**In vivo and haematological study of some selected vegetable condiments**

**Abstract**

Basil Leaf, Efрин, daidoyia, nchanwu or scent leaf, whose botanical name is Ocimum gratissimum, is a tropical plant species that belongs to the family of Labiatae. Bitter leaf as the name implies, is a plant that is often known for its bitter taste, but underneath that bitterness, both plants classify as vegetable condiment because of the attribute such as its flavour, taste and domineering to the sauce. The objective of this project is to formulate dietary, conduct in vivo and haematological study of vegetable condiments; basil leaf (ocimum gratissimum) and bitter leaf (vernonia amygdalina) Nigeria. The vegetable condiments dietary formulated consisted of Basil Dietary (BD), Control Dietary (CD), Basil 10% Platelet 10% Basil 80% Dietary (BPB), Platelet 10% Bitter 10% Basil 80% Dietary (PBB), Bitter 10%, Basil 10% Basil 80% Dietary (BBB). Fifty (50) albino rats were randomly selected weighted and grouped into five groups of ten each. They were assigned to formulated dietary. The result showed that the growth rate, non protein diet (BD), declined from 71.50–70.88, protein dietary increased for Control (CD) 112.84–71.74, basil (BPB), 116.02–71.70, bitter leave (PBB), 83.04–71.70, basil bitter leave (BBB) 83.50–71.20. Bioassay analysis revealed that NPR, PRE and NPU of experimental dietary were favorably comparable to the control dietary. It was concluded that basil dietary compared with bitter leaf had the best growth response, both have medicinal value, home available, has health benefits. Nitrogen retention is present in various tissues of the internal organ which is adequate for bodybuilding. Nutrient compositions in the dietary samples meet daily nutrient requirement intake and amino acid profile that is adequate to complement human diet. Protein quality of both basil leaf (ocimum gratissimum) and bitter leaf (vernonia amygdalina) are viable to promote human growth. Basil leaf (ocimum gratissimum) and bitter leaf (vernonia amygdalina) has confirmed to be source of Vitamin-A, K and mineral to support and improve human health. In summary the haematology study has confirmed that consuming dietary contain Vegetable condiments such as bitter leaf (vernonia amygdalina), basil leaf (ocimum gratissimum) will enable children pregnant woman and elderly to be free of Infection such as leukemia, anemia, bleeding, malnutrition, kidney disease, polycythemia, and blood related disease.

**Keywords:** vegetable, condiment, in vivo study, bitterness, basil leave

**Abbreviations:** BD, basil dietary; CD, control dietary; BPB, Basil 10% Platelet 10% Basil 80% Dietary; PBB, Platelet 10% Bitter 10% Basil 80% Dietary; BBB, Bitter 10% Basil 10% Basil 80% Dietary

**Introduction**

Basil Leaf, Efрин, daidoyia, nchanwu or scent leaf, whose botanical name is Ocimum gratissimum, is a tropical plant species that belongs to the family of Labiatae. A vegetable condiment give our diet better taste and improve our appetite to taken food.1–3 Bitter–leaf is mostly available around our house Basil Leaf and bitter leave has confirmed to be source of Vitamin–A, K and mineral to support and improve human health. Basil has Vitamin K which is essential for the production of clotting factors in the blood and plays a vital role in the bone strengthening and mineralization. Basil herb contains a good amount of minerals micro and macro mineral element for human taking care of the kidney and the liver and production of animal starch (glycogen). Some researcher has established that taken bitter leave can lower and neutralized high blood sugar level in diabetic patient.1–5 Bitter leaf can repair damage pancreas which is responsible for the production of insulin for boost of glucose that supply to the body.1–3

**Material and methods**

Vegetable condiments, bitter leave (vernonia amygdalina), basil leaf (ocimum gratissimum) and maize were bought from vegetable local supermarket at outskirts of Ile-Ife, Nigeria. It was sorted, washed reduced to sizes with knife and solar dried for 10 hours and pulverized into fine powder and made to pass metal mesh of size 0.50mm.

