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Therapeutic Efects of Formulated Purple Fleshed Potato and Peels of Purple Fleshed Potato-Soybean *(Solanum Tuberosum)* Based Dietson Haematological Indices of Wistar Rats Induced with Trypanosomiasis

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Abstracts

This study aims at evaluating the therapeutic and haematological activities of formulated purple fleshed potatobased diet and peels of Purple Potato based diet on Human African Trypanosomiasis (HAT) and Animals African Trypanosomiasis (AAT) in albino rats respectively.Anaemia, has been the most significant clinical symptom of Human African Trypanosomiasis (HAT), and Animal African Trypanosomiasis with grievance consequence. Thirtyanimals were randomly divided into five (5) groups (non-infected fed with rat pellet, infected fed with rat pellet only, infected treated with formulated diet PFP1SJC3G2 only, infected treated with PPL4SJC3G2 diet and infected treated with drug) of six rats each. The diets were administered once daily and drugs once in the cause of the experiment. The clearance of parasites after day two of post treatment with formulated diets for (HAT and AAT) and significant increased p>0.05) in RBC, PCV and MCV when compare with the control indicated that the purple fleshed potato and peels of potato-based diets exhibited therapeutic effect.

Keywords: Trypanosomiasis, Formulated Purple Fleshed Potato-Based Diet and Peels of Purple Fleshed Potato-Based Diet, Anaemia, Wistar Rats.

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INTRODUCTION

Health conditions often throw trypanosomiasis patients into confusion as regards their medication, due todrugsresistance and lack of appropriate preventive measures. Drugs has one or more of these drawbacks: high cost, highly toxic, need parenteral administration and parasites increasing resistance, while some were developed more than 30 years ago and are old (Marin and Soto, 2020). This confusion comes as a result of ignorance of what to choose as remedy even around the locality whereas, the land and sea are abundantly blessed with foods which have both nutritional and medicinal values, of which if properly utilized will definitely solve the problem of hunger and also serves ascurative remedies to most ailments such as trypanosomiasis and identifying these locally available foods materials will help to erase their confusion as regards remedy.

Trypanosomiasis is among the world's most neglected tropical diseases (NTDs) causing morbidity and mortality of individuals and animals living in poor rural sub-Saharan region of Africa (BUsche*et al*., 2017and Yusuf *et al*., 2023). Neglected tropical diseases (NTDs) are groups of sicknesses instigated by parasites, viruses and or bacterial infection (WHO, 2022). Combating it has been very tough mission to accomplish. Synthetic drugs topped the list of medication, with high cost implications even their long-term use also raises serious concerns (WHO, 2020).

Trypanosomiasis, excessively affect underprivileged persons and mostly occur in riverine, creek, tropical and subtropical areas worldwide. Every year, several lives are lost hundreds are severely disabled or disfigured and unable to work due to the delay in access to medication (Rume*et al*., 2022). Anaemia, has been the most significant clinical symptom of Human African Trypanosomiasis (HAT), and Animal African Trypanosomiasis with grievance consequence (Musaya*et al*., 2015; Farikuo*et al*., 2023). Eradication of HAT remains one of the most challenging tasks, due to the numerous gaps in understanding the more clinical signs, the diagnosis, the possible new therapeutic approaches, and complications. Efforts to prevent, control and cure *Trypanosomiasis* are unsuccessful, somewhat due to confusion in diagnosis, drug resistance or lack of appropriate vector control methods(Varghese *et al*, 2024).

The lethal effects and high cost of conventional trypanosomal drugs, has necessitate the development of safe alternatives against trypanosomiasis from diets. Research has shown that there are foods for a parasite infected patient, which is recommended to have increase protein, low carbohydrate, high phytonutrient, and high fibre per unit of food. This study attempts to formulate food, determine the nutrient contents and used in the treatment of Trypanosomiasis (Fairlamb and Horn, 2018) and Oaikhena*et al*., 2024).

Chemotherapy which form the major means of treatment for Trypanosomiasis has numerous short comings such as limited efficacy and lethal consequence. Food is an important source of chemical substances with potential therapeutic effects and therefore, research into food with formulation for use as antitrypanosomal is a useful strategy in the search for new antitrypanosomal diets, trypanosomiasis being one of the causes of scourge in human and animal. However,every year, many people die and hundreds are severely disabled, disfigured or unable to work due to the delay in access to treatment and care (Alice*et al*, 2021)

Consequently, "is there no nutritional alternative to chemotherapy and herbal remedy for Trypanosomiasis. In light of this, the importance of finding efficient treatment in form of food, points out the opportunity to study natural products plants in combination with some animal species, which have attracted the interest of the scientific platform, especially, interest in locally available plants and animals has been steadily increasing as new strategies needed to implement the mandate of WHO's HAT eradication programs and reach the goals established for 2030.

