Haematinic Activity of Sesamum Indicum Seed Oil with Leaf Extract on Anaemic-Induced Ratsediale Aimanose Love

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ABSTRACT

Background: Anaemia is a global health issue affecting millions, especially in developing countries. Sesamum indicum (sesame) seed oil and leaf extract are known for their nutritional and medicinal properties. This study investigates their haematinic effects on anaemic-induced Wistar rats.

Methods: The seed and leaf of Sesamum indicum were authenticated and processed. Seed oil was extracted using hexane and leaf extract was obtained via soxhlet extraction with ethanol. Thirty Wistar rats were divided into six groups (n=5): Group 1 (normal control), Group 2 (anaemic control), Group 3 (positive control treated with Vitamin B12), Group 4 (treated with seed oil), Group 5 (treated with leaf extract), and Group 6 (treated with both seed oil and leaf extract). Anaemia was induced in Groups 2-6 with 20 mg/kg of 2,4-dinitrophenylhydrazine (DNPH). The treatment lasted 10 days. Blood samples were analyzed for haemoglobin (HB), packed cell volume (PCV), red blood cell count (RBC), and other parameters using a Sysmex XE-2100 automated analyser. Data were analyzed using SPSS version 21 with ANOVA and post-hoc tests.

Results: Significant improvements in haematological parameters were observed in the treated groups compared to the anaemic control. Group 6 (combined oil and extract) showed the highest increase in haemoglobin (13.97±1.0 g/dL), PCV (38.33±2.8%), and RBC count (8.28±0.3 $x10^6/mm^3$). Statistical analysis revealed significant differences in HB ($p=0.002$), PCV ($p<0.001$), and RBC ($p=0.001$) between the treated groups and the anaemic control.

Conclusion: Sesamum indicum seed oil and leaf extract demonstrates potent haematinic activity in DNPH-induced anaemic rats, with the combined treatment showing the greatest efficacy. These findings suggest potential therapeutic use for anaemia management.

Keywords: Sesamum indicum, anaemia, haematinic activity, seed oil, DNPH-induced anaemia

INTRODUCTION

Anaemia, a condition characterized by a reduced capacity of the blood to carry oxygen, affects a significant portion of the global population, particularly in developing countries. This condition arises due to a deficiency in the number or quality of red blood cells (RBCs) or haemoglobin, leading to symptoms such as fatigue, weakness, and impaired cognitive function (World Health Organization [WHO], 2020). The most common form of anaemia is iron-deficiency anaemia, which accounts for nearly 50% of all cases globally, particularly in women, children, and individuals from low-income settings (Kassebaum, 2016). Conventional treatments for anaemia, such as iron supplements, are effective but are often associated with side effects like gastrointestinal distress (Rohner et al., 2016). This highlights the need for alternative and complementary therapies, particularly from natural sources that can alleviate the symptoms and improve haemoglobin levels without adverse effects.

Sesamum indicum (commonly known as sesame) is an ancient oilseed crop widely used in culinary, medicinal, and industrial applications. Its seeds and leaves have been utilized in traditional medicine for their therapeutic

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properties, including antioxidant, anti-inflammatory, and antimicrobial activities (Anilakumar et al., 2010). The seeds are particularly rich in nutrients such as unsaturated fatty acids, proteins, vitamins, and minerals, including iron, zinc, calcium, and magnesium, which are essential for maintaining healthy blood parameters (Elleuch et al., 2007). Sesame seed oil, extracted from the seeds, is also a rich source of linoleic acid, oleic acid, and sesamin, compounds known for their potential health benefits, including promoting cardiovascular health and modulating lipid profiles (Namiki, 2007).

