 10^3/µl)	18.18±0.78^{a}	24.45±0.95^{b}	25.25±1.15^{b}	27.08±2.68^{b}
LYM (x 10^3/µl)	13.58±2.48	19.60±0.40	21.10±0.10	30.95±4.65
MID (x 10^3/µl)	3.36±0.44	2.65±0.25	2.50±0.50	2.73±0.28
GRA (x 10^3/µl)	2.08±0.42	1.20±0.20	1.65±0.65	1.40±0.70

Comment [O32]: Upper case

Comment [O33]: acclimatize

Comment [O34]: check spelling and italicise

Comment [O35]: repetition

Comment [O36]: check unit

Comment [O37]: analyses

Comment [O38]: remove

Comment [O39]: these are not scientific and necessary

Comment [O40]: ditto

Comment [O41]: analyzed

Comment [O42]: include values in ranges of the results before the tables.

Comment [O43]: Recast! This statement is not scientific

Comment [O44]: Ditto.

Comment [O45]: There should be a key (legend) after the table, providing the meaning for all abbreviated terms

LYM (%)	77.73±13.83	66.40±1.40	83.70±4.10	59.95±16.45
MID (%)	17.50±4.40	14.30±0.80	9.85±1.65	7.28±3.63
GRA (%)	9.43±4.77	15.30±0.60	6.45±2.45	22.78±12.83
RBC (x 10^6/µl)	7.78±0.04	7.73±0.41	7.33±0.20	7.19±0.45
HGB (g/dl)	16.92±0.62	15.75±0.05	15.35±0.05	14.55±0.95
HCT (%)	41.49±0.29	40.55±0.25	39.05±0.75	38.38±1.68
MCV (µm^3)	53.41±0.71	52.65±3.05	53.35±2.45	52.85±0.15
MCH (ρg)	21.71±0.91	20.45±1.15	21.00±0.50	20.30±0.10
MCHC (g/dl)	40.85±1.25	38.85±0.15	39.30±0.90	38.40±0.30
RDW-CV (%)	16.00±0.50	17.20±0.10	18.95±1.55	17.43±0.07
RDW-SD (µm^3)	30.93±0.73	30.00±1.90	33.00±0.90	31.15±1.05
PLT (x 10^3/µl)	451.25±87.25	456.50±1.50	443.00±53.00	724.75±249.25
MPV (µm^3)	8.21 ± 0.31^{a}	6.75 ± 0.15^{b}	7.80 ± 0.30^{a}	6.98 ± 0.07^{b}
PCT (%)	0.36±0.07	0.31±0.01	0.34±0.03	0.50±0.17
PDW (%)	18.68±1.38	16.20±1.30	17.70±1.90	15.93±0.73
P-LCR (%)	11.14 ± 0.86^{a}	5.85 ± 0.65^{b}	11.80 ± 1.60^{a}	7.00 ± 0.70^{b}

All values are expressed as Mean ± S. E., N = 5,

The structure, function, metabolic transformation, and concentration of biomolecules, enzymes, and even metabolic pathways can all be significantly altered by the injection of a chemical agent (Polignano et al., 2010). These changes, which could occur quickly or gradually, could trigger various biochemical processes that result in comparable pathological, clinical, and laboratory findings (Murray et al., 2000). The magnitude of a foreign compound's harmful effect on the blood, including plant extract, can be assessed using haematological measures. It can also be used to illustrate how plant extracts with chemical compounds work in relation to the blood (Afolabi et al. 2018). Hematology, which includes the diagnosis, treatment, and prevention of illnesses of the blood, bone marrow, immune, hemostatic, and vascular systems, is the study of blood and blood-forming organs. Animal diseases are frequently diagnosed and treated using hematologic analysis. Hematology has grown in importance for disease detection and treatment in smaller laboratory animals as analytical methods have gotten more sensitive, necessitating smaller sample volumes. It can be challenging to create reference values for hematologic assays due to a number of physiologic and physical parameters (Olafedehan et al., 2010). Age, breed and strain, gender, the season as well as the time of day, nutrition, illness, stress, and trauma are all examples of physiological influences. The location of the blood draw, the type and amount of anticoagulant used, and sample preparation and handling are all crucial physical aspects (Dyer and Cervasio, 2008).

