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Wilkinson: The David-Gardiner Method of Feeding Lepidopterous Larvae on a Se

THE DAVID-GARDINER METHOD OF FEEDING LEPIDOPTEROUS LARVAE ON A SEMI-SYNTHETIC DIET

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One of the most interesting entomological developments in recent years has been the introduction of semi-synthetic diets for feeding lepidopterous larvae. Vanderzant and Reiser (1956a, 1956b) reared pink bollworms (*Pectinophora gossypiella*) on such a medium. The medium was subsequently modified by Ignoffo (1963), who experimented with mass-rearing of the cabbage looper (*Trichoplusia ni*), and by others. The method showing the most spectacular results is that of David and Gardiner (1965), which, since its publication, has been proven suitable for a number of species with diverse feeding habits. Although not a universal pabulum for larvae, the David-Gardiner formula deserves to be better known in America as it solves two of the problems encountered in rearing many larvae; *viz.*, it provides (1) a readily available food which may be (2) sterilized to eliminate disease.

The announcement of the formula mentioned only its use in rearing larvae of *Pieris brassicae*, but Dr. B.O.C. Gardiner (personal communication) has shown that a number of other species may feed successfully on his "artificial leaves." One must admit that a formula on which *Philosamia ricini*, *Arctia caja*, *Pieris brassicae*, *P. napi*, *P. rapae*, *Panaxia dominula*, *Vanessa atalanta*, and even the orthopteran *Carausius morosis* (a privet-feeder) may all be reared surely has even wider potentiality of which amateur breeders could well take advantage. The method may solve the problem of rearing larvae when the foodplant is unknown, not indigenous, or (as is more common) not readily available. Plans are being laid by a private concern to market the formula, but meanwhile Dr. Gardiner has kindly given permission to communicate it to *The Michigan Entomologist* so that it may be of use in the coming season. Some skill in laboratory techniques is necessary in its preparation, but this should not deter the "home experimenter" who may wish to try a simpler adaptation.

FORMULA

(a)	Distilled water	110 ml
	Potassium hydroxide, 4 molar	1.8 ml
	Casein (light white soluble)	12.6 g
(b)	Sucrose	12.6 g
	Wheat germ	10.8 g
	Cabbage (dried powder, see Note 1 below)	5.4 g
	Salt mixture (see Note 2 below)	3.6 g
	Cellulose powder, Whatman Chromedia, CF11 grade	1.8 g

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(c)	Choline chloride (10% w/v solution)	3.6 ml
	Methyl parahydroxybenzoate (15% w/v in 95% ethanol)	3.6 ml
	Formaldehyde solution (10% w/v solution)	1.5 ml
	Vitamin stock (see Note 3 below)	0.8 ml
(d)	Distilled water	200 ml
	Agar (fine Japanese powder)	9 g
(e)	L-Ascorbic acid	1.5 g
	Aureomycin (veterinary grade)	0.8 g

NOTES

(1) The cabbage leaves are prepared by drying in thin layers in a ventilated oven at 105° C. for 15-20 minutes. They may then be ground by hand and passed through a 60-mesh sieve, or ground in a Christy-Norris mill fitted with an 0.5 mm mesh screen.

(2) The salt mixture is composed in grams as follows: $CaCO_3$, 120; K_2HPO_4, 129; $CaHPO_4 \cdot 2H_2O$, 30; $MgSO_4 \cdot 7H_2O$, 40.8; NaCl, 67; KI, 0.32; $FeC_6H_5O_7 \cdot 6H_2O$, 11; $MnSO_4 \cdot 4H_2O$, 2.0; $ZnCl_2$, 0.10; $CuSO_4 \cdot 5H_2O$, 0.12.

(3) The vitamin mixture is composed in mg as follows: nicotinic acid, 600; calcium pantothenate, 600; riboflavin (B_2), 300; thiamine hydrochloride (B_1), 150; pyridoxine hydrochloride (B_6), 150; folic acid, 150; D-biotin, 12; cyano-cobalamine (B_{12}), 1.2; 100 ml water.

PROCEDURE

David and Gardiner (1965) may be quoted for the precise method of combination: "The ingredients listed in (a) are placed in a blender with a capacity of 800 ml. and thoroughly mixed together. The mixed solids (b) are then added with further blending. The solutions (c) are next added, separately, while the blender is running. Meanwhile, the agar solution (d) has been prepared in a water bath. It is cooled to 70° C. and added to the mixture. Finally, the ingredients (e) are added and the whole medium is thoroughly blended." The original directions for feeding may also be followed, as they have continued to be successful, but the jars may be replaced with locally available wide-mouthed bottles of a comparable size: "The warm medium was poured into sterilized 1 lb. jam jars to a depth of about 0.5 in. and while still warm each jar was tipped and twisted so as to coat some of the sides. As soon as the medium was cool the jars were turned upside down to prevent unnecessary contamination. They can be conveniently stored at about 12° C. After the larvae were introduced the jars were kept on their sides so that comparatively little frass fell on the medium. Whatman No. 1 filter paper was first used to close the jars as this reduced evaporation and prevented the medium drying out too rapidly, but when the larvae reached the fifth instar the paper was changed for a piece of . . . gauze as more ventilation was now necessary to prevent conditions in the jars becoming too humid and sticky. About 15 fifth instar

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larvae can be kept in a jar and of course more younger larvae."

It will be recalled that the larvae described are those of *Pieris brassicae*, as it would hardly do to keep 15 fifth instar saturniid larvae in a jar of the described size. For extremely small larvae, the authors recommend specimen tubes, and in all cases suggest that the medium be renewed weekly; the paper on *brassicae* may be consulted for further details. Dr. Gardiner has recently informed me by letter that the food should be successful on all normally polyphytophagous arctiids, noctuids, and others if suitable feeding stimulants are added.

LITERATURE CITED

David, W.A.L. and B.O.C. Gardiner. 1965. Rearing *Pieris brassicae* L. larvae on a semi-synthetic diet. Nature 207:882-883.

Ignoffo, C.M. 1963. A successful technique for mass-rearing cabbage loopers on a semisynthetic diet. Ann. Entomol. Soc. Amer. 56: 178-182.

Vanderzant, E.S. and R. Reiser. 1956a. Aseptic rearing of the pink bollworm on synthetic media. J. Econ. Entomol. 49:7-10.

_____. 1956b. Studies of the nutrition of the pink bollworm using purified casein media. J. Econ. Entomol. 49:454-458.