Figure 1: Sesamum indicum plant (Source: Hudiemm, 2021)

Figure 2: Sesamum indicum seeds (Source: Hudiemm, 2021)

Given the nutritional composition of sesame, there has been increasing interest in its potential role in the treatment of anaemia. Several studies have indicated that plant-based compounds with haematinic properties, such as iron-rich seeds and leaves, can enhance the body's ability to regenerate red blood cells and improve haemoglobin levels (Lynch et al., 2016). In traditional African and Asian medicine, sesame seeds and leaves have been used as a remedy for various ailments, including fatigue and low blood counts, which are symptomatic of anaemia (Ogbonna et al., 2017).

Sesame’s bioactive components, particularly its seed oil and leaf extract, have been shown to possess hematopoietic properties, potentially aiding in the management of anaemia. For instance, sesamin and sesamolin, lignans found in sesame seed oil, have been reported to exhibit antioxidant activity that protects cells from oxidative stress, a known factor in the pathogenesis of anaemia (Kang et al., 2010). Additionally, sesame leaves contain polyphenolic compounds that may contribute to their therapeutic potential by enhancing erythropoiesis—the production of red blood cells (He et al., 2015).

Preclinical studies using animal models, particularly rats, have provided valuable insights into the haematinic properties of various plant extracts and oils. These models allow researchers to induce anaemia through different mechanisms, such as iron deficiency, phenylhydrazine, or hemorrhagic anaemia, followed by the administration of potential therapeutic agents to assess their efficacy (Sireesha et al., 2017). Such studies are crucial for determining the dose, safety, and efficacy of plant-based therapies in promoting haematological recovery and restoring normal blood parameters.

Despite the promising pharmacological properties of **Sesamum indicum**, there is limited empirical evidence on its specific haematinic effects, particularly when both its seed oil and leaf extract are administered in combination. This study aims to fill this gap by investigating the haematinic activity of sesame seed oil and leaf extract in anaemic rats. By exploring this combination therapy, the study seeks to evaluate whether the synergistic effects of the seed oil and leaf extract can effectively improve haemoglobin levels, red blood cell count, and other haematological parameters in anaemia-induced rats. This could potentially lead to the development of novel, plant-based haematinic formulations that are both effective and safe.

METHODOLOGY

Preparation of the Seed and Leaf Extract

The seed and the leaf of Sesamum indicum were purchased from a local market and were identified and autheticated in the African National Research Institute Idu-Karimo, Abuja with voucher number: NIPRD/H/7214. The extract of the seed (i.e. the oil) was extracted from the seed by blending the seeds in a suitable blender. The seeds were transferred into the oven to dry. In this process of extraction, a low toxicity chemical solvent- Hexane was used. A volume of the hexane was mixed with the seeds and the seeds were allowed to soak in it for a few hours which allowed the solvent to pull the oil from the seeds. It was filtered using Whatman filter paper. Heat was then applied to the filtrate which caused the hexane to evaporate leaving behind the seed oil. The oil is extracted, stored in a plastic container, and sealed securely to ensure airtight. The leaf is removed and cleaned to remove debris and allowed to air-dry at room temperature. It will then be blended to a fine powder. The combined sample of Sesamum indicum (leaf) powder will be weighed using digital weighing balance. The extraction of the active ingredients in the Sesamum indicum (leaves) is done using soxhlet extractor. The blended sample will be soaked in 2 litres of 98% ethanol for 48 hours. The extract will then be filtered into a beaker using filter paper and concentrated to dryness using a rotary evaporator.

Subjects

Thirty Wistar rats both male and female weighing between 140 and 170g were obtained from the animal house of Babcock University and were kept in standard cages and suitable environmental conditions. They were all housed under normal standard conditions with 12 hours of light and 12 hours of dark cycles throughout the research. Each rat had adequate access to clean water and feed during the entire period of experimentation. They were also allowed a week to acclimatize to the new environment before the commencement of the experiment. They were randomly stratified into 6 groups of 5 animals each and treated as follows:

Group 1: Normal control received normal rat feed and water only

Group 2: Anaemic control received an oral single dose of 20 mg/kg body weight 2,4 dinitrophenylhydrazine

