Variation in immune defence in relation to developmental pathway in the green-veined white butterfly, \textit{Pieris napi}

Keshav Prasai and Bengt Karlsson

Department of Zoology, Stockholm University, Stockholm, Sweden

ABSTRACT

**Question:** Is immune defence affected by developmental pathway in a bivoltine butterfly?

**Hypotheses:** Individuals of the pierid butterfly, \textit{Pieris napi}, undergoing direct development (development without diapause) are time and nutrient stressed compared with overwintering individuals. If this is the case, direct developers will have a diminished immune defence system.

**Organism:** Green-veined white butterfly, \textit{Pieris napi}.

**Methods:** In a laboratory experiment, we examined phenoloxidase activity in larvae of \textit{P. napi} and their adult encapsulation ability in response to artificial parasites made of nylon monofilaments. We reared larvae on two different food plants, \textit{Alliaria petiolata} and \textit{Armoracia rusticana}.

**Results:** The developmental pathway (direct or diapause) can have a strong impact on the defence system in \textit{Pieris napi}. Individuals of the direct-developing summer generation had lower phenoloxidase activity and lower encapsulation ability than individuals of the overwintering generation. Larvae reared on the two different food plants showed no difference regarding phenoloxidase activity, but encapsulation ability was higher for individuals reared on \textit{Armoracia rusticana}. Males had higher phenoloxidase activity but lower encapsulation ability than females.

**Keywords:** diapause, direct development, immune system, phenotypic plasticity, seasonal polymorphism, trade-off.

INTRODUCTION

Insects living in seasonal environments often escape harsh periods by entering a diapause stage. Depending on the length of the reproductive season, many species may also have time to insert a non-diapause, direct-developing summer generation. Thus an individual might, depending on environmental cues (often temperature and/or day length), develop either directly and reproduce or enter diapause and reproduce the next season (Tauber et al., 1986). This ability to diapause or to develop directly is an example of developmental plasticity or
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