The iron concentration in SA may be responsible for the study's non-significant difference in RBC, with the rise in heamoglobin and heamatocrit in both treated and control rats. According to Agoreyo *et al*.'s (2012) research, Solanum fruit aids in the transportation of oxygen by RBCs through hemoglobin, which remained unaffected. This study concurs with that of Agoreyo *et al.* (2012), who noted comparable tendencies brought on by SA fruit extract. According to Gracelin *et al.* (2019), SA may have blood detoxifying potentials, as has been seen in various vegetables (Elatrash and El-haleim 2015), which may have played a physiological role in maintaining the levels of RBC, HCT, and HCB of wistar rats treated with fruit extract of SA. The considerable drop in red blood cell count found is consistent with findings from Alhassan et al. (2012) who reported that rats given S. aethiopicum extract saw a significant drop in red blood cell count. According to a study by Ossamulu et al. (2014), saponins, an abundant bioactive ingredient in eggplant, may trigger hemolysis in red blood cells (Kar, 2007). According to Lopez and Martos (2004), eggplants have a high concentration of dietary fiber that can bind cations like iron. As a result, iron's bioavailability may be compromised, which could reduce red blood cell production (Reinhold

Comment [O46]: Phytochemical analyses should have been reported in this work et al., 1981). According to Fuschia (2006), the non-significant decrease in MCV, MCH, and MCHC values indicates that eggplant (Solanum aethiopicum) may not actually have any hemopoeitic properties and may not even have any substantial haematotoxicity or general toxic effect. Our current findings are (roughly) in agreement with those of Adamson and Longo (2001).

White blood cells, or leucocytes, are a crucial part of the immune system (host defense), which works to defend the body from infectious disorders brought on by bacteria, fungi, viruses, and parasite invasion (Stock and Hoffman, 2000). The large rise in white blood cell count seen in this study is consistent with the findings of Alhassan et al. (2012), who examined the impact of S. *aethiopicum* on the circulation of Wistar rats and discovered an increase in white blood cell count. Both Lowenthal, Connick, McWater, and York (1994) and Saba, Olayinka, and Ofuegbe (2009) reported that eggplant may play a role in cellular immunity. The response to numerous stimuli, such as changes in hormone levels, stress, shock, infection, drug use, allergic reactions, and inflammations, can cause changes in white blood cell count. Alkaloids, phytosterol, and certain pigments that may occasionally trigger allergies have all been linked to eggplants (Ossamulu et al., 2014; Patnaik, 1993). White blood cells may become mobilized as allergic reactions progress, raising their concentration. The differential cell analysis and white blood cell count both indicated that the mean lymphocyte values had increased. An improvement in the body's immunological state, particularly the cell-mediated immune response, is correlated with an increase in the number of white blood cells and lymphocytes in circulation. The results here are consistent with those of (Saba et al., 2009) and (Lowenthal et al., 1994), who proposed that administering an aqueous extract of eggplant leaf may benefit the cells engaged in immunity.

The main job of platelets is to stop and stop bleeding, repair wounds, and help the body mend itself. This suggests that Solanum aethiopicum has the potential to be therapeutic. and low readings may point to the development of antibodies, liver illness, or issues with blood coagulation (Yilmaz et al., 2004). As seen in this study, when compared to the control group, the platelet count was higher in the group that received an aqueous extract of Solanum aethiopicum meals. PDW and MPV are two platelet indices that could be helpful markers for the early detection of thromboembolic illnesses (Vagdatli et al., 2010). Animals in the control group that were exposed to air pollution without receiving any therapy had significantly higher PDW levels (p 0.05) than the control. MPV levels were greater but not substantially (p 0.05) different. According to Amin et al. (2004), PDW increases in sickle cell anemia, which may be a factor in erythrocyte abnormalities and platelet dysfunction. High MPV concentrations have been linked to vascular diseases such atherosclerosis, coronary artery disease, and ischemic stroke. (Yilmaz et al., 2004; Karagöz et al., 2009). All of the animals who received Solanum aethiopicum exhibited elevated PLT. This might be due to the polyphenols and vitamins included in this vegetable (Olajire and Azeez 2011).

