UPDATE ON EDN™ FOR PRE-PLANT APPLICATION

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EDN (active ingredient -Ethanedinitrile C_2N_2) is a broad-spectrum fumigant, highly toxic to soil borne pathogens, nematodes, weeds and insects. EDN is neither an ozone depleting substance nor it is a green-house gas. It is in the process of approval in Australia, Israel, Turkey and Russia. EDN has a number of advantages for pre-plant application. EDN is a "true fumigant" means it disperses through the soil pores primarily as a gas (boiling point is -21 ° C), dissolve in the soil water (450 cm^3/100 cm^3 water @ 20°C) and kill the target pests found in both air and water surrounding the soil particles. EDN and its metabolite breaks down quickly in the treated soil hence, replanting of vegetable and fruit crops can be done after 2 weeks of application. Based on these characteristics, EDN could be a solution for the growers shifting to alternative fumigants to maintain the crop production as a result of methyl bromide phase out.

EDN air emissions and its fate in soil under shank and drip fumigation systems were studied in two fields (shank field ~0.78 ha and drip field ~0.89 ha) at the USDA - ARS/University of California Research Farm, Salinas, California. EDN was applied under TIF plastic sheet (Vaporsafe) and the emission rates were determined by measuring the air concentrations using sampling monitors placed in eight directions surrounding each field for 13 days. EDN air sampling was conducted using XAD-2 and soda lime solid sorbent tubes and analysed by gas chromatography equipped with Mass Selective Detector (GC-MS). A maximum EDN air concentration of 32 ppb was measured at 14 m from the edge of the shank applied bed during application. AERMOD modelling was used to compute the emission flux from both fields. An EDN peak emission rate of 24 µg/m/sec and 28.2 µg/m/sec were released approximately 83 and 28 hours in shank and drip applied plots respectively. A total percent mass loss of 13.1% and 15.6% of the initially applied amount in shank and drip applied plots respectively. Negligible amount of EDN was detected after tarp cutting (10 days after application). EDN and its break down compounds degrade to non-toxic forms in the soil within 2 weeks of application.

In Turkey, four field trials were conducted between 2014 and 2015 to control soil borne pathogens (*Fusarium oxysporum, F.solani, Rhizoctonia solani*) and root knot nematode (*Meloidogyne incognita*). Multiple EDN rates (20, 30, 40 and 50 g/m2) were applied using drip application and compared with control and standard fumigant in four commercially greenhouses grown tomato at Mersin. There was no significant difference between the multiple EDN dose rates except 20 g/m2. EDN suppressed the disease population compared with control and standard fumigation treatment.

In USA, an EDN field trial was conducted in 2017 to control soil borne pathogens and weeds in tomato. Multiple rates (30 to 60 g/m2) of EDN were applied using shank or hot gassing and compared with Pic-Clor (25 g/m^2) in an experimental farm at the Gulf Coast Research and Education Centre Balm, Florida. All beds were covered with TIF (Berry Plastics). EDN was as effective as industry standard in controlling weeds (Nut

edge) and pathogen (*Fusarium* sp) with both application techniques were equally effective.

Another tomato field trial was conducted at Florida Ag Research institute, Thonotosassa Florida in 2017. Three rates (300, 400 and 500 lb/acre) of EDN with (200 lb/acre) and without chloropicrin and compared with Chloropicrin 100 (200 lb/acre) or Pic-Clor 60 (250 lb/acre). EDN was applied using hot gassing through drip tape and Chloropicrin or Pic-Clor 60 was applied using shank method. All beds were covered with TIF (Vapoursafe). Increase in EDN dose rate greatly suppressed the disease population (Fusarium and Blight) and nematodes. However, the performance significantly improved with EDN + chloropicrin application. EDN provided better weed control (Nut edge) than chloropicrin or Pic 100 alone. There was no significant difference in overall weed control between EDN applied at 400and EDN with chloropicrin combination plots.

Further scientific research is being conducted in Australia, USA, Czech Republic (supported by research grant TH02030329), Turkey, Israel and South Africa to generate fate and efficacy data for various pathogens and weed species and for registration approvals. The results from this ongoing research will be presented.