Purple fleshed potato (PFP)as the key ingredient in this research and others are locally available. PFP is loaded with antioxidants and anthocyanin being disease fighting phytonutrient that work together to offer

amazing health benefits, such as reducing inflammation (Zhang *et al*, 2017; Reddivari*et al*, 2018).The disease Trypanosomiasis is characterized by drastic weight loss, a constant rise in temperature, anemia, induced oxidative stress, inflammation, and suppressed immune system, poor reproductive performance, poor milk production, fatigue, and finally death (Bezie*et al*, 2014; Ngulde*et al*., 2016; Kinjir*et al*., 2021).

Anthocyanin pigments as medicine (Sampaio; Lonchamp; Dias. and Liddle,2021) have been a part of folk medicine for ages and used as remedies for liver dysfunction, high blood pressure and eye disease and other polyphenols, which can help protect against cell damage, inflammation, and chronic diseases (Lewis *et al*, 1998; Zhang *et al*, 2017).

According to Kumar *et al*., (2020) consumption of potato have several health benefits which includes improvement in digestion, reduction in cholesterol levels, protection of small intestine from cancer, strengthening the immune system, slowing ageing process, maintenance of Na+ and K+ levels in the blood and protection to skin damage.

Presence of different health beneficial nutrients such as phenolics, anthocyanins, lipids, vitamin C, riboflavin, thiamine, niacin and biguanide related compounds (BRCs) in the potato makes it a complete food (Changan*et al*., 2020; Lai *et al*., 2020).

Justicia secundavahl is one among wide variety of medicinal plants and vegetable which may serves as food and major sources of trado-medicines (Zambrano and Bustamante, 2018). Consumption of plant-based product may be associated with low incidence of various pathological conditions including cardiovascular diseases, diabetes, obesity even cancer, because of their phytochemicals composition which produces definite physiological action in human body (Koffi*et al*, 2013). Despite, the developments in healthcare delivery systems using chemotherapy, medicinal plants still constitute an essential part of human and animal healthcare systems with approximately 80% of the global population still depends on them for basic healthcare needs (Onochie *et al*, 2020).

Justicia secundavahl is a plant belonging to Acanthaceae family. Plants in this family are reported to have positive effect on the central nervous system (CNS) and are exploited in the management of epilepsy, other mental ailments, headache and fever, maybe due to their sedative and analgesic properties (USDA, 2014).Stein*et al*, (2014) showed Central Nervous System infection that offers novel insights in how trypanosomes hide in an immune privileged area to establish a chronic state of the disease.Onoja*et al*; (2017) demonstrated that the plant *Justicia secundavah*possesses the haematinic, anti-sickling, anti-hypertensive and anti-microbial potentials.The leaves decoction is taken as blood booster medicine in some parts of Nigeria e.g. Akwa Ibom State, Cross Rivers, Delta and South Eastern States.

Soybeans are rich in nutritive components. It is one of the few known plant foods that contain all the essential amino acids, like those found in meat (Ihedinachi*et al.*, 2025). Besides the very high protein content, it contains, high fibre, high saturated fat, cholesterol free, lactose free, a good source of omega-3 fatty acids, a source of antioxidants and high in phytoestrogens. Soybeans is also rich in vitamins and minerals. Most of these minerals and vitamins in soybean are well known hematinic and are essential for the formation of red blood cells (Guobadia, 2015)

Crayfish is a common seafood well known in Nigeria. It is a very common cooking ingredient with an amazing taste. Crayfish is a flavor enhancer in dishes like puddings, soups, stews, porridge, and soups. Crayfish can be eaten freshly cooked or dried. Crayfish is not enjoyed only for its rich flavor or seasoning quality but it’s packed with a lot of essential nutrient rich like protein, calories, iron, minerals and vitamins. This includes phosphorus, potassium, selenium, calcium, copper, zinc, magnesium, vitamin A, B1, B2 and B3, B6, B9, B12, and vitamin E. Crayfish must be thoroughly cooked as the crustaceans can contain harmful bacteria and cause food poisoning (Monterrey, 2020).Crayfish contain important nutrients to ameliorate infections, including B-vitamins to power the brain and cellular health, vitamin E to boost the immune system and protect cells, copper to facilitate absorption of iron, selenium to fuel cell growth, and zinc to energize the body and help fight against germs. Crayfish are also full of protein and

omega-3 fatty acids and dietary cholesterol to build healthy cells. Due to pollution, all fish and shellfish contain varying levels of mercury, a toxic metal that can harm the central nervous and neurological systems, particularly in babies and young children; but crayfish generally are typically low in mercury and safe for all age (Deanies, 2019).