4. CONCLUSION

The results of this study demonstrate that eggplant improves cell-mediated immunity, which in turn strengthens the body's immune system. Also, according to the findings of this thesis, chronic administration of Solanum aethiopicum extract does not appear to have a hemotoxic impact. Additionally, it implies that S.A. might improve immunity, particularly cell-mediated immunity. According to this study, *Solanum aethiopicum* is a potential source of haematinics, which are extremely beneficial in the treatment of anemia or iron deficiency issues. Other fruits in the Solanaceae family include tomatoes, carrots, and garden eggs. Plant extracts from S.A. may be employed in the future to manage and treat those who have been exposed to harmful substances and to treat disorders brought on by anemia.

Comment [O47]: 1993 before 2014

Comment [O48]: 1994 before 2009

Comment [O49]: Major role

Comment [O50]: italics

Comment [O51]: how? No infection was carried out in this study

Comment [O52]: check grammar

Comment [O53]: italics

Comment [O54]: you mean administration?

Comment [O55]: What do you mean by air pollution? This is not stated in the methodology, likewise this work does not involve any therapy, rather a biosafety assay

Comment [O56]: italics

Comment [O57]: this was scientifically justified, rather boost blood indices

Comment [O58]: meaning? Higher concentration?

Comment [O59]: italics

Comment [O60]: remove, statement is contradictory to the focus of the study

Comment [O61]: recast

8. ETHICAL APPROVAL

This research design was reviewed and approved by the College of Science Ethical board, Federal University of Petroleum Resources, Effurun (CS/EMT/2021/006).

9. REFERENCES

1. Abubakar, A.R., Sani, I.H., Malami, S and Yaro, A.H. (2021) Anxiolytic and Sedative Activities of Methanol Extract of Solanum aethiopicum (Linn.) Fruits in Swiss Mice. *Trop. J. Nat. Prod. Res*.; 5, 353–358.

2. Adamson JW and Longo DL (2001). Anemia and polycythemia. In: Braunwald E, Fauci AS, Kasper DL, Hauser SL, Longo DL, and Jameson JL (Eds.): *Harrison's Principles of Internal Medicine, 15th Edition, New York, McGraw-Hill.*. p. 348-54.

3. Aderemi FA. (2004) Effects of replacement of wheat bran with cassava root sieviate supplemented or unsupplemented with enzyme on the haematology and serum biochemistry of pullet chicks. *Tropical Journal of Animal Science*.(7):147- 153.

4. Afolabi KD., Akinsoyinu A O., Olajide R and Akinleye SB. (2010) Haematological parameters of the Nigerian local grower chickens fed varying dietary levels of palm kernel cake. *Proceedings of 35th Annual Conference of Nigerian Society for Animal Production*.;247.

5. Agoreyo B O., Obansa E S and Obanor E O.(2012) Comparative nutritional and phytochemical analysis of two varieties of *Solanum. aethiopicum. Sci World J*.; 7: 5-8.

6. Aké-Assi E. Etude (2015) taxinomique des plantes à potentialité décorative de la flore du Sud de la Côte d'Ivoire et essai de domestication de *Thunbergia atacorensis* Akoègninou et Lisowski (Acanthaceae), une espèce nouvellement introduite. Thèse de Doctorat ès Sciences Naturelles. Université Félix Houphouët-Boigny, *U.F.R. Biosciences, Laboratoire de Botanique,* 216p.

7. Alhassan, A., Mabrouk, M.A., Okpe, E.A., Salawu, E.O., and Omotoso, O.D. (2012). Effects of Aqueous Extract of *Solanum. aethiopicum* on Blood System of Wistar Rats. *World Journal of Life Science and Medical Research*, 2(5), 159-164.

8. Alomar M J. (2014) Factors affecting the development of adverse drug reactions (Review article). *Saudi Pharm J*. 2;22(2):83-94.

9. Amin, M.A., Amin, A.P. and Kulkarni, H.R. (2004), "Platelet distribution width (PDW) is increased in vasoocclusive crisis in sickle cell disease", *Ann. Hematol*., 83(6), 331-335.

10. Anosike CA., Obidoa O and Ezeanyika LU. (2012). The anti-inflammatory activity of garden egg (*Solanum aethiopicum*) on egg albumin-induced oedema and granuloma tissue formation in rats. *Asian Pac J Trop Med.* 2012;5:62-66.

11. Anosike, C.A., Obidoa, O and Ezeanyika, L (2012). US. egg albumin-induced oedema and granuloma tissue formation in rats. *Asian Pac. J. Trop. Med.* 5, 62–66.

