

Title Damage characteristics produced by insect pests in packaging film
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Abstract

This study investigated the morphology of damage produced by three important stored-product pest species, *Rhyzopertha dominica*, *Sitophilus oryzae* and *Lasioderma serricorne*, in food packaging film. Three different types of plastic film (polypropylene 25 µm, polyethylene 50 µm and polyester 12 µm), a multilayer film (paper, polyethylene 15 µm, aluminium 7 µm and polyethylene 30 µm), and cigarette paper were compared. Damage was examined using a stereomicroscope at 20× to 40× magnification and a scanning electron microscope. All three species produced several different types of damage on the surface of the side where insects perforated the plastic film. This damage consisted of scratches and tears on the contours of the holes. In comparison, damage around the holes was much less pronounced on the exit side. In polypropylene, holes produced by adults of *S. oryzae* and *R. dominica* and larvae of *L. serricorne* could be identified by the large damaged area, the small scratches produced and the deep scars left around the holes. Scratches on polyethylene produced by *R. dominica* were deeper and more marked than damage produced by the other two species. Holes covered with filaments were characteristic of the damage produced by *S. oryzae*. Conversely, in polyester it was difficult to differentiate between holes produced by *S. oryzae* and *R. dominica*: the easiest way to distinguish between damage by these species was on the basis of hole size. Larvae of *L. serricorne* did not produce holes in polyester. In cigarette paper the presence of filaments differentiated the holes produced by *S. oryzae* from those produced by the other two species. All three species were able to produce holes in multilayer film with a 7 µm thickness of aluminium foil. In this film, the morphology of damage was similar to that produced in paper because the first layer of this film was made of paper. The diameter of the perforations, including the damaged area around the holes, ranged from 0.58 to 1.86 mm for all three species.