Nutritional potential of two species of Coleoptera consumed in Togo: *Gnathocera trivittata* (Swederus, 1787) and *Gnathocera impressa* (Olivier, 1789)

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INTRODUCTION

Researchers have long focused on studies of high-energy staple foods such as wheat, rice and corn in order to achieve food security. However, many of these foods contain insufficient amounts of micronutrients essential to human health. This leads to deficiency problems. In addition, the often neglected insects are good food sources containing these micronutrients. In Togo, as in most Sub-saharan African countries, many species of insect are consumed, but their chemical composition is not known. Consequently, data on their nutritional values are absent from international scientific directories. It is to fill this gap in knowledge of the components of edible insects that this work was initiated. The objective of this study is to determine the nutritional values of two insect species in Togo in order to promote their consumption.

MATERIAL AND METHODS

Biological material

G. trivittata (1) et *G. impressa* (2)

Biochemical assays

Determination of water content : SCALTEC electronic moisture analyzer (SM®01 Instrument GmH, Germany)
Determination of ash, lipid, protein (AOAC, 1995),vitamin (AOAC, 1990)
Composition of fatty acids by chromatography (AOAC, 1995) and of amino acids by the Biochrom 30+ amino acid analyzer.
Fibers content by AFNOR (1985)

$$Carbohydrates = 100 - (Water + Protein + Lipids + Ashes + Fibers)$$

$$Energy = 37xLipids + 17xProteins + 17xGlucides + 8xFibers$$

Determination mineral content : oxidation of organic matter (nitric acid); phosphorus (colorimetry) and all other minerals (spectrophotometry

Statistical analysis

Tests (triplicate); descriptive statistics by SPSS 17 software

RESULTS

Proximate composition of insect species (%) and their energy value (kJ/100g)

Species	Water	Ashes	Proteins	Lipids	Fibers	Carbohydrates	Energy
G. trivittata	5.34 ± 0.05[a]	12.21 ± 0.8[a]	61.63 ± 0.25[a]	9.09 ± 0.96[a]	10.05 ± 1.09[a]	1.65 ± 0.42[a]	1493.06 ± 3.89[a]
G. impressa	4.98 ± 0.23[a]	14.36 ± 1.1[b]	59.36 ± 0.97[a]	9.86 ± 1.57[a]	8.35 ± 0.32[b]	3.08 ± 1.45[a]	1493.24 ± 42.31[a]

*In a column the affected averages of the same letter are not statistically different (ANOVA-1 at the 5% threshold)

Researched vitamins content of edible insects (mg/100g)

Species	Retinol	Thiamin	Riboflavin	Niacin	Tocopherol
G. impressa	0.06± 0.04[a]	1.87 ± 0.03[a]	1.75 ± 0.05[a]	6.57 ± 0.18[a]	4.63 ± 0.13[a]
G. trivittata	0.01 ± 0.00[b]	1.25 ± 0.24[b]	1.67 ± 0.13[b]	7.63 ± 0.13[b]	3.41 ± 0.28[a]

*In a column the affected averages of the same letter are not statistically different (ANOVA-1 at the 5% threshold)

Fatty acids profile (g/100g)

Fatty acids	*G. Trivittata*	*G. impressa*
C12:0	ND	2.51 ± 0.01
C14:0	0.86 ± 0.01	1.14 ± 0.00
C16:0	49.73 ± 0.0	30.55 ± 0.04
C18:0	6.13 ± 0.02	7.38 ± 0.01
C16:1	ND	2.41 ± 0.02
Cis(C18:1)	33.13 ± 0.0	44.51 ± 0.01
Trans(C18:1)	0.62 ± 0.01	ND
C18 :2	5.78 ± 0.01	5.68 ± 0.00
C18:3	1.18 ± 0.01	1.77 ± 0.01
Ɔ6/Ɔ3	3.2	4.89

*ND: Not Detected

Amino acids profile (g/100g)

Amino acids	*G. trivittata*	*G. impressa*
Ile	1.17 ± 0.08	1.85 ± 0.28
Leu	2.18 ± 0.01	3.32 ± 0.14
Lys	1.68 ± 0.07	1.45 ± 0.01
Met	0.70 ± 0.06	0.82 ± 0.17
Phe	0.87 ± 0.01	0.96 ± 0.19
Trp	0.36 ± 0.07	0.58 ± 0.01
Thr	0.70 ± 0.01	1.02 ± 0.05
Val	1.92 ± 0.17	2.43 ± 0.22
Arg	0.70 ± 0.03	1.22 ± 0.10
Hist	2.58 ± 0.01	1.47 ± 0.21
Ala	2.06 ± 0.03	3.30 ± 0.68
Asx	1.79 ± 0.15	2.34 ± 0.05
Glx	2.19 ± 0.19	3.56 ± 0.20
Cys	0.68 ± 0.04	0.81 ± 0.03
Gly	3.52 ± 0.03	3.14 ± 0.16
Pro	1.78 ± 0.05	3.89 ± 0.32
Ser	0.95 ± 0.03	1.07 ± 0.11
Tyr	5.78 ± 032	7.46 ± 0.74

Mineral composition (mg/100g)

Mineral	*G. trivittata*	*G. impressa*
Ca	66.54 ± 0.16[a]	52.66 ± 0.36[b]
Mg	33.43 ± 0.46[a]	26.76 ± 1.74[b]
P	64.06 ± 0.14[a]	53.28 ± 0.14[b]
K	1102.41 ± 2.3[a]	886.12 ± 1.2[b]
Na	44.80 ± 0.25[a]	56.34 ± 1.00[b]
Fe	14.82 ± 0.09[a]	16.75 ± 0.12[b]
Mn	2.44 ± 1.76[a]	0.09 ± 0.04[b]
Cu	4.39 ± 0.21[a]	2.49 ± 0.03[b]
Zn	13.59 ± 0.12[a]	13.94 ± 0.12[a]
Na/k	0.04	0.06
Ca/P	1.03	0.98

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CONCLUSION

The insects studied contain all the essential amino acids for humans. They provide fats rich in unsaturated fatty acids and especially in essential fatty acids. They also contain minerals and vitamins essential to the functioning of the human organism. The ratios of essential fatty acids and minerals in these insects are balanced, making them of excellent nutritional value.

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