THE EFFECTS OF VITAMINS ON THE DEVELOPMENT OF *NYMPHALIS ANTIOPA* (NYMPHALIDAE).

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In the past there have been many papers reporting the effects of freezing, heating, or chemical treatment on the development of Lepidoptera. Most of these papers have stressed the phenotypic changes, if any, which were produced. The increased production of melanin in individuals of many species when their pupae are subjected to near-freezing temperatures is a well known phenomenon.

I have experimented with the effects of cold temperature myself. Immediately after ecdysis, pupae of *Zerynthia hypermnestra* Sc. were subjected to a temperature of –10° C for 30 minutes, followed by an hour at 18° C, and another 30 minutes at –10° C. The resulting imagos were characterized by an abnormally extensive black pattern.

A colleague in Hungary, L. Bezsilla, produced a series of *Nymphalis antiopa* (L.) aberration hygiae by injection of a solution of phosphomolybdic acid into the pupae. This experiment also produced a marked shortening of the pupal period.

The above experiment gave me the idea of treating larvae or pupae with solutions of purified vitamins. I attempted two types of experiments, the first of which I describe below.

On June 22, 1958, ten groups of five three-day old *Nymphalis antiopa* larvae were fed *Salix* leaves upon which the following vitamin solutions had been brushed: 1) Vitamin C; 2) Vitamin B_1; 3) Vitamin B_{12}; 4) Vitamin B_1 and B_{12}; 5) Vitamin B_1 and C; 6) Vitamin B_{12} and C; 7) Vitamin B_1, B_{12}, and C; 8) Vitamin D_2; 9) Vitamin A and D_2; 10) Control.

In the groups with combinations of vitamins, one was brushed on the leaves after the previous one had been applied.

By June 24 conspicuous size differences were noticeable in several groups. On July 1, some caterpillars died displaying symptoms similar to those produced by virus disease, *i.e.* the internal portions of the body became liquified. Among those that died were those treated with oily vitamins (A and D_2). The larvae fed leaves treated with oily vitamins had hardly fed, and had not increased in size very perceptibly.

On July 3, the larvae of group six (B_{12} and C) had pupated, and all of the larvae of group one (C) had pupated by July 6. On July 6, the controls had only reached the half way point in their development, and none had pupated until July 13.

The first adult emerged on July 9, and was produced from a group six (B_{12} and C) pupa. The first adult from the control group emerged on July 25. The total emergence of the different groups was as follows:

GROUP NUMBER	VITAMINS	NUMBER OF ADULTS
1	C	4
2	B_1	2
3	B_{12}	3
4	B_1, B_{12}	3
5	B_1, C	3
6	B_{12}, C	5
7	B_1, B_{12}, C	4
8	D_2	0
9	A, D_2	0
10	Control	4

It is remarkable that the larval and pupal stages of the larvae fed extra vitamins, especially group six (B_{12} and C), were so strikingly shortened. The production of adults occurred within the range of 33 to 40 days from the start of the experiment for the control group and only 17 to 29 days for those groups which had been subjected to vitamin treatment.

A phenotypic change was also produced in the individuals which had received extra vitamins as larvae. In these adults the normally yellow border was almost completely black.

The second type of experimentation involved the direct injection of vitamin solutions into *N. antiopa* larvae. As the author was not properly equipped and thus, could not inject exact dosages, the results were inconclusive.

Injections of vitamins into pupae produced no noticeable effects.

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