**Automated blood count**

**Procedures**

Blood Counts were determination such as WBC, RBC, HCT PLT and PCT was performed according to Ibironke et al.6

**Animal grouping experimentation**

**Experimental animal procedure**

White Wister, fifty white (50) albino rats of both sexes were purchased from the Faculty of Health science, Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria. The weights of albino rats

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and ages taken and were ranged from 50–70g, also were noted to be between three to six weeks old, respectively. All the experiment animals were weighed on the scale carefully, selected randomly and divided into five experimental groups of ten per divisional group and was accommodated in a metabolic cage mesh. The experimental animal were familiarized to new environment and fed ad libitum with feed meant for animal. Each sectional group of animal was placed on the experimental dietary for over a period of 28days. Water and food were giving adequately ad libitum to five groups of ten animals each as allotted. Amount of food taken per day were recorded. The experiment animals were weighed in every three days for 28days and graphically represented. The faeces and urine of the experimental animals in the different groups was collected separately, urine was stored inside a bottle containing 6N HCL to preserve it prior analysis, and the faeces was dried in an oven at 60°C for 12hours, cooled, weighed and stored inside sealed polythene, per group. At the end of the 28days, the animals was weighed, aneauthetized and sacrificed. Tissue samples from liver, kidney and plantaris muscles were removed, Nitrogen in the faeces and urine was determined by the micro kjeldahl method. The experimental organs were collected from the animal were immediately fixed in 10% formyl saline for further analysis such as Nitrogen retention.

Bioassay Calculations

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\text{Protein efficiency ratio (PER)} = \frac{\text{Weight gain of test animal (g)}}{\text{Protein consumed by the test animal (g)}}
\]

\[
\text{Protein efficiency ratio (PER)} = \frac{\text{Weight gain of test animal (g)}}{\text{Protein consumed by the test animal (g)}}
\]

\[
\text{Net protein retention (NPR)} = \frac{\text{Weight gain of test animal (g)}}{\text{Average Weight Loss of Animal}}
\]

\[
\text{Protein retention efficiency (PRE)} = \text{NPR} \times 16
\]

Feed Conversion ratio was determined by

\[
\text{Feed Conversion ratio} = \frac{\text{Feed Consumed (g)}}{\text{Gain in body weight (g)}}
\]

Ethical consideration

White Wister, fifty albino rats were approved by the Animal Ethical Welfare Review Committee of the Obafemi Awolowo University, Osun State, Ile-Ife, Nigeria.

Figure 1 & 2 shows the portrait of the scent leaf (Ocimum gratissimum) and bitter leaf (Vernonia Amygdalina) in the home garden.

Chemical analysis

Protein was determined by using microkjedal equipment and followed stages by digestion, distillation, and titration (nitrogenx6.25). Moisture was done using gallekamp oven 4, crude fat was determined with soxhlet apparatus, carbohydrate was determined by different, and vitamin of the dietary samples were determined according to AOAC methodolody.

Energy value

Caloric value was calculated (kJ/100g) using the equation:

Energy value=(37x fat)+(17x carbohydrate)+(17x protein)

Figure 1 Ocimum gratissimum.

Figure 2 Vernonia Amygdalina.

Result and discussion

White Blood Cells including LYM% were found rated high, It has ranged from 73.9–89.2 and above limit of 2.5–10.5 while values for WBC10⁶, GRAN% ranged from 4.3–15.6 and has moderate for MON% of ranged from 6.6–12.2 and MON#. Red Blood Cells were found to be high in RBCs, HGBg/dl was found moderate with ranged from 3.9–6.76, while HCT% ranged from 29–39, Hemoglobin% ranged from 11.7–13.6 (Hb or Hgb), (MCHC) were be moderate (Figure 3) (Table 3)

Table 2 reported the Chemical composition of basil and bitter leave

Protein% ranged from 14–42.88, Moisture% ranged from 2.30–7.50, Fat% content ranged from 2.30–7, Ash% ranged from 4.22–4.30, Crude% Fiber ranged from 3.80–6.50, Ash% ranged from 4.22–4.30, CHO% ranged from 40.36-66 and Dry% Matter 97.50–97.80

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respectively. Protein content in bitter leave is about triple higher than that of basil leaf both have moisture of less than 5% which indicates that they are less liable to micro-organism growth. The fat content is very low being obtained leaf extract. Mineral ash is quite adequate to supply mineral to the diet for body upkeep. They both have higher carbohydrate that required for source of energy.\textsuperscript{32,33}

