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Is Insect Eating Festival a Viable Strategy in Promoting Entomophagy? An Investigation in Marawi City, Philippines

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Abstract
The practice of eating insects by people otherwise known as entomophagy is not widely adopted in the Philippines unlike in some countries where insects are regularly eaten as protein source. Researchers are now considering the integration of entomophagy in the ways and means of achieving food security. In view of this, the Mindanao State University (MSU), Marawi City, Philippines conducted Insect Eating Festivals (IEF) to provide students with direct and concrete experience in using edible insects as a substitute for animal protein source. This study was conducted to determine the conception, consumption of edible insects and significant change in consciousness among participants in the pre and post IEF. Data were collected from the participants through survey questions and subjected to descriptive and t-test analysis. It was found that Chinese grasshopper (*Oxyachinensis*) (37%), rice and corn weevils (*Sitophilus oryzae* and *S. zeamais*) (22%), and earwigs and ants (undetermined spp.) (21%) were the edible insects consumed at IEF. The significant change in participants' consciousness level after IEF on edibility of insects and as protein source reveals the viability of IEF as entomophagy promotion strategy.

Keywords: consciousness, edible insects, entomophagy, protein source, viable strategy.

Introduction

People of Asia, Africa and Latin America incorporate insects in their diets. (Halloran & Vantomme 2013). In fact, indigenous peoples considered insects as traditional foods (DeFoliart 1995). In his study on insects as human food, DeFoliart (1992) provided an information on the nutritional contents of insects, such as; protein, fats, calories, vitamins and minerals. Moreover, the study of Shantibala et al. (2014) showed that insects are good source of minerals like sodium, calcium, and magnesium. Likewise, Quijano & Vergara (2005) as cited by Lokeshwari & Shantibala (2010) disclosed the high protein and mineral content in cochineal species. Its residuals can be used both as avian food enhancer and for fertilizers. Thus, studies show the benefits of consumption of edible insects. For instance, DeFoliart (1999) revealed the inverse relationship between consumption of grasshoppers and pesticides use. Moreover, Chakravorty et al. (2011) disclosed that palatability, availability, and nutritional value are among the factors considered in entomophagy.

Aside from insects' utilization as food, it can also be used for other purposes such as feed alternative, fertilizer and medicine. DeFoliart (1995) revealed the 1994 locust outbreak in the Philippines, where people harvested locusts for sale both as food and feed. The International Feed Industry Federation as cited by Halloran & Vantomme (2013) stated that insects can supplement traditional feed and producers from different countries are now engaged in flies rearing for feed. Despite the nutritional benefits of insects, the practice of eating insects, known as entomophagy is still disgusting to some people especially those who have aversion of eating insects. Pliner and Salvy (2006) disclosed that when new products are introduced, it generally induced neophobia or the feelings of fear and rejection. Rozin and Fallon (1980) explained the hypotheses of neophobia in entomophagy as the rejection of insects due to its perceived negative background or habitat and the anticipated consequences. As regards safety issues on entomophagy, Halloran and Vantomme (2013) noted that there are no known cases of transmission of diseases or parasitoids to humans due to the consumption of edible insects.

In view of the potentials of insects for food security, Insect Eating Festival (IEF) was conducted at the Mindanao State University (MSU) in Marawi City, Lanao del Sur, Philippines to promote entomophagy. IEF is designed to educate the MSU constituents about the prospect of utilizing insects as food and overcome their biases of insects. The festivals featured various activities such as slide and video presentations and eating insect-laden food. The insect pests of several crops were utilized as insect- laden food. They included grasshoppers*, Oxyachinensis*, and *Attractomorphapsitaccina*, rice bugs, *Leptocorisaoratorius*, Malaysian black bugs, *Scotinopharacoarctata*, ladybird beetles, *Micraspiscrocea*, green leafhoppers, *Nephotettix*sp. , snout beetles, *Metapocyrtus* sp., Asiatic palm weevils, *Rhynchoporusferrugineus*, rhinoceros beetles, *Xylotrupesgideon*, cabbage worm, *Crocidolomiapavonana*, coconut leaf beetles, *Brontispalongissima*, rice moths, *Corcyra cephalonica, and* superworms, *Zophobasmorio.* They were gathered and prepared as insect-laden food like *turon, pulvoron,* burgers and sandwich food toppings. This study considered whether IEF is a viable strategy in promoting entomophagy in Mindanao State University, Marawi City, Philippines particularly on participant's consumption on insect –laden foods at IEF, their changes in awareness level of entomophagy before and after IEF, and their perceptions on the potentials of entomophagy as benchmark for further studies.

