

Influence of temperature on the biological parameters of the anholocyclic species *Cinara tujaefilina* (Hemiptera: Aphidoidea)

Research Article

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Abstract: Aphids are a good model to study insect reaction to habitat change. Temperature is one of the main factors that influences insects. This paper examines the influence of temperature on developmental stages, fecundity, survival rate and demographic parameters of *Cinara tujaefilina* (Hemiptera: Aphidoidea, Lachnidae), connected with decorative plants of the Cupressaceae family. *C. tujaefilina* was reared in a laboratory on *T. orientalis* at five constant temperatures of 10, 15, 20, 25 and 28°C, 70% humidity and 14L:10D. The pre-reproduction stage varied from 7 at 25°C to 19 days at 10°C. Developmental threshold was assigned at 3.5°C. The longest reproduction stage for the aphids developing was recorded at 25°C, namely 33 days, while the shortest, at the temperature of 10°C, lasted 8 days. At 25°C this species is characterised by the shortest pre-reproduction stage, the highest fecundity, the highest survival rate and the highest demographic parameters, particularly r_m (0.17). The results suggest that the optimal temperature for the species is 25°C, and indicate that climatic change will favourably influence its development and increase its role as a pest of decorative plants.

Keywords: Lachnidae • *Cinara* sp. • Development • Life table • Temperature • Ecology • Climatic change

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1. Introduction

Climatic change phenomena lead to faunistic changes [1]. Aphids have been indicated as a good study model due to their flexibility and telescopic development, which enables them to react very quickly to changing habitat conditions [2,3]. The main factor influencing insects is temperature, apart from photoperiod and the quality of the host plant. Climate changes influence the following: species diversity and the terms of spring aphid flights [3-9], the geographical range of thermophilous species [10], life cycles (an increased share of anholocyclic clones, *i.e.* those which develop parthenogenetically throughout the year in comparison with holocyclic aphids, *i.e.* those producing sexual morphs) [11-14], as well as biology and development [15]. Climate warming most strongly influences the development and the number of aphid generations in comparison with other

insects [4,7]. Yamamura & Kiritari [16] and Harrington *et al.*, [4] claim that as a consequence of 2°C temperature rise during the year aphids can produce up to 5 more generations.

Climate changes particularly favour fauna feeding on plants introduced in European countries, also including ornamental plants. Decorative plants of the Cupressaceae family, such as *Chamaecyparis sp.*, *Cupressus sp.*, *Juniperus sp.*, *Thuja sp.*, are now more and more often grown in parks and gardens. Thanks to climate warming the insects connected with those plants can expand their ranges and adapt their life cycles to local conditions.

Cinara tujaefilina (del Guercio, 1909) (Hemiptera: Aphidoidea, Lachnidae) has been recently recorded in Poland as a permanent species, however, it is recorded more frequently every year [17]. It is an anholocyclic species, which means it always develops

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