Food is an important source of organic substances with potential therapeutic and prophylactic effects. Trypanosomiasis remains one of the main diseases affecting human health and food security in sub-Saharan. Consequently, research into diets for cure of Trypanosomiasis is a beneficial strategy for elimination of Trypanosomiasis (HAT and AAT) globally.

Materials and methods

This study was carried out at Department of Pharmacological Sciences, University of Uyo, Uyo, Akwa Ibom State (AKS). AKS is located at 4º14'N to 2º16'E and land mass of 917,156 km^2 in South-south geopolitical zone of Nigeria. It is marked by two distinct seasons, rainy and dry. Rainfall is generally heavy and occurs between the months of March and October through November with an average rainfall of 367mm annually. The dry season occurs between December and March and is characterized by periodic harmattan. It has a relatively constant temperature range of 25º C to28º C (77º and 82º F). Akwa Ibom State has a rural riverine Local Government Areas were Tsetse fly is known e.g. Eastern Obolo LGA with evergreen mangrove vegetation and thickly populated by people of varying occupations.

Materials

The materials for this study were purple-flesh potato (*Solanum tuberosum* L), Soybean (*Glycine max*), striped shore crab (*Pachygrapsuscrassipes*), Crayfish **(***Cambarusspp***),** *Justicia seccundavahl,* clove, ginger, garlic, *Trypanosoma Brucei, brucei,* albendazole, diminazene aceturate (Veriben). Others include: Camry kitchen weighing balance, hot air oven (Gallenkamp BS oven 250, Model No. 320), hammer mill, A Kenwood mixer, kitchen knife, sodium chloride (Dangote), sieve (5.3 mesh), water, Basins, Cups, plates, spoons and cellophane, spectrophotometer, EDTA, plain bottles and rags, 5ml syringes, thermometer, beaker, foil paper, cotton wool, normal saline, assay kits and reagents from Randox

Laboratories Ltd, UK.

Sources of Raw Materials

Purple-flesh potato (*Solanum tuberosum* L) were purchased from a private garden in Elile Town, Eastern Obolo LGA, Akwa Ibom State, Nigeria.

Blood leaves *(Justicia seccundavahl)* were harvested (plucked) at convenience from three locations (Elile, Okorombuko and Kampa) all in Eastern Obolo LGA. Crayfish and crabs were purchased at Edowi and Lagos fishing ports respectively in Eastern Obolo LGA, Akwa Ibom State, Nigeria. Soybean, ginger, garlic, clove were purchased from Urua Akpan Andem Market in Uyo Metropolis, Akwa Ibom State, Nigeria.

Preparation of Purple Flesh Potato (*Solanum tuberosum L*) Flour

Purple flesh potato was sorted manually, washed with tap water, weighed with Kitchen scale, peeled manually with kitchen knife and sliced into 1mm thick slices. The slices were washed with clean tap water and blanched in sodium chloride solution (1 %, w/v) at 8ºC for 5min. They were oven dried at low temperature (50^O – 60^O) to constant weight, milled and sieved through 5.3 mm mesh sieve. The flour was packed in high density polyethylene bags and labelled as Purple flesh potato flour**.** The flow chart for the preparation of Purple flesh potato flour is presented in Figure 3.1.

Purple Fleshed Potato (*Solanum tuberosum* L*)*

↓

Sorting

↓

Washing

↓

Weighing

↓

Peeling

↓

Slicing the flesh to chips (1mm thick slice) for easy drying

↓

Blanching (in sodium chloride solution (1 %, w/v) 8^{o} C for 5 min.) to reduce Anti-nutrient content

↓

Drying (to constant weight)

↓

Milling: (Milled to fine flour,avoiding excessive handling to reduce the risk of contamination)

↓

Sieving (5.3mm screen size)

↓

Store: (package as Purple flesh potato flour in sealed containers at room temperature)

Preparation of Soybean (*Glycine max*) Flour

Two kilograms of soybean were sorted by hand picking, cleaning and soaked in tap water (H_2O) in the ratio of 1:3 (w/v) for 6 hours. The grains were oven dried at low temperature of 40 -50^{O} C for 10 minutes in a hot air oven (Gallenkamp BS oven 250, dehulled manually and sun dried to constant weight. The dried sample were then milled to fine flour, sieved through 70 mm mesh screen. The flow chart for the preparation of soybean flour is presented in Figure 3.3.

