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Effects of Continuous and Split Developmental Photophases During Each 24 Hour Period on Adult Color and Pubescence in *Thyanta Calceata* (Hemiptera: Pentatomidae)

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EFFECTS OF CONTINUOUS AND SPLIT DEVELOPMENTAL PHOTOPHASES DURING EACH 24 HOUR PERIOD ON ADULT COLOR AND PUBESCENCE IN *THYANTA CALCEATA* (HEMIPTERA: PENTATOMIDAE)

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ABSTRACT

Rearing immatures of *Thyanta calceata* in 8L:16D, 8L:4D:8L:4D, and 16L:8D photoperiods showed that the length of each photophase, rather than an accumulation of shorter photophases, during each 24 h period was the determining factor in producing adult dimorphism in color and pubescence.

Thyanta calceata (Say) occurs from New England south to Florida, and west to Illinois (Blatchley 1926) and Missouri (Oetting and Yonke 1971). This phytophagous stink bug is dimorphic as adults in color and pubescence. McPherson (1977a) has shown it to be bivoltine and seasonally dimorphic; green adults with short pubescence (shorter than diameter of tibia) are found during summer months, and brown adults with long pubescence during the fall and spring. McPherson has also shown that (1977b) the summer and fall/spring morphs can be produced in the laboratory by rearing immatures under 16L:8D (light:dark) and 8L:16D photoperiods, respectively, that (1978a) the older instars are most sensitive to photoperiod influence, and that (1978b) a threshold photoperiod near 12.5L:11.5D is involved in the dimorphic response; animals reared in photophases above and below the threshold develop into the summer and fall/spring morphs, respectively.

All of the photoperiods used in the above experiments were based on a 24 h day and continuous periods of light and dark (e.g., a 16 h photophase followed by an 8 h scotophase). Not determined previously was the necessity of these continuous periods for it was possible that the same results could be obtained by split photophases during each 24 h period. The results of an experiment to determine this are reported here.

METHODS AND MATERIALS

Forty five males and 45 females from F_1 generation laboratory stock were placed in an incubator (23.9 ± 1.1°C) under a 16L:8D photoperiod; the stock was established with individuals collected July–August 1981, in Greene County and Craighead County, Arkansas, and Jackson County, Illinois. They were maintained in mason jars (five of each sex/jar) provided with cheesecloth as an oviposition site, a paper toweling strip, and filter paper, and fed green snap beans (*Phaseolus vulgaris* L.), as described by McPherson (1971).

Each resulting egg cluster was placed in one of the following three photoperiods, and the individuals reared to adults as described by McPherson (1971): 8L:16D, 8L:4D:8L:4D, and 16L:8D. The 8L:4D:8L:4D photoperiod exposed the animals to only 8 h of continuous light but a total of 16 h of light/24 h. All individuals were reared at 23.9 ± 1.1°C during the light and dark phases, and in about 260 ft-c during the light phases (Sylvania, 15W Daylight, F15T8/D).

Adult characters compared were color (green or brown) and pubescence (long or short); short hairs were defined as those shorter than the diameter of the tibia. The data were not analyzed statistically because the results were clear.

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RESULTS AND DISCUSSION

There were no differences in color and pubescence between males or females reared in the 8L:16D and 8L:4D:8L:4D photoperiods; all were brown with long pubescence (Table 1). All adults from specimens reared in the 16L:8D photoperiod were green with short pubescence.

These results show that the length of each developmental photophase, rather than the combined total of all photophases, during 24 h determines the adult morph. They also help to explain the role of the dark period.

In earlier experiments, it had been assumed that the observed dimorphism resulted from the length of the photophase, not the scotophase. For example, in the experiment to determine the threshold photoperiod (McPherson 1978b), animals were reared in photoperiods ranging from 8L:16D to 18L:6D. It was possible that the range of scotophases, not photophases, produced the results.

In the present experiment, scotophases of 4 and 16 h were involved in the production of the fall/spring form and 8 h, the summer form. Thus, it appears that photophase does determine the morph, that scotophase is only breaking the photophase, and that the length of the scotophase is unimportant between 4 and 16 h, perhaps less.

Table 1. Comparison of color and pubescence between *Thyanta calceata* adults reared in continuous and split photophases during each 24 h period.

		Color				Pubescence	
		Dorsal		Ventral			
Photoperiod	Sex	Brown	Green	Brown	Green	Short	Long
8L:16D	♂	20	0	20	0	0	20
8L:4D:8L:4D	♂	20	0	20	0	0	20
16L:8D	♂	0	20	0	20	20	0
8L:16D	♀	20	0	20	0	0	20
8L:4D:8L:4D	♀	20	0	20	0	0	20
16L:8D	♀	0	20	0	20	20	0

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