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Rearing Techniques of Diamondback Moth (DBM) *Plutella xylostella* (Linnaeus)

S. Ramesh[1], M. N. Rudra Gouda[1] and Archana Anokhe[2]
[1]Ph.D. Scholar, Division of Entomology, ICAR-IARI, New Delhi
[2]Scientist, Division of Entomology, ICAR-IARI, New Delhi

SUMMARY

Insect rearing is pivotal to many areas of entomological research leading to successful production of beneficial insects and their products, and also in insect pest management.Rearing of insects on their natural hosts is time consuming due to regular change of plant material and also involves more manpower.Not only a lot of plant material is wasted but also frequent handling of the culture results in high mortality of the insects. These drawbacks have led to evolve artificial diets.

INTRODUCTION

Rearing of insects on their natural hosts under laboratory is time consuming due to regular change of plant material and also involves more manpower.Rearing of insects in the laboratory on artificial foods, thereby avoiding the often-costly effort necessary to maintain natural foods.The term artificial diet (AD), when applied to insects, is one that has been defined as anydiet that is not the natural food of the insect Vanderzant., 1966.

Importance of insect artificial diet:

Insects are reared in the laboratory for various purposes. They may be reared either on their natural food or artificial diets. Developing artificial diets may be difficult and time consuming but once optimized, artificial diets usually are simple to prepare and easy to use. Because they are processed from commercial ingredients, they are available year-round and generally cost-effective. With proper quality control procedures, it is possible to rear high-quality insects on artificial diets which are comparable and sometimes superior to those raised on their natural food. To date, a large number of artificial diets have been developed and many species are being reared successfully on these diets.

This name encompasses all thevarious terms such as synthetic, chemically defined, purified, holidic, meridic, andoligidic that are used to describe insect diets. Diets are used for studying nutrition, testing compounds for physiological effects,maintaining colonies, and mass-producing insects for various purposes.

Artificial diets can beclassified in three general types:

1. Holidic diets: The holidic diet as defined by Dougherty.,1959. Diets in which the ingredients can be represented by chemical formula are known as chemically defined diets or holidic diets. This diet consists of entirely of known pure chemicals.Contaminants are commonly present in many of the components, such as agar used in the diet. Perhaps the amino acid diet may be regarded as one of the holidic diets. The holidic diets are most desirable for critical nutritional studies.

2. Meridicdiets: Diets containing one or more unrefined plant or animal substance (plant tissue, liver powder or extracts, yeast, wheat germ) are called as meridic diets or semi-synthetic diets. The main characteristic of these diets is that mostof the nutrients are provided as pure or refined substances also. The largest numberof diets for the laboratory rearing of insects.

3. Oligidicdiets: Diets made up of crude materials. They are designed to imitate the natural food,or they were composed of substances known to have a high nutrient content.and are assumed to have all the required nutrients with undigestible inert material. The diets are economical and can be used for mass rearing.

Development of insect artificial diet:

The first artificial diet for insect was developed byE. Bogdanow in 1908, for rearing of blue bottle fly, *Calliphoravonitoria*, from egg to adult on a diet ofmeat extract, starch, peptone and mineral salts.(Thompson and Simpson.,2009).

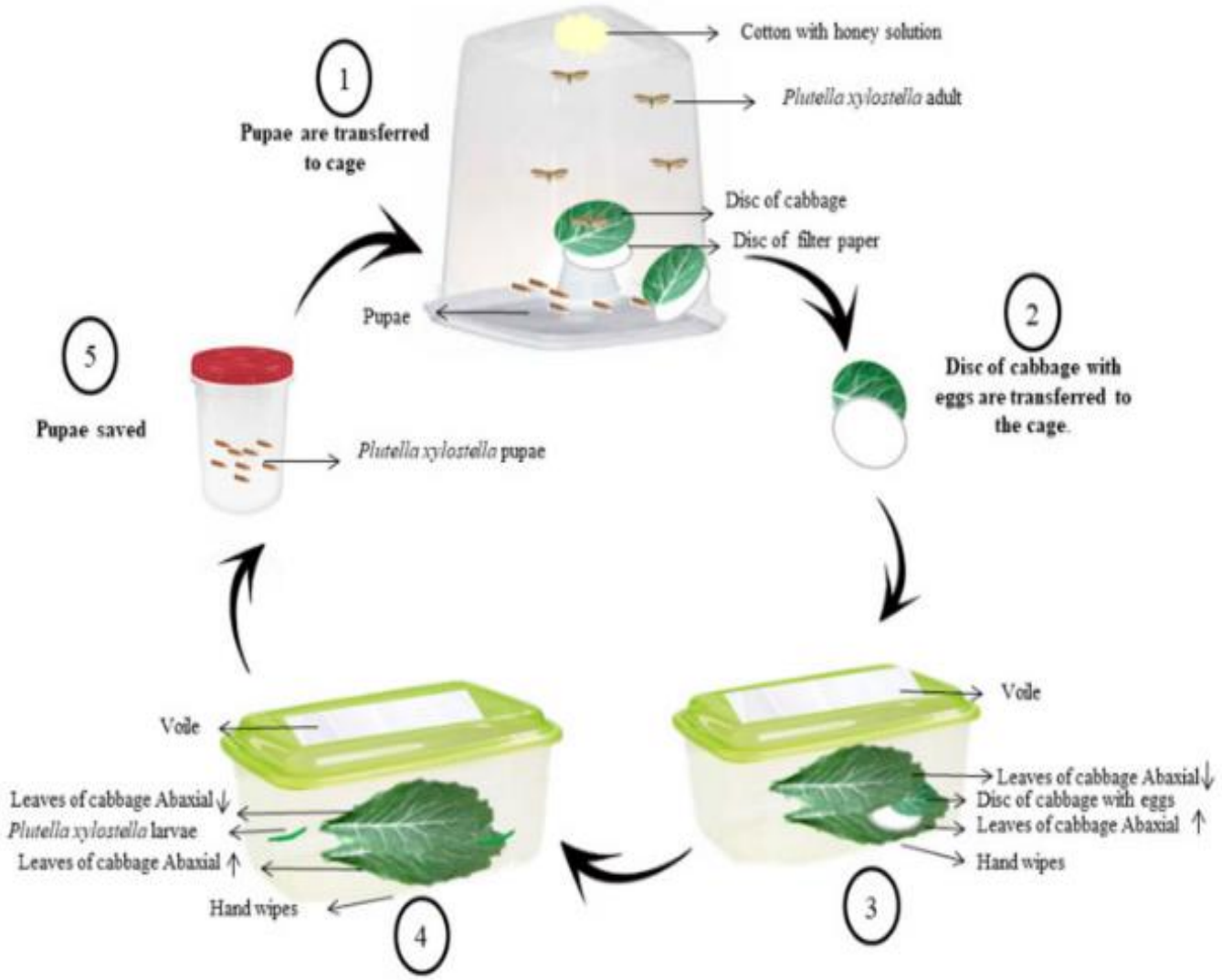
Bottger (1942) and Beck *et al.* (1949) developed diets using highly purified natural products for the European corn borer, *Ostrinianubilalis*. These two works present the beginning of the development of modern artificial diets for phytophagous insects.

