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INSECT BREEDING, GENETICS AND BEHAVIOUR

On a quest for superior strains: a progress report on Haid group's black soldier fly selective breeding program

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The black soldier fly (BSF) is highly effective in upcycling organic waste into valuable feed ingredients approved for animal diets by the US and EU. The increasing demand for high-quality protein and organic waste reduction has created a need for greater quantity and quality of BSF products. However, selective breeding in BSF has been sparsely implemented. Haid Group as the world's largest aquafeed company, has a strong demand for alternative protein resources to replace fish meal and has made promising strides in a BSF selective breeding program aimed at improving production traits. We strongly encourage colleagues to initiate their own breeding programs and consider collaborating to develop superior strains of BSF, thereby propelling the industry to new heights. Multiple strains were established by selecting individual BSF based on different production traits, obtained from a BSF production facility operational for over four years. Each strain underwent continuous inbreeding for more than one year. The target traits of all strains were consistently monitored throughout each generation, unless no viable offspring were produced. The rearing environment was carefully maintained at a temperature of 30 °C and a relative humidity of 70%. Several selected strains were subjected to crossbreeding experiments to evaluate the effect of heterosis. Significant improvements were observed across all selective breeding experiments, with different traits displaying varying degrees of improvement and stability over generations. Positive heterosis was consistently observed in the crossbreeding experiments, persisting for multiple generations. To ensure a successful breeding program, it is crucial to address three key elements: genetic diversity, inbreeding depression, and sex separation. We strongly recommend forming a breeding alliance to collectively tackle these issues as a team. The BSF industry stands to benefit greatly from a selective breeding program that creates strains with improved production traits. Given the short life cycle of BSF, positive results can be achieved within a relatively short period of time.

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