

Edible Insect Workshop Engages Public in Sustainable Food Conversation

Abstract

A 6-hr train-the-trainer workshop focused on introducing the concept that insects may play a significant role in food security as the world population is projected to exceed 9 billion people by the mid 21st century. Workshop topics including cultural, nutritional, culinary, and commercial aspects surrounding edible insects were presented and packaged into a formal curriculum for later use by the participants. A 12-item sensory evaluation of insect-fortified foods provided participants a tangible experience with product palatability. By the end of the workshop, participants had increased various dimensions of their knowledge about edible insects and reported a generally positive perception toward insect-based foods.

Keywords: [entomophagy](#), [edible insects](#), [sensory evaluation](#), [curriculum](#), [food](#)

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Introduction

It is estimated that the world population will exceed 9 billion people by 2050 (Evans, 2009; Godfray et al., 2010). Feeding this growing population will take agricultural innovations to improve productivity, initiatives to grow food in new places such as urban centers, and cultural momentum to explore new food alternatives with significant nutritive value. To bolster that point, a Food and Agriculture Organization of the United Nations report suggested that insect protein for human consumption should be considered as a source for nutrients in the future (van Huis et al., 2013).

However, proponents of the use of such unique food options and those involved in emerging insect food industries face challenges because food is a deeply rooted part of human culture and identity (Larson & Story, 2009) and eating insects is still considered taboo in most Western cultures. On the other hand, it is estimated that at least 2 billion people around the world consume insects as part of their traditional diets (van Huis et al., 2013). Although there are differences between species and life stages, from a nutritional standpoint, insects are generally high in protein and micronutrients such as iron, zinc, calcium, B12, magnesium, and omega fatty acids (Rumpold & Schlüter, 2013).

Project Description

In light of suggestions to broaden the use of insect protein as a food source for humans, we developed a relevant resource-supported curriculum and then hosted a train-the-trainer edible insect workshop to teach fellow educators and volunteers about how eating insects could help solve future global food security challenges. Our objectives were to increase knowledge about consumption of edible insects worldwide, increase knowledge about insects as a nutrition source, introduce Ohio entrepreneurs who have created business models to address the larger conversation on food security, and provide a sensory evaluation of insect-fortified foods.

Given the looming food security issue and the short timeline for meeting the challenge, our intent was to use the workshop to begin the conversation on possible solutions. The workshop occurred April 8, 2016, and was funded by an Ohio State University Outreach and Engagement Grant. We began the 6-hr program with presentations on food security issues, insects-as-human-food concepts, nutritional benefits of insect consumption, and perspectives from other cultures where eating insects is not taboo. Prior to lunch, attendees participated in a sensory evaluation of insect-fortified foods. The workshop wrapped up with two presentations by Ohio companies, Big Cricket Farms, which produces food-grade crickets for human consumption, and Enviroflight LLC, which makes insect-based feed products for the aquaculture and pet industries.

To enable workshop participants to spread the word about entomophagy, we provided our resource-supported curriculum via USB flash drive and online. The curriculum includes a series of specific lessons, descriptions of local industry experiences, and explanation of sensory evaluation procedures (Table 1). To enhance the learning experience and quality of future workshops, we provided additional resources to each participant in the train-the-trainer workshop (Table 2).

Table 1.

Workshop Curriculum Materials Made Available to Train-the-Trainer Workshop Participants

Description	Type
Preamble: Feeding 9 billion people 6 legs at a time	PowerPoint
Nutritional quality of insects	PowerPoint
Introduction to entomophagy: Are bugs the food of the future?	PowerPoint
Cooking with bugs: Culinary aspects of edible insects, by Big Cricket Farms	PowerPoint
Chapulines in rural Mexican diet: Ecology, economics, and taste	PowerPoint
Café Insecta: Teaching 2nd- and 3rd-grade youths about insect foods	PowerPoint
Sensory evaluation: Taste testing insect-based foods	pdf
Bugs save the world: Enviroflight manufacturing insect products	PowerPoint ^a

^aThe recent acquisition of Enviroflight, LLC, by Intrexon and Darling Ingredients restricted some content from being fully shared online due to business confidentiality.

Table 2.