Soybean (*Glycine max*)

↓

Sorting (Assessment of physical appearance, size and shape, Moisture content determination, insect infestation assessment)

↓

Cleaning (3 steps washing process of pre-rinse, scrubbing and finalrinse)

↓

Soaking (for six hours)

↓

Drying (Oven dried at 50-60^{o} for 10 minutes)

↓

Dehulled (manually)

↓

Sun dry (to constant weight)

↓

Milling: Milled to fine flour (avoid excessive handling to reduce risk of contamination)

↓

Sieving (7.0 mm screen size)

↓

Soybean flour (storage in sealed container at room temperature)

Preparation of Crayfish (*Cambarussp)*

5 Kg of dry crayfish was sorted, heated up in the oven, and filtered using a colander, milled into fine flour and stored at room temperature.

Preparation of Crabs (Stripe shore crab (*pachygrapsuscrassipes*)

5 Kg of crabs were washed, boiled, and filtered using a colander, cooled, shell separated from the eatables, oven dry at low temperature of 40-50^{O} to constant weight, milled into fine flour, sieved through 70 mm mesh screen and stored at room temperature.

Processing of Blood Leave (*Justicia seccundavahl)*

*Justicia seccundavahl*were harvested (plucked) at convenience from three locations within Eastern Obolo LGA. One kilogram of *Justicia secundavahl*were sorted, washed with cleaned tap water and blanched in sodium chloride solution (1 %, w/v) at 8^{o}C for 2 min, dried to constant weight at room temperature, grind, sieved through 7.0 mm meshed and stored as *Justicia secundavahl*powder in an airtight container.

Formulation of Purple Fleshed Potato-Soybeans Based Diets Therapy

The anti-trypanosomal diets therapy for HAT and AAT were formulated based on the procedure of Pearson square method. Parasite infected patient are recommended to have increase protein, low carbohydrate, high in phytonutrient, high fibre per unit of food volume by percentages (WHO, 2022; CDC, 2022 and NIH, 2022) and modified for this work as presented in Table 3.1

The PFPSJC3G2 flour: Purple (P), flesh (F), Potato (P), soybean (S), *Justicia secundavahl*(J), Crayfish (C), crab (C), Clove (C), Ginger and garlic for Potato man diets. While, PPL4SJC3G2: Purple fleshed Potato (P), Peels (PL) soybean peels (S), *Justicia secundavahl*(J), crayfish fur (C), Crab shells, Clove, Ginger and garlic for animals' diet were mixed as shown in Table 3.1 below. A Kenwood mixer were used for mixing the samples for 2 minutes to achieve uniform mixing.

Table 3.1: Percentage Composition of the Purple-Fleshed Potatobased Diet and Peels of Purple Fleshed Potato based Diet

Group	Diets	Potato (%)	Soybean (%)	*Justicia secundavahl*(%)	Crayfish (%)	Crab (%)	Clove (%)	Ginger (%)	Garlic (%)
A	PFP1SJC3G2	74	-	7.4	7.4	7.4	0.8	1.5	1.5
B	PPL4SJC3G2	42	32	7.4	7.4	7.4	0.8	1.5	1.5

Experimental Design:

Thirtyanimals were randomly divided into five (5) groups (non-infected fed with rat pellet only, infected fed with rat pellet only, infectedtreatedwith formulated diet PFP1SJC3G2 only, infected treated with PPL4SJC3G2 diet only and infected treated with drug) of six rats each into well ventilated plastic cages

15×22×10 m^3 dimension equipped with wire mesh lids. The parasites, *T. brucei, brucei* (Federe strain) were obtained from the stabilates kept in Vector and Parasitology Department, Nigerian Institute for Trypanosomiasis and Onchocerciasis Research, Kaduna. The parasite was inoculated into a healthy rat which serve as donor rat. Infected blood from a donor rat at peak parasitemia, that is, 4 days post infection (DPI) was collected by means of tail pricking and diluted with cold physiological saline. The number of parasites in the diluted blood was determined through the method described by Herbert and Lumsden (1976), and a volume containing approximately 1×10^6 parasites were injected intraperitoneally into each rat in the test groups.

Non-infectedgroup was not infected but fed orally with pelletized animal feed coded as (RPSANF) 10 g/kg as (negative control) and water was given *ad libitum*.

The infected groups were intraperitoneally infected with 1×10^6 inoculum containing *T. Brucei, brucei* and fed with RPSANF 10 g/kg body weight, formulated dietsPFP1SJC3G2 and PPL4SJC3G2 10 g/kg body weight respectively and water given *ad libitum*.