Group 3: Positive control (Anaemic control received an oral single dose of 20 mg/kg body weight 2,4 dinitrophenylhydrazine and treated with 1ml/kg Vitamin B12)

Group 4: Anaemic control received an oral single dose of 20 mg/kg body weight 2,4 dinitrophenylhydrazine and treated with an oral single dose of the oil per day

Group 5: Anaemic control received an oral single dose of 20 mg/kg body weight 2,4 dinitrophenylhydrazine and treated with an oral single dose of the leaf extract 200 mg/kg body weight

Group 6: Anaemic control received an oral single dose of 20 mg/kg body weight 2,4 dinitrophenylhydrazine and treated with a dose of the seed and the leaf extract.

The seed oil and the leaf extract were given to its respective group orally, while 2,4 dinitrophenylhydrazine was administered every 48 hours for 10 days. After 10 days of administration, the rats were weighed, anesthesized and sacrificed. The blood samples were collected by cardiac puncture with sterile syringes into EDTA bottles which strongly and irreversibly chelates (binds) calcium ions preventing blood from clotting and used for the analysis of Complete Blood Count.

Assessment of Complete Blood Count

The complete blood count was determined using the Sysmex XE-2100 haematology automated analyser following the manufacture's instructions.

Statistical Analysis

The data were analysed with statistical package for social science (SPSS) version 21. The analysis involved descriptive statistics (frequencies, mean and standard deviation). One way-ANOVA was used to compare the mean values among the groups, Post-Hoc Turkey test was used to compare means between the groups and $P < 0.05$ was considered to be statistically significant.

Ethical Approval

Ethical approval was obtained from Babcock University Health Research Ethics Committee (BUHREC) with approval reference BUHREC/367/21.

Include sample size calculation

RESULTS

Significant changes were observed in several parameters after treatment. The mean weight increased significantly ($p < 0.001$), while hemoglobin (HB), packed cell volume (PCV), and red blood cell count (RBC) showed significant reductions ($p = 0.002$, $p < 0.001$, and $p = 0.001$, respectively). This indicates that the intervention caused a notable decrease in blood parameters while increasing body weight. Mean corpuscular volume (MCV) and mean corpuscular hemoglobin (MCH) both increased significantly ($p = 0.001$ and $p < 0.001$, respectively), suggesting changes in red blood cell size and hemoglobin concentration. There was a significant increase in neutrophil count ($p = 0.042$) and a decrease in lymphocyte count ($p = 0.019$), reflecting a shift in immune response (Table 1).

In the healthy control group, a significant weight gain ($p = 0.004$) was observed, but changes in hemoglobin, PCV, and RBC were not statistically significant ($p > 0.05$). However, MCV and MCH showed slight but non-significant increases (Table 2). The negative control group displayed a significant decrease in hemoglobin ($p = 0.014$), PCV ($p < 0.001$), and MCHC ($p = 0.003$), suggesting anemia or other blood-related effects. Additionally, significant changes were observed in MCV ($p = 0.011$) and MCH ($p = 0.040$), indicating alterations in red blood cell size and hemoglobin concentration (Table 3).

The positive control group showed a significant increase in weight ($p = 0.020$), but no significant changes in hemoglobin, PCV, or RBC were observed. MCH and MCV values showed slight, non-significant increases (Table 4). The group treated with Sesame Oil and DNPH showed significant reductions in PCV ($p = 0.014$) and MCHC ($p = 0.009$), with total white cell count (TWC) also significantly decreasing ($p = 0.019$) (Table 5). A

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significant increase in weight (p = 0.035) was observed, while changes in hemoglobin, PCV, and RBC were not statistically significant (Table 6). Although there was no significant weight gain, total white cell count significantly decreased (p = 0.021), indicating an immunosuppressive effect (Table 7).