Method

Participants

Ninety (90) IEF participants were included in this study. They were comprised of students enrolled in technical courses in agriculture; particularly Crop Protection (Crop Prot) 1 and Entomology (Entom) 51 students during the second semester, Academic Year 2014-2015.

Design

This study was a survey type of research which was conducted at Mindanao State University (MSU) Marawi City, Philippines using total enumeration, since there were only few IEF participants. According to Kelly et. al. (2003) survey research is commonly used in applied social research of selected people from a pre-determined population.

Materials

This survey research utilized questionnaire with three (3) main parts: Part I is composed of consumption on insect-laden food at IEF, Part II comprises the awareness of the participants on entomophagy before and after IEF and Part III includes the perceived potentials of entomophagy. It was subjected to content validity by the experts of entomophagy, professors of Crop Protection and Entomology and the organizers of IEF. Creswel (2005) emphasized that

content validity suggests that answers make sense and allow the researchers to draw conclusions regarding the populations being investigated.

Procedure

Prior to administering the questionnaire, respondents were subjected to screening to exclude those allergic to crustaceans that will likely develop insect-food allergy. Children and pregnant women are also excluded. Orientation was also given as to the nature and purpose of the study, that participation is voluntary; no monetary compensation is received for participation and all responses be treated with utmost confidentiality. Limitation was also considered, like insects' acceptability attributes as to taste, colour, texture not yet covered due to difficulty of measurement since insects were powdered, made as toppings or incorporated in different delicacies. All questions were explained orally to ensure comprehension. They were encouraged to carefully answer every question based on their personal view or belief and experience and by not sharing their answers to others.

Descriptive Statistics was used in describing participants' consumption of insect laden-food and the perceived potentials on entomophagy using Likert Scale. The *t*-test is used to determine participants' change in awareness level on entomophagy before and after IEF. All data were subjected to Statistical Package for the Social Sciences (SPSS).

Results

The IEF revealed the consumption preference on insect-laden food among Crop Prot 1 and Entom 51 student- participants. Data indicated that they consumed Chinese grasshopper (*Oxyachinensis)* toppings (37%), rice and corn weevils (*Sitophilus oryzae& Sitophilus zeamais)* (22%) and earwigs and ants *(undetermined spp.)* (21%) (Table1). This revealed that IEF can be one of the strategies in convincing college students on entomophagy through direct and meaningful experience.

Table 1. Consumption of insect-laden food at IEF in MSU Marawi City, Philippines

Insect- Laden Food	Frequency * (N=90)	Percentage
Chinese grasshopper (*Oxyachinensis)*	33	37
Rice and Corn weevils (*Sitophilus oryzae& Sitophilus zeamais)*	20	22
Earwigs and Ants *(undetermined spp.)*	19	21
Super worms (*Zophobasmorio)*	15	17
Bees (*Apismillefera)*	15	17
Cabbage worms (*Crocidolomiapavonana)*	9	10

*Multiple responses

The *t*-test result showed there was a significant difference on the change of awareness level of the Crop Prot 1 and Entom 51 student- participants before and after IEF especially on insect edibility and as protein source (Table 2).

Table 2. Awareness on entomophagy before and after IEF in MSU Marawi City, Philippines.

Indicators	N	Mean		SD		*T*	sig (P)
		Pre IEF	Post IEF	Pre IEF	Post IEF		
Insect edibility	90	2.64	3.25	0.82	0.95	- 4.25	0.00**
Insect as protein source	90	3.01	3.31	0.93	0.97	2.30	0.02*
Insect-laden food	90	2.94	3.18	0.90	0.94	- 2.01	0.05^{ns}
Insect availability	90	3.24	3.26	0.95	0.97	- 0.16	0.87^{ns}
Ethno-entomophagy	90	3.00	3.20	0.94	1.03	- 1.38	0.17^{ns}
Overall Mean		2.97	3.24	0.05	0.22	-1.98	0.05^{ns}

* P< .05
** P< .01
^{ns}Not Significant

The IEF participants perceived various potentials of entomophagy such as an option for managing pest populations during outbreaks (54%), an option for animal feeds (42%) or fish feeds (42%) and a solution to malnutrition (39%) (Table 3).

