

研究论文

二次正交旋转回归设计在小菜蛾饲料配方筛选中的应用

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收稿日期 2006-8-14 修回日期 2007-5-24 网络版发布日期: 2007-7-25

摘要 应用二次正交旋转回归组合设计方法, 筛选小菜蛾半合成人工饲料配方, 以化蛹率为目标函数建立了二次回归模型, 通过统计寻优获得的优化配方为: 每100g人工饲料中, 麦芽5 g、蔗糖 3.5 g、菜叶粉 5 g、干酪素 3 g、螺旋藻0.75 g。在温度24~26℃, 相对湿度60%~70%, 光照周期为13L: 11D的条件下, 用该优化配方饲养小菜蛾, 幼虫期8.45 d, 蛹期 4.5 d, 初孵幼虫至成虫羽化的历期平均12.95 d, 化蛹率74.7%, 羽化率94.9%, 蛹重5.14 mg/头, 雌虫平均寿命9.5 d, 雄虫寿命13.5 d, 每雌产卵量135.67粒。与发芽菜苗饲养相比, 存活率和发育速度无显著差异, 蛹重和产卵量显著增加。该饲料价格低廉, 配制和应用管理方便, 饲养过程中不必更换饲料。

关键词 [小菜蛾; 二次正交旋转回归设计; 优化配方](#)

分类号 [Q143](#)

Application of quadratic orthogonal rotation combination design to optimise the semi-synthetic diet of diamondback moth

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Abstract The quadratic-orthogonal-rotation-combination design was used to determine the effects and interactions of the main components (leaf powder of Chinese cabbage (*Brassica chinensis*), malt powder, sucrose, casein and spirulina) of the semi-synthetic diet of the diamondback moth (*Plutella xylostella* L.), and a model of the main components and the rate of pupation was constructed and analyzed. The results showed that proportions of Chinese cabbage leaf powder, casein and malt powder influenced the rate of pupation significantly ($p = 0.05$). The optimum proportions of the components were: malt powder 5 g, sucrose 3.5 g, Chinese cabbage leaf powder 5 g, casein 3 g and spirulina 0.75 g in 100 g of diet.

When diamondback moth larvae were reared on this diet at 24-26°C, 60%-70% RH and a 13L : 11D photoperiod, the developmental periods of the larvae and pupae were 8.45 days and 4.5 days respectively and the duration of development from newly-hatched larvae to adult emergence was 12.95 days on average. The rate of pupation was 74.7%, average pupal weight was 5.14 mg, average adult emergence was 94.9%, average longevity of the female adult was 9.5 days, and females laid 135.67 eggs on average. Compared with the control in which the moth was reared on seedlings of Chinese cabbage, rates of pupation, development of the larvae, adult emergence and the longevity of the adult were not significantly different, but the pupal weight and the averaged eggs laid by females were significantly greater. This diet is cheap to prepare, and the preparation protocol and application of the diet is simple and convenient. The diet does not need to be changed during rearing of the larvae and pupae.

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Key words [diamondback](#) [moth](#) [quadratic-orthogonal-rotation-combination](#) [design](#) [arval](#) [diet](#)

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