Infected treated with drug group were infected with the same dose of inoculum and treated drug as follows: RPSANF 10 g/kg body weight + drug (3.5mg/kg) as (positive control).

Evaluation of Therapeutic Efficacy of Formulated Purple Fleshed Potato-Soybean Based Diets

This is to evaluate the antitrypanosomal activity of the formulated purple fleshed potato-soybeans diets, and conventional drug on an already established *T. Brucei, brucei* infection. This were done using Ryley and Peters (1970) and Herbert and Lumsden (1976) method. Thirty (30) Wistar rats were randomly grouped intofive groups of six (6) animals each and were inoculated intraperitoneally with 1×10^6 inoculum containing *T. Brucei, brucei* (Federe strain) parasite on day zero (D0). Parasitemia were established on the 3th day (D3). The first group A wasnon-infected fed with pellet, group B was infected not treated, groupsC wasinfected treated with formulated purple fleshed potatobased diet PFP1SJC3G2 only, group Dwas infected treated with formulated peels of purple fleshed potatobased diet PPL4SJC3G2onlywhile the last group wasinfected treated with Diminazene aceturate drug. The diets were administered once daily and drugs once in the cause of the experiment. The diets were given for 4 consecutive days immediately infection was confirmed and Diminazene aceturate given once. Leishman's stain and thin smears was prepared from the tail blood samples collected on each day of treatment to monitor parasitemia level. The parasitemia count/level were checked every day after infection for 8 day.

Confirmation of Trypanosomiasis

Several parameters of *T. Brucei, brucei* rats were determined at the sampling time, such as weight, rectal temperature and parasitemia daily, for weight loss, fever and presence of parasites.

Sample collection

The level of parasitaemia was monitored from day 1 after inoculation until day 3 before commencing treatment. The parasitaemia level were checked and recorded everyday after treatment for 4 days. A drop of blood was placed on clean greases-free microscopic slide, covered with coverslip and viewed at 40x magnification using a light microscope. The number of parasites were determined using the method described by (Herbert and Lumsden, 1976). Microscopic counting was done at 1,000× and focus on the number of parasites per field (t/f) in whole blood and logarithm values of the parasite counts from the wet film were matched with the table and converted to antilogarithm to provide absolute number of trypanosomes per milliliter of blood.

Hematological Analysis

At the end of the experiment, the whole animals were sacrifice humanly and blood samples collected by cardiac puncture for hematological test and placed in plain bottles containing 10 % ethylene diamine tetracectic acid (EDTA). The blood samples were analyzed using automatic blood analyzer to determine

the following haematological. Packed cell volume (PCV), haemoglobin (Hb) and red blood cells (RBC), Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH), and Mean Corpuscular Hemoglobin Concentration (MCHC), WBC, neutrophils, lymphocytes and platelets were analyzed as described by Banfi; Fabbro and Mauri (2016). All the results from the treated groups were compared against the normal control group to indirectly determine the effect of both infection and treatment.

Ethical Approval

The steps of the current study were carried out according to the Ethical guidelines approved by the Ethical Committee of University of Uyo, Uyo, Nigeria.

3.18 Statistical Analysis ofAntitrypanosomial Activities of the Formulated Purple Fleshed Potato-Soybean Diets Study

Data obtained from this work were subjected to analysis of variance. Mean were separated using Duncan Multiple Range Test (DMRT) while Level of significance was at 5% ($p < 0.05$) and some data were analyzed using GraphPad 8.0.2 version II system package. Results were expressed as mean ± standard error of mean. One-way ANOVA and multiple comparism and T-Test was employed with the significance level of $p<0.05$.

RESULTS

Induction of Trypanosomiasis on Body Weight, Rectal Temperature and Parasite Count

Induction of Trypanosomiasis in Wistar rats are shown in Table 4.1, 4.2 and 4.3.revealing the changes in body weight, body temperature, and parasite counts in the rats non-infected and rats infected with *T. Brucei, brucei.*

Table 4.1 shows the induction of trypanosomiasis on body weight of wistar rats. The results showed that wistar rats non-infected with *T. Brucei, brucei* shows significant increased ($p > 0.05$) in body weight while rats infected with *T. Brucei, brucei* and not treated shows significant decreased ($p < 0.05$) in body weight on day three post infection. Sign of infection was characterized by emaciation.

