
WELCOME

COURSE SEMINAR(ENT-699)
ON
INSECTS ARE USED IN HUMAN FOOD

Submitted By

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INTRODUCTION

- Entomophagy is the term used to describe the practice of consumption of insects as food.
- FAO estimates that insects already form part of the traditional diets of at least 2 billion people.
- World population is increasing, it is expected to hit 9 billion people by 2050.
- Current food production will need to almost double but land is scarce will have profound implications on food production
- therefore UN's has formulated eight Millennium Development Goals among them 2 are important -
  - ✓Eradicating extreme poverty and hunger, and
  - ✓Reducing child mortality.

Cont.....

- FAO is interested in the use of insects as an alternative food sources.
- Edible insects contribute to the diet of a part of the world population such as those living in Africa, Asia, and Latin America,(Banjo *et al.,* 2006).
- The most commonly consumed insects globally are beetles, caterpillars, bees, wasps and ants, but in some societies there is a degree of distaste for their consumption.
- Insect are rich in protein, amino acids, fat, CHO, various vitamins and trace elements. (Chen and Feng 1999).

- Insects also have a high feed conversion ratio: on average insects use 2 kg of feed to produce 1 kg of meat compared to cattle that require 8 kg for every 1 kg of meat produced.
- Insects are cheap and nutritious food for the vulnerable groups. (DeFoliart, 1999).
- Eating insects is very sustainable and healthy for the environment since raising them does not require large amounts of land or other resources.
- FAO is looking at insects as a food source for the future.

WHY NOT EAT INSECTS?

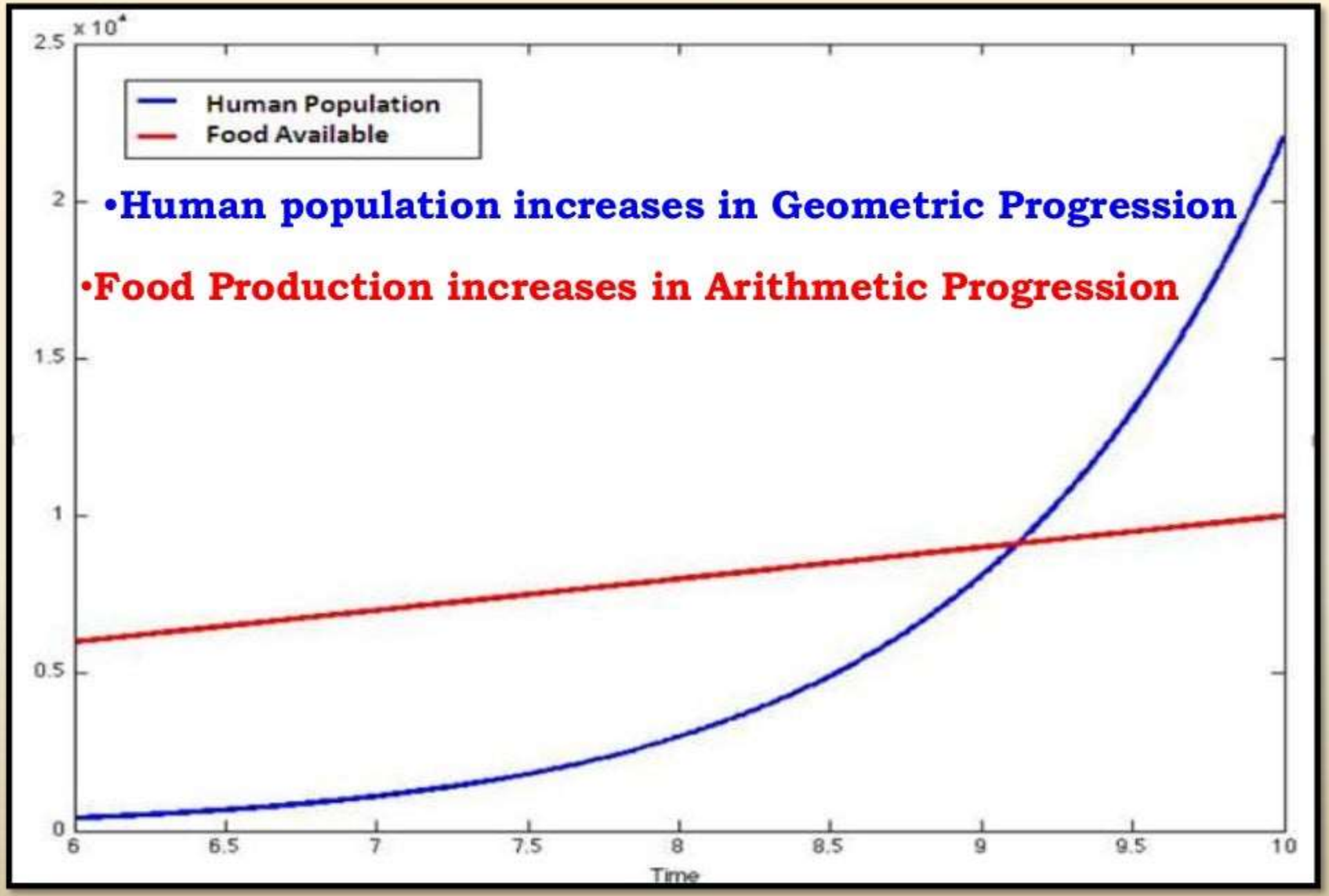
- In many countries, beef, chicken, and fish are not easy to procure .

