CONSUMPTION PATTERN, NUTRIENT COMPOSITION, IRON AND ZINC BIOAVAILABILITY OF COMMONLY CONSUMED EDIBLE INSECTS IN KADUNA STATE, NIGERIA

BY

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ABSTRACT

In order to reduce malnutrition and food insecurity, especially in Nigeria, it is still imperative to address vitamin deficiencies. Edible insects, rich in iron, zinc and protein, present a sustainable nutritional alternative. The purpose of this research was to assess the dietary habits, nutritional makeup, tibia zinc, hematological parameters, and iron and zinc bioavailability of widely eaten edible insects. The edible insects include: crickets (*Branchytropes memberanacoeu*), termites (*Macrotermes bellicosus*), and grasshoppers (*Kraussaria angulifera*). The study adopted cross-sectional and randomized block designs. The consumption pattern of edible insects among 360 randomly selected respondents from the 3 senatorial district of Kaduna state was assessed using interviewer administered questionnaire. Fatty acid and amino acid profile compositions, proximate, micronutrients, anti-nutrients, and *in vitro* protein digestibility were all ascertained. Iron and zinc bioavailability, serum albumin, serum ferritin, serum zinc and tibia zinc were determined by depletion and repletion method using fifty male albino rats. Frequency, percentage, analysis of variance, Duncan test, and paired T-test at $\alpha_{0.05}$ were used to analyze the data. The result showed that the respondents' age range was 19-50 years, grasshopper and termite were the most commonly consumed insects and with 80.8% consume them in roasted form. Moisture, ash, lipid, protein, crude fibre, total carbohydrate contents ranged from 4.99-6.48g/100g, 7.15-9.93g/100g, 34.34-42.70g/100g, 22.77-42.63g/100g, 23.27-28.69g/100g and 2.08-28.33g/100g, respectively. Zinc, iron, calcium, sodium, lead, potassium and magnesium contents ranged from 0.58-1.19mg/100g, 1.90-4.81mg/100g, 91.49-285mg/100g, 23.49-32.88mg/100g, -0.45-1.29mg/100g, 0.17-0.28mg/100g and 4.06-4.79mg/100g, respectively. Vitamins A, C and E contents ranged from 9.10-12.05mg/100g, 0.32-0.49mg/100g and 9.48-14.48mg/100g, respectively. Saponin, phytate, tannin and oxalate

contents ranged from 28.95-44.91mg/100g, 0.05-0.07mg/100g, 3.15-6.00mg/100g and 0.07-0.08mg/100g, respectively. *In vitro* protein digestibility contents ranged from 54.53-59.73mg/100g. Indispensable, dispensable and conditionally indispensable amino acids were identified in all the insects. Grasshopper met the recommended amino acid scoring pattern for Tryptophan and Histidine. The total saturated and monounsaturated fatty acids contents ranged from 25-188g/100g, and 133-185g/100g, respectively. The result revealed no notable variations ($p \leq 0.05$) between the depletion and repletion phases for serum albumin, serum ferritin, serum zinc and tibia zinc respectively but there was a notable distinction ($p \leq 0.05$) for hemoglobin value of grasshopper. There was significant difference between the depletion and repletion phases for hemoglobin-iron ratio of normal, negative, positive, cricket, grasshopper and termite groups with p-values of 0.307, 0.001, 0.817, 0.021, 0.058 and 0.044, respectively. Hemoglobin regeneration efficiency of normal, negative, positive, cricket, grasshopper and termite groups with p-values of $0.01\pm0.9\text{-}^{3}$, $0.01\pm0.4\text{-}^{2}$, 0.02 ± 0.01, $0.01\pm0.3\text{-}^{2}$, 0.04 ± 0.01 and 0.03 ± 0.02, respectively did not differed significantly ($p \leq 0.05$). The relative biological value of normal, negative, positive, cricket, grasshopper and termite groups 1.00 ± 0.00, 0.65 ± 0.50, 0.91 ± 0.81, 1.24 ± 0.14, 2.04 ± 0.76 and 0.69 ± 0.35, respectively differed significantly ($p \leq 0.05$). There was no significant variation ($p \leq 0.05$) in the depletion and repletion phases of the zinc retention capacity of the insect species. In conclusion, because the iron and zinc in edible insects were bioavailable, they could be a good source of these elements. Therefore, encouraging the large-scale production of edible insects and raising awareness of their micronutrient content could be very important in reducing iron and zinc deficiencies in Nigeria.