Table 4.1: Effect of *T. brucei brucei* Inoculation on Body Weight of Wistar Rats

Group	No. of Rats	Dosage of *T. Brucei, brucei*	Initial Body Weight (g)	Final Body Weight (g)	Weight Difference (g)	Percentage Weight Difference (%)
1 (non infected)	6	1×10^6	132.02± 10.76	157.80 ± 13.14	25.60±9.39	16.07±5.11
2 (infected)	6	1×10^6	181.00±14.59	176.80±14.75	-4.20±0.45	-2.39±0.38

Table 4.2 shows the induction of trypanosomiasis on rectal temperature of the wistar rats. The results showed that there was no significant rise ($p > 0.05$) in rectal temperature of *T. Brucei, brucei* non-infected wistar rats with *T. Brucei, brucei* while rats infected rats with *T. Brucei, brucei* and not treated shows significantly increased ($p > 0.05$) in rectal temperature on day two post infection.

Table 4.2: Effect of *T. brucei brucei* Inoculation on Rectal Temperature of Wistar Rats

Group	No. of Rats	Dosage of *T. Brucei, brucei*	DAY 1 TEMP (^{0}C)	DAY 2 TEMP (^{0}C)	DAY 3 TEMP (^{0}C)	DAY 4 TEMP (^{0}C)	DAY 5 TEMP (^{0}C)	DAY 6 TEMP (^{0}C)
1 (non infected)	6	1×10^6	35.72±0.29	35.38±0.09a	35.54±0.92	35.50±0.30	35.16±0.24	35.92±0.23
2 infected	6	1×10^6	33.36 ± 0.24a	36.10 ± 0.24b	36.34 ± 0.30a	AD	AD	AD

AD - Dead animals

Table 4.3 shows the induction of trypanosomiasis on parasite count in blood stream of wistar rats. The results showed that there was no detection of parasite in non-infected wistar rats with *T. Brucei, brucei* while rats infected rats with *T. Brucei, brucei* and not treated shows parasite presence on day three post infection.

Table 4.3: Effect of *T. brucei brucei* Inoculation on Parasite in Wistar Rat

Group	No. of rats	Dosage of *Brucei, brucei*	Day 3 Density of Parasite (×103µl)	Day 4 Density of Parasite (×103µl)	Day 5 Density of Parasite (×103µl)	Day 6 Density of Parasite (×103µl)
1 (non infected)	6	1×10^6	ND	ND	ND	ND
2 (infected)	6	1×10^6	370.9 ± 77.16a	AD		

ND = Negative

AD = Dead

Table 4.4 shows that parasites were detected in the blood stream of the infected wistar rats on day 3 post infection. On day 4 post infection, non-treated rats fed with rat pellets died off. In the PFP1SJC3G2 and PPL4SJC3G2 formulated diets groups, there were drastic decreased ($p<0.05$) in parasitaemia within 24hrs post treatment, then by 48 hrs post treatments the parasites were cleared till the end of the experiment and no death recorded. A single dose of diminazene aceturate cleared the parasites within 24hrs post treatment and no death was recorded. There was a significant increase in WBC, MCV, HCH, MCH and LYM count following infection, decrease in RBC, PCV, PLT and NEUT in cause of infection when compared with their non-infected control. The deterioration in PCV values began with the presence of trypanosomes in circulation in the control group. While there were significant decreased in WBC, MCV, HCH, MCH and LYM in the groups fed with PFP1SJC3G2 and PPL4SJC3G2 formulated diets when compared with the control. Meanwhile, there was significant increase in RBC, PCV, PLT and NEUT in the groups fed with PFP1SJC3G2 and PPL4SJC3G2 formulated diets when compared with the untreated group.

Table 4.4: Therapeutic Effect of Formulated Purple Fleshed Potato Based Diet and Peels of Purple Fleshed Potato based Diet on Parasitemia of *T. Brucei, brucei* Infected Wistar Rats

GROUPS	TREATMENT	Day 4 Density of Parasite ($\times10^3$µl)	Day 5 Density of Parasite ($\times10^3$µl)	Day 6 Density of Parasite ($\times10^3$µl)	Day 7 Density of Parasite ($\times10^3$µl)	Day 8 Density of Parasite ($\times10^3$µl)
NON-INFECTED	RPSAN	ND	ND	ND	ND	ND
INFECTED	RPSAN	370.9 ± 77.16^a	AD	AD	AD	AD
INFECTED + DIET	PFP1SJC3G2	166.7 ± 87.00^a	18.70 ± 14.05^a	.00 ± 0.0	00 ± 0.0	00 ± 0.0
INFECTED + DIET	PPL4SJC3G2	239.1 ± 126.6^a	50.74 ± 35.19^b	.00 ± 0.0	.00 ± 0.0	00 ± 0.0
INFECTED + Drug	Diminazene aceturate	289.4 ± 37.98^a	.00 ± 0.0	.00 ± 0.0	.00 ± 0.0	00 ± 0.0

