

## Artificial Diet for Mass Production of Predators and Their Effect on Fitness Parameters

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### Summary

There is an increasing demand on utilizing the natural enemies for insect pest management but availability of these natural enemies is far from sufficient. The foundation of biological control is the release and mass production of natural enemies which is a very complex process. In natural system, target host or prey reared on its host plant is used as food for rearing the beneficial insects, which is very time consuming and expensive. Hence developing the artificial diet is considered as a requirement for the successful and inexpensive biological control. Use of artificial diet reduces the complexity of the agricultural system to manageable level by eliminating the rearing of host species. But to date their success is very low because of non-availability of rigorous diet evaluation. One of the major drawbacks for culturing natural enemies on artificial diet is the high chances of microbial and chemical spoilage. Hence proper evaluation and management system should be developed to use artificial diet to enhance the availability and quality of natural enemies.

### Introduction

Biological control is the major component of pest management programs for managing the pests by the action of other living organisms such as predators, parasitoid, entomopathogenic nematodes, fungi, *Bt* and Baculovirus. Owing to the non-chemical and environmentally safe nature of these agents their demand is increasing day by day yet their availability is far from sufficient. The natural enemies, particularly predators and parasitoids, cannot be store for a longer period and also have very short life span. Of late, few discoveries for the automation in the production of bio control agents at large scale have removed several bottlenecks for their economic and efficient production. The foundation of bio-control is the production and release of natural enemies' at large scale, which is a complex process. In natural system, target host or prey reared on its host plant is used as food for rearing the beneficial insects, which is very time consuming and expensive. Hence

developing the artificial diet is considered as a requirement for the successful and inexpensive biological control. Artificial diets play a critical role in advancing the mass production and commercialization of natural enemies. It intends to obliterate the need to rear host species and hence reduces the system complexity to a manageable level. But to date their success is very low because of non-availability of rigorous diet evaluation.

### **Factors to be considered while formulating the artificial diet for natural enemies**

- ✚ **Attractiveness of the Diet:-** The texture of artificial diet should resemble the actual texture of prey/host. It should have proper chemical stimulants or attractants for incitation of feeding response in the natural enemies. Insect components from its prey can also be added to increase its attractiveness towards predators.
- ✚ **Essential Nutrients:** - The predator feeds on a diversity of prey species in its life period to obtain the required essential nutrient. Hence, the diet should provide all the nutrients such as carbohydrates, protein, vitamins, cholesterol, and minerals in optimum amounts to allow complete development and reproduction.
- ✚ **Easy Food Mix:** - It is easier to have an artificial diet from the supermarket as a ready to use formulation because many artificial diets are required to mix with ground extract of prey, wherein the rearing of the insect is required.
- ✚ **Rearing Setup:** - The rearing area should be free from any microbial contaminants to avoid the spoilage. The adequate size of container used for rearing the natural enemies should be used to avoid overcrowding and cannibalism. For example, spiders are reared in single confinement to circumvent cannibalism. The material used should provide adequate ventilation and should be non-toxic to natural enemies.
- ✚ **Economics of Production:-** Production must be inexpensive for it to be an intrinsic part of the pest management program. The right constituent, in the right amount and taking account of all the possible interactions among the constituent is the prime requisite for developing a cost-effective diet.

### **Challenges for the Practical Use of Artificial Diets**

One of the major drawbacks for culturing natural enemies on artificial diet is the high chances of microbial and chemical spoilage. Particularly, the feeding by bugs leads to increase in the spoilage because of contamination by extra-oral digestion. The problem can be solved by sterilizing the diet or by incorporating antimicrobials and antioxidants.

### Future Research

The major modification is required in the current criteria used to measure the effectiveness of artificial diet. Present criteria are based on different life parameters such as survival of the larvae, development time, body size, adult emergence, sex ratio, adult longevity etc. The important parameters that are being overlooked is the predatory potential. Rearing the natural enemies on artificial diet for a longer time may results in reducing the capacity of natural enemies to capture, locate or kill the target host. So, these parameters should be considered as a rational estimate of artificial diet success.

### Suggested Readings:

- Cohen A C(1999) Artificial media for rearing entomophages comprising sticky, cooked whole egg.US Patent 5945271.
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