白蛾黑基啮小蜂繁殖生物学及寄主选择性研究

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摘要：白蛾黑基啮小蜂*Tetrastichus nigricoxae* Yang是我国杨树人工林主要食叶害虫杨小舟蛾*Micromelalopha troglodyte* Graeser等的蛹期内寄生性天敌，通过中间寄主蛹人工繁殖，已应用于杨小舟蛾等杨树食叶害虫的防治。但在人工繁育过程中，白蛾黑基啮小蜂常出现出蜂质量不稳定、出蜂量低等问题；同时人工繁蜂长期以柞蚕蛹为替代寄主，随着续代繁育，子代蜂逐渐出现活力下降，寄生率、出蜂率降低等现象，需要定期对柞蚕蛹繁育的子代蜂进行复壮。

为进一步充实白蛾黑基啮小蜂生殖生物学的基本内容并解决人工繁蜂及应用上的问题，在已有研究工作的基础上，开展了繁殖生物学和寄主选择性研究，主要内容包括白蛾黑基啮小蜂生殖方式和行为；寄主选择性；替代寄主蛹主要营养成分、蛹壳厚度和几丁质含量对选择性的影响；寄主选择过程中的感受机制等。

通过实验发现白蛾黑基啮小蜂的生殖方式为两性生殖和孤雌生殖，主要为两性生殖，孤雌生殖的后代都为雄蜂；啮小蜂有近亲繁殖现象。经寄主选择实验得出啮小蜂对杨小舟蛾预蛹和1日龄蛹的寄生率和出蜂率最高，同时对柞蚕蛹有明显选择性，利用柞蚕蛹繁育的子代蜂在质量和数量方面均高于家蚕蛹和杨小舟蛾蛹等结果。以寄主选择结果为依托对不同日龄杨小舟蛾蛹进行营养测定，并进行相关性分析，发现其主要营养含量随着日龄的增加而减少；蛋白质和脂肪含量与寄生率、出蜂率呈显著正相关，总糖含量与寄生率、出蜂率相关不显著。同时蛹壳厚度与几丁质含量随着日龄的增加而增长；蛹壳厚度和几丁质含量与寄生率、出蜂率呈显著负相关。三种寄主蛹营养测定发现蛋白质、脂肪、总糖、含水量从高到低序列为柞蚕蛹＞家蚕蛹＞杨小舟蛾蛹。此结果与寄主选择实验相呼应。

对白蛾黑基啮小蜂求偶识别和接受过程进行观察实验，发现雄蜂触角柄节部位起主要作用，其次是鞭节棒节部位，再次是鞭节索亚节部位；雌蜂触角鞭节索亚节部位起主要作用，然后是鞭节棒节部位，最后是柄节部位。电镜扫描结果发现啮小蜂触角上有多孔片状感器、单孔毛状感器、毛形感器、锥形乳状感器、锥形感器、感觉孔、Böhm 氏鬃毛、腔形感器等8种感器。其中毛形感器为主要感器，数量大，分布广；雌、雄蜂触角上感器的种类相同，

但同种感器的数量和分布位置存在明显的性二型现象。白蛾黑基啮小蜂产卵器由腹产卵瓣、内产卵瓣、背产卵瓣三部分组成；产卵器包含浅凹状感器、锥形感器、毛形感器、栓锥感器、腔锥感器等5种。经实验观察发现产卵器上感器种类和数量的分布与产卵器各部位的行为动作相呼应。

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Studies on Reproductive biology And Host Selection of Tetrastichus nigricoxae Yang

Abstract: *Tetrastichus nigricoxae* Yang is an endoparasite of pupae of *Micromelalopha troglodyta* Graeser.It is the mian pest of Poplar in China.Artificial production with pupae of *Antheraea pernyi* as hosts，at present *T.nigricoxae* Yang already applied to the prevention and control of the pests of Poplar.Laboratory studies were conducted to determine the reproductive biology and host selection of *T.nigricoxae* Yang. Artificial breeding process,The bees quality of *T.nigricoxae* Yang is not stable, the bees quantity of *T.nigricoxae* Yang is low; At the same time *Antheraea pernyi* as substitute host, parasitic rate and the bees rate to decrease, the daughter bees decline gradually appeared vigor, parasitic rate, the bees lowered rates, need to periodically *Antheraea pernyi* breeding the progeny of bees then for regeneration.Some questions relating with the artificial propagation and application in forest of *T. nigricoxae* Yang were studied. Main contents included the mode of reproduction and reproductive behavior，host pupa selection，nutrient content of host pupa，effections of pupa shell thickness and chitin content on the host pupa selection and the sensing mechanism of host selection behavior.The main conclusions are as follows,*T.nigricoxae* Yang employed parthenogenesis and sexual reproduction，mainly by sexual reproduction.The parthenogenesis produced only male progeny. There existed inbreeding phenomenon.Parasitization rate and number of offspring rate of pre-pupae and 1 day old *M.troglodyte* Graeser pupae are highest.Artificial propagation by *Antheraea pernyi*，the quality and quantity of progenies were higher than by *Bombyx mori* pupae and by *M. troglodyte* pupae.Nutrient content gradually increased with the day-age of pupa.Protein content，fat content of pupae were significantly positively correlated with the parasitization rate and the number of

offspring per pupa. The total sugar content of pupae were not significantly correlated with the parasitization rate and the number of offspring per pupa.The pupa shell thickness and its chitin content gradually descended with the increase of pupa day-age. The shell thickness and chitin content were generally negatively related with the parasitization rate and the number of offspring rate per pupa. The nutrient contents of three species of host pupae，from high to low，were ranked as *Antheraea pernyi* > *Bombyx mori* pupae > *M.troglodyte* Graeser pupae.The importance of different antennal parts in the copulation of male *Tetrastichus nigricoxae* Yang，from high to low，were ranked as antennal scape>antennal club>antennal flagellum.In the female，it was ranked as antennal flagellum>antelnnal club>antennal scape.Eight types of sensory receptors were found，sach as multiporous plate sensilla，uniporous trichoid sendilla，trichodea sensilla，basiconic capitate sensilla，basiconica sensilla，sensory pore，böhm's bristles，coeloconica sensilla.The uniporous trichoid sendilla was the commonest and widely distributed.There were obviously sex dimorphisms in difference of number and distribution of sensilla.The ovipositor of *T.nigricoxae* Yang consisted of ventral valvulae，inner valvulae， dorsal valvulae.Five distinct types of sensory receptors were found on the ovipositor，including slight surface depression，basiconic sensillum，trichoid sensillum，styloconic sensillum，coeloconic sensillum.