Bio-Manufacturing Applications for Insect Diets

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Introduction and Rationale

Years ago, Ken Hagen found that a fermented dairy product called Wheast was an excellent nutrient for predators. We undertook this project to develop a series of insect diet components that were improved by fermentation.

Rationale for fermentation

- Removal of anti-nutrients such as lactose, phytic acid, and protease inhibitors
- Addition of nutrients such as yeast proteins, yeast lipids, vitamins
- Enhancement of minerals by formation of organic species such as L-(+)-Selenomethionine and amino acid chelates of minerals
- Increase nutritional value of diet components of lesser costs and lower nutritional values
- Increase bioavailability of nutrients
- Improve diet textures
- Improve stability

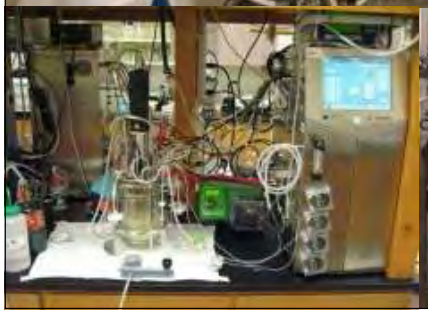
Novel approaches to diet components: fermentation/bio-processing

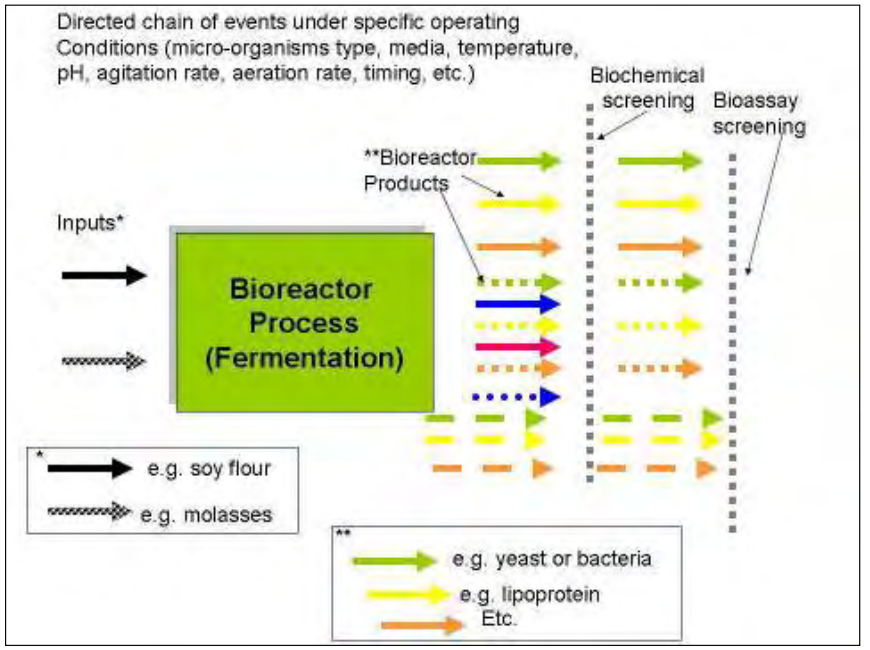
- Fermentation has been used extensively in human foods (soy products, alcoholic beverages, pickles, sour kraut, olives, etc.)
- Fermentation adds nutritional value to foods
- Fermentation removes anti-nutrients (phytic acid, protease inhibitors, amylase inhibitors, lectins, etc.)
- Fermentation products (except for brewers and torula yeast) have been somewhat limited in insect diets

Left: A 300 liter bio-reactor being used for whey fermentation

Below left: a 3 liter bioreactor
Below right: a 30 liter bio-reactor

Dr. José Bruno-Bárcena

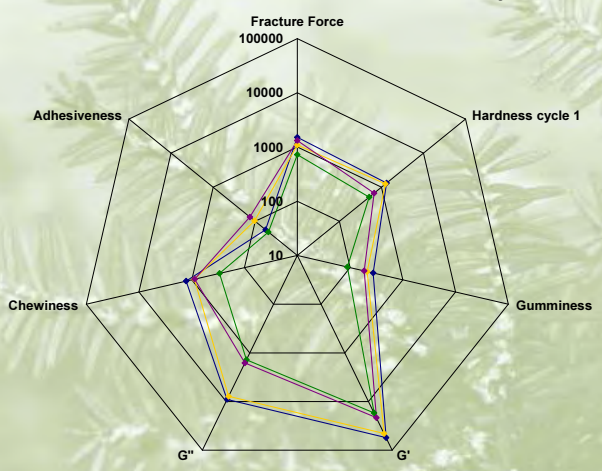




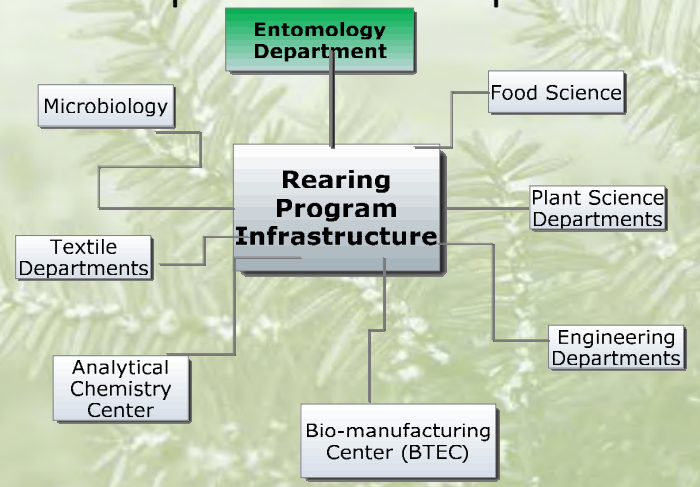
The Next Slide Is an Example of How Our Rearing Program Integrates Multiple Disciplines:

- Entomology (Diets/rearing)
- QC/Industrial & Systems Engineering
- Food Science (Rheology)
- Bio-Manufacturing (BTEC)
- Analytical Chemistry

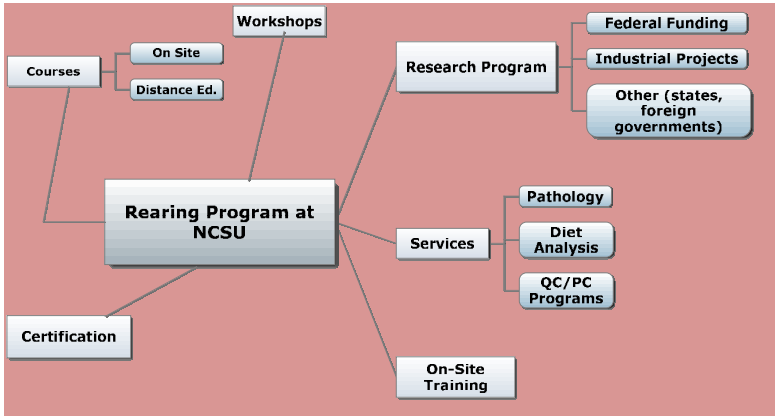
Texture analysis & quality control of bio-manufactured diet components



Insect Rearing Program at NCSU: Partnerships with these Departments



Infrastructure of New Rearing Program at NCSU



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