Table 3. Perceived potentials of entomophagy in MSU Marawi City, Philippines

Perception of entomophagy	Frequency * N=90	Percentage
An option for managing pest population during period of outbreaks	49	54
An option for animal feeds	38	42
An option for fish feeds	38	42
An alternative solution for malnutrition	35	39

*Multiple Responses

Discussion

The respondents highly preferred cassava cake with Chinese grasshopper toppings because it is a common delicacy in MSU, Marawi City while grasshoppers are abundant thus commonly seen by students in the campus. Horseradish is a popular crop in the Philippines known for its health benefits. On the other hand, the presence of weevils in rice and corn are usually undetected because of their small size, hence they are unknowingly consumed by many Filipinos. These are desirable conditions for acceptability of insect laden-food. This is consistent with Rogers (1995) assertion that the rate of acceptance or adoption increases with visibility and triability. In addition, Van Huis et al. (2013) revealed that grasshoppers, ants and bees are amongst popular insects eaten around the world. In addition, Meyer-Rochow (2009) disclosed that traditions and beliefs of the society largely affect the acceptability of insects as food. Domoguen (1980) revealed that minority groups in North Luzon, Philippines practiced insect eating. Chakravorty et al. (2011) pointed out that roasting, boiling, or frying are the common methods in preparing edible insects for human consumption. For example, Bender (1975) as cited in Defoliart (2002) noted that boiled, dried and powdered locusts and dragon fly as well as red and flying ants, beetles and water bugs were eaten by Ifugaos of the Philippines. Starr (1991) revealed that in Laoag City, Philippines, the June beetles (Melolonthinae) was commonly eaten.

IEF has enhanced the awareness of the students in considering insects as food thereby reducing fear and aversion of seeing them in plates. Through IEF, the participants have learned the nutritional benefits of insect- eating. This implies that IEF is an effective strategy in promoting entomophagy. Moreover, Vernon & Berenbaum (2004) as cited in Van Huis et.al. (2013) disclosed that provision of direct experience can enhance understanding on the nature of insects. Chamala and Shingi (1997) asserted that dictation arouses reaction, but demonstration develops imagination, participation produces comprehension and empowerment leads to application.

The data show possible contributions of entomophagy to food and feed security especially with growing population and marginalization of our resources today. These potentials however, need further multidisciplinary studies. For instance, there is need to determine edible insect pests of major crops in the Philippines, analyze their nutrient content, utilize them as alternate food by making delightful and palatable recipes, assess their acceptability and market these edible insect pests as food to help manage their population during periods of outbreaks. Likewise, there is a need for feasibility studies on the utilization of insects as fish and feed ingredients. Most importantly, there is a need to consider safety issues on the consumption of insects through Hazard Analysis and Critical Control Points (HACCP) - food safety program of Food and Drug Administration. Van Huis et al. (2013) emphasized that the adoption of Hazard Analysis Critical Control Points (HACCP) will be a key factor in the success and development of the edible insect sector.

Conclusion

Results of the study showed that the Insect Eating Festival (IEF) promoted entomophagy which is manifested in the consumption on insect-laden food among participants. The participants consumed Chinese grasshopper (*Oxyachinensis)* toppings (37%), rice and corn weevils (*Sitophilus oryzae& Sitophilus zeamais)* (22%) and earwigs and ants *(undetermined spp.)* (21%).This consumption preference may serve as benchmark in preparing insect-laden food to further promote entomophagy through insect eating festivals.

The importance of Insect Eating Festival in promoting entomophagy was evident in the result of *t*-test. There is a significant change of awareness level of the Crop Prot 1 and Entom 51 student-participants before and after the festival especially on insect edibility and nutrient content. This suggests that the festival has enhanced the awareness of the students in considering insect as key food for nutrition. The participants learned the nutritional benefits of insect-eating. Thus, Insect Eating festival is an effective strategy in promoting entomophagy.

The overall findings of the study show that IEF is a viable strategy for educating people on entomophagy and the various potentials of entomophagy such as an option for managing pest populations during period of outbreaks, an alternative for fish and animal feeds and a solution to malnutrition. However, these potentials need further multidisciplinary studies like food safety issues, feasibility studies, and consumers' acceptance.

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