Take care treating and handling stored grain

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Grain growers are urged to increase their awareness of important occupational health and safety issues when storing and handling grain.

It is vital to think about safety whenever working around silos and grain handling equipment and ensure chemicals used for grain protection are handled and applied in a safe and efficient manner.

Misuse of chemicals and grain handling and storage equipment can cause serious accidents, illness and even death.

A range of information

Any person working with agricultural chemicals used for grain protection and structural treatment needs to be aware of the hazards and take precautions to ensure their safe use.

It is important to read and interpret the symbols and safety information provided on product labels correctly. Avoid contact with pesticides during application and use and apply the chemical at the specified label rate.

The National Registration Authority provides a comprehensive database for registered agricultural and veterinary chemicals which can be accessed from the web site www.nra.gov.au. The Queensland Department of Primary Industries has also produced a CD-ROM version of a database on agricultural and veterinary chemicals called Infopest. This contains comprehensive information on all chemicals registered for use in Australia. Details of the Infopest CD can be accessed at www.dpi.qld.gov.au. State WorkCover authorities also provide information on silo safety and on-farm chemical use.

Every fumigant and insecticide sold in Australia has a Poisons Schedule rating or number which indicates its toxicity. Most insecticides registered for use as grain or structural treatment have a Poisons Schedule rating of either 5 or 6.

Schedule 5 chemicals are slightly toxic and include insecticide products with methoprene as the active ingredient. Do not relax safety precautions when handling Schedule 5 chemicals.

Schedule 6 chemicals are moderately toxic and include insecticide products with organophosphorus type grain protectants (chlorpyrifos methyl, dichlorvos and fenitrothion) as active ingredients. Phosphine has a Poisons Schedule rating of 7 and is extremely toxic.

Material safety data sheets are also available for every fumigant and insecticide sold in Australia. They detail safe work procedures, short- and long-term health effects and first aid treatment for accidents.

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Think safety when working and handling stored grain. To minimise the risk of exposure to toxic gases or fumigants do not enter silos unless they have been well-ventilated.

Safe phosphine use

Phosphine is an extremely toxic gas and misuse or lack of knowledge of this fumigant can have serious consequences. If accidents or dangerous incidents occur, regulations are likely to be tightened and phosphine use will become more restricted. Correct use according to the label will reduce these risks.

For a safe and effective fumigation:

- Ensure there is enough time for fumigation before the grain has to be moved.
- Seal the silo to the pressure test standard before grain is loaded.
- Read the preparation label for instructions on safe storage, correct application and disposal of residues.
- Do not handle or carry phosphine-generating preparations in a confined space or inside a vehicle.
- Do not fumigate during transport or where gas could leak into working or living areas.
- Do not contaminate grain with phosphine preparation residues — use a tray or similar vessel placed on, or suspended above the grain surface which contains and enables the removal of spent preparation following venting of the gas.
- Do not heap phosphine-producing preparations — place pellets or tablets evenly across the tray or vessels.
- Do not add water to phosphine-producing preparations.
- Do not fumigate when grain temperature is less than 15 degrees Celsius.
- Reseal the structure after the preparation is added.
- Label the structure as 'under fumigation'.
- Do not enter any silo bin when it contains fumigated grain. If trays containing spent residues cannot be easily reached, devise a method of retrieval, which avoids bin entry. Remember unspent residues can still produce phosphine.
- Allow the full exposure period plus an airing time before removing the preparation residue or the grain.
- Correctly dispose of the residues according to label regulations.

A record of the fumigation is useful if any problems occur afterward. Ideally, record the fumigation date, the storage capacity, the phosphine rate, infestation level (heavy, medium or light) and the date grain was cleared for moving.

At a glance

- It is important to be aware of the health and safety issues associated with handling stored grain and treating with chemicals.
- When using fumigants and insecticides follow the label instructions on safe storage, correct application and residue disposal.
- To reduce the risk of exposure to dangerous carbon dioxide and carbon monoxide levels, ensure adequate ventilation of sealed silos before handling.
- Careful planning and design of the silo site can improve accessibility and safety.

Toxic gas levels

The risk of naturally accumulated toxic levels of carbon dioxide (CO_2) and carbon monoxide (CO) in untreated grain can be high under certain conditions. Adequate ventilation of sealed or closed (but sealable) bins before handling is recommended to minimise the risk of exposure.

