



Short-term toxicological evaluation of Neocarya macrophylla seed oil based diets in albino rats

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INTRODUCTION

Neocarya macrophylla (formerly Parinari macrophylla Sabine) commonly known as “Gawasa” in Hausa language belongs to Chrysobalanaceae family. N. macropylla is a plant employed in traditional medicine to manage pain conditions in Northern Nigeria.[1] It is also used in treating diarrhea, asthma, dysentery, skin infections, cancer, pulmonary troubles, ear and eye infections, tooth decay, snakebite, pain, inflammation and skin infections. Some preliminary phytochemical screening and physico-chemical studies of the seed oil,[2] as well as the antimicrobial studies on the fruit and root bark of the plant have been previously undertaken.[3] The leaves have anthelmintic activities.[4] The nutritional and anti-nutritional profiles of the seeds have also been reported.[5] The utilization of N. macrophylla seed oil in diets and other food supplements has not been investigated.

OBJECTIVES

The main objective of the study was to assess the toxicity effect, nutritional potential and growth performance of N. macrophylla seed oil (NMSO) on rat. This is part of our efforts to bring into focus the many lesser known seed oils for nutritional and industrial purposes.

METHODOLOGY

➔ Preparation of gingerbread plum oil

➔ Feed formulation and preparation

➔ Experimental animals, diets and feeding

➔ Nutritional assessment

➔ Haematological examination

➔ Histological examination

➔ Statistical analysis

EXPERIMENTAL ANIMALS

A total of 28 wistar albino rats were divided into four groups of 7 rats each. Group A was fed with an industrially purchased feed and group B with a control diet compounded with 10 % (w/v) groundnut oil containing 22.84±0.12 % of protein, 4.80±0.01 % of fat, 44.8±0.14 % of carbohydrate and 1328.11±0.69 of energy value. Groups C and D were fed with diet compounded with 5 % (w/v) and 10% (w/v) NMSO respectively.

After 6 weeks, the rats were sacrificed and their blood samples and organs collected for analysis.

