Use of chemicals in integrated grain storage

Introduction
Store preparation, drying and cooling are the main ways to protect against grain storage pests. Changing temperatures and increasing moisture contents at the surface of grain bulks may allow residual infestations to develop. Occasional control failures due to poor management may require remedy.

Most storage insects carry over from previously stored grain, so it is important to detect any residual infestations.

Fabric treatments may not eliminate infestations but will reduce insect numbers significantly, thus delaying re-infestation and detection.

Chemical grain treatment may be justified if persistent infestations cannot be controlled by drying and/or cooling.

Protectants include:
- liquid pesticides which may be applied to store fabric or grain itself to kill insects and mites.
- fumigants which eliminate infestations within a few days.
- smoke generators (not fumigants), primarily used to control flying insects.
- diatomaceous earth (DE) which is not regarded as a pesticide.

Approval of pesticides
Defra’s Pesticides Safety Directorate (PSD) is responsible for all chemicals approved for agricultural use in grain stores. The Health and Safety Executive deals with chemical use in domestic and food storage areas.

Table 1 lists current PSD approvals; these may change as new chemicals are marketed and older chemicals withdrawn. Some grain buyers may have their own more restricted lists of approved pesticides.

For up-dated information consult the CSL ‘Liaison’ website. Only single pesticide applications are permitted and no pesticide treatments are allowed for organic storage or on rapeseed.

Application
The success of any pesticide treatment depends on even and accurate application. With liquid pesticides, this means matching conveying and spraying rates.

It may take 7 or more days to kill insects at 10°C or below but cooling grain will extend periods of protection.

Always follow label instructions on use of pesticides.

Always consult your end-user before using any chemical treatment.

If you are unsure about any of the suggested actions, or want them interpreted for your local conditions, consult a professional agronomist.
The role of chemicals in integrated grain storage

**Resistance**

Low doses may allow some resistant individuals to survive and breed. As resistance develops, populations survive higher and higher doses until the recommended dose fails.

At present, in practice even resistant insects are killed using the recommended dose. Control failure is usually due to poor dosing.

However, many populations of mites survive twice the recommended dose. In situations where mite control has proved problematic, prophylactic treatment, rather than treatment of infestation, may help to achieve good control.

**Fumigants & desiccants**

If cooling systems are inadequate, consider employing a licensed contractor to fumigate grain until it can be cooled adequately. Usually phosphine is applied in farm stores as aluminium or magnesium phosphide. As moisture is absorbed, fumigant is released. This is rapid at temperatures above 10°C. Although rapid in effect, fumigation confers no lasting protection, so cooling remains a priority.

Diatomaceous earth (DE) acts by physical means and so is not regarded as a pesticide. DE can be used to treat both store fabric and grain, but only as a top-dressing (Topic Sheet 79). However, check with your buyer; some processors do not accept DE-treated grain.

**Summary**

Much Defra and HGCA-funded research, widely reported in ‘The grain storage guide’ and Topic Sheets, has shown that grain can be stored successfully without chemical treatment.

Chemicals can still be used both for fabric treatment and as grain protectants under certain circumstances. However, recent regulatory changes and the withdrawal of active ingredients and formulations have left farmers confused. This Topic Sheet aims to clarify the position.

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Topic Sheets 7, 8, 53, 79

The grain storage guide, HGCA (revised 2003)

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**Table 1. Chemicals currently approved by PSD for use in grain stores**

<table>
<thead>
<tr>
<th>Name</th>
<th>Active</th>
<th>Use</th>
<th>Application rate</th>
<th>MRL 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostore 420</td>
<td>bifenthrin/malathion</td>
<td>fabric admix</td>
<td>125ml in 5-151 water/100m²</td>
<td>0.5/8</td>
</tr>
<tr>
<td>Greenecrop Storeclean 225</td>
<td>chlorpyrifos-methyl 1</td>
<td>fabric admix</td>
<td>200ml in 5-101 water/100 m²</td>
<td>3</td>
</tr>
<tr>
<td>Reldan 22</td>
<td>chlorpyrifos-methyl 1</td>
<td>fabric admix</td>
<td>200ml in 5-101 water/100m²</td>
<td>0.02/t</td>
</tr>
<tr>
<td>Actellic EC³</td>
<td>pirimiphos-methyl</td>
<td>fabric admix</td>
<td>200ml in 2.5-151 water/100m²</td>
<td>5</td>
</tr>
<tr>
<td>Actellic D</td>
<td>pirimiphos-methyl</td>
<td>fabric admix</td>
<td>200-400ml in 2.5-151 water/100m²</td>
<td>5</td>
</tr>
<tr>
<td>Prostore 157 UL</td>
<td>bifenthrin/malathion</td>
<td>admix</td>
<td>40ml/t</td>
<td>0.5/8</td>
</tr>
<tr>
<td>Actellic smoke generator No 10</td>
<td>pirimiphos-methyl</td>
<td>fabric</td>
<td>1/285m³</td>
<td>5</td>
</tr>
<tr>
<td>Actellic smoke generator No 20</td>
<td>pirimiphos-methyl</td>
<td>fabric</td>
<td>1/570m³</td>
<td>5</td>
</tr>
</tbody>
</table>

1 Must be stored for 90 days before consumption or processing.
2 MRL = Maximum residue level [mg/kg (ppm)].
3 No longer sold - must be used up by 31st December 2005.

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