

OBJECTIVES

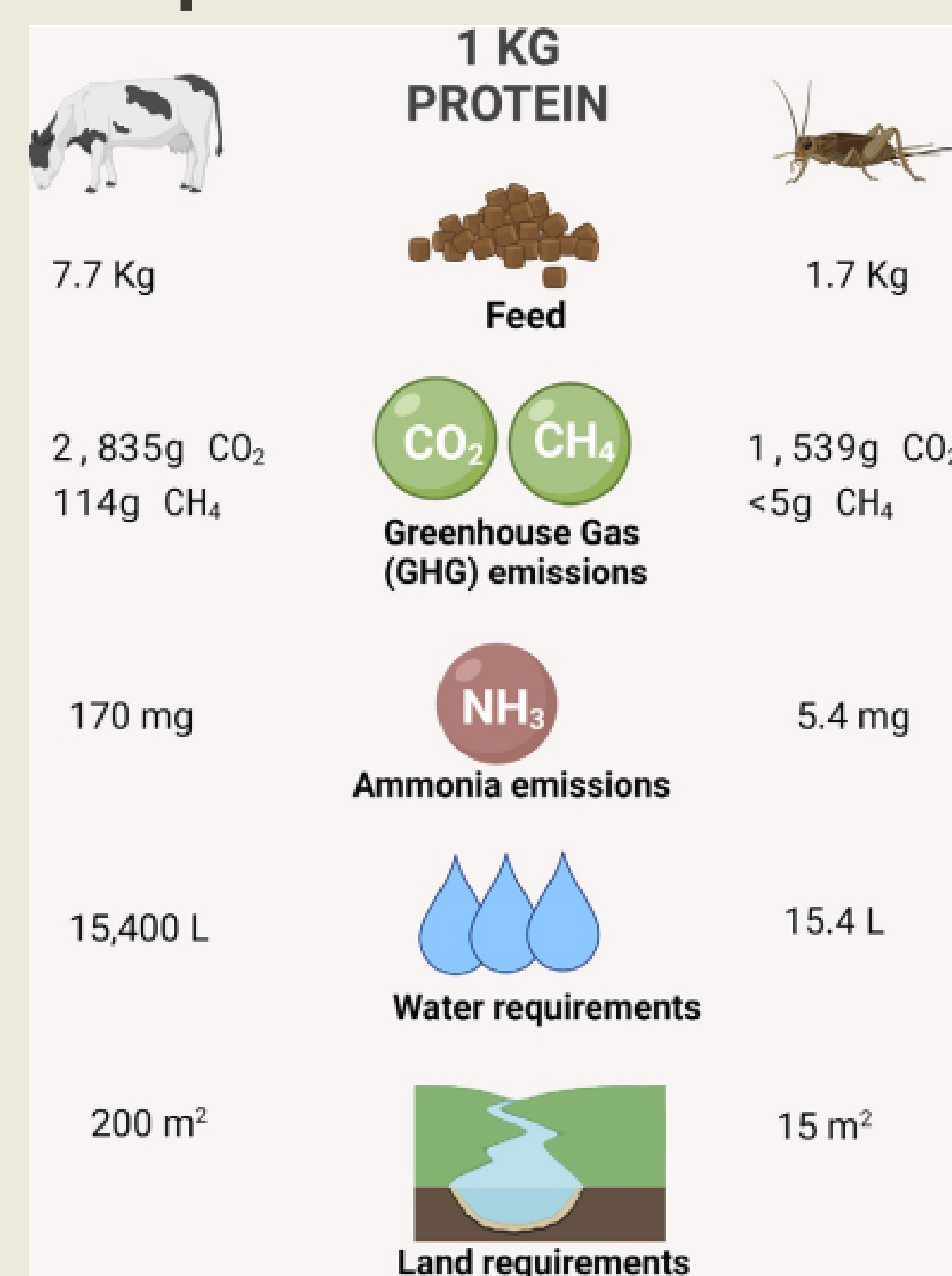
- If insects could be an alternative source of proteins
- What are the main insects for human consumption
- Know the nutritional value of edible insects
- Know the characteristics and applications of insects proteins
- Research about the processing methods most used in the insect industry

Entomophagy as an alternative of the future

Entomophagy is the term used to describe the process of ingesting insects as a food.

The approach to the consumption of insects is born from the need to seek a more sustainable source of protein by reducing livestock production and guaranteeing at the same time a diet rich in proteins.

Comparison of insect production with current protein sources



Safety and risks

Nutritional risks

Insects can present allergenic risks due to tropomyosin, a myofibrillar protein. Expected reaction in people allergic to crustaceans.

Biological risks

Insects can be carriers of microorganisms harmful to health. Such as: bacteria, virus, fungi and parasites.

Chemicals risks

Insects raised in agriculture can be exposed to mycotoxins, pesticides and other hazards such as toxic metals and dioxins.

Nutritional value of the main edible insects

Insect order	Example	% Protein	% Fat	% Fiber	Number of species consumed in the world
Blattoidea	Cockroaches, termites	35,3	29,9	5,3	96
Coleoptera	Larvae, beetle	40,7	33,4	10,7	659
Diptera	Flies	49,5	22,8	13,6	37
Hemiptera	Cicadas	48,3	30,3	12,4	237
Hymenoptera	Bees, wasps, ants	46,5	25,1	5,7	321
Lepidoptera	Butterflies	45,4	27,7	6,6	361
Odonates	Dragonflies	55,2	19,8	11,8	61
Orthopterans	Lobsters, crickets	61,3	13,4	9,6	278

It's difficult to generalize the nutritional value of insects. Because the nutritional composition varies according to the species, sex, the stage of development (eggs, larvae, pupae or adults), the origin, the feeding of the insect and the environment.