Rearing techniques of Diamondback moth (DBM) *Plutellaxylostella* (Linnaeus):

The diamondback moth (DBM), *Plutellaxylostella* (L) (Lepidoptera: Plutellidae), is a serious pest of cruciferous crops worldwide, In India, diamondback moth has national importance on cabbage as it causes 50-80% annual loss in the marketable yield also reported that there is 52% loss in yield due to the attack of diamondback moth(Ayalew G.2006). Rearing of diamondback moth canbe carried by following methods

1. Conventional laboratory rearing: rearing on live plants such as seedlings or leaves of cruciferous crops.
2.Rearing on artificial diet

1. **Rearing on natural hosts:**Individuals were maintained under constant temperature (25 ± 2 °C), relative humidity (55% ± 5%) and photoperiod (12 h). The pupae were placed in a transparent plastic cage (9-cm-long × 19-cm-wide × 19-cm-high) until the adults emerged, which were fed with a 10% honey solution. Cabbage leaf discs, manually cut to 8 cm in diameter, were placed on a paper filter and used as an oviposition substrate. These discs were replaced daily, and the eggs were transferred to sterile plastic pots measuring 30-cm-long × 15-cm-wide × 12-cm-high. After hatching, the larvae remained in these containers until they reached the pupal stage. The feeding substrate of the larvae was composed of organic cabbage leaves (B. oleracea var. acephala) cleaned with 5% sodium hypochlorite solution and later washed in running water. The cabbage leaves were arranged with the adaxial face facing the plastic container and the abaxial face free. The larvae were placed on them, and then, another leaf of cabbage was placed with the abaxial side facing the larvae. This procedure was performed daily, always keeping the leaves higher, and was repeated until the pupae were formed.



A schematic representation of the methodology used for rearing *Plutellia xylostella*

2. Rearing on artificial diet: Preparation of artificial was formulated based on Biever and Boldt diet (Perera *et al.* 2015).

Table:1 Ingredient levels for one kg of diet formulation:

Ingredient	Artificial Diet	Ingredient	Artificial Diet	Ingredient	Artificial Diet
Agar	23.0 g	Cholinechloride	10.0 g	Linseedoil	12.0 ml
Alphacel	5.0 g	Sucrose	35.0 g	Formaldehyde	0.5 ml
Ascorbicacid	4.0 ml	Wessonssalt	10.0 g	VitaminB	1.0 g
Aureomycin	1.5 g	Wheatgerm	30.0 g	Water	814.0 ml
Cabbage(dry)	12.5 g	MethylP	1.5 g		
Casein	35.0 g	KOH	5.0 ml		

The ingredients were weighed separately. Dry ingredients were mixed with hot water (70 °C) in a blender. Agar was dissolved in a beaker at 80 °C, cooled to 70 °C and added to the mixture in a blender. Cabbage leaf powder and the heated wheat germ were mixed thoroughly. Sucrose, casein and Wesson's salt mixture were added to the melted agar solution, and the resulting solution was poured together with the solid mixture into a blender. Then, aureomycin, ascorbic acid and vitamin B were added immediately. The whole mixture was ground thoroughly in the blender for 1-2 min enabling it to be dispensed. The leaf powder is usually prepared from fresh cabbage leaves by drying at 60 °C for 24 h and then grinding in a blender, and the powder is then screened through a 100-mesh sieve before storing at low temperature. The prepared diets were dispensed into autoclaved Petri dishes.

The diets were cut into pieces of one cubic centimetre and one cube of each diet was placed in a sterilized Petri dish individually, where ten 2^{nd} instars (three-four day old) DBM larvae were placed. The diet cubes were replaced at regular intervals.

Insects are reared in the laboratory for various purposes. They may be reared either on their natural food or artificial diets. Developing artificial diets may be difficult and time consuming but once optimized, artificial diets usually are simple to prepare and easy to use. Because they are processed from commercial ingredients, they are available year-round and generally cost-effective. With proper quality control procedures, it is possible to rear high-quality insects on artificial diets which are comparable and sometimes superior to those raised on their natural food. To date, a large number of artificial diets have been developed and many species are being reared successfully on these diets.

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