- Insects are cheap, sustainable, tasty protein source
  - ✓ Lots of vitamins and minerals
  - ✓ Low in fat and cholesterol

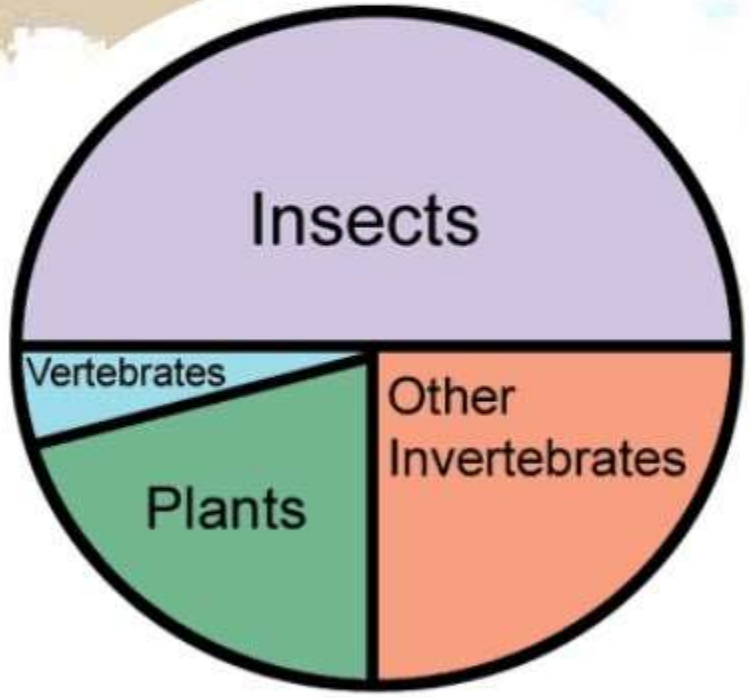
- Many other insect are also eaten
- Lobsters, crabs, and shrimp
  - ✓ Scorpions
  - ✓ Spiders. **(Mary Hall , 2013)**

