TIF MULCH FILM – THE LEADING FUMIGANT EMISSION TOOL

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State of the art coextrusion technology, high gas barrier material innovation, research support, industry collaboration and repeated outstanding performance on field trials continue to strengthen the viability of Kuraray TIF™ mulch film as the leading fumigant emissions mitigation tool. The excellent fumigant barrier properties of EVAL™ EVOH resin at the core of the TIF film structure delivers significant reduction of fumigant and VOC emissions and creates a significant potential for fumigant rate reduction opportunities. This paper provides an update on the development of TIF films as a vastly superior fumigation film than standard polyethylene tarps and a significantly better alternative to Nylon-based VIF films.

Numerous fumigant permeation measurements, monitored field flux studies, efficacy studies and several commercial demonstrations have been conducted. Permeation testing has been conducted by Dr. Husein Ajwa of UC Davis, Dr. Mike Stanghellini of TriCal, and most recently by Dr. Quian Yaorong of the Biological and Economical Analysis Division / Analytical Chemistry Branch of the USEPA. Fumigants tested include methyl bromide, methyl iodide, chloropicrin, 1,3-dichloropropene; all with outstandingly low and consistent permeation coefficient results . Seven flux studies have been completed with methyl bromide/chloropicrin mixtures in California and Florida. In all studies TIF film was successfully deployed and demonstrated its fumigant barrier function in both drip applications and shank broadcast applications. In October 2009 Dr. Steve Fennimore of UC Davis completed a fumigant efficacy - rate reduction trial with drip applied Pic-Clor 60. His work indicated that 200 pounds of Pic-Clor 60 was equivalent to 350 lbs of methyl bromide/chloropicrin under standard tarp. Numerous trials in both the Western and Eastern US on a variety of crops have been done in collaboration with UC Davis, USDA/ARS, TriCal, Hendrix & Dail, Trident, Raven Industries, and university researchers. In May 2010, TriCal and Trident successfully deployed the largest commercial application of TIF film in a quarantine broadcast application of methyl bromide/chloropicrin against the Pale Cyst nematode in a 50-acre potato field in Idaho.

The USEPA Re-registration Eligibility Decisions (REDs) files of July 2008 approved buffer zone reduction credits for a type of TIF film (referred to as “EVAL/Mitsui film”) of 25% and 40% for methyl bromide and chloropicrin, respectively. In May 2009, the USEPA increased buffer zone credits for both methyl bromide and chloropicrin to 60% based on UC Davis film permeability testing of a TIF film produced by Raven Industries that had been put through the rigors of field application using standard industry practices and equipment. In the Fall of 2010, the USEPA is expected to increase buffer zone credits for the use of methyl bromide and chloropicrin with TIF film based on the field flux trials conducted in 2009 and 2010 using VaporSafe™ TIF mulch film. More recently,

the USDA/UC Davis, and Cal/EPA Department of Pesticides Regulation have initiated a large Ambient Monitoring Project that will study the effect of tarp time on fumigant retention and total emissions; data which will allow DPR to develop worker exposure management procedures with TIF in California.

TIF film has also been making its marks around the world. In Japan, rate reduction trials are underway for potatoes and other root vegetables in the Chiba, Gumma and Tokushima prefectures with collaboration between Kuraray, JA (National Federation of Agricultural Cooperative Associations) and NIAES (the National Institute of Agro-Environmental Sciences).

Successful TIF film extrusion trials have been conducted by a couple of converters in Italy for initial field deployment trials and fumigant permeation testing. In the United Kingdom, Custodian Trading completed a pilot study in August 2010 on the effect of Chloropicrin alone on Pale Cyst Nematode including a small patch with TIF film produced by IPM in Italy. The results of this trial are promising as the film successfully deployed and glued, and there is indication of improved efficacy, not only in yield, but skin finish.

Fresh Del Monte and CPP Industries are now assessing the rate reduction potential of TIF film in a melon farm in Costa Rica. TIF film technology has now been commercialized by Ipesa Rio Chico in Argentina for rate reduced production of tomatoes, bell peppers and eggplants.

Kuