CARBONYL SULFIDE AND CYANOGEN AS POTENTIAL NEW SOIL FUMIGANTS

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Both carbonyl sulfide (COS) and cyanogen (C_2N_2) were patented by CSIRO as new fumigants to replace methyl bromide (MeBr) in a variety of applications. Soil fumigation is one of the largest uses of methyl bromide, that will be phased out under the terms of the Montreal Protocol. This preliminary work is aimed at assessing the potential of COS and C_2N_2 for use as soil fumigants.

Penetration of COS and C_2N_2 through soil and sorption or uptake of the fumigants by soil was tested on a variety of soil types from Queensland, New South Wales, Victoria and Western Australia. Both COS and C_2N_2 diffused and penetrated through the soils faster and deeper than methyl bromide and carbon disulfide. Soils of different moisture content were fumigated in sealed gas jars. Sorption of the fumigants was measured by monitoring the loss of the fumigants in the headspace. Cyanogen was rapidly and strongly sorbed by all soils, followed by COS and MeBr. That is, cyanogen and COS were partitioned with higher ratio into soils than MeBr, which means that there is less emission to air. Both fumigants were stable in soil for 3-5 hr, after which they were broken down to naturally occurring soil components, such as H_2S and CO_2.

Both COS and C_2N_2 were shown to control 1st-instar whitefringed weevil, *Graphognathus leucoloma* (Boheman), nematodes (*Steinernema carpocapsae*) and soil pathogens (*Fusarium graminearum, Bipolaris soroikiniana, Pythium irregulare and Rhizoctonia solani*).

From these results, both COS and cyanogen appear to have potential as soil fumigants to replace methyl bromide. Formulations and application methods are being investigated to develop good agricultural practice for these fumigants.