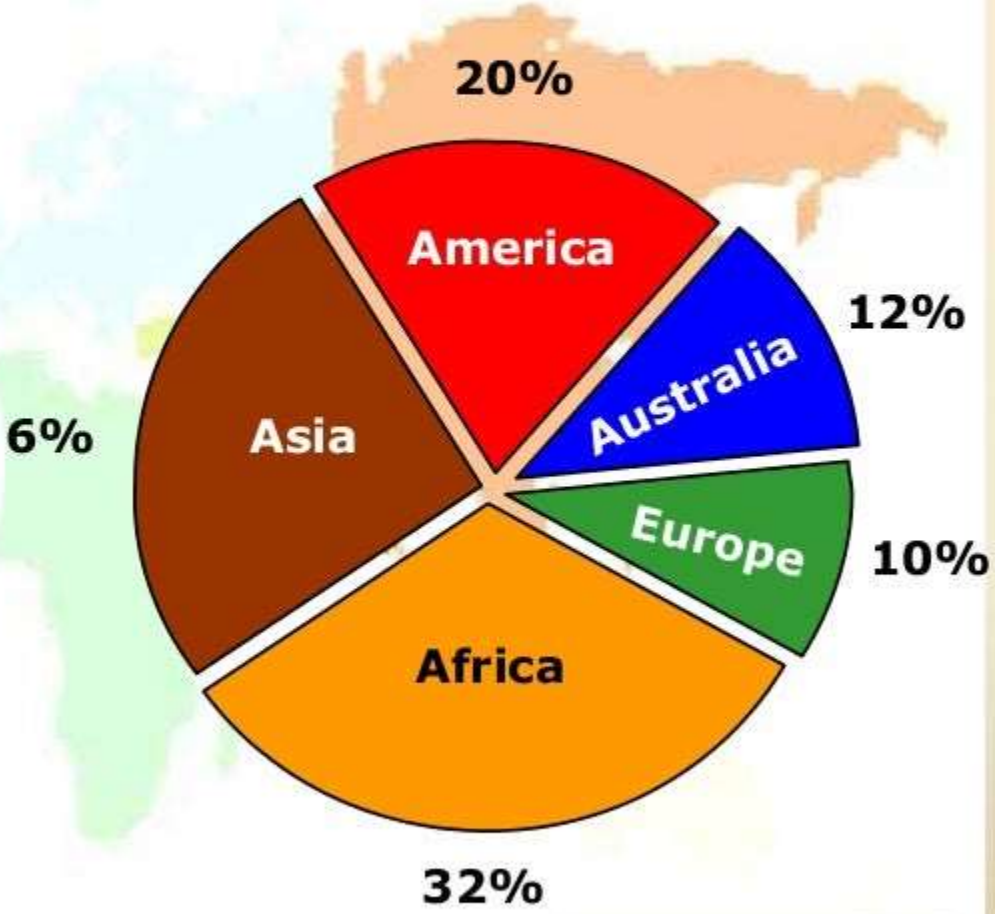
Eat more insects to fight hunger: UN

Human population V/S Food production



Insects population and consumption status in the world





(Ramel, 2010)

Entomophagy

- Is the practice of eating insects - including arachnids (tarantulas) and myriapods (centipedes).The word "entomophagy" derives from the Greek term éntomos, or éntomon, meaning, "insect(ed)," literally meaning "cut in two," referring to an insect's segmented body, and phăgein, "to eat." Combined, the two terms mean, "insect eating.

Commonly Eaten Insects

Grasshoppers

Crickets

Termites

Ants

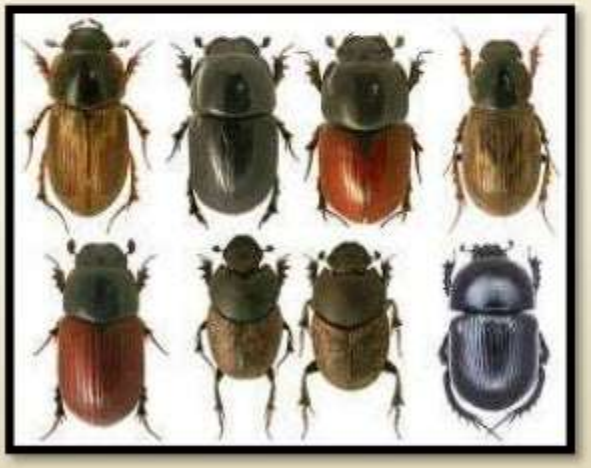
Beetle larvae (grubs)