Note: *Each value is a mean of triplicate determinations (n = 5). Mean value with the same alphabet as superscript on the same column is not significantly different from one another (p <0 .05). (Mean ± Standard Error of Mean). AD =Dead, ND = Negative*

Non-infected = p < 0.05 (all treatment group in comparison with commercial rat pelletRPSANF100)

Infected = p < 0.05 (all treatment group in comparison with commercial rat pelletRPSANF100)

Infected = p < 0.05 (all treatment group in comparison with formulation PFP1SJC3G2 70: 30)

Infected = p < 0.05 (all treatment group in comparison with PPL4SJC3G2 55:45 peels of Potato-soybean animal feed)

Infected + Drug = p < 0.05 (all treatment group in comparison with commercial rat pelletRPSANF100)

Source: Field work (2025)

Table 4.5: TherapeuticEffect of Formulated Purple Fleshed Potato Based Diets and Peels of Purple Fleshed Potato based Diet on Haematological Parameter of *Trypanosome Brucei, brucei Infected* Wistar Rats

GROUPS	TREATMENTS	WBC ($\times10^3$µl)	RBC ($\times10^4$µl)	HCT ($\times10^2$µl)	HGB	MCV(FL)	MCH ($\times10^2$µl)	MCHC ($\times10^2$µl)	PLT ($\times10^2$µl)	LYM (#) ($\times10^2$µl)	LYM (%)	NEUT (#) ($\times10^2$µl)	NEUT (%)
NON-INFECTED	RP5ANF	10.55 ± 4.37^{a}	5.00 ± 0.26^{bc}	38.54 ± 2.05^{b}	12.76 ± 0.47^{b}	77.42 ± 4.83^{b}	26.20 ± 1.44^{a}	33.66 ± 0.71^{a}	266.00 ± 21.54^{a}	1.57 ± 0.38^{a}	24.74 ± 6.53^{a}	8.32 ± 4.8^{c}	71.70 ± 15.49^{bc}
INFECTED	RP5ANF	17.26 ± 2.75^{b}	2.57 ± 0.3^{a}	20.90 ± 1.19^{a}	6.98 ± 0.43^{a}	74.30 ± 5.73^{ab}	28.24 ± 1.53^{b}	33.64 ± 1.22^{a}	191.20 ± 35.84^{a}	2.60 ± 2.11^{a}	15.04 ± 14.3^{c}	$6.81 \pm 0.57b$	67.22 ± 10.18^{c}
INFECTED + DIET	PFP1SJC3G2	7.04 ± 0.67^{a}	3.37 ± 0.1^{b}	26.34 ± 0.94^{ab}	9.08 ± 0.42^{ab}	80.26 ± 4.86^{c}	27.8 ± 1.27^{b}	33.22 ± 0.89^{a}	301.00 ± 46.07^{b}	2.92 ± 1.23^{a}	27.98 ± 1.07^{a}	$5.45 \pm 1.42b$	62.16 ± 1.21^{c}
INFECTED + DIET	PPL4SJC3G2	8.15 ± 0.88^{a}	3.01 ± 0.78^{ab}	29.14 ± 0.95^{b}	7.68 ± 0.51^{a}	80.00 ± 1.34^{c}	29.10 ± 1.69^{ab}	33.56 ± 0.59^{a}	295.60 ± 5.77^{b}	3.92 ± 0.28^{b}	75.04 ± 3.17^{d}	$6.12 \pm 0.69c$	67.28 ± 2.68^{c}
INFECTED + DRUG	RPSAN + Drug	18.79 ± 7.92^{b}	3.63 ± 0.68^{b}	30.16 ± 5.62^{b}	10.62 ± 2.29^{ab}	78.82 ± 6.50^{bc}	26.92 ± 2.67^{a}	33.74 ± 0.30^{b}	306.00 ± 78.04^{b}	$3.03.00 \pm 1.19a$	$17.78 \pm 10.75a$	$11.60 \pm 6.72b$	69.28 ± 9.77 b

Note: *Each value is a mean of triplicate determinations (n = 6). Mean value with the same alphabet as superscript on the same column is not significantly different from one another (p <0 .05). (Mean ± Standard Error of Mean).*

Non-infected = p < 0.05 (all treatment group in comparison with commercial rat pelletRPSANF100)

Infected = p < 0.05 (all treatment group in comparison with commercial rat pelletRPSANF100)

Infected = p < 0.05 (all treatment group in comparison with formulation PFP1SJC3G2 70: 30)

Infected = p < 0.05 (all treatment group in comparison with PPL4SJC3G2 55:45 peels of Potato-soybean animal feed)

Infected + Drug = p < 0.05 (all treatment group in comparison with commercial rat pelletRPSANF100)

Source: Field work (2025).