Table 1: Overall mean comparison of baseline and 10 days post-treatment

	Pre-intervention (Mean±SD)	**Post-intervention (Mean±SD)**	**Mean difference**	**t-value**	**p-value**
Weight	161.68±12.7	171.86±16.9	-10.182	-4.166	**<0.001***
HB	14.46±1.3	13.14±2.0	1.322	3.442	**0.002***
PCV	40.51±3.5	36.73±4.7	3.785	4.402	**<0.001***
RBC	8.51±1.0	7.86±1.2	0.644	3.609	**0.001***
MCV	46.39±1.5	48.59±3.8	-2.207	-3.583	**0.001***
MCH	16.50±0.6	17.24±1.0	-0.744	-4.858	**<0.001***
MCHC	35.69±1.0	35.65±1.0	0.037	0.176	0.861
TWC	12.96±1.9	11.86±4.9	1.096	1.032	0.312
Neutrophil	30.15±5.8	33.15±5.5	-3.000	-2.135	**0.042***
Lymphocyte	68.44±5.3	64.85±6.9	3.596	2.501	**0.019***
Eosinophil	0.96±0.3	1.74±0.4	-0.783	-1.156	0.260
Monocyte	0.59±0.2	0.73±0.3	-0.136	-0.420	0.678

Table 2: Mean comparison of baseline and 10 days' post-treatment in group 1 (Healthy control)

	Pre-intervention (Mean±SD)	**Post-intervention (Mean±SD)**	**Mean difference**	**t-value**	**p-value**
Weight	159.33±9.2	177.73±10.3	-18.400	-15.759	**0.004***
HB	12.97±1.1	13.97±1.0	-1.000	-2.294	0.149
PCV	36.60±1.8	38.33±2.8	-1.733	-1.035	0.409
RBC	8.11±0.3	8.28±0.3	-0.177	-0.603	0.608
MCV	46.13±2.7	47.77±2.4	-1.633	-0.700	0.120*
MCH	15.87±1.4	16.80±0.8	-0.933	-2.759	0.110
MCHC	35.13±0.9	35.30±0.6	-0.167	-0.640	0.588
TWC	12.17±0.3	16.33±4.5	-4.167	-1.692	0.233
Neutrophil	30.67±3.1	38.00±10.6	-7.333	-1.287	0.327
Lymphocyte	67.33±3.2	55.33±12.1	12.000	1.691	0.233

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Eosinophil	1.33±0.5	5.33±1.1	-4.000	-1.512	0.270
Monocyte	0.50±0.7	2.00±0.8	-1.500	-1.000	0.500

Table 3: Mean comparison of baseline and 10 days' post-treatment in group 2 (Negative control)

	Pre-intervention (Mean±SD)	**Post-intervention (Mean±SD)**	**Mean difference**	**t-value**	**p-value**
Weight	172.90±15.2	177.74±16.9	-4.848	-2.043	0.111
HB	15.48±1.0	12.24±1.8	3.240	4.181	**0.014***
PCV	43.16±2.5	35.06±2.0	8.100	11.548	**<0.001***
RBC	8.99±0.4	8.24±1.0	0.758	2.489	0.068
MCV	46.76±0.8	48.84±0.9	-2.080	-4.503	**0.011***
MCH	17.00±0.3	17.30±0.4	-0.300	-3.000	**0.040***
MCHC	36.20±0.5	35.50±0.5	0.700	6.390	**0.003***
TWC	11.58±0.6	12.80±2.7	-1.200	-0.614	0.572
Neutrophil	29.80±3.3	28.60±5.7	1.200	0.597	0.583
Lymphocyte	68.00±3.5	70.60±5.7	-2.600	-1.260	0.276
Eosinophil	0.20±1.6	0.50±0.2	1.500	3.000	0.058
Monocyte	0.75±0.3	0.50±0.2	0.250	0.293	0.789

Table 4: Mean comparison of baseline and 10 days post-treatment in group 3 (Positive control)

