

KHAPRA BEETLE (KB) *Trogoderma granarium*

Description:

Adults:

Adults are 2-3 mm, dark brown, and oval shaped with smudged yellow-brown and red-brown transverse markings on wing covers. Females are larger than males. Adult khapra beetles do not feed or fly. Quarantined in U.S.

Eggs:

Eggs are laid loosely on infested grain. Females lay between 80-125 eggs: number of eggs resource dependent. Eggs are rounded at one end and pointed with spine-like projections at the other. White to opaque in color.

Larvae:

The damaging life-stage in this pest, larvae grow to 6 mm. Yellowish-brown in color and spindle-shaped. Larvae are always distinguishable by the dense setae that emit from all body segments with longer setae on the last segment resembling a tail. Mature larvae migrate away from food to pupate. In unfavorable conditions larvae can survive without food and withstand low temperatures for long periods.

Pupae:

Pupation occurs in last stage of larval skin and are often mistaken as larvae.



Left: Male (left) and female (right) Khapra beetle (source: Rob Morrison PhD, USDA ARS). Right: Adult Khapra beetle (top) and juvenile larvae (bottom) pictured on grains of rice. (Source: Science and Surveillance Group, Department of Agriculture, Water, and the Environment, AUS).

Hosts:

All grains and grain products, including pinto beans, cotton seed, alfalfa seed, castor beans, nuts, fish meal, among others.

Damage:

- Larval feeding damages the seed coat and embryo rendering the seed unviable.
- Cereal grains often hollowed out until only the husk remains.
- Losses incurred in grains and processed grain products are primarily due to frass, pupal sheds, body parts, and hair that remains in the commodity in addition to the actual weight loss due to direct feeding.
- Infested grains are known to cause allergic reactions in humans and animals.

Phenology:

- Khapra Beetles spend the longest amount of time as larvae.
 - Larvae can go into facultative diapause at any time when ambient temperatures are below 30°C (86°F); no development is possible below 21°C (70°F).
 - Larvae can move in and out of facultative diapause and have been recorded to stay in facultative diapause for up 6 years when in the 5th instar.
 - In unfavorable conditions larvae can regress an instar.
- Complete development from egg to adult can take 26 to 220 days, depending on temperature.
- When ambient temperatures are below 21°C (70°F) larvae will be immobilized in a refuge making detection nearly impossible.

Lure Type and Maintenance:

Lure type	Replacement
STORGARD® KB/WB Pheromone	6-8 weeks
STORGARD® KB/WB Kairomone	6-8 weeks

Lure Storage:

- Store in unopened factory sealed packages in a cool place (< 74° F or 24° C maximum) for short periods until used or refrigerate longer term.
- Refrigerate or freeze unopened packages to carry over for annual storage.

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Trap Design:

- STORGARD® KB Wall Trap, STORGARD® QC™ DOME®, STORGARD® Original DOME®, or STORGARD® II Trap.

Placement Time:

- Traps should be placed before insect activity becomes apparent.
- Place when ambient temperatures are a minimum of 21°C (70°F); 30°C (86°F) or higher are ideal for monitoring.

Placement Pattern:

• STORGARD® QC DOME®:

- Place in a grid pattern at 10–20-meter intervals.
- Place near walls, around pallets of susceptible materials, near building posts, and/or around processing, filling, and packaging equipment.
- In retail outlets, traps should be used on or around shelving and in product storage areas.
- Trap locations should be recorded on a facility map.
- Avoid high traffic areas where traps can be easily dislodged or damaged.

• STORGARD® KB Wall Trap:

- Place traps in known areas of infestation or near potential refuges.
 - Common refuge zones outside of the commodity include unsealed brick, textured concrete, cardboard, unsealed plaster, wood, grout between bricks or tile, inside or on small animals and insect carcasses, husks, shells, and other porous fibrous substrates.
- The trap should be placed on or touching a surface that is favorable to larvae to increase probability of capture. Larvae will not seek refuge or favor slick or sealed surfaces such as painted drywall, sealed concrete, hard plastic, metal, tiles, stones, or epoxy. If traps must be placed on these surfaces, ensure there is a path to the trap though/on a favorable surface.
- Place the trap along grout lines if on a brick wall, or at the intersection of the wall and floor if the wall is painted or sealed.

Trap Density:

- One STORGARD® QC DOME® trap every 10 – 20 meters.
- One STORGARD® KB Wall trap every 7-14 meters.
- For Warehouse beetle only: one STORGARD® II trap every 762 – 1524 meters, or one for every 5 or 6 wall traps.

Trap Maintenance:

- Check traps every two weeks without detection, and every week after a detection.
- **STORGARD® QC DOME®:**
 - Care should be taken not to damage the “rim” of the inside ramp on traps.
 - DOME®: Clean trap reservoir with soapy water when fouled.
 - QC DOME®: use rebait kits.
- **STORGARD® KB Wall Trap:**
 - Only fill tray 1/4th full of wheat germ. If overfilled, larvae can use debris on near the top of the catch tray to crawl out.
 - Ensure “ramps” on the back of the trap are fully extended and free from jacket before adhering trap to the wall/surface.

Recommendations:

• STORGARD® KB Wall Trap:

- Upon inspecting the trap, dump wheat germ contents into a labeled zip-lock bag and replace with a new tray.
- Zip-lock contents can be held at room temperature for up to two more weeks and examine again to be sure small larvae were not missed initially.
- Ensure catch tray is snugly fit in-between the folds of the cardboard matrix. Catch tray should not touch the outer cover.
- In general, if one larva is trapped, be alarmed. If two or more are trapped, or if one location produces consecutive larval captures, this indicates a potential major problem.

Source: Recommendations and certain other sections were sourced from Barak, 2021 personal communication, Lampiri et al, 2020 “Population Growth and Development of the Khapra Beetle (Coleoptera: Dermestidae), on Different Sorghum Fractions”, and University of Florida Extension “Khapra Beetle”.

Note, always:

- Use only one pheromone lure per trap in addition to the kairomone and/or food attractant.
- Count and record captures as recommended.
- Change trap as needed.
- Discard lures in trash far from the area of use and remove trash afterwards.
- Follow recommendations.
- Contact local extension authorities and consultants for regional advice.