Workshop Resources Made Available to Train-the-Trainer Workshop Participants

Description	Type
Insect foods list and where to buy insects	pdf
Insect food samples: Cricket chips, cricket protein bars, cricket-flour baked goods	Samples

Presentation scripts	PowerPoint
Edited video recordings of lessons (available at go.osu.edu/edibleinsects2016)	Videosa
Sensory evaluation protocol and score sheets	pdf
Edible Insects: Future Prospects for Food and Feed Security, by FAO	Publication
Nutritional comparison chart for cricket protein and conventional protein sources	pdf
Recipes	pdf
Booklist	pdf
Flash drive of all content	USB flash drive

Note. FAO = Food and Agriculture Organization of the United Nations.

aThe recent acquisition of Enviroflight, LLC, by Intrexon and Darling Ingredients restricted some content from being fully shared online due to business confidentiality.

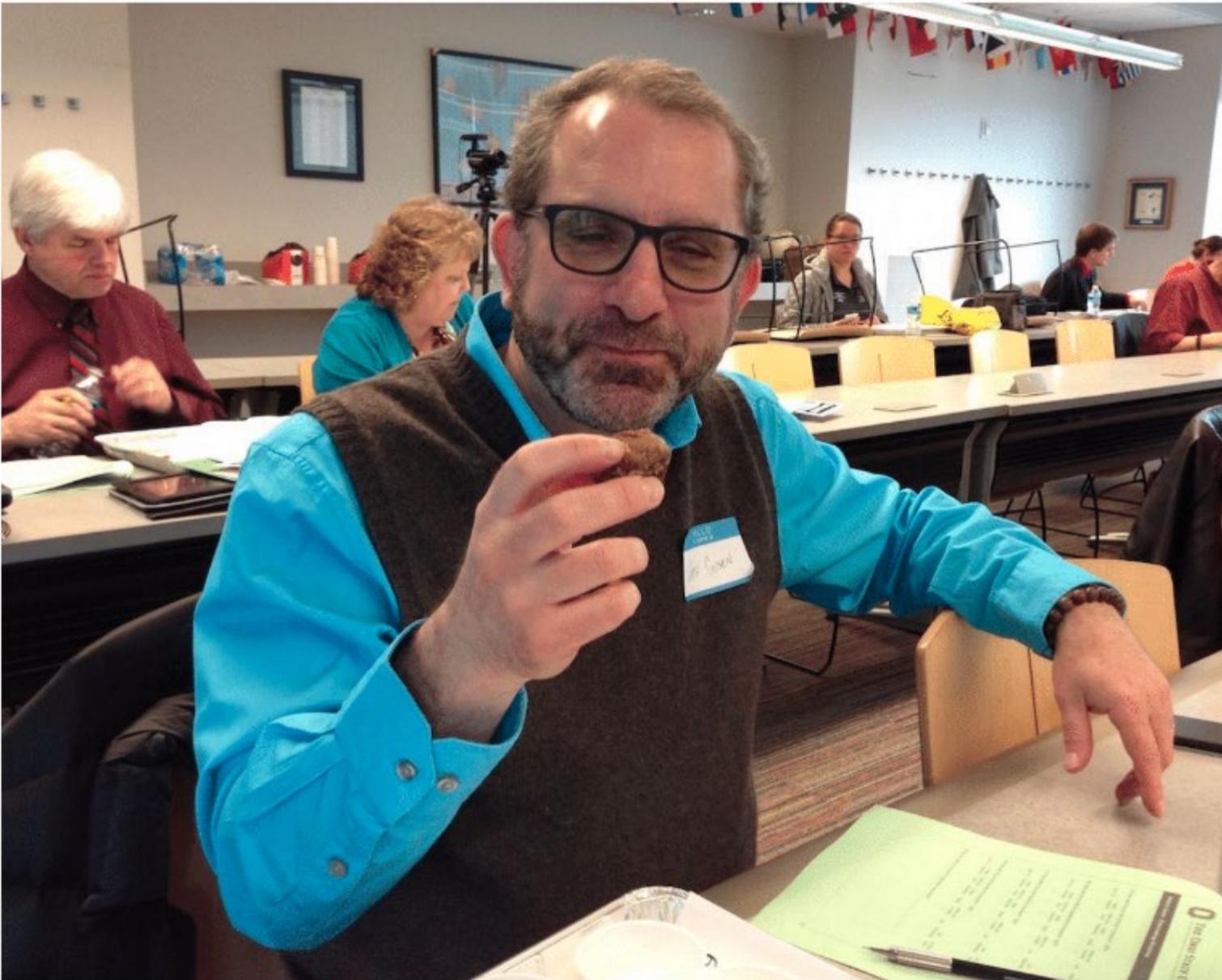
At the end of the workshop, participants were asked to share the information and materials in their communities to engage adults and children in conversations about sustainable food options and to advance acceptance of insects as food. The lessons were formatted to be used either individually for specific presentations or together in larger workshops to promote awareness and pragmatic discussion about food security solutions involving insects.