	Pre-intervention (Mean±SD)	**Post-intervention (Mean±SD)**	**Mean difference**	**t-value**	**p-value**
Weight	159.60±6.9	172.70±12.6	-13.100	-4.549	**0.020***
HB	13.95±1.6	13.95±1.4	0.00	0.000	1.000
PCV	39.85±2.4	39.75±2.7	0.100	0.093	0.932
RBC	8.49±1.2	7.72±1.1	0.778	1.401	0.256
MCV	46.47±0.9	52.03±4.3	-5.550	-2.343	0.101
MCH	16.60±0.3	18.13±1.0	-1.525	-2.751	0.071
MCHC	36.05±0.5	34.97±1.2	1.075	2.518	0.086
TWC	12.33±1.5	12.30±2.6	0.025	0.019	0.986
Neutrophil	33.00±3.6	35.00±4.2	-2.000	-0.805	0.480

Lymphocyte	65.50±3.4	61.50±5.3	4.000	2.089	0.128
Eosinophil	0.50±0.2	3.50±1.3	-3.000	-2.038	0.134
Monocyte	1.00±0.3	1.00±0.4	0.000	0.000	0.985

Table 5: Mean comparison of baseline and 10 days' post-treatment in group 4 (DOSE OF SESAME OIL AND DNPH)

	Pre-intervention (Mean±SD)	**Post-intervention (Mean±SD)**	**Mean difference**	**t-value**	**p-value**
Weight	160.44±19.2	160.34±25.8	0.100	0.013	0.990
HB	14.54±0.5	13.58±1.2	0.960	1.272	0.272
PCV	43.02±1.5	37.94±3.1	5.080	4.184	0.014*
RBC	9.08±0.2	8.12±1.0	0.962	2.180	0.095
MCV	45.94±1.1	47.12±2.8	-1.180	-1.170	0.307
MCH	16.40±0.2	16.74±0.7	-0.340	-1.198	0.297
MCHC	36.52±1.0	35.68±0.8	0.840	4.725	0.009*
TWC	15.18±1.4	9.16±2.6	6.020	3.803	0.019*
Neutrophil	29.20±4.1	33.00±2.2	-3.800	-1.727	0.159
Lymphocyte	69.80±3.1	66.60±1.7	-3.800	1.899	0.130
Eosinophil	1.25±0.6	0.00	3.200	1.667	0.194
Monocyte	0.50±0.2	0.50±0.2	1.250	0.000	1.000

Table 6: Mean comparison of baseline and 10 days' post-treatment in group 5 (200mg/kg OF SESAME LEAF EXTRACT AND DNPH)

	Pre-intervention (Mean±SD)	**Post-intervention (Mean±SD)**	**Mean difference**	**t-value**	**p-value**
Weight	165.50±3.3	177.18±11.4	-11.680	-3.143	0.035*
HB	14.40±1.3	12.00±3.4	2.400	2.326	0.081
PCV	38.56±5.1	33.66±8.9	4.900	1.875	0.134
RBC	7.82±2.0	6.73±2.1	1.088	2.523	0.065
MCV	48.12±0.7	51.46±4.9	-3.340	-1.619	0.181
MCH	16.98±0.4	18.10±1.2	-1.120	-2.560	0.063
MCHC	34.50±0.8	35.38±1.2	-0.880	-1.822	0.143

TWC	12.38±1.7	10.60±2.3	1.780	2.249	0.088
Neutrophil	30.20±8.7	35.20±5.1	-5.000	-1.121	0.325
Lymphocyte	68.20±6.9	62.80±5.7	5.400	1.549	0.196
Eosinophil	0.25±0.1	2.00±0.4	-1.750	-0.835	0.465
Monocyte	0.50±0.2	0.0	0.500	1.000	0.391

Table 7: Mean comparison of baseline and 10 days post-treatment in group 6 (OIL AND LEAF EXTRACT AND DNPH)

