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A Black-backed Larval Mutant of *Lymantria dispar* (L.) (Lepidoptera: Lymantriidae) in Japan

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Abstract. Six mutant larvae of *Lymantria dispar* (L.) were found in Sekigahara, Aichi Prefecture, Honshu, Japan, in June 1977. The distinctive 'black-backed' mutant late-stage larvae had nearly solid black dorsum. Otherwise, all setae, veruccae, and dorsal glands were colored as in normal larvae. All mutant larvae died of natural enemies, thus we could not determine if mutant larvae produced distinctive adults. The mutant appeared in less than 1% of the total population.

Introduction

The gypsy moth, *Lymantria dispar* (L.), is famous for variations in coloration among its different races or forms in both adults (Witt 1933, Mosbacher 1968) and larvae (Baltzer 1920, Monne 1927, Goldschmidt 1934). Recognizable mutants are also recorded. During 30 years of laboratory rearings, Klatt (1944) identified a larval mutant and two adult mutants. Frequencies of larval variants may occur as a result of differing ecological conditions and population densities, suggesting that different larval color variants have different adaptive advantages (Kolybin and Zelinskaya 1972). Herein we record further evidence of the genetic variability in coloration of *L. dispar* larvae.

In the Japanese archipelago, the gypsy moth has perhaps greater color variation than in any land mass of comparable size. Numerous publications by Goldschmidt, culminating in a review (1934), document variations in so-called 'sex-races' and variation in larval and adult coloration throughout Japan. Presently we report on the discovery of a rare larval mutant of the gypsy moth in central Honshu, Japan.

Description of Black-backed Larval Mutant

The mutant appeared perfectly normal in anatomy (Fig. 1A). The mature larval head capsule and body armature, including the dorsal (beta)

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veruccae (which are characteristically blue on the thorax and first two abdominal segments and brick red on the 3rd through 8th abdominal segments), setal armature, and dorsal glands, appeared normal. The striking characteristic of the mutant was the solid black background coloration of the dorsal integument on all thoracic and abdominal segments. Normally the dorsal integument is a mottled gray formed by intricate markings of black, white and varying degrees of yellow (Fig. 1B). The black of the mutant individuals extended laterally to a sharp demarcation line about 1 mm laterad of the dorsal veruccae (Fig. 1A). Laterally, the normal integumental coloration was present. In two individuals there was a slight yellow break in the solid black pattern at medial sites where yellow spotting often occurred in normal larvae. The individual illustrated (Fig. 1A) is one such exception while others were completely black and showed no yellow midline spotting.

Collection and Rearing of Mutants

The unusual mutation was found at Sekigahara, Aichi Prefecture, Honshu,Japan. Six mutant individuals were found between 4 and 21 June 1977 by the senior author. All larvae were on persimmon, *Diospyros kaki* Thunb., which was a common host for *L. dispar* larvae in south-central Honshu. *Lymantria dispar* caused recognizable levels of defoliation in individual trees or in small persimmon orchards during 1977. All *L. dispar* larvae found were scored in order to estimate the frequency of this mutation. Three mutants (n = ca. 250) were found on 4-5 June, 2 mutants (n = 109) on 19 June, and 1 mutant (n = 267) on 21 June. The mutant appeared in less than 1% of the population. By 21 June, widespread mortality from the fungus disease, *Entomophthora aulicae* (Reich.) Sorok. had depleted the populations although phenotypic scoring did include many dead or moribund larvae. The samples were made in different orchards but 5 of the mutant larvae were found in an area less than 300 meters squared. The 6th larva was found in an orchard located about 1.5 km from the first location.

Each of the 6 mutant larvae was isolated and reared on persimmon leaves. These mutants suffered from natural enemies as did the entire population. Of the 3 larvae collected on 4 June, 1 died from *Apanteles liparidis* Bouche and 1 from *Entomophthora aulicae*. The surviving larva pupated but was killed by emerging tachinid larvae, *Blepharipa* sp. The 2 larvae collected on 19 June died from *E. aulicae*. The final mutant larva pupated but was also killed by an emerging *Blepharipa* sp. larva.

One individual, killed by *A. liparidis*, has been preserved in alcohol, along with the parasite cocoons, and this specimen was deposited in the collection of the Division of Entomology, National Institute of Agricultural Sciences, Tokyo. The 2 diseased specimens collected 19 June were preserved dry but coloration differences from normal larvae did not

Fig. 1. Black-back mutant (A) and normal (B) last stage larvae of *Lymantria dispar* (L.) from Japan. Photos taken at Sekigahara, Aichi Prefecture, Honshu, on June 19-21, 1977.

preserve well. These two mutant specimens and a normal larva have been retained in the collection of the Asian Parasite Laboratory, USDA, Sapporo, Japan.

Discussion

Subsequent to our discovery of this mutant gypsy moth form in Japan, we learned of its presence in Korea. Dr. Hai-Poong Lee (Pers. comm. Oct. 1978) related that he and his students found ca. 20 black-backed specimens among nearly 200 larvae collected at Taejon, South Korea. What may reflect the more common occurrence of this mutant in Korea than in Japan, is the color illustration of a black-backed mutant individual in an Anonymous (1969, pg. 38) publication, in which the caption for the illustration does not mention the unusual coloration, suggesting that this condition may be common. Another illustration on the same page showed a dish containing at least 3 individuals with normal coloration. Both pictures were assumed to be of Korean specimens but this was not verified.

The presence of the black-backed mutant is not unique to the Orient. The same phenotype has been recorded in Europe (Klatt 1928, Baltzer 1920). According to Goldschmidt (1934), this phenotype was first found

near Berlin by Klatt and was then found in other European localities by Baltzer, Kominsky, and Goldschmidt himself. Thus its presence in Europe has been well established. Although Goldschmidt studied the gypsy moth and traveled in Japan quite extensively, he never encountered this phenotype in the Orient to our knowledge. Our present record appears to be the first confirmation of this mutant in Japan. In Korea, its presence was documented by illustration but the author was apparently unaware that the illustrated larva was mutant; or did not consider it unusual or significant (Anonymous 1969).

It now appears that this mutant is more widespread than was previously thought. With its presence in Europe and the Orient established, we believe it probably has a Palearctic distribution.

Little can be concluded as to the success of this mutant in the Japanese population. No mutant larvae matured, thus it is unknown if any anomaly is expressed in the adult stage. Since the entire population suffered heavily from natural mortality, especially from the fungus disease, *E. aulicae*, it is very unlikely that many mutants contributed genetically to the subsequent generation. Further study in future seasons may again reveal the presence of this phenotype; thereby indicating a reoccurring expression of this mutation.

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