Moth caterpillar pupa

Butterfly

Cicadas

Wasp



Beetles

Spider

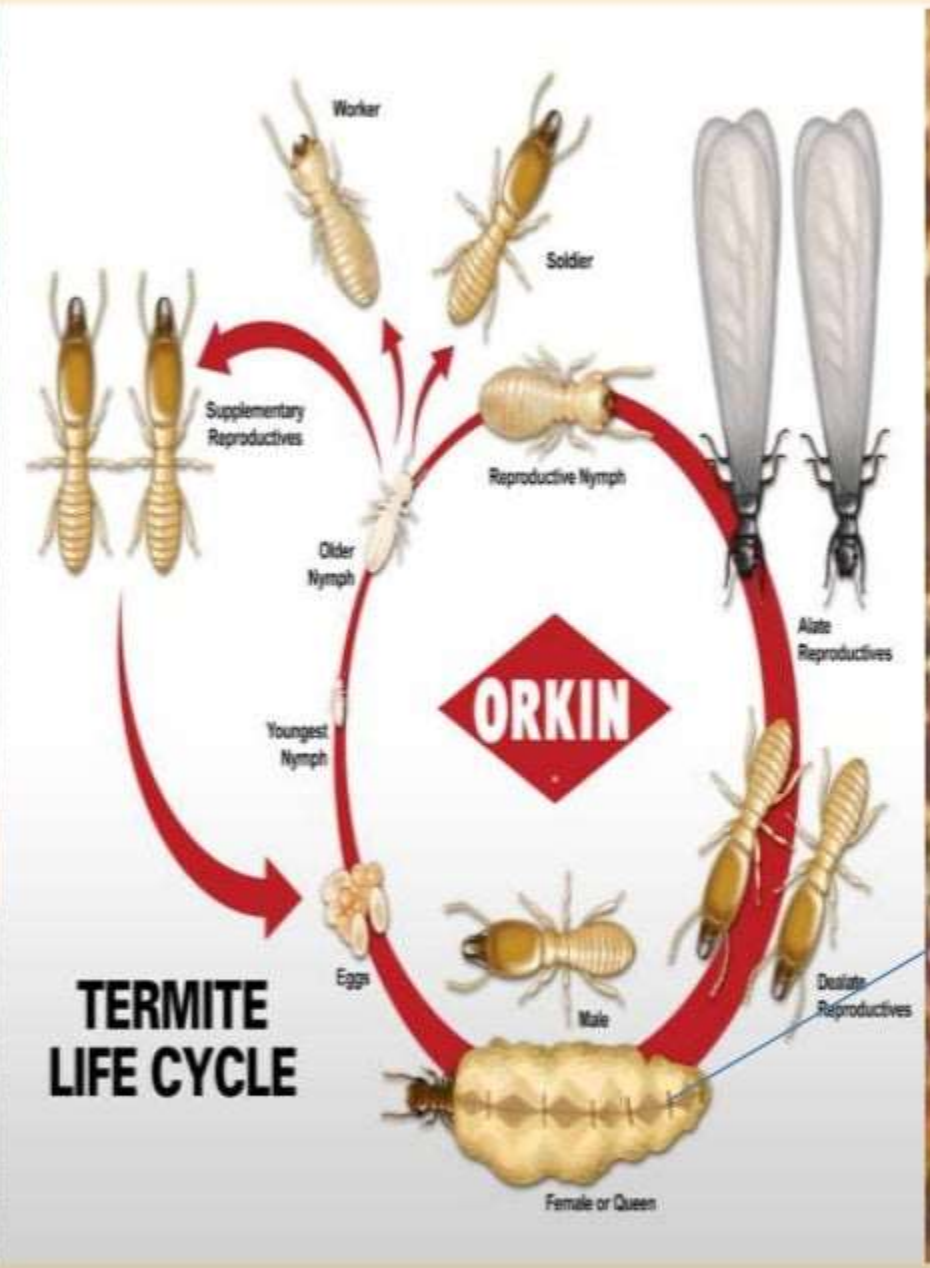
Scorpions

Consumption of Insect in Different Countries

Country	Consumption of Insect
South America	Butterfly ,Grasshoppers, crickets, Cicadas, Ants, Flies, Bees and Wasps.
Colombia	Giant queen ants, Palm grubs and Caterpillars.
Asia	Grasshoppers, Crickets, Silk worm pupa, Dragonflies, Termites, and Beetles .
Thailand	Giant water beetle.
Africa	Caterpillars , Mopane worm, Termites and Locusts.
Pacific Islands	Papua, Palm grubs, Grasshoppers, Crickets, Stick insects, Mantids and Locust.
Australia	Honey ants, Grubs, Moth, Bardi grubs and Cerambycid beetle.
China	Silkworm pupa, Fly larvae, Cricket, Blattaria,Termites and Locusts.
India	Termite, Dragonfly, Grasshopper, Ants,Eri and Mulberry silkworm, Honey bee, Cricket.

