FATE OF ^{14}C-LABELLED COS ON GRAINS AND GRAIN FRACTIONS

Yong Lin Ren* and Peter Annis
CSIRO Entomology, Stored Grain Research Laboratory
GPO Box 1700 ACT 2601 Canberra, Australia. Yonglin.Ren@csiro.au

It has been shown that COS levels in fumigated grain fall rapidly to natural levels post fumigation. This study was undertaken to determine the distribution of residues within the grain, to understand whether there was any preferential accumulation in any particular grain fractions.

^{14}C-labelled carbonyl sulfide (COS) was used to measure amount of sorbed fumigant and its alteration products in grains. Wheat, paddy rice, polished rice, mungbean and safflower were exposed to a 60 mg L^{-1} of ^{14}COS for 7 days. After airing for 5 days, COS and/or its alteration products in sugars, protein, starch, amino acids, protopectines, hemicelluloses were undetectable (detection limit of 1 ng g^{-1} COS equivalents for this method) (Table 1) .

The total uptakes of radioactivity determined after fractionation and also by extraction were in the range 36-53 ng g^{-1} (ppb, w/w) COS equivalents. The total radioactivity determined by autoradiography was below the detection limit of 70 ng g^{-1} (Figure 1). Radioactivity in the commodities was less than 0.003% of total radioactivity applied.

All these results provide an upper limit of COS residues. In view of high natural COS levels, the radiolabelling demonstrates that only a very low fraction of additional residues can be expected from COS treatment. Because the experiments here were conducted with five different grains, it can be argued that this can be generally expected.

Table1. Scheme for the fractionation of commodities into nutrient classes and radioactive residues in fumigated commodities (mungbean, wheat, safflower, polished rice and paddy rice).

Scheme for the fractionation	**Fractionating nutrients**	**Radioactive residues (ng g^{-1} COS equiv)**
Crushed grain (total)		30-65
⇓		
Soxhlet extraction	total lipids (lipid, fat-soluble vitamin, pigments, etc.)	14-25
⇓		
Water extraction (ion exchange columns)	Water soluble components:	
	• Organic acids	9-27
	• Amino acids	<1
	• Sugars	<1
⇓		
Protein digestion (protease)	Digested protein	<1
⇓		
Starch digestion (diastase)	Digested starch (maltose)	<1
⇓		
Residues	Celluloses, lignins, hemicelluloses and protopectines	5-10

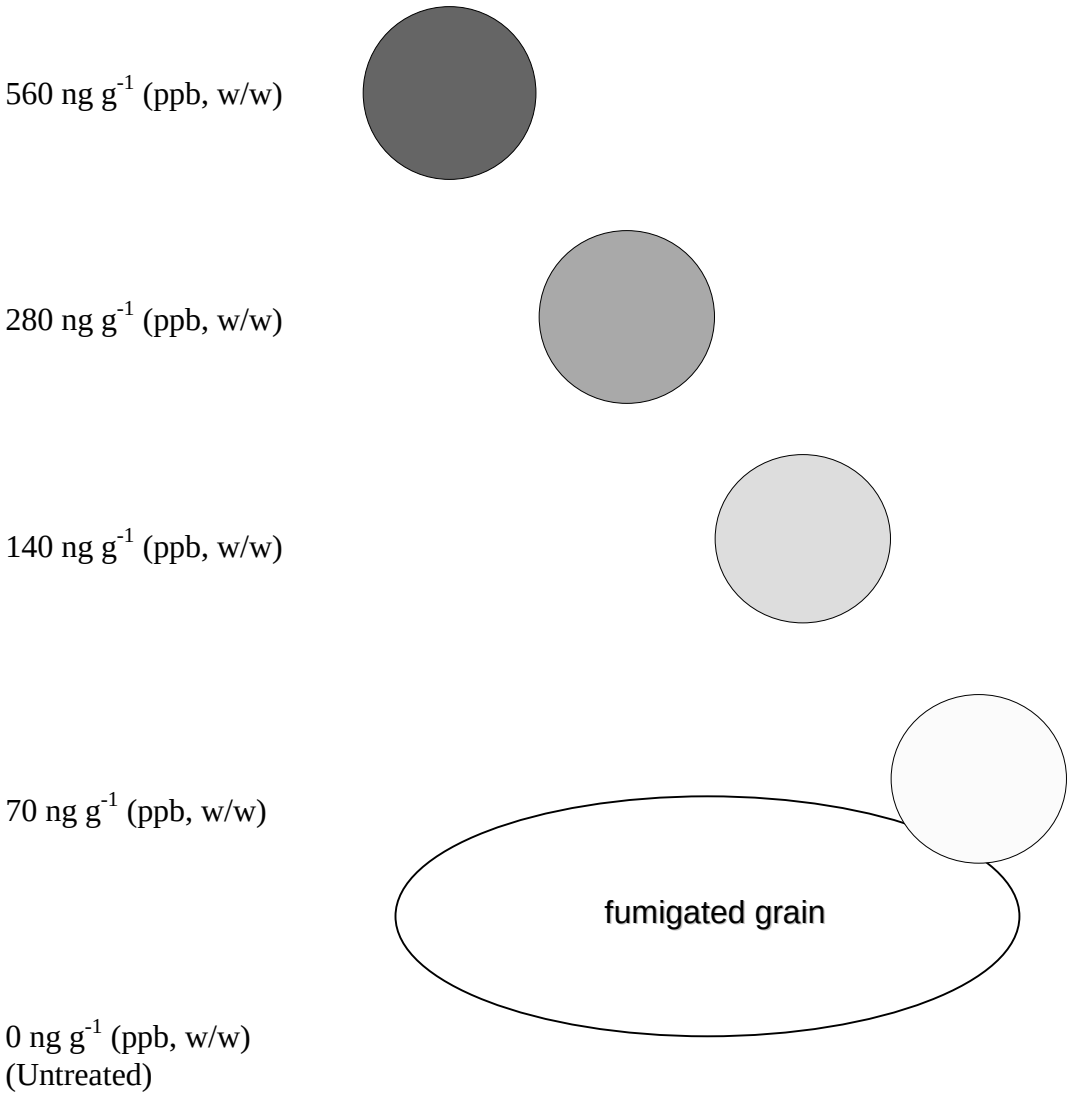

Figure 1. Schematic representation of a serial dilution autoradiograph to determine total radioactive residues in grains under 30 days exposure at -75°C.