12. Asanga E E,, Dennis A., Udosen E O., Uboh F E. (2015). Evaluation of the effect of ethanolic leaf extract of *solenostemon monostachys* on blood glucose and liver enzymes in STZ induced diabetic rats. *European Scientific Journal*;11(12)

13. Asl, M.N and Hosseinzadeh, H. (2008) Review of Pharmacological Effects of Glycyrrhiza sp. and its Bioactive Compounds. Phytother. *Res*., 22, 709–724.

14. Bagchi, M., Milnes, M., Williams C., Balmoori, J. Ye X and Stohs, S **(**1999) Acute and chronic stress-induced oxidative gastrointestinal injury in rats, and the protective ability of a novel grape seed proanthocyanidin extract. *Nutr. Res*, 19, 1189–1199.

15. Bello., S.O, Muhammad, B.Y., Gammaniel, K.S., Abdu-Aguye., I, Ahmed., H, Njoku., C.H, Pindiga, U.H and Salka, A.M. (2005) Preliminary Evaluation of the Toxicity and Some Pharmacological Properties of the Aqueous Crude Extract of *Solanum. aethiopicum*. *Res. J. Agric. Biol. Sci.*, 1, 1–9.

16. Bukenya, Z.R and Carasco, J.F. (2012) Ethnobotanical aspects of Solanum L. (Solanaceae) in Uganda. In Solanaceae IV: *Advances in Biology and Utilization; Royal Botanic Gardens: Kew, UK* pp. 345–360.

17. Chinedu, S.N., Olasumbo, A.C., Eboji, O.K, Emiloju, O.C., Olajumoke, K., Dania, D.I (2011**)** Proximate and Phytochemical Analyses of *Solanum aethiopicum* L. And *Solanum macrocarpon* L. Fruits. *Res. J. Chem. Sci.*, 1, 65–71.

18. Costa C, Tsatsakis A., Mamoulakis C., Teodoro M., Briguglo G and Caruso E (2017) Current evidence on the effect of dietery polyphénols intake on chronic diseases. *Food Chem. Toxicol*; 110:286-299.

19. Das M and Nilotpal B. (2013) "Pharmacological activities of *Solanum. aethiopicum* Linn. (Brinjal plant)." *International Journal of Green Pharmacy*.; 7(4): 274.

20. Diatta, K W., Fall, A.D., Ibra, S., Dieng, M., Mbaye, A.I., Sarr, A and Adegbindin, M.A. (2020) Evaluation of the Antioxidant Activity of Stalk and Fruit of Solanum aethiopicum L. (Solanaceae). *Asian J. Res. Biochem*., 6, 6–12.

21. Doyle D and William Hewson (2006) 1739-74. The father of haematology. *British Journal of Haematology*. 133(4):375-381.

22. Dyer, S.M and Cervasio, E.L., (2008). An overview of restraint and blood collection techniques in exotic pet practice. *Vet. Clin. North Am. Exotic Anim. Pract.* 11, 423–443.

23. Edeke A., Uchendu N., Omeje K and Odiba A S. (2021) Nutritional and Pharmacological Potentials of *Solanum. aethiopicum* and *Solanum aethiopicum* Fruits. *Journal of Phytopharmacology*.;10(1):61-67.

24. Elatrash A M and El-Haleim SZ. (2015) Protective role of ginkgo biloba on monosodium glutamate: Induced liver and kidney toxicity in rats. *Res J Pharma Biol Chem Sci*.;6(1):1433-1441.

25. Eletta, O.A., Orimolade, B.O., Oluwaniyi, O.O and Dosumu, O.O. (2017) Evaluation of proximate and antioxidant activities of Ethiopian eggplant (Solanum aethiopicum L.) and Gboma Eggplant (*Solanum macrocarpon* L.*). J. Appl. Sci. Environ. Manag.*, 21, 967–972.

26. Emiloju, O.C and Chinedu, S.N. (2016) Effect of Solanum aethiopicum and Solanum macrocarpon Fruits on Weight Gain, Blood Glucose and Liver Glycogen of Wistar Rats. *World Journal*, 4, 1–4.