Insects Cambridge World History of Food ,Shantibala,2012

Consumption of insect in India

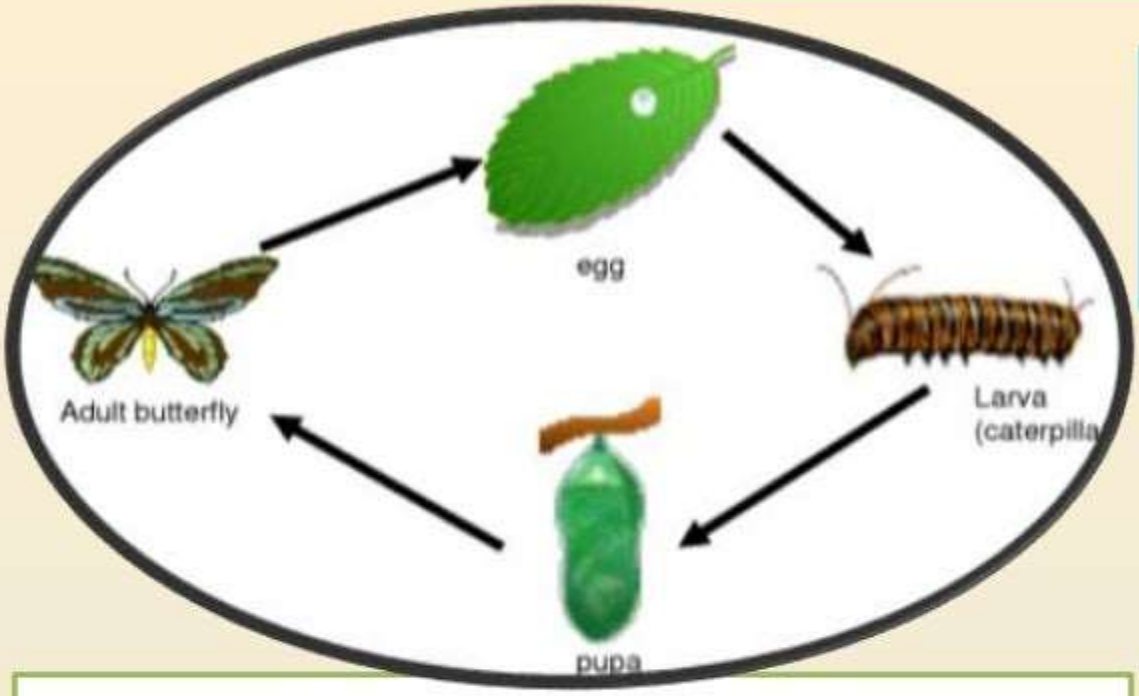


Common edible insects in India

Scientific name	Common name	Order	Edible form
Cybister confuses	Diving beetle	Coleoptera	Roasted fried and curry
Hydrophilus olivaceus Fab.	Water scavenger	Coleoptera	RoastForms of larva and adult
Anoplophora glabripennis Mot.	Asian long horned beetle	Odonata	Roasted and fried forms
Acisoma panorpoides Ram.	Dragonflies	Odonata	Roasted or fried body
Belostoma indica	Giant water bug	Hemiptera	With edible herbs and spices
Oecophylla smaragdina	Red Ant	Hymenoptera	Chatni
Laccotrephes maculatus Fabr.	Nepa	Hemiptera	Fried body
Oxya hyla hyla	Grasshopper	Orthoptera	fried and edible with herbs
Odentotermies sp.	Termite	Isoptera	Consumed live

Shantibala et al , 2012

Types of Insects Eaten



Approximately 1,417 species can be eaten. insects are eaten in their adult or larva stage,

- 234 species of butterflies and moths,
- 344 species of edible beetles,
- 314 species of wasps, ants, and bees are being eaten.
- There are 239 species of grasshoppers, crickets and cockroaches, as well as other insects (Wikipedia).

Silk worm pupa

Protein content of common insects on a dry weight basis

Insects	Protein percentage
Leafhoppers	56.22
Yellow mealworm beetle larvae	47.76
House fly larvae	54.17
House fly pupae	61.54
June beetle larvae	56.22
Honey bee larvae	42.62
Honey bee pupae	55.56
Water boatmen & backswimmers	41.68
Water boatmen adults	49.30
Stink bugs	63.80
Leafcutting ants	53.80
Paper wasp pupae	44.10
Red legged locusts	58.30
Corn earworms	75.30
White agave worms	41.98

De-Foliart, 2008

Nutritional Value of Insects per 100 Grams

Insect	Protein (g)	Fat (g)	CHO (g)	Calcium (mg)	Iron (mg)
Giant water beetle	19.8	8.3	2.1	43.5	13.6
Red ant	13.9	3.5	2.9	47.8	5.7
Silk worm pupae	9.6	5.6	2.3	41.7	1.8
Dung beetle	17.2	4.3	0.2	30.9	7.7
Cricket	12.9	5.5	5.1	**75.8**	9.5
Large grasshopper	14.3	3.3	2.2	27.5	3.0
Small grasshopper	20.6	6.1	3.9	35.2	5.0
June beetle	13.4	1.4	29	22.6	6.0
Caterpillar	28.2	n/a	n/a	n/a	35.5
Termite	14.2	n/a	n/a	n/a	35.5
Weevil	6.7	n/a	n/a	n/a	13.1

