室內人工飼養蜜蜂幼蟲之研究

Experimental Rearing of Honeybee Larvae in the Laboratory

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[摘要]

本研究採用的高產、正常及低產三種產量之蜂王乳，此三種蜂王乳經化學分析，其六種基 本化學組成除粗蛋白質之外，其餘均有顯著差異，其中以灰分及癸烯酸含量差異最大。今個別以高產、正常及低產之蜂王乳(royal jelly)，加上葡萄醣(glucose)、果醣(fructose)、酵母抽出物(yeast extract)及無菌水，調配成人工飼養幼蟲的基本食物(BLD)。在實驗室內飼養剛孵化 12　24 小時之雌性幼蟲，羽化率皆可維持在 74％　79％之間，其中低產量之蜂王乳所育成之蜂后階級比例明顯較另兩組為高。將 BLD 中的醣類及酵母抽出物及蜂王乳比例修改，藉以探討食物因子對幼蟲生長與分化之影響，其中發現修改後之 BLD，醣類及酵母抽出物比例過高或過低均對幼蟲生長有不利之影響。當 BLD 中加入 2%與 4%的酵母抽出物時，成蜂羽化率分別為 85.7%與 64.3%，但都有蜂后階級之個體出現。唯前者蜂后比例為 19.2%，而後者蜂后比例卻高達 50.0%。另外，整個幼蟲期 以蜂王乳餵飼之幼蟲，則並無成蜂羽化。取四種不同孵化時間的幼蟲進行幼蟲飼養試驗，發現 0~12hrs 和 13~24hrs 的成蜂羽化率各為 68.8 %及 68.2%，而 25 ~ 36hrs 和 37 ~ 48hrs 的成蜂羽化率則高達 80.2 %及 84.3%。另外，以育成工蜂階級所設計之幼蟲食物配方，成蜂羽化率也都達 80.0%以上，且成蜂個體全數為工蜂階級。以育成蜂后階級所設計之幼蟲食物配方，雖然成蜂羽化率只有 60%，但有 46.3%為蜂后個體。以針對雄蜂階級所設計之幼蟲食物配方，飼養一日齡及二日齡之雄蜂幼蟲，其成蜂羽化率分別可達 70.0%與 65.0%。將生鮮蜂王乳以不同溫度及儲存天數的處理之後，作為配製 BLD 的材料源，其中以儲存於 4 ℃環境下 30 天與 25℃環境下 10 天以上之蜂王乳配製者，皆出現幼蟲生長發育不佳的情形。以五個不同蜂場所生產之生鮮蜂王乳配製者只有一個樣品的羽化率為 47.7 %；以三家不同 廠商及自行乾燥處理之乾燥蜂王乳粉末樣品配製者，有一個樣品所飼養之羽化率只有 5.5%。將人工飼養之三種階級所得成蜂，經標示引入蜂群後，蜂后的蜂群接受度為 10%，交尾成功率為 20%；工蜂和雄蜂的蜂群接受度皆為 100%，且於蜂群中之活動均正常。

關鍵字: 蜜蜂　honeybee
西洋蜂　Apis mellifera
蜂王乳　royal jelly
幼蟲　larvae
人工飼養　artificial rearing

[摘要]

In this study, fundamental chemical composition of six components werefound statistically different in royal jelly which went through three different treatments, high productivity, normal productivity, and low productivity. These six components are moisture, ash, carbohydrate, crute fat, crute protein, and 10-OH-δ-2-decenoic acid (10-HAD), and the differences are65. 16% ~ 66.25%, 1.09% ~ 1.21%, 9.02 ~ 11.77%, 2.01 ~ 3.09%, 13.70 ~ 14.58%,1. 13 ~ 1.38%, respectively. The basic larvae food (BLD) was made up of fresh royal jelly, glucose, fructose, yeast extract, and distilled water.Different BLDs were made up by different royal jelly that was treated underdifferent treatment mentioned beforehand. One-day-old female larvae were fed withBLDs, and the survivorship to the next stage held between 74%~79%. The number ofthe queen caste was higher in the low productivity treatment than the othertwo treatments. In order to find out the effect of the diet factor on the development ofthe larvae, the proportion of carbohydrate, yeast extract, and royal jelly was adjusted in the BLD. It was found that too high or too low proportion of carbohydrate and yeast extract has negative effects on the larvaldevelopment. When there is 2% and 4% of yeast extract in the BLD, the survivorship ofthe adults is 85.7% and 64.3 %, including 19.2% and 50.0% queen caste adult.No adult obtained when fed royal jelly for all larval stage. Taking larvae, which went though four different hatch periods asexperimental material, it was found that hatch periods for 12 hours and 24 hours have larvae survivorship was 68.8% and 68.2%, respectively. For hatch periodsof 36 hours and 48 hours the larval survival rate was 80.2% and 84.3%,respectively. Further, we design different BLDs to feed honeybee larvae for three caste.The result, showed the adult survival rate of worker caste, was over 80.0%,and all adults were workers. In queen assay, we had 46.3% queen caste adults,but the total adult proportion was 60% only. In drone assay, adult survivalrate was 70.0% and 65.0%, respectively when one-day-old and two- days-oldlarvae fed on drone diet. In summary, in order to get the information of thelarvae differentiation, the diet should be adjusted as larvae develop. Fresh royal jelly was treated and stored under different temperature for different numbers of days, and was taken as the diet for the larvae. Itwas found that royal jelly which is stored at 4 degree Celsius for 30 days, orat 25 degree Celsius over 10 days is the more bad diet for larvaedevelopment. We used five royal jelly samples that collected from different beekeepers,and the larvae defecation rate was below 60% in one sample. In test of fourdry royal jelly samples of larvae diet, when fed with larvae, no survival ratewas found in one sample. Behavior of the three caste honeybee adults were observed in thelaboratory. The mating rate of queen was 20% and the recipient rate of workers anddrones were 100%. All of these artificial reared honeybee adults from threecastes acted and behaved normally in the beehive.