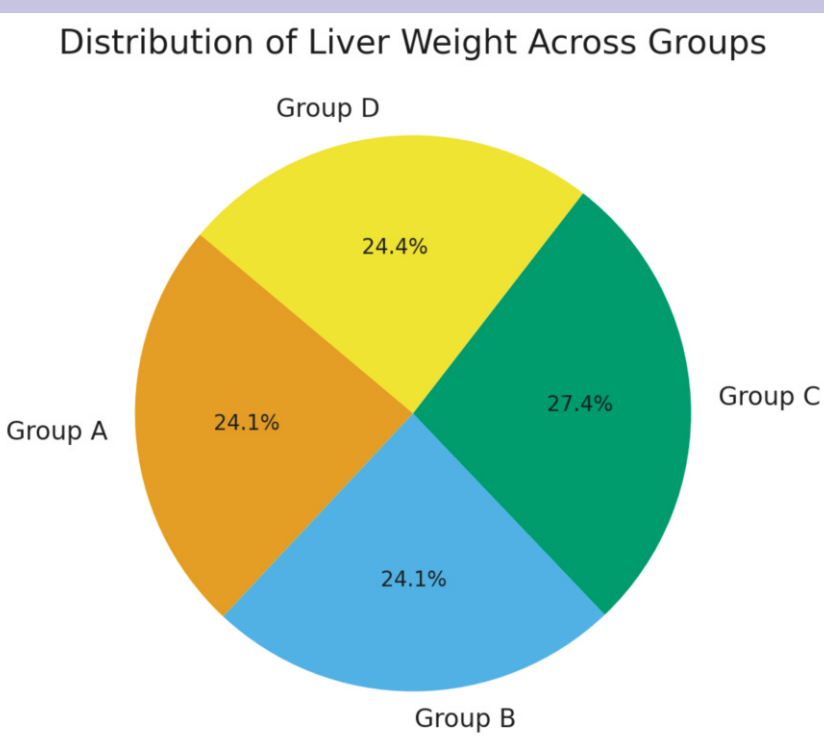
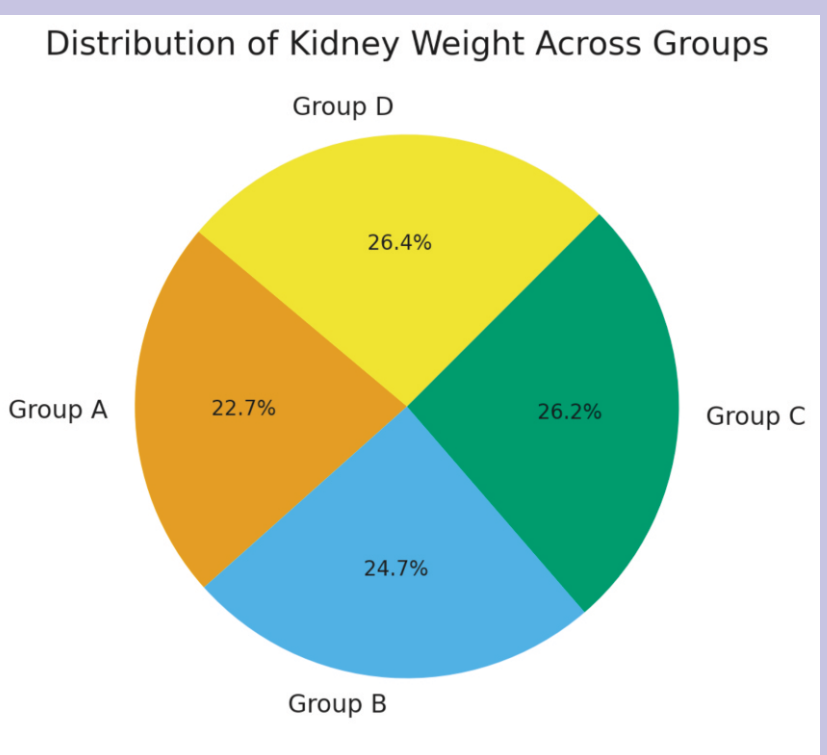
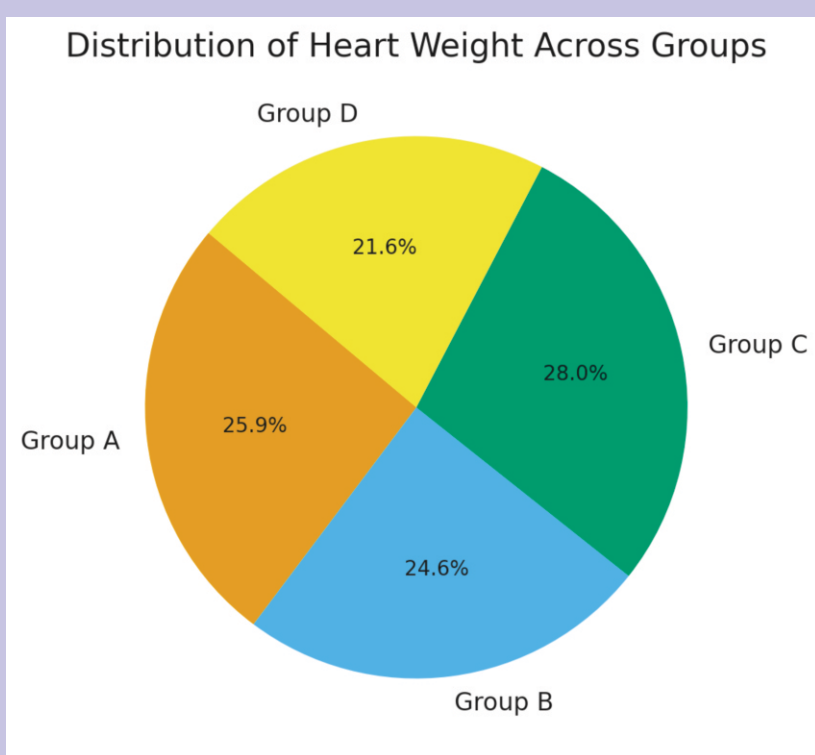
The growth parameters of the rats in the four groups appeared considerably good at the end of the experiment. Rats in group C had the highest weight gain.

RESULTS

Table 1. Effect of NMSO on body weight, feed-intake, growth, feed utilization and % survival rate of rats fed with varying percentage of the oil

Parameter	Group A	Group B	Group C	Group D
Initial Weight	68.86±17.12	76.57±3.18	77.71±7.63	78.29±9.16
Final Weight	174.29±34.68	178.57±22.63	199.00±17.75	184.14±12.48
Weight gain	105.45	102.00	121.29	105.85
% Weight gain	153.14	133.21	156.08	135.20
Mean Weight gain	105.45	102.00	121.29	105.85
Feed Intake/Week	113.05	126.88	119.62	123.12
Feed Intake/day/g	16.15	18.12	17.09	17.59
Feed conversion ratio (FCR)	6.43	7.46	5.92	6.98
Specific growth rate (SGR)	2.21	2.02	2.24	2.04
Daily growth rate	2.51	2.43	2.88	2.52
Survival	100.00	100.00	85.71	100.00

Means of three determinations ± SD, mean values in columns with different letters are significantly different at (P ≤0.05); GFCE = Gross feed conversion efficiency



