

## Grain temperature impact on storage pests

### Lower limits to insect's reproduction

Insect	Temp ° C
Rust – red Flour beetle	20
Bruchid – Cowpea weevil	20
Lesser grain borer	18
Saw-toothed grain beetle	17.5
Flat grain beetle	17.5
Rice weevil	15

Examples:

Life cycle for the Lesser Grain borer is completed in 4 weeks at 35° C but at 22° C the life cycle is slowed to 7 weeks, this significantly decreases the population increase. Breeding ceases at 18° C.

For the Rust –red flour beetle the life cycle is completed in 4 weeks at 30° C but at 22° C the life cycle is slowed to 11 weeks, again significantly decreases the population growth and insect activity. Breeding ceases at 20° C.

### Impact of grain temperature on insect

Temp ° C	Effect
61	*death 1 minute
55	*death 30 minutes
50	*death 29 hours
25-35	optimum insect breeding
15-25	development slows
15-20	development stops
5	death in days

Example:

All storage pests, including all life cycle stages are killed once grain temperatures reach 61° C for a duration of 1 minute.

Reference :

- \*"Heat disinfestation of wheat in a continuous –flow spouted bed" – paper 8<sup>th</sup> IWPSPP York July 2002, R. Qaisrani, Stephen Beckett CSIRO SGRL Canberra
- Pat Collins presentations to GRDC Updates

## **Insect susceptibility to heat**

Insect pests of stored foods are killed within seconds when exposed to temperatures above 60°C. The exposure time required to kill insects increases with decrease in the treatment temperature, taking a few hours at 50°C and days at 45°C. The time taken at a given temperature to kill all insects infesting grain is shown in Table 1. At temperatures that are not instantly lethal, insects die through heat stress and dehydration. Heat can also make insects more susceptible to other methods of treatment.

Table 1: Temperature-time mortality relationship

<b>99.9% mortality is reached in</b>	<b>at a temperature of</b>
Less than one minute	60°C
5 minutes	57°C
20 minutes	55°C
29 hours	50°C
About 96 hours	45°C