Sensory Evaluation

Our purpose in incorporating a sensory evaluation component into the workshop was to introduce participants to a wide variety of insect-fortified foods currently on the market to dispel anxiety around eating these foods as part of a nutritional diet (Looy & Wood, 2006). The taste test included 12 foods containing processed crickets (Figure 1). Ten of these items are commercially available: four varieties of Chapul cricket protein bars (Salt Lake City, UT), three varieties of Six Foods cricket tortilla chips (San Francisco, CA), and three varieties of Bitty Foods cricket cookies (San Francisco, CA). Two additional items, a cinnamon cricket muffin and cranberry chocolate cricket bark, were homemade (prepared by our family and consumer sciences team member to ensure food safety) to familiarize participants with home applications for insect ingredients.

Figure 1.

Train-the-Trainer Workshop Participant Contemplates Next Bite of Cinnamon Muffin Made with Cricket Flour



In consultation with the Sensory Evaluation Program at The Ohio State University Department of Food Science and Technology, we demonstrated techniques that can be used to minimize bias (Robbins, 2003) during sensory evaluations. Participants were instructed on how to conduct a proper taste test for future workshops or presentations. A true sensory evaluation is different from a simple taste test because the samples are coded so that the tester does not know what he or she is eating. Participants evaluated each food sample using a standardized score sheet to rate the item in four categories: odor, appearance, flavor, and texture. The score sheet was developed around a 9-point hedonic balance scale ranging from 1 (*extremely dislike*) to 9 (*extremely like*).

Evaluation and Impacts

At the conclusion of the workshop, each participant and presenter received an evaluation form for documenting any changes in knowledge around edible insect-related topics. Results are shown in Table 3.

Table 3.

Mean Knowledge Levels Before and After Train-the-Trainer Workshop on Insect Food Topics ($n = 17$)

Question	Before workshop	After workshop
Rate your level of knowledge about the drivers behind insects as food in the United States.	1.6	3.2
Rate your level of knowledge of insects used as food in other cultures.	2.0	3.3
Rate your level of knowledge of the nutritional aspects of insects before and after attending the workshop.	1.5	3.1
Rate your level of knowledge of the culinary aspects of using insects before and after attending the workshop.	1.7	2.9

Note. Scale was 1 = not knowledgeable to 4 = very knowledgeable.

We found that participants' knowledge of edible insects was greater for all four question areas after the workshop as compared to before the workshop. The sensory evaluation positively influenced 50% of participants and very positively influenced 12% of participants regarding their perceptions toward insect-fortified food. As this was a train-the-trainer event, we also wanted to know whether participants intended to present the curriculum material in whole or in part in their communities; 87% of participants responded that they would share the workshop with adults and children within the subsequent 12 months.

We followed up with educators within 12 months of the train-the-trainer workshop. We found that three educators had used the workshop content to teach others. Their programs were all geared toward youths, ranging from preschool-aged children to teenagers, and they had reached over 300 youths.

Summary

Our workshop demonstrated that varied Extension program areas are relevant when discussing the topic of edible insects and food security. 4-H educators can introduce these concepts to youths, agricultural educators can discuss environmental impacts of raising microlivestock versus traditional livestock, and family consumer science educators can explore healthful food options using insects as novel ingredients. If eating insects is part of our future, there are multiple programming angles that we in Extension need to consider.

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