27. Food and Agriculture Organization of the United Nations, Rome (2007). Date accessed July, 2022. Website http://faostat.fao.org/faostat/

28. Fuchsia D. (2006) Revolutionary Chinese Cookbook:Recipes from Hunan Province, *Ebury Press. p*.202.

29. Gill H and Tomar B. (1991) Vegetable Statistics at Glance. *Indian Agricultural Research Institute, New Delhi, India. Tech.* Bull.No.4

30. Gracelin DHS., Britto AJ., Stephan RTL and Rathnakumar PBJ (2011). Assessment of genetic relationships among five species of *Solanum* as revealed by RAPD markers. Life Sci Leaflets;19:809– 814.

31. Grubben, G. J. H. and O. A. Denton, Eds. (2004). Plant Resources of Tropical Africa II: Vegetables, Leiden, Wageningen: Backhuys Publishers.

32. Hanson PM., Yanga RY., Tsoua SCS., Ledesmaa D., Englea L and Lee TC (2006). Diversity in eggplant (*Solanum. aethiopicum*) for superoxide scavenging activity, total phenolics, and ascorbic acid. *Journal of Food Composition and Analysis;* 19:594–600.

33. Horna, D., M. Smale, and J. Falck-Zepeda. (2006). "Assessing the Potential Economic Impact of Genetically Modified Crops in Ghana: Tomato, Garden Egg, Cabbage and Cassava." *Program for Biodiversity Systems report*, October 2006. pp. 15.

34. Horna, J. D. and G. Gruère. (2006). Marketing Underutilized Crops for Biodiversity: The case of the african garden egg (Solanum aethiopicum) in *Ghana 8th International BIOECON*

35. Isaac LJ., Abah G., Akpan B and Ekaette IU. (2013) Haematological properties of different breeds and sexes of rabbits. *Proceedings of the 18th Annual Conference of Animal Science Association of Nigeria.*;24- 27.

36. Kamga, R.T., Kouamé, C., Atangana, A.R., Chagomoka, T., Ndango, R (2013). Nutritional Evaluation of Five African Indigenous Vegetables. *J. Hortic. Res*., 21, 99–106.

37. Kar, A. (2007). Pharmaocgnosy and Pharmacobiotechnology (Revised-Expanded Second Edition). 1113-124

38. Karagöz, B., Alacacioðlu, A., Bilgi, O., Demirci, H., Özgün, A., Erikçi, A.A., Sayan, Ö., Yilmaz, B. And Kandemir, E.G. (2009), "Platelet count and platelet distribution width increase in lung cancer patients", Anat. J. Clin. Invest., 3(1), 32-34.

39. Khan TA and Zafar F. (2005) Haematological study in response to varying doses of estrogen in broiler chicken. *International Journal of Poultry Science*.;4(10):748-851.

40. Lagos – Nigeria*", Chemosphere*, 84(8), 1044-1051.

41. Lester, R.N and Seck, A. (2004) *Solanum aethiopicum* L. In Plant Resources of Tropical Africa/Ressources Végétales de l'Afrique Tropicale; Grubben, G.J.H., Denton, O.A., Eds.; *Backhuys Publishers: Wageningen, The Netherlands,;* pp. 530–536.

42. Lester, R.N. (2010) Taxonomy of Scarlet Eggplants, *Solanum aethiopicum* L. *Acta Hort.*, 182, 125–132.

43. Lim, T.K. (2015). Edible medicinal and non medicinal plants. *Springer*, 6, 310–317.

44. López, M.A.A and Marto, F.C. (2004). Iron availability: An updated review. *International Journal of food Science Nutrition*, 55(8), 597-606.

45. Lowenthal JW., Connick T and McWater (1994) PG. York JJ. Development of T cell immune responsiveness in the chicken. *Immunology and Cell Biology*; 72:115-22.

46. Mangambu M. (2013) Taxonomie, biogéographie et écologie des Ptéridophytes de l'écosystème forestier des montagnes du Parc National de Biega à l'Est de la République Démocratique du Congo. *Thèse de Doctorat, Université d'Anvers/Belgique,* , 463p.

47. Michael, U., Banji, A., Abimbola, A., David, J., Oluwatosin, S., Aderiike, A., Ayodele, O and Adebayo, O. (2017) Assessment of variation in mineral content of ripe and unripe African eggplant fruit *(Solanum aethiopicum* L.) Exocarps. *J. Pharmacog. Phytochem*., 6, 2548–2551.

48. Mmereole FUC (2008). The effects of replacing groundnut cake with rubber seed meal on the haematological and serological indices of broilers. *International Journal of Poultry Science.*;7:622-624.