DISCUSSION

In this present study, it was shown thatformulated purple fleshed potato-soybean based diets and peels of purple fleshed potato-based diet intake had a remarked influence *T. Brucei, brucei* clearance, improveshaematological parameter and rate of recovery of *trypanosome brucei, brucei infected* wistar rats without administration of trypanosodal drug. Formulated purple fleshed potato-based diets and formulated purple fleshed potato peel peels-based dietwas able to increase the haematological effects of *T. Brucei, brucei* infections in the infected rats when compared to the control.

Anemia is one of the most dependable indicators of the health progress in *Trypanosoma* infection and is measured by the PCV level, Hb and red blood cell count RBC of the infected animal. In our study, there was a significant reduction in the Hb, RBC, PCV, PLT and NEUT; and significant increase in white blood cell WBC, MCV, HCH, MCH and LYM mean value of the infected and untreated group which resulted from the effect of the high level of parasitemia associated with a significant decrease in Hb, RBC, PCV, PLT and NEUT and increase in WBC, MCV, HCH, MCH and LYM. However, the different ratio of purple fleshed potato and soybean in the formulated diets gave remarkable degree of recovery and significant increasein Hb, RBC, WBC. A significant normal haemogram range observed in the treatment group is an indication that there was a parasite reduction to clearance by the various treatment

group comparable with the standard drug. This finding is in agreement some previous studies by other researchers who reported an improved Hb and Red blood cell level (Ngwena*et al*., 2020, Abdeta, *et al*., 2020), Packed cell volume usually gives an indication of the anemia and status of a trypanosome infected animal. The present study recorded a significant restoration or improvement of the PCV values compared to the PCV values of the untreated groups. Although the PCV of the treated group was lower than the normal, which could be as a result of already established anaemic condition before commencement of treatment which may require a double or longer treatment to correct.

Although the investigated wistar rats were highly infected at the time we started treatment in therapeutic model, there was a progressive reduction in the parasite loads in the treatment group leading to a total clearance of the parasite at day 2 after treatment for 20mg/kg dose treatment with 100% formulated purple fleshed potato diets (PFP1SJC3G2) and formulated peels of purple fleshed potato based diet (PPL4SJC3G2). In an animal model trial, a cure is defined as the absence of parasites in the blood and survival after 30 days (Field *et al*., 2017). Complete clearance of the parasite from the bloodstream achieved using formulated purple fleshed potato-based diets and and formulated peels of purple fleshed potato-based diet (PPL4SJC3G2) within 2 days at 20 g/kg shows that the diets can serve as a source of the lead therapy for the management of Human African Trypanosomiasis (HAT) and African Animal Trypanosomiasis (AAT). A related study by Ochanda, 2017., Kuete, 2018 and Bamodu 2020 attributed the presence of antioxidant properties in anthocyanin as having ant-trypanosomes effect, including antimicrobial, pharmacological, therapeutic, oxidative stress in the parasites and potentially leading to apoptosis-like cell death. Boniface., Ferreira and Fabrice (2023) reported the role of flavanones as scaffolds for the development of new treatments against malaria and African and American Trypanosomiasis which is one of the phytonutrients in abundant in the formulated diets in this study. It was interesting to note that we did not record any mortality as a result of parasitemia in the treatment group in this model (therapeutic studies). The therapeutic effect of the studied formulated diets could be attributed to the bio-active components of the compounds found in the formulated diets. No doubt, the presence of unknown phytochemical compounds present in the diets is responsible for its effective activities which should further be investigated why the formulated purple fleshed potato-based diets show a total clearance of the parasite when administered.

Conclusion

It is therefore, concluded that the formulated purple fleshed potato and peels of purple fleshed potato-based diets intake clears *T. Brucei, brucei,* ameliorates the adverse effect of Trypanosomiasis disease and also enhances the rate of recovery. The ability of the formulated diets to prevent relapsed from occurring indicate that it has a prolonged life-span and clearance as seen in all treated groups (PFP1SJC3G2 and PPL4SJC3G2 respectively) also shows a possible pharmacological effect on Trypanosomiasis infection.

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