



## Protectants for stored grain in Qld

Pat Collins, Senior Entomologist, DPI, Indooroopilly, Qld

Bulletin GS006 4th edition May 1994

Agdex 102/615

**G**rain protectants are insecticidal chemicals that are mixed with grain during augering into storage to prevent insects from breeding. They *protect* grain by breaking the life cycle of the insect, often by killing the small larva after it has hatched.

Up to nine months protection is possible depending on the type and rate of protectant used.

Most protectants are nerve poisons, controlling both adult and immature life stages. Methoprene (Diacon or IGR) is an example of a type of protectant which affects the insect's hormonal system and prevents larvae from successfully moulting to the pupa or adult. It will not kill adult insects.

### ► Advantages and limitations

Protectants are effective in all types and standards of storage - no modifications to storages or equipment are required.

However protectants will not necessarily kill adult insects in grain; their action is to prevent an infestation from developing if adults migrate to the bulk after it has been treated. For this reason protectants are not registered for controlling an established infestation - in this case a fumigant such as phosphine is needed.

Dichlorvos (Mafu, Vapona) may also be used to disinfest grain and it may provide short-term protection for one to three weeks if the grain is very cool.

**Controlled aeration and fumigating in sealable silos are often cheaper and more acceptable to buyers than chemical protectants**

### ► Caution

Grain protectants leave detectable residues which may affect sales to some markets. Always check with buyers before using chemicals. Insects can also develop resistance to stored grain protectants - a major problem (see *GRAINSAFE* Bulletin GS008).

### ► What about Dryacide?

Dryacide® is a protective dust that collects on insects as they crawl through grain. It deactivates the wax that protects insects against excessive moisture loss. Under dry conditions insects die within a few days of exposure.

To effectively protect grain stored on-farm, Dryacide must be applied evenly to clean, dry grain, preferably immediately after harvest.

A rate of 1 kg/tonne is effective on grain with less than 12% moisture content, and gives up to 12 months protection during storage. Longer periods may be possible if the grain remains dry.

Grain which is dirty or infested, and is intended only for stock feed, may require higher rates as listed on the label.

Dryacide has no withholding period and is non-toxic to humans and stock. It is not, however, accepted on grain by some buyers and handlers (including GRAINCO and NSW GrainCorp) because it changes the handling properties of grain.

Note that the above restriction on delivery applies only to grain that has had Dryacide mixed through it, *not* to grain that has been held in a storage which has had areas such as the walls and floor treated with Dryacide.

cont'd

## ► Development of protectants

All chemicals available for use as protectants were developed for Australian conditions over the last 20 years by the Working Party on Grain Protection formed by the Australian Wheat Board.

The Working Party undertakes large-scale testing to prove effectiveness and limitations and ensures that the insecticide is safe to apply to grain when used according to the label.

## ► Recommendations 1994-1995

Grain protectants are most effective when applied to new-season's grain received into a thoroughly clean storage. They must not be used for any purpose other than those approved on the label.

The protectants listed in Tables 1 and 2 comply with the DPI/GRAINCO resistance management strategy. Table 1 gives recommendations for use of insecticides to *protect* cereal grain and peanuts. Table 2 details options available to *disinfest* grain.

For *protection* of grain, two application rates are given - **short term** storage of 6 weeks to 3 months and **long term** for 3 to 9 months. The short term rate minimises residue levels in grain stored up to 3 months.

All recommended application rates are lower than permissible levels set for stock feed. No withholding period is needed before treated grain can be fed to stock.

Actellic and Dichlorvos (Mafu, Vapona) are also registered for peanuts, and Dichlorvos (Mafu, Vapona) for soybeans and navybeans.

Some chemicals in Tables 1 and 2 are not accepted by certain markets. Always check that your buyer allows the use of particular protectants. A phone call is cheap insurance.

**Remember that buyers have the right to specify low or nil residues of registered grain protectants on grain. Check with potential buyers before you treat.**

More information on resistance of insects to chemicals is given in GRAINSAFE Bulletin GS008.

## ► Applying grain protectants

- use the correct dose - under-dosing may result in reduced protection; overdosing is wasteful and grain may need to be held longer to allow residue levels to decline;
- mix concentrated insecticide with rainwater if possible - alkaline water causes the insecticide to breakdown very quickly; use clean containers; don't hold mixed pesticides for more than a few days (mix just enough spray and use it as soon as possible);
- apply protectants to grain while it is being delivered into storage - liquids may be sprayed into the auger hopper, outlet or casing; use a flow meter if possible;
- high-volume pumps allow bypass to agitate liquid spray mixtures; other pump types may be used with care; thoroughly wash equipment with water after use;
- calibrate protectant applicators before every use on grain.

More information on protectant applicators is given in GRAINSAFE Bulletin GS007.

## ► Safety

- wear protective clothing - goggles, gloves and overalls when handling protectants;
- avoid breathing the fumes;
- don't eat, smoke or put your fingers in your mouth;
- when finished, wash well and change your clothes before starting other activities.