Table 3 reflects the various tissues of the internal organ of the experimental animal, the Liver(g) ranged from 3.80–4.40, and Heart(g) ranged from 0.37–0.46 Kidney left(g) ranged from 0.37–0.54 respectively. It is noteworthy dietary the experiment animal had two kidney but left kidney were found higher in weight. Also, basil fortified diet were similar to control diet while basal diet were found similar in diet fortified with bitter leaf, bitter taste may be due to concentrate of andrographolide content.\textsuperscript{2,6}

Table 4 showcases the nitrogen retention in various tissues of the internal organ Kidney mg/g ranged from 20.20–70.64, Liver mg/g 20.05–70.08 Muscle mg/g ranged from 10.30–70–78 Fecal mg/g ranged from 10.30–0.86–Urime mg/g ranged from 0.14–0.35. The nitrogen retention of basal diet was very low compared to other experimental animal.\textsuperscript{31} The basil fortified diet had the highest retention of nitrogen followed by control dietary.\textsuperscript{2,6,32}

Table 5 reflects the Bioassay of the experimental animal Bioassay BV% ranged from 59.60–72.06, NPU% 1.33–4, 43, PER 1.10–4.40, FER 3, 78–6.85, NPR 1.07–4.37, PRE and 20, 16–69.92. The highest BV%, NPU%, PER, FER, NPR and PRE were found in basil fortified diet (BPB) when compared with control diet (CD). The basal diet (BD) had no biological value. The bitter leaf fortified diet (PBB) was also found to be less in biological value than mixture of bitter and basil leave diet. This may be responsible by andrographolide content responsible for bitterness in the leave as shown in figure one.\textsuperscript{2,6}

Table 1 Haematological Study of some Vegetable Condiments

| Parameter       | BD  | CD  | BPB | PBB | BBB |
|-----------------|-----|-----|-----|-----|-----|
| WBC/10\(^{-3}\)L | 6.3 | 6.6 | 2.0 | 1.5 | 4.4 |
| LYM%            | 73.9| 89.2| 81.9| 77.3| 76.8|
| GRAN%           | 14.1| 4.3 | 10.6| 15.6| 11.0|
| LYM/10\(^{-3}\)L | 8.6 | 6.6 | 1.6 | 1.2 | 3.4 |
| GRAN/10\(^{-3}\)L| 1.4 | 0.4 | 0.2 | 0.2 | 0.5 |
| RBC/10\(^{12}\)L| 6.76| 6.62| 6.39| 6.68| 6.47|
| HGBg/dl         | 12  | 12.7| 13.6| 11.7| 13.6|
| HCT%            | 34.2| 39.1| 33.1| 29  | 34.4|
| MCVL            | 60.6| 69.1| 51.9| 51.1| 50.2|
| MCHpg           | 17.7| 19.1| 21.2| 20.5| 21  |
| RDW-SDIL        | 32  | 32.4| 41  | 40.3| 41.9|
| RDW-CV%         | 13.6| 17.4| 13.7| 13.9| 13.1|
| PLT/10\(^{12}\)L| 440 | 503 | 428 | 264 | 622 |
| MPVL            | 6   | 6.7 | 6.9 | 9.4 | 6.9 |
| PDW%            | 7   | 7.9 | 7.9 | 9.7 | 7.9 |
| PCT%            | 0.47| 0.33| 0.29| 0.24| 0.42|
| PLCR%           | 13.3| 18.3| 18.5| 18.5| 18.4|

Figure 3 Animal grouping experimentation.

Abbreviations: BD, basal dietary; CD, control dietary; BPB, Basil 10% platelet10% basal 80% dietary; PBB, Platelet10%bitter10% basal80% dietary; BBB, bitter10%basil 10% basal80% dietary.
Table 2 Chemical composition of basil and bitter leaf

| Sample code | Protein% | Moisture% | Fat% | Ash% | Crude fiber% | CHO% | Dry matter% |
|-------------|----------|-----------|------|------|--------------|------|-------------|
| Bitter leaf | 42.64±04 | 2.30±02   | 6.50±03 | 4.30±01 | 3.80±03 | 40.46±04 | 97.70±04 |
|             | 42.89±00 | 2.40±02   | 6.00±02 | 4.22±00 | 3.86±02 | 40.61±03 | 97.60±02 |
|             | 42.04±02 | 2.50±03   | 7.00±01 | 4.26±04 | 3.84±01 | 40.36±02 | 97.50±03 |
| Scent Leaf  | 15.32±02 | 2.50±03   | 2.25±02 | 4.22±03 | 6.50±02 | 66.21±04 | 97.75±02 |
|             | 14.00±02 | 2.50±01   | 2.30±04 | 4.25±04 | 6.00±03 | 65.95±04 | 97.70±03 |

