EDN (ETHANEDINITRILE) DEGRADATION IN SOIL AFTER SHANK AND DRIP APPLICATION UNDER TIF

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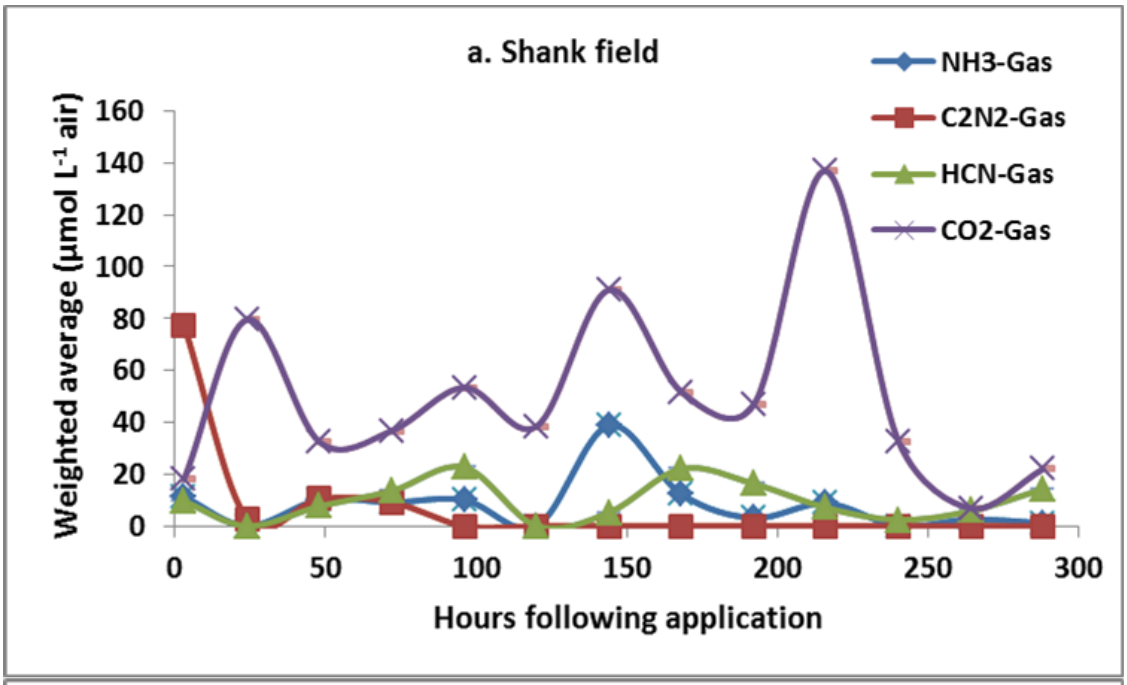
EDN (Ethanedinitrile, C_2N_2) has a very low boiling point and high vapor pressure and is a viable preplant soil fumigant. This study evaluated the transformation of C_2N_2 in the soil profile under shank injection and drip fumigation. Potential C_2N_2 degradation products in the soil gaseous phase (eg., CO_2, HCN, NH_3) and in the soil liquid phase (eg., NH_4, HCN, and NO_3) were monitored for 12 days after EDN applications under TIF.

The concentration of C_2N_2 in the soil gaseous phase of drip and shank fumigated fields was highest after 3 hours following EDN application. Very small concentrations were detected after 24 hours (less than 0.2 mg C_2N_2/L of soil air). The concentrations of NH_3 and HCN gases in the soil air were highest after 144 to 168 hours following application. However, the concentrations in the drip field were much lower than the concentrations in the shank field. The concentration of CO_2 was variable due to the high CO_2 background concentration in the soils. With few exceptions, CO_2 concentrations in both fields were similar.

The shank field had lower water content and fewer EDN degradation products are dissolved in soils with lower water content. In the drip field, EDN is applied in water and a large fraction of the soluble degradation products remain in water. Soil residual concentrations of NH_4^+ and CN^- were much lower in the shank-fumigated soil than in the drip-fumigated soil. These results confirm that a larger portion of the EDN degradation products remain in the water phase in drip fumigated field than in the shank field (dryer soil). However, CN^- concentrations were very small in both fields after 12 days and degrades quickly in soil or/and reacts with soil components to form insoluble and non-toxic products.

This study showed that EDN degrades very quickly to non-toxic forms and the byproducts (gaseous HCN and soluble CN^-) dissipate from the soil within 2 weeks after EDN application under TIF



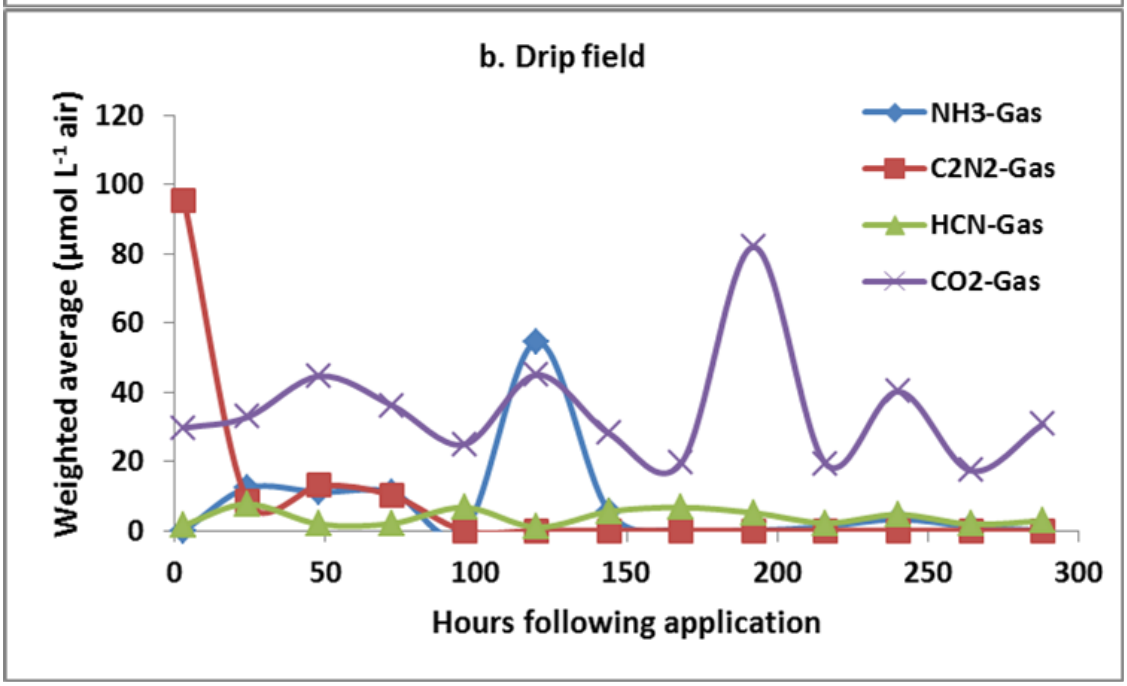


Figure 1. Weighted average concentration of EDN degradation gases in the soil profile (55 cm depth) of the (a) shank field and (b) drip field (the CO_2 conc. = 0.1 x mmol L^{-1} air)