<http://www.ent.iastate.edu/Misc/insectnutrition.html> 26 Nov. 2010

Nutritional content of insects compared with beef and fish

Insect and Animal	Energy (Kcal)	Protein (g)	Iron (mg)	Thiamine (mg)	Riboflavin (mg)	Niacin (mg)
Termites *(Macrotermes subhyalinus)*	**613**	14.2	0.75	0.13	1.15	0.95
Caterpillar *(Usata terpsichore)*	370	28.2	35.5	3.67	1.91	5.2
Weevil *(Rhynchophorus phoenicis)*	**562**	6.7	13.1	3.02	2.24	7.8
Beef	219	27.4	3.5	0.09	0.23	6.0
Fish	170	28.5	1.0	0.08	0.11	3.0

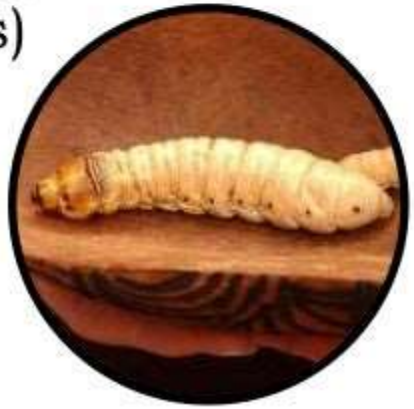
(Finke, 2012),

Widely available insects for home cooking

- Honey bee larvae – excellent suited in butter or deep fat fried. Taste like walnuts, sunflower seeds or rice crispies

- Crickets– *some recipes: tempura* cricket with vegetables, cricket seaweed salad, cricket pot pie, *etc.*

- Wax moth larvae– *thin-skinned,* tender and succulent; best when fried in hot vegetable oil (taste like potato chips or corn puffs)



Fried grasshoppers (*belalang goreng*)

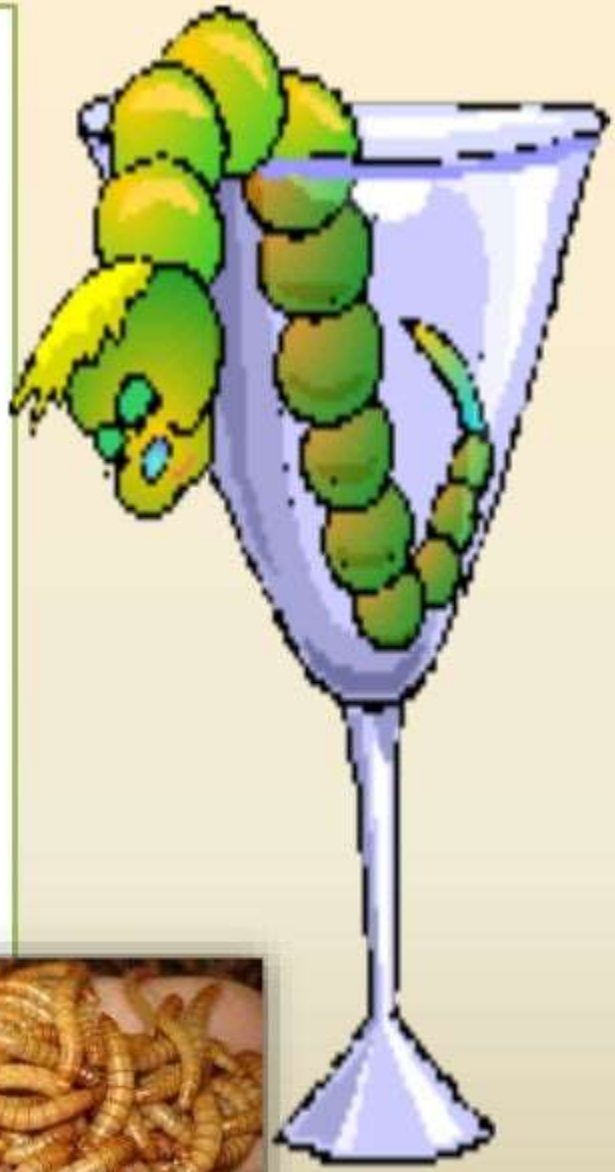
- *Ingredients*
- 2 cups of grasshoppers
- 1 cup of wheat flour,1 egg
- salt, pepper, garlic
- coconut oil or African palm oil

Method

- Soak the grasshoppers in boiling water for one minute and then dry them. Mix and stir the egg, salt, pepper, garlic and add a little water; then dip the grasshoppers individually in the mix and fry them in hot coconut oil. Serve with hot coffee or tea.