49. Offor, C.E.; Igwe, S.U. (2015) Comparative Analysis of the Vitamin Composition of Two Different Species of Garden Egg (Solanum aethiopicum and Solanum macrocarpon). *World J. Med. Sci*., 12, 274 276.

50. Ogunbajo SO., Alemede IC., Adama JY and Abdullahi J (2009) Haematological parameters of Savannah brown does feed varying dietary levels of flamboyant tree seed meal. *Proceedings of 34th Annual Conference of Nigerian Society for Animal roduction*.;88-91.

51. Olafedehan CO, Obun AM, Yusuf MK, Adewumi OO, Oladefedehan AO, Awofolaji AO, (2010) A effects of residual cyanide in processed cassava peal meals on haematological and biochemical indices of growing rabbit. *Proceedings of 35th Annual Conference of Nigerian Society for Animal Production.*;212.

52. Olajire AA, Azeez L (2012) Effects of Solanum macrocarpon (African eggplant) on haematological parameters of Wistar rats exposed to urban air pollution. *Adv Environ Res* 1:109–123

53. Olajire, A.A., Azeez, L. and Oluyemi, E.A. (2011), "Exposure to hazardous air pollutants along Oba Akran road,

54. Onyeyelli PA., Egwu GO., Jibike GI., Pepple DJ and Ohaegbulam J.O (1991). (Seasonal variations in haematological indices in the Grey Breasted Guinea Fowl (Numida Meleagris Galeata Pallas). *Nigerian Journal of Animal Production.*;18(1):108-110.

55. Orororo OC., Samuel OAS., Oghri E., Egbune E., Oliseneku (2017). Effects of garden egg, carrot and oat-supplements on biochemical parameters in cadmium exposed rats. *African Journal of Biochemistry Research.*;12(3):28-39.

56. Ossamulu, I.F., H.O Akanya,. A.A., Jigam and E.C. Egwim (2014) Nutrient and phytochemical constituents of four eggplant varieties. *Elixir Food Science*, 73, 26424-26428.

57. Ovuru Ekweozor I (2004). Haematological changes associated with crude oil ingestion in experimental rabbits. *African Journal of Biotechnology*.;3;32-38.

58. Owusu, J. (1980). "The effect of Gardona (Tetrachlovinphos) on the insect fauna of garden egg, *Solanum. aethiopicum* L" B.Sc. (Agric.) *Dissertation. Faculty of Agriculture, University of Ghana, Legon.*

59. Plazas, M., Andújar, I., Vilanova, S., Gramazio, P., Herraiz, F.J and Prohens, J (2014). Conventional and phenomics characterization provides insight into the diversity and relationships of hypervariable scarlet (Solanum aethiopicum L.) and gboma (S. macrocarpon L.) eggplant complexes. Front. *Plant Sci*., 5, 1–13.

60. Polignano, G., Uggenti, P., Bisignano, V and Gatta, C (2010) Genetic divergence analysis in eggplant (*Solanum. aethiopicum* L.) and allied species. *Genet. Res.* Crop Evol., 57, 171–181.

61. Prasad, D.N and Prakash, R. (2014) Floral biology of brinjal (*Solanum. aethiopicum* L.). *Indian J. Agric. Sci.,* 38, 1053.

62. R. K. Murray., K. D. Granner., P. A. Mayer and V. W. (2000) Rodwell. Harper's Biochemistry. 20th edition. McGraw-Hill, p. 594-602.

63. Reinhold, J.G., Garcia, L.J.S., and Garzon, P.M.D. (1981). Binding of iron by fiber of wheat and maize. *American Journal of Clinical Nutrition*, 34, 1384-1391.

64. Saba, A.B., Olayinka, A.O. and Ofuegbe, S.O. (2009). Evaluation of haematological and serum electrolyte changes in Wistar rats administered with ethanolic extract of whole fruit of Lagenaria breviflora Robert. *Journal of Medicinal Plants Research*;3(10):758-62.

65. Sbhatu DB and Haftom BA. (2020) Preliminary Antimicrobial Profile of *Solanum incanum* L.: A Common Medicinal Plant. Evidence-Based Complementary and Alternative Medicine, 1-7.

66. Sermet OC., Olaru OT., Gutter CM., Nitulescu GM., ILie M. and Negres S (2018). Toxicity of plants extracts containing pyrrolizidine alkaloids using alternative invertebrate models. Mol Rep.;17:7757-7763.