The protein content in the dry matter of insects ranges from 7 to 91%, although that most species contain 60% on average.

Comparison of protein content between insects and current protein sources

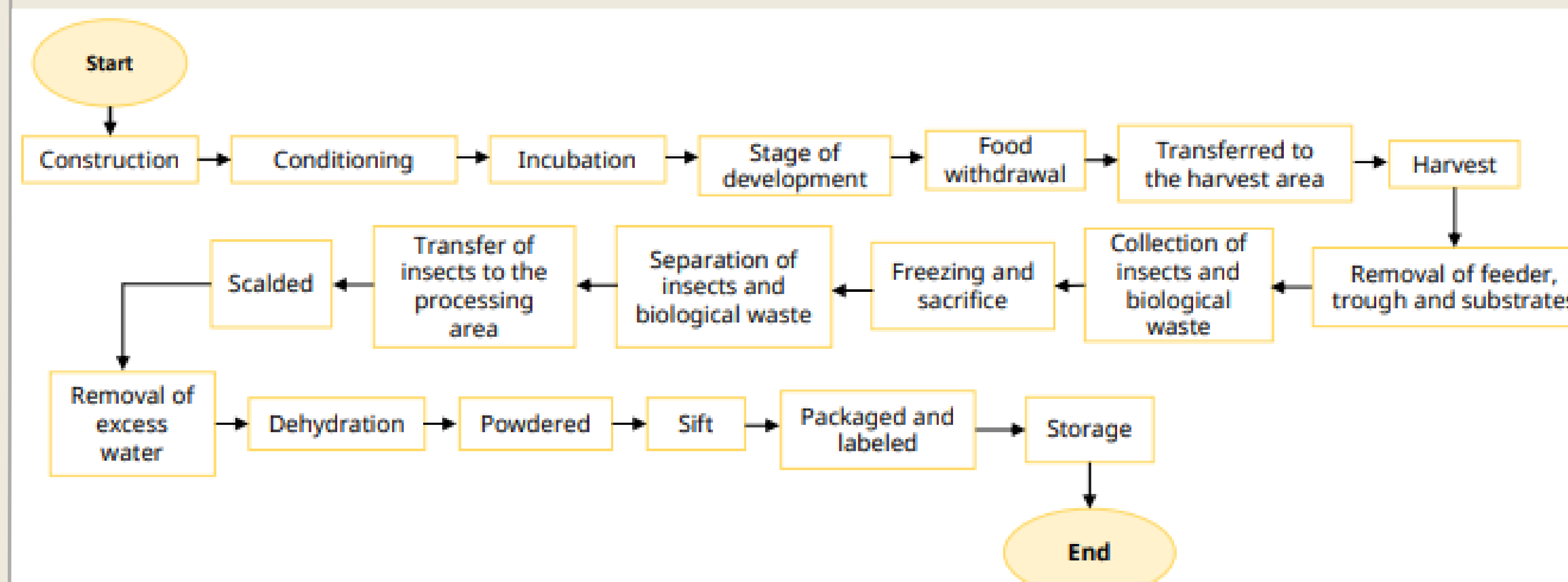
Nutrient	Psalm	Chicken	Beef	Pig	Crickets	Yellow mealworms
Protein	22,2%	22,2%	22,5%	21,0%	21,3%	20,3%
Fat	4,7%	2,6%	8,7%	2,2%	7,3%	13,8%
Carbohydrates	0,0%	0,0%	0,0%	0,0%	4,1%	3,1%
Fiber	0,0%	0,0%	0,0%	0,0%	3,2%	1,7%

Edible insects are a nutritious source of proteins, lipids and fiber. It must be taken into account that the protein content will vary according to the species and its life cycle stage.

Processing of edible insects

The ideal temperature for proper growth is between 20 to 35°C.

The euthanasia of insects is carried out by lowering the temperature (freezing for 24h at -18°C) or heating (scalded for 4 to 7 min, at 80-100°C).



It has been used for the main edible insects, the domestic cricket (*Acheta domestica*) and the flour worm (*Tenebrio monitor*).

Edible insect preparations: Insects dust

For the sacrifice a freezing process is recommended for one hour. Afterwards, they are placed in water boiling (95-100°C) to reduce the microbial load and eliminate possible pathogens. After blanching, the excess water is removed with a strainer to speed up the process dehydration.

In the last stages, most of the dry crickets are made to facilitate a homogeneous powder.

Other methods

Protein extraction

Insect proteins can be extracted using water, organic solvents and enzymes. Protein extraction gives the possibility of using them as an ingredient.

Enzymatic Hydrolysis

It has been used for the modification of proteins, to facilitate their acceptance as an ingredient in food and to improve functional properties. Also, it can reduce the potential allergenic.

Fermentation of edible insects

The fermentation of certain insects shows a longer useful life, improved nutrition, improved taste and reduced risk of microbial contamination.

Chitin extraction

Chitin extraction involves five steps: defatted, demineralized, decolorized, deproteinized and deacetylated.

CONCLUSIONS

- Insects are a good alternative source of protein.
- They have health benefits thanks to their nutritional composition.
- As a difficulty for the consumption of insects there is a low level of social acceptance for the western culture.
- Interest is shown in new food products as an ingredient in an unrecognizable way.
- There is a growing demand in the field of research on edible insects.
- Now it is in our hands to accept this new food product.