Mealworm chocolate chip cookies

1/2 cup butter
1/2 cup brown sugar
1/2 cup white sugar
1 egg
1/2 teaspoon vanilla
1 cup all purpose flour
1/2 teaspoon salt
1/2 teaspoon baking soda
1/2 cup oats
1/2 cup chocolate chips
1/4 cup mealworm flour



Flavours of insects

Insect	Tastes like…
Ants	Sweet, almost nutty
Aquatic insects	Fish
Leaf-footed bugs	Pumpkin
Stinkbugs	Apple
Termites	Nutty
Wasps	Pine nuts
Mealworms	Nutty, whole wheat bread

Insect as therapeutic food

- Low calories and low protein are the main causes of death for approximately 5 million children annually, insect protein formulated into a ready to use therapeutic *Nutriset's Plumpy'Nut* could have potential as a relatively inexpensive solution to malnutrition.

Applications of insect

- Dried and crushed bodies of the female cochineal insect are used to add color to foods (youso).
- This red, pink, and purple color is used to color ice cream, yogurts, fruit juices, candies and more (youso).

Cochineal Insects On Prickly Pear

shellac insect

- Shellac insect used in confectioner's glaze, resinous glaze, pure food glaze and natural glaze. This product is used in many candies to make them shiny and keep them from sticking together (Youso).
- It's also used to make fruit, such as apples, shiny again once it has been cleaned (Youso).

Insect commodities sold in the market

Cricket

Tequila flavoured candy with worm

Silk worms

Giant water beetle

Fried grasshoppers, wrapped in fresh tortillas.

Insects food stall in Bangkok, Thailand

Nutritional Value of selected Insect serving size

Crickets
Serving size: 100g

Amount Per Serving

Calories 122
Total Fat 5.5g
Phosphorus 185mg
Iron 10mg
Calcium 76mg
Carbohydrate 5.1g
Protein 12.9g

Nutrition Facts
Giant water bugs
Serving size: 100g

Amount Per Serving

Calories 62
Total Fat 8.3g
Phosphorus 226mg
Iron 14mg
Calcium 44mg
Carbohydrate 2.1g
Protein 19.8g

Red ant eggs
Serving size: 100g

Amount Per Serving

Calories 83
Total Fat 3.2g
Phosphorus 113mg
Iron 4mg
Calcium 8mg
Carbohydrate 6.5g
Protein 7g

Small grasshoppers
Serving size: 100g

Amount Per Serving

Calories 153
Total Fat 6.1g
Phosphorus 238mg
Iron 5mg
Calcium 35mg
Carbohydrate 3.9g
Protein 20.6g

Silkworms

Cicadas

Grosshoppers

Mole crickets

Preserved weaver ants

ADVANTAGES

- Insects provide high-quality protein and nutrients compared with meat and fish.
- Insects are particularly important as a food supplement for undernourished children because most insect species are high in fatty acids (comparable with fish).
- They are also rich in micronutrients.
- Insects pose a low risk of transmitting zoonotic diseases
- New efforts and standards are required to assure nutritional quality and safety of insect foods.

DISADVANTAGES

- Pesticide use can make insects unsuitable for human consumption
- Herbicides can accumulate in insects through bioaccumulation
- Cases of lead poisoning after consumption of chapulines were reported by the California Department of Health Services in November 2003
- Adverse allergic reactions are also a possible hazard

CONCLUSION

- Insects hold potential as a safe, nutritious, flexible and reliable protein source for the future.
- Insect consumption as an alternative source of food as increasing in worldwide.
- Edible insects are rich in protein and amino acid, especially essential amino acids for the human body.
- They are rich in fatty acid, nutritive elements, vitamins and carbohydrates compared to animal products.
- Insects also have a high feed conversion ratio: on average insects use 2 kg of feed to produce 1 kg of meat compared to cattle that require 8 kg for every 1 kg of meat produced.

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