67. Singh AP., Luthria D., Wilson T., Vorsa N., Singh V., Banuelos GS and Pasakde S (2009). Polyphenols content and antioxidant capacity of eggplant pulp. *Food Chemistry*;114:955-61.

68. Sodipo, O.A., Abdulrahman, F.I., Alemika, T.E and Gulani, (2012) I.A. Chemical Composition and Biological Properties of the Petroleum Ether Extract of Solanum macrocarpum L. (Local Name: Gorongo). *Br. J. Pharm. Res.*, 2, 108–128.

69. Stommel, J.R., Whitaker., B.D. (2003) Phenolic Acid Content and Composition of Eggplant Fruit in a Germplasm Core Subset. *J. Am. Soc. Hortic. Sci.*, 128, 704–710.

70. Tanveer A., Maria C., Qumer I., Agustín A., Asmat B and Rana MT (2019). Phytochemicals in *Daucus carota* and their health benefits. *Review article. Foods.*;8(242):2-3.

71. Tchoupang, E.N., Reder, C., Ateba, S.B., Zehl, M., Kählig, H., Njamen, D., Holler, F., Glasi Tazreiter, S and Krenn, L(2017). Acetylated Furostene Glycosides from Solanum gilo Fruits. *Planta Med J*., 83, 1227–1232.

72. Togun VA., Oseni BSA., Ogundipe JA., Arewa TR., Hammed AA and Ajonijebu DC (2007) Effects of chronic lead administration on the haematological parameters of rabbits – a preliminary study. *Proceedings of the 41st Conferences of the Agricultural Society of Nigeria*.;341.

73. Tunwagun, D.A., Akinyemi, O.A., Ayoade, T.E and Oyelere, (2020) S.F. Qualitative Analysis of the Phytochemical Contents of Different Anatomical Parts of Ripe Solanum aethiopicum Linneaus Fruits. *J. Complement. Altern. Med. Res.*, 9, 14–22. [CrossRef]

74. Tyagi N., Santosh K and Verma A (2020). Aspects of Phenolic Compounds in Pharmacological Activities of Solanum Family. *Mol Biol*.;9(2):1-5.

75. Vagdatli, E., Gounari, E., Lazaridou, E., Katsibourlia, E., Tsikopoulou, F. and Labrianou, I. (2010), “Platelet distribution width: a simple, practical and specific marker of activation of coagulation”, *HIPPOKRATIA*, 14(1),28-32.

76. Vinson, J.A., Hao, Y., Su, X and Zubik, L. (2021) Phenol Antioxidant Quantity and Quality in Foods: Vegetables. J. Agric. Food Chem. , 46, 3630–3634. Horticulturae, 7, 126 16 of 17

77. Vohora, S.B., Kumar, I., Khan, M.S.Y. (1984) Effect of alkaloids of *Solanum. aethiopicum* on the central nervous system. *J. Ethnopharmacol.*, 11, 331–336.

78. Wang M., Moran AE., Liu J., Coxson P., Penko J and Goldman L. (2016) Projected Impact of salt restriction on prevention of cardiovascular disease in China: A modelling study.;11(2).

79. Weingand, K., Brown, G., Hall, R., Davies, D., Gossett, K., and Neptun, D. (1996). Harmonization of animal clinical pathology testing in toxicity and safety studies. Fund. Appl. Toxicol. 29, 198–201.

80. Xu, R., Zhao, W., Xu, J., Shao, B and Qin, G. (1996) Studies on Bioactive Saponins from Chinese Medicinal Plants. *Adv. Exp. Med. Biol.*, 404, 371–382.

81. Yang, R.-Y and Ojiewo, C. (2013) African Nightshades and African Eggplants: Taxonomy, Crop Management, Utilization, and Phytonutrients. In African Natural Plant Products: Discoveries and Challenges in Chemistry, Health, and Nutrition; Juliani, H.R., Simon, J.E., Ho, C.-T., Eds.; ACS Symposium Series; *American Chemical Society: Washington, DC, USA,; Volume 2,* pp. 137–165

82. Yilmaz, M.B., Saricam, E., Biyikoglu, S.F., Guray, Y., Guray, U., Sasmaz, H. and Korkmaz, S. (2004), "Meanplatelet volume and exercise stress test", *Thrombolysis,* 17(2), 115-1120.