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# Genetic Analysis of Photoperiodism in a Polyvoltine Race of *Bombyx mori* using Polymorphic DNA Markers

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Insects often display circadian rhythms in their physiological and behavioral feature, which can be oscillating with approximately 24h period, synchronized or entrained by environmental stimuli such as light. Genetic and molecular studies on *Drosophila melanogaster* revealed some of the key clock components, genes *period, clock*, and so on. Silkworm may also have a circadian oscillator composed by the genes called *Bmper, Bmclock, Bmcry* and *Bmcyc*, which have been recognized as the homologs of above clock genes.

While, some of the tropical polyvoltine strains in *B.mori* produce dormant or nondormant eggs in response to photoperiod in the larval stage; diapause in long days such as 18L6D (18-light, 6-h dark) and nondiapause in short days as 6L18D. Circadian oscillating clock may regulate this photoperiodic response that is based on dark-time measurement. So we try to make it appear whether there is or not any relationships between circadian clock and photoperiodism by comparing the loci of the genes which regulate these properties.

To begin with, we investigated the genetic loci of the clock genes, making use of molecular markers. To obtain markers, RFLPs between two parental strains Ringetsu and C108 (Ringetsu; one of the photoperiodic strains, C108; a bivoltine strain) were screened using previously available or newly designed a number of markers. These strains showed a *Bmclk* polymorphism, and *Bmclk* appeared to be on the Z chromosome. We also investigated, in parallel, the linkage groups that greatly affect photoperiodism by means of variance analysis. RFLPs were put over 14 chromosomes (3, 6, 7, 10, 12, 14, 15, 17, 18, 19, 20, 21, 23, 25). Resting rate of the eggs laid by (Ringetsu x C108) x Ringetsu 47 females was calculated, then influence of chromosome composition (homozygous or heterozygous) was analyzed on each chromosome by using RFLPs. As a result, on the third chromosome, since the value of the F-test is less than 0.05, there is a statistically significant difference between the means of the homozygous group and the heterozygous group at the 5% significance level. This result suggests that one or more genes on the third chromosome are partly regulating photoperiodic response. We are continuously analyzing the rest chromosomes and planning to do mapping of the photoperiodic genes onto the Z chromosome by QTL analysis.