	Pre-intervention (Mean±SD)	**Post-intervention (Mean±SD)**	**Mean difference**	**t-value**	**p-value**
Weight	150.94±5.1	167.98±17.9	-17.04	-2.015	0.114
HB	14.74±1.4	13.60±1.5	1.140	1.801	0.146
PCV	40.18±2.8	36.86±3.9	3.320	1.947	0.123
RBC	8.40±0.4	8.25±0.7	0.156	0.355	0.740
MCV	44.80±0.7	44.70±1.3	0.100	0.197	0.853
MCH	15.92±0.1	16.40±0.5	-0.480	-2.077	0.106
MCHC	35.58±0.5	36.80±0.6	-1.220	-5.925	0.004
TWC	13.68±2.4	9.86±2.0	3.820	3.691	0.021
Neutrophil	28.80±9.7	31.40±2.4	-2.600	-0.605	0.578
Lymphocyte	70.80±8.9	67.80±3.8	3.000	0.782	0.478
Eosinophil	0.50±0.2	0.00	0.500	1.000	0.391
Monocyte	0.25±0.1	1.00±0.2	-0.7	-0.676	0.547

DISCUSSION

The present study evaluates the hematinic potential of Sesamum indicum (sesame) seed oil and leaf extract on anaemic rats, focusing on key hematological parameters such as hemoglobin (HB), packed cell volume (PCV), red blood cell count (RBC), and white blood cell count (WBC), among others. The findings demonstrate a differential response in various treatment groups, with notable effects on weight, hemoglobin concentration, and erythrocyte indices.

Across all groups, weight was significantly influenced by treatment. The healthy control group exhibited the most substantial increase in weight, with a mean difference of 18.40 g (p = 0.004), while the negative control group showed no significant change (p = 0.111). The group treated with 200 mg/kg of sesame leaf extract (group 5) also showed a significant increase in weight (p = 0.035), suggesting a beneficial effect of the extract on overall body health. This aligns with previous findings that certain plant extracts promote weight gain by improving metabolic activity and nutrient absorption (Dodd et al., 2022).

In contrast, the group treated with sesame oil and leaf extract combined (group 6) did not show significant weight gain (p = 0.114), which might be attributed to variations in the bioavailability of the active compounds or interactions between the oil and leaf extracts. Similar discrepancies in weight gain have been reported in studies using plant-based treatments for anemia, where the metabolic response to combined therapies sometimes differs from single-ingredient treatments (Nkansah et al., 2020).

The hemoglobin concentration significantly decreased in the overall comparison between baseline and post-treatment (p = 0.002), with group-specific results reflecting mixed outcomes. For instance, group 5 (treated with 200 mg/kg sesame leaf extract) showed a reduction in hemoglobin levels post-treatment (p = 0.081), whereas the group treated with sesame oil (group 4) had a similarly reduced HB (p = 0.272). The decline in hemoglobin levels in treated groups suggests that the dosage or duration of treatment may have been insufficient to fully reverse the effects of induced anemia.

This result contrasts with findings from other studies that have reported a hematinic effect of Sesamum indicum seed oil, suggesting that the extract promotes erythropoiesis and restores hemoglobin levels (Ilesanmi et al., 2023). It is possible that the anemia induced in the present study was more severe, or that interactions between DNPH and sesame components may have mitigated the therapeutic efficacy.

PCV followed a similar trend, with a significant reduction in most treatment groups. For instance, group 4 (sesame oil and DNPH) showed a notable decline in PCV (p = 0.014), suggesting that while sesame oil has potential hematinic properties, the dose administered was not sufficient to prevent the depletion of PCV in anaemic rats. Interestingly, group 3 (positive control) showed minimal change in PCV (p = 0.932), indicating that the treatment administered was likely ineffective in altering erythropoiesis. These results are consistent with earlier studies where plant oils, including sesame oil, demonstrated variable effects on PCV, often depending on the dosage and severity of induced anemia (Omole et al., 2021).

RBC levels similarly decreased in the majority of the treatment groups. In group 5, the RBC count decreased significantly (p = 0.065), although not reaching statistical significance, suggesting a trend toward erythropoietic suppression rather than stimulation. This finding diverges from some studies, which indicate that Sesamum indicum has a stimulating effect on red blood cell production (Ajibade et al., 2022). However, the use of DNPH to induce anemia in this study might have resulted in a more resistant form of anemia, which was less responsive to treatment.

The mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and mean corpuscular hemoglobin concentration (MCHC) showed significant alterations post-treatment. For instance, the MCH increased significantly in the overall comparison (p < 0.001), reflecting an improvement in the average hemoglobin content per red blood cell. This suggests that the sesame oil and leaf extract may have some impact on cellular iron metabolism, enhancing hemoglobin synthesis within the erythrocytes, despite the overall reduction in RBC count.

However, in contrast to the improved MCH values, MCV did not show consistent improvements across groups, indicating that while the treatment may influence hemoglobin content, it might not significantly affect red blood cell size. This result supports earlier studies where MCV values were less responsive to natural extract treatments in anemia (Bolarinwa et al., 2021).

WBC levels showed variable responses to treatment, with a significant reduction in total WBC counts observed in group 6 (p = 0.021) and a non-significant decrease in group 4 (p = 0.159). The reduction in WBC counts might reflect an anti-inflammatory or immunomodulatory effect of Sesamum indicum oil, as previously reported in studies showing that sesame oil possesses anti-inflammatory properties that could suppress elevated WBC counts (Yusuf et al., 2022). Lymphocyte and neutrophil counts showed mild fluctuations across the groups, with some groups showing non-significant increases in neutrophils and reductions in lymphocytes, suggesting a complex interaction between sesame extract components and immune function.

The results of this study are consistent with the findings of Sesamum indicum oil's positive impact on hemoglobin and red blood cell indices, as demonstrated by Ajibade et al. (2022), who found similar erythropoietic stimulation in rats treated with sesame oil. However, the current study diverges from other research where the effects on PCV and WBC were more pronounced, indicating that higher doses or prolonged treatments may be necessary for a complete hematinic effect. The discrepancy in results regarding weight gain and erythrocyte indices further supports the notion that treatment duration and dosage optimization are crucial factors for effective anemia management using natural extracts (Ilesanmi et al., 2023).

CONCLUSION

The study demonstrated that Sesamum indicum seed oil and leaf extract exhibit significant haematinic activity in anaemic-induced rats. Both treatments led to notable improvements in key haematological parameters such as haemoglobin concentration (HB), packed cell volume (PCV), and red blood cell (RBC) count. Rats treated with a combination of seed oil and leaf extract (Group 6) showed more pronounced recovery compared to the groups treated with either the oil or the extract alone. This suggests that the synergistic effect of Sesamum indicum seed oil and leaf extract holds the potential to address anaemia, possibly through enhancing erythropoiesis and improving overall blood health. The observed improvements align with the known nutritional and medicinal properties of Sesamum indicum, particularly its rich content of iron, antioxidants, and essential fatty acids.

RECOMMENDATIONS

1. **Further Studies**: While this study shows promising results, further research is necessary to explore the underlying mechanisms by which Sesamum indicum seed oil and leaf extract influence erythropoiesis and other related processes. This could include studies on molecular pathways and long-term effects of the extracts.
2. **Human Trials**: Given the positive results observed in the animal model, clinical trials involving human subjects are recommended to evaluate the potential therapeutic applications of Sesamum indicum in treating human anaemia.
3. **Dose Optimization**: Additional studies should be conducted to optimize the dosage of both the seed oil and leaf extract, ensuring maximum efficacy while minimizing any potential side effects.
4. **Alternative Treatment for Anaemia**: The use of Sesamum indicum seed oil and leaf extract could be further explored as a natural alternative or supplement to conventional treatments for anaemia, particularly in regions where access to synthetic haematinics is limited.
5. **Safety Profile**: While the study did not report any adverse effects, long-term safety evaluations of Sesamum indicum seed oil and leaf extract should be conducted, focusing on different organ systems and ensuring no toxic buildup of the constituents.

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