RESULTS

Table 3. Result of Haematological Analysis

Parameters	Group A	Group B	Group C	Group D
PCV (%)	40.25±3.59 ^a	39.75±6.55 ^a	45.25±5.25 ^a	42.25±3.59 ^a
Hb (g/dL)	13.35±0.97 ^a	13.08±2.40 ^a	14.85±1.75 ^a	13.83±0.89 ^a
RBC (10 ⁶ /μL)	6.66±0.41 ^a	6.55±1.43 ^a	7.58±0.94 ^a	7.00±0.46 ^a
WBC (10 ³ /μL)	4637.50±534.44 ^a	5512.50±759.80 ^a	4625.00±988.69 ^a	5375.00±1002.08 ^a
Platelet (x 10 ⁴)	28.35±2.98 ^a	22.10±6.0 ^{ab}	16.40±9.98 ^b	17.05±4.14 ^b
Lymphocyte (%)	65.50±5.32 ^a	68.00±3.74 ^a	70.25±2.99 ^a	65.75±4.35 ^a
Neutrophyl (%)	31.00±6.27 ^a	28.00±3.16 ^a	26.25±3.10 ^a	30.25±4.65 ^a
Monocyte (%)	1.75±0.50 ^a	2.00±0.82 ^a	1.75±0.50 ^a	2.50±1.00 ^a
Eosinophyl (%)	1.75±0.96 ^a	2.00±0.82 ^a	1.75±0.50 ^a	3.00±0.00 ^a
MCV (fL)	60.37±1.79 ^a	61.40±4.34 ^a	59.78±0.98 ^a	60.30±1.28 ^a
MCHC (%)	33.21±0.78 ^a	32.82±0.78 ^a	32.81±0.25 ^a	32.77±0.80 ^a
MCH (pg)	20.03±0.25 ^a	20.13±1.09 ^a	19.60±0.18 ^a	19.75±0.13 ^a
Lymphocyte	3039.00±426.31 ^a	3765.00±662.75 ^a	3256.38±748.29 ^a	3519.13±566.91 ^a
Neutrophyl	1439.63±335.69 ^a	1530.13±156.73 ^a	1204.00±252.27 ^a	1638.38±495.33 ^a
Monocyte	79.25±17.15 ^a	110.25±51.29 ^a	84.63±35.48 ^a	128.25±40.75 ^a
Eosinophyl	79.63±40.06 ^b	107.13±34.22 ^b	80.00±27.68 ^b	178.50±27.58 ^a

Table 5. Summary of the Histopathology of tissues of the control and

experimental animals

Organ	Heart	Kidney	Liver
Group A	There are a few foci of mild degeneration of cardiomyo-cytes evidenced by loss of striations. There is moderate congestion of coronary blood vessels.	There is mild congestion of interstitial renal blood vessels. The glomeruli, tubules and renal interstitium appear normal.	Hepatic plates are closely-packed. There are multiple foci of mild vacuolar change of hepatocytes.
Group B	There are a few foci of mild degeneration of cardiomyo-cytes evidenced by loss of striations. There is moderate congestion of coronary blood vessels.	There are locally extensive foci of mild sloughing off and flattening of epithelium of tubules in the renal medulla cortico-medullary junction.	There is moderate thinning of hepatic plates. There is widespread marked vacuolar change of hepatocytes (Hepatocytes have clear cytoplasmic vacuoles).
Group C	Cardiomyocytes appear normal. No visible lesion.	The glomeruli, tubules and renal interstitium appear normal.	There are multiple foci of moderate thinning of hepatic plates with consequent dilation of hepatic sinusoids. There are random foci of single-cell hepatocellular necrosis.
Group D	Cardiomyocytes appear normal. No visible lesion.	There are a few foci of flattening of tubular epithelium.	There are multiple foci of moderate thinning of hepatic plates with consequent dilation of hepatic sinusoids. There are random foci of single-cell hepatocellular necrosis.

Table 4. Result of Biochemistry Analysis

Parameters	Group A	Group B	Group C	Group D
Total protein (g/dL)	7.90±0.66 ^a	7.97±0.38 ^a	7.97±0.29 ^a	8.07±0.32 ^a
Albumin (g/dL)	3.10±0.72 ^a	2.93±0.76 ^a	2.90±0.82 ^a	2.63±0.85 ^a
Globulin (g/dL)	4.80±0.10 ^a	5.03±0.38 ^a	5.07±0.55 ^a	5.10±0.89 ^a
Albumin/Globulin	0.60±0.17 ^a	0.57±0.21 ^a	0.53±0.25 ^a	0.50±0.26 ^a
AST (μL)	40.67±1.52 ^a	40.33±2.52 ^a	40.00±1.73 ^a	41.67±3.22 ^a
ALT (μL)	28.00±2.65 ^a	29.00±3.46 ^a	28.67±3.79 ^a	30.00±3.00 ^a
ALP (μL)	76.00±7.21 ^b	92.00±19.47 ^{ab}	103.00±3.00 ^a	89.00±6.25 ^{ab}
Urea (mg/dL)	15.53±1.17 ^{ab}	16.67±0.57 ^a	15.13±0.38 ^b	16.93±0.64 ^a
Creatinine (mg/dL)	0.73±0.23 ^a	0.77±0.06 ^a	0.77±0.06 ^a	0.77±0.21 ^a

