

Photo: CIAT



Photograph of a bean (enlarged) showing an adult *Acanthoscelides* bruchid and feeding holes made by its larvae.

Avoiding bruchid infestation in stored beans

Sindi Kasambala and Hendry A. Mziray

The common bean (*Phaseolus vulgaris*) is an important part of the diet of poor people in eastern, central and southern Africa. Beans are a major source of protein and calories, and contain 2 - 3 times the amount of protein present in most cereal grains. After the harvest, farmers often experience considerable losses, due in large part to damage by insects. In Tanzania, the *Eastern and Central Africa Bean Research Network* (ECABREN) and the *International Centre for Tropical Agriculture* (CIAT) are working with farmers to improve bean production and reduce post-harvest losses.

Storage beetles

In northern Tanzania small beetles called bruchids, notably *Zabrotes subfaciatus* and *Acanthoscelides obtectus*, are important storage pests. Larvae of bruchids enter the beans and make feeding holes, which greatly reduces the value of the beans.

Researchers found that farmers in Hai district of Kilimanjaro region regularly experienced high bruchid infestation in beans after only a few weeks of storage, forcing them to sell the beans soon after the harvest at low prices. Wasambara farmers in Lushoto district, however, did not experience these problems. It turned out that these farmers harvest their beans earlier than farmers in Hai district, as soon as the beans have reached (physiological) maturity. Harvesting at this stage avoids bean pods in the field becoming too dry, which makes them crack and lose the grains. The Wasambara farmers sell their produce soon after harvest, because they are aware of the potential danger of bruchid infestation during storage. They also know that quick sale of early harvested beans means extra income because these beans have higher moisture levels and are therefore heavier. But the farmers also found that if beans are harvested early and air-dried to a maximum moisture content of 12% they can be kept for four months without bruchid infestation. Longer-term storage can be achieved by adding dust or by drying or smoking the harvested beans.

A time-of-harvest experiment

Farmers in Hai district were unaware of the fact that *Acanthoscelides* attacks beans when they are still in the field, and that the time of harvesting determines the level of field infestation by these bruchids.

With the objective of demonstrating that there is a relationship between time of harvest and bruchid infestation during storage, a sequential harvesting program was initiated with the farming community in Hai district. A total of 95 farmers participated in this activity. The beans were harvested at three different times: first at physiological maturity, then two weeks and four weeks later. The pods were grouped into intact pods and split/damaged pods. The beans were extracted from the pods, put in sealed paper bags and stored for 8 weeks. After this, the type and number of insects present were recorded, as well as the number of damaged beans.

Beans from damaged pods had four times as many bruchids than beans from intact pods. Beans that had been harvested at physiological maturity showed less damage. Each week of delayed harvest resulted in a seven percent increase in infestation by *Acanthoscelides obtectus*.

Control strategies

After realizing that *Acanthoscelides* bruchids infest beans when they are still in the field, the farmers were eager to develop management strategies for controlling the pest. The following measures were taken:

- Timely harvesting of the beans, to reduce the risk of infestation by *Acanthoscelides* in the field
- Proper drying of beans before storage
- Good storage hygiene: cleaning the store and the containers before storing the beans; disinfecting the store if necessary; avoiding mixing newly harvested beans with stored ones
- The use of plant extracts such as neem (*Azadirachta indica*) powder or vernonia (*Vernonia* spp.) leaves and wood ashes to protect stored beans
- Storage of beans in air tight containers, e.g. polythene bags, drums, calabash (*Lagenaria* spp.) and clay pots.

The farmers reported that the measures can be carried out locally and are easy to apply. The rate of infestation by bruchids was found to be low and controlled. Farmers explained that the use of plant extracts to protect stored beans against bruchids had proved to be very efficient. They no longer use expensive and hazardous chemical pesticides. Stored beans now last for up to six months before being infested. These strategies have helped farmers to improve their food security and increase their income, which is used for paying school fees, buying food products or hiring land.

This experience shows that a combination of measures, e.g. time of harvesting, proper drying before storage, suitable storage structures and adequate protection of stored beans can offer effective protection from bean bruchids.

Sindi Kasambala. ECABREN. SADC/CIAT, P.O. Box 2704, Arusha, Tanzania. Fax: +255-27 2548557. Email: ecabren@habari.co.tz

Hendry A. Mziray. CIAT. Arusha, Tanzania. Email: ciattz@habari.co.tz