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Rearing parasitoids for biocontrol experiments: could laboratory conditions influence sex-ratio?

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Abstract

Parasitoids are insects whose larvae develop on or within a host, killing it when they reach maturity. Parasitoids can be used as biocontrol agents against certain pests after they have been tested in the laboratory. This requires a stable supply of individuals. However, sex-ratio is known to fluctuate greatly in parasitoid populations reared in the lab. With an insufficient number of females being born, the colony can die out. Different mechanisms related to individual biology and population ecology are involved in sex allocation. Given this complexity, it is difficult to know the exact cause of these fluctuations, but conditions in the laboratory are a possible source. We hypothesised that parameters that influence sex-ratio would appear more often in articles mentioning sex-ratio. We conducted a systematic literature review using Web of Science, using the terms rear, parasitoid, mass, population, method, factor, effect, environment and parameter. The search yielded nine hundred and thirteen articles. The parameters investigated were sex-ratio, temperature, humidity, pressure, diet, environment structure, host quality and population dynamics. Occurrences of each topic were counted programmatically using a list of twenty-nine keywords. Pressure, humidity and host quality were the least often mentioned, totaling together approximately 5 % of hits. Environment structure, population dynamics and sex-ratio together amounted to 25 % of hits. Temperature and diet were mentioned in 90 % of papers. Sex-ratio and host quality had the highest correlation between the number of mentions. However, an analysis of variance concluded that the mention of sex-ratio had no significant influence on the number of mentions of other parameters ($p = 0.297$). Furthermore, a chi-square test concluded that the mention of sex-ratio had no significant influence on another parameter being mentioned at all ($p = 0.339$). The Jaccard index was calculated for all possible pairs of parameters. The most strongly associated topics were temperature and diet.

Keywords: Biocontrol, sex ratio, systematic review, text analysis

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