Canola stored for an extended time in a sealed bin can produce levels of CO_2 and CO, which present a danger to human health.

In CSIRO studies, canola was shown to rapidly produce both CO_2 and CO levels in sealed vessels which far exceeded levels reported for dry cereals and field peas.

Grain temperature and moisture content influence the rate of CO_2 and CO production, with a higher production rate in response to higher grain temperature and moisture content.

Changes in the storage atmosphere are a concern, particularly in situations where

grain has been stored untreated in a sealed bin and is not expected to contain toxic levels of gas. Atmospheres with CO_2 concentrations more than 10 per cent or oxygen (O_2) concentrations less than 10% can lead to unconsciousness or death. High CO_2 concentrations can be hazardous even when sufficient levels of oxygen are present.

Reduced O_2 levels (at about 10–14%) produce symptoms similar to drunkenness with loss of co-ordination and some euphoria. There are not sufficient warning symptoms of inadequate oxygen levels. $C0_2$ is a strong respiratory stimulant and atmospheres of less than 5% are most unpleasant to humans, rapidly causing respiratory distress. Atmospheres of 10% CO_2 may take several minutes to produce unconsciousness. If a person suffering symptoms from exposure to low O_2 or high CO_2 is removed quickly into fresh air, recovery should occur without ill-effects.

Carbon monoxide is much more dangerous and symptoms are irreversible and fatal at high concentrations. The toxicity of CO is increased in high CO_2 and low O_2 atmospheres. Uptake of CO is also increased in the presence of CO_2 due to increased breathing rates.

Grain protectants

Poisoning from organophosphorus insecticides during application usually occurs by absorption through the skin from accidental contamination from spray drift or spills, rather than by ingestion or inhalation. Their toxicity is due to the inhibition of cholinesterase and damage can be severe and may not be reversible unless the patient is treated within a few hours.

Carry out decanting, dilution and mixing of insecticide products with full protective clothing, including full-face protection, overalls, non-permeable rubber or poly-vinyl carbonate (PVC) gloves and suitable footwear. Check that mixing vats and spray equipment are in good working order and plan mixing and application procedures to minimise exposure. Thoroughly rinse all equipment following treatment.

For added personal protection, have washing facilities close at hand to enable immediate rinsing of spilled insecticide from eyes or skin. Remove any contaminated clothing as soon as possible following accidental spills and wash hands and exposed skin before eating and drinking and following completion of treatment. Avoid working in spray mist. Insecticide over-exposure symptoms include skin irritation, nausea, vomiting and drowsiness.

Silo safety

Careful planning of a silo complex layout can improve accessibility and safety. Consider the position on the property, suitability of soil (high strength and good drainage), accessibility of grain handling equipment and operational safety. Avoid locations in close proximity to overhead power lines and consider movement of handling equipment into and around the site. A continuous concrete pad set on a well-drained site is recommended.

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When applying insecticides wear full protective clothing including face protection, gloves and sensible footwear.

Old silos have few safety features. Contemporary silo design should include handrails or grab rails on the top to improve safety when accessing the inloading chute or to carry out sealing and maintenance. Make regular checks of the silo structure for any evidence of corrosion, damaged supports, or rivet or bolts loose or missing. Before making any repairs to silo structure, consult the manufacturer.

Silos are a hazard to children. Do not allow them to play around a storage area. A person can be drawn under moving grain within seconds. To prevent accidents, all ladders should be above child height and fitted with a device to prevent child access. Fit a safety grid over all bin entrances to restrict access.

When empty, clean silos through the safety outlet located at the silo base. Self-cleaning hoppers efficiently out-turn grain and reduce the amount of residues remaining. If entry into a silo is unavoidable, remember it is a confined space with inherent hazards.

Ensure the silo is well ventilated before entry. Where the silo has been previously used to fumigate grain, measure the composition of the atmosphere before entry. Phosphine still can be produced from unspent formulation residues in an empty silo. Remove or disconnect machinery such as screw augers to prevent them from accidentally activating. Ensure a safety harness is worn when working at heights and have someone keep watch.

The Australian Silo Manufacturers' and Grain Storage Association has adopted a national code ensuring all silos manufactured by Association members have minimum safety levels. Some States may specify special precautions before entry. Check with the WorkCover Authority Code of Practice for details on silo design and operation.

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