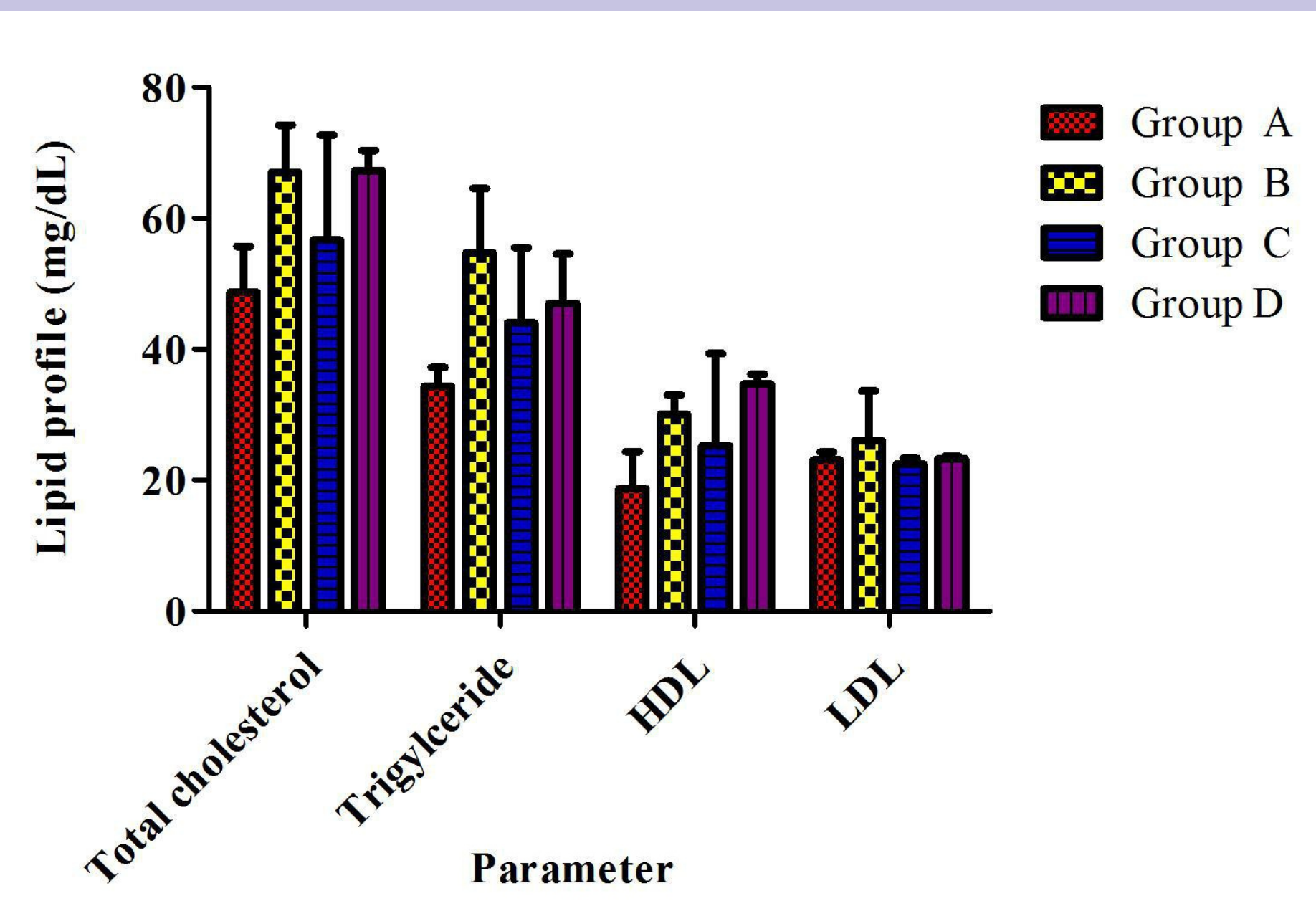


Figure 1: Graphical representation of means of total lipid profile of control and test rats

CONCLUSION

N. macrophylla seed oil in moderate quantities seemed suitable for consumption and can suitably replace conventional seed oils such as groundnut oil. The seed oil can also be used in diet formulation for people with cardiovascular diseases, since it has high HDL and low LDL.

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