THE CONTROL OF OLIVE LARVAL COLOUR IN *SATURNIA PAVONIA* LINN. (LEPIDOPTERA: SATURNIDAE)

By DR. M. E. N. MAJERUS*

In 1981, on a visit to the Loire Valley I collected 3 larval nests of *Saturnia pavonia*. The larvae were all in their second and third instars, each nest was probably the product of a single female. Surprisingly, the resulting fourth and fifth instar larvae were extremely variable. This variation was due firstly to the amount and pattern of the green and black markings, which showed a range in the fourth instar from some individuals which were virtually all green to all black individuals. Secondly there was great variation in tubercle colours which were white, pink, yellow or orange. The imagines resulting from these larvae, supplemented occasionally with wild caught, Cambridgeshire males, have been used to set up stocks for studies into the genetics of this larval variation. The results to date suggest that while there is a high genetic component to both these aspects of larval variation, the genetic mechanisms are quite complex, and in the case of the green and black markings the variation is probably regulated by a polygenic system. In this note I wish to describe the discovery of an aberrant larval form and its genetic control.

The larvae from one of the crosses (brood BE7) reared in 1982 produced 21 fourth instar larvae. The fourth and fifth instar ground colour of 3 of these was abnormal, the normal bright green colour being replaced by an olive green colour. These 3 larvae were separated from the rest of the brood. Only 2 emerged. They, and 2 of their sibling imagines, were used in further crosses in 1983. In addition another cross (BE56) in which neither parent came from BE7 produced a small number of olive larvae. Progeny from these broods were again used in crosses in 1984. The results of all these broods are given in Table 1. Because of the limitations of time and space only a proportion of larvae in most broods were retained to the fourth instar. Thereafter the larvae and cocoons were retained until adults emerged. All larvae were fed on hawthorn throughout. The larvae were scored for ground colour in the fourth instar. None of the larvae changed their basic ground colour between the fourth and fifth instars.The number of imagines produced from each colour class of larvae was also recorded for each brood.

The most probable explanation of the data is that ground colour is controlled by a single biallelic gene, with the green ground colour dominant to olive, the olive allele being semi-lethal when homozygous.

*Department of Genetics, University of Cambridge, Dowing Street, Cambridge CB2 3EH.

It is suggested that one of the parents of the original larval nests carried the olive gene, and that brood BE7 was a cross between two heterozygotes. Further it is suggested that the parents of BE56, BE156, BE159, and the female parents of BE62 and BE67 were also heterozygotes carrying both the green and olive alleles. In this case BE7, BE56, BE156 and NE159 should each have given a 3:1 ration of green to olive larvae. However, in all these broods the number of olive larvae is less than a quarter the number of greens, though not significantly so. Broods BE62 and BE67 should have given a 1:1 ratio of green to olive, and this is close to observation although in BE67 there is again a deficiency in the number of olives.

Brood BE134 the only brood in which both parents had been of the olive ground colour, all progeny were olive. In this brood the female produced 226 ova from which only 15 larvae hatched, and only 1 imagine was produced despite meticulous care and attention being lavished on the brood throughout. Indeed as Table 1 shows of the 42 fourth instar larvae which were scored as olive, only 9 (21.4%) reached the adult state while in the same broods, 86 adults were produced from 100 green scored larvae. This strongly suggests that the olive allele is semi-lethal, possible causing both reduced fertility and reduced viability.

Finally cross BE180 in which the female parent came from a new and normal stock taken in Cambridge endorses the dominance of the green ground colour over olive, all progeny being green.

Brood number	Origin and larval colour of parents		Number of larvae in 4th instar. Number of resulting imagines given in brackets	
	Female	Male	Green	Olive
BE7	France normal	France normal	18(16)	3(2)
BE1	France normal	France normal	55(52)	0
BE8	France normal	France normal	23(8)	0
BE25	France normal	France normal	50(50)	0
BE26	France normal	France normal	38(33)	0
BE56	BE25 normal	BE8 normal	37(32)	8(1)
BE62	BE26 normal	BE7 olive	6(6)	8(0)
BE67	BE7 normal	BE7 olive	10(9)	5(4)
BE69	BE1 normal	BE7 normal	83(80)	0
BE70	Cambridge normal	Cambridge normal	194(161)	0
BE134	BE67 olive	BE67 olive	0	11(1)
BE156	BE67 normal	BE67 normal	18(12)	5(1)
BE159	BE67 normal	BE67 normal	11(11)	2(0)
BE180	BE70 normal	BE67 olive	50(46)	0

Table 1 Results of broods reared to elucidate the inheritance of olive larval ground colour in *Saturnia pavonia.*