■  
Tables 1 and 2 are attached

**Table 1. Insecticide application rates for protection of cereal grains and peanuts, 1994-1995 (Queensland only)**

If grain is to be sold, use insecticides only if approved by your buyer or handler<sup>a</sup>. (Cereal grains include : wheat, barley, sorghum, maize, oats, triticale, rice, millets.)

Grain	Use	Insecticide	6 wks - 3 mths rate <sup>b</sup>	3 mths - 9 mths rate <sup>b</sup>	Notes
			\$/t <sup>c</sup>	\$/t <sup>c</sup>	
<b>All grains</b>	Markets not accepting grain with residues	Do not use residual insecticides			Consider using fumigation, controlled atmospheres (e.g. CO <sub>2</sub> ), aeration and good hygiene
<b>Barley</b>	Malting	Fenitrothion or Fenitrothion plus BRM	6 mL 0.16 - 0.34 10 mL 0.67 - 0.87	12 mL 0.32 - 0.67 20 mL 1.34 - 1.74	Some insects infesting barley are resistant to acceptable protectants - consider using alternatives to protectants Withholding period - 90 days for higher rate Withholding period - 1 day for both rates
<b>Cereal grain</b>	On-farm use, or sale for animal feed	Reidan plus Carbaryl or Bugmaster <b>OR</b> Dryacide	10 mL 0.38 - 0.49 10 mL 0.08 - 0.10 1 kg 2.61	20 mL 0.72 - 0.98 16 mL 0.13 - 0.17 1 kg 2.44	Do not apply to malting barley or rice Do not apply to malting barley. Do not apply to wheat for delivery to GRAINCO or sale to AWB and some flour millers. Withholding period for human consumption- 90 days for the higher rate. Grain treated with Dryacide (amorphous silica) will NOT be accepted by many buyers and handlers: use only on grain for farm use. Do not use on dusty, infested, or high moisture (more than 12%) grain.
<b>Cereal grain</b>	Delivery to buyer or handler who accepts grain with chemical residues	Reidan plus Diacon or IGR	10 mL 0.38 - 0.49 20 mL 1.10 - 1.98	20 mL 0.72 - 0.98 20 mL 1.10 - 1.98	Check with your buyer or handler before using protectants Do not apply to malting barley or rice Diacon (or IGR) does not disinfest (i.e. does not kill adult insects)
<b>Peanuts in shell</b>		Actellic	25 mL 1.55 - 1.61	25 mL 1.55 - 1.61	

<sup>a</sup> Insecticide residues in grain sold for human consumption must not exceed Maximum Residue Limits (MRL). Where application rates exceed the MRL withholding periods are suggested to ensure that residues decay to acceptable levels before the grain is sold. All recommended application rates are lower than residue limits set in Agricultural Standards Regulations for feed grain. No withholding period is needed before feeding treated grain to stock.

<sup>b</sup> Dilute liquid concentrates in water at the specified rate per litre, then spray 1 litre of the mixture per tonne of grain while augering the grain. Add dusts at the specified rate per tonne directly to the grain.

<sup>c</sup> Costs (dollars per tonne) are for chemicals only. These 1993 figures are presented as an approximate guide.

**Table 2. Insecticide application rates for treatment of infested grain, 1994-1995 (Queensland only)**

If grain is to be sold, use insecticides only if approved by your buyer or handler<sup>1</sup>. (Cereal grains include : wheat, barley, sorghum, maize, oats, triticale, rice, millets.)

Grain	Insects	Insecticide	Rate <sup>2</sup>	Cost <sup>3</sup>	Notes
Cereals species	(a) Most Mafu or Vapona	Dichlorvos or	5.3 mL	10 - 20 c	Withholding period after dichlorvos treatment is 7 days. Dichlorvos will not control dried-fruit beetle or resistant lesser grain borer.
			12 mL	22 - 44 c	
	(b) Dried-fruit beetle	Reldan	10 mL	38-49 c	Do not apply to malting barley or rice.
Cereals, peanuts, soybeans, navybeans	Moths	Dichlorvos (Mafu or Vapona)	4.4 mL	8 - 14 c	Withholding period after Dichlorvos (Mafu, Vapona) treatment is 7 days.
			10 mL	24 - 33 c	

<sup>1</sup> Insecticide residues in grain sold for human consumption must not exceed Maximum Residue Limits (MRL). Where application rates exceed the MRL withholding periods are suggested to ensure that residues decay to acceptable levels before the grain is sold. All recommended application rates are lower than residue limits set in Agricultural Standards Regulations for feed grain. No withholding period is needed before feeding treated grain to stock.

<sup>2</sup> Dilute liquid concentrates in water at the specified rate per litre, then spray 1 litre of the mixture per tonne of grain while augering the grain. Add dusts at the specified rate per tonne directly to the grain to control beetles, or spray 1 litre per 20 square metres of grain surface to control moths.

<sup>3</sup> Costs (cents per tonne or cents per 20 square metres) are for chemicals only. These 1993 figures are presented as an approximate guide.