## Creating artificial beans for bean beetles, Callosobruchus maculatus, using a mechanical pill press

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The bean beetle, Callosobruchus maculatus (Coleoptera, Chrysomelidae), has become a widely used insect species in undergraduate laboratory education. This species is particularly suitable for course-based undergraduate research experiences (CUREs) due to its short generation time, ease of handling and culturing in the laboratory, and sexual dimorphism in its sedentary phase. Bean beetles complete their growth and development inside a host seed (bean) with at least eight different host species. However, conducting manipulative experiments with bean beetles would be enhanced if it were possible to readily prepare artificial beans on which the beetles could complete their lifecycle. Here, we report on the use of a mechanical pill press (LFA Machines Model TDP-0) to make artificial beans. We prepared artificial beans by making whole blackeye pea flour (Vigna unquiculata) using a coffee grinder. That flour was used in the pill press to make 8mm diameter x 5-9mm thick disk-shaped pills with and without additives. Adult female bean beetles readily laid fertilized eggs on the surface of these artificial beans. Offspring emerged 4-5 weeks later at 25°C, the same development time that would have occurred in natural intact blackeye pea seeds. No special treatments of the artificial beans were required to induce females to lay eggs on them nor for the pills to remain intact during the period of larval and pupal development. This mechanical pill press can produce 30-50 pills per minute, so artificial beans can be produced rapidly in sufficient numbers to conduct meaningful experiments. This simple and effective method for making artificial beans creates the opportunity to conduct studies that have been difficult or impossible in the past. For example, future studies may evaluate treatments such as plant secondary compound concentrations, nutrient content, and antibiotic exposure on bean beetle life history and microbiome communities.

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