Mean±SD values of five determinations (P<0.05)

Table 3 Various tissues of the internal organ of the experimental animals

| Dietary   | Liver(g) | Heart(g) | Kidney right(g) | Kidney left(g) |
|-----------|----------|----------|-----------------|---------------|
| BD        | 3.80±01  | 0.37±02  | 0.38±04         | 0.37±00       |
| CD        | 4.36±02  | 0.46±03  | 0.48±03         | 0.54±02       |
| BPD       | 4.38±04  | 0.43±04  | 0.48±04         | 0.52±03       |
| PBB       | 4.40±03  | 0.36±04  | 0.36±03         | 0.40±00       |
| BBB       | 4.20±02  | 0.40±03  | 0.40±02         | 0.42±01       |

Foot note: Mean±SD values of five determinations with significantly different (P<0.05). BD, Basal Dietary; CD, Control Dietary; BPB, Basil 10% Platelet 10% Basal 80% Dietary; PBB, Platelet 10% Bitter 10% Basal 80% Dietary; BBB, Bitter 10% Basil 10% Basal 80% Dietary.

Table 4 The nitrogen retention in various tissues of the internal organ

| Dietary | Kidneymg/g | Livermg/g | Musclemg/g | Feacalmg/g | Urinemg/g |
|---------|------------|-----------|------------|------------|-----------|
| BD      | 20.20±00   | 20.05±01  | 10.30±02   | 1.20±03    | 0.28±04   |
| CD      | 70.04±02   | 70.08±03  | 70.06±03   | 0.62±04    | 0.14±02   |
| BPB     | 70.64±01   | 70.61±02  | 70.78±03   | 0.80±03    | 0.21±04   |
| PBB     | 50.01±00   | 50.02±04  | 50.09±00   | 0.74±04    | 0.14±04   |
| BBB     | 55.76±03   | 55.62±03  | 55.69±03   | 0.86±04    | 0.35±03   |

Foot note: Mean±SD values of five determinations with significantly different (P<0.05). BD, Basal Dietary; CD, Control Dietary; BPB, Basil 10% Platelet 10% Basal 80% Dietary; PBB, Platelet 10% Bitter 10% Basal 80% Dietary; BBB, Bitter 10% Basil 10% Basal 80% Dietary.

Table 5 Bioassay of the experimental animal Bioassay

| Diet   | BV %   | NPU%  | PER  | FER   | NPR  | PRE  | Gained/loss |
|--------|--------|-------|------|-------|------|------|-------------|
| BD     | -      | -     | -    | -     | -    | -    | -0.62       |
| CD     | 71.11±02 | 4.11±02 | 4.10±01 | 6.8±00 | 4.05±02 | 64±04 | 41.1        |
| BPB    | 72.06±01 | 4.43±04 | 4.40±02 | 7.3±03 | 4.37±04 | 69±02 | 44.32       |
| PBB    | 59.60±03 | 1.13±00 | 1.10±03 | 3.78±04 | 1.07±01 | 17±03 | 11.34       |
| BBB    | 63.77±02 | 1.33±02 | 1.30±01 | 4.43±02 | 1.26±02 | 20±02 | 13.30       |

Foot note: Mean±SD values of five determinations with significantly different (P<0.05). BD, Basal Dietary; CD, Control Dietary; BPB, Basil 10% Platelet 10% Basal 80% Dietary; PBB, Platelet 10% Bitter 10% Basal 80% Dietary; BBB, Bitter 10% Basil 10% Basal 80% Dietary.

Conclusion

Basil compared with bitter vegetable dietary had the best growth response, both have medicinal value, home based, has health benefits. Nitrogen retention is present in various tissues of the internal organ which is adequate for body physiology and building. Nutrient compositions in the dietary samples meet daily nutrient requirement intake and amino acid profile that is adequate to complement human diet in pregnant women, children and elderly. Protein quality of both basil leaf (ocimum gratissimum) and bitter leaf (vernonia amygdalina) are viable to promote human growth. Basil leaf (ocimum gratissimum) and bitter leaf (vernonia amygdalina) has confirmed to be source of Vitamin-A, C and K and mineral to support and improve human health of the populace.

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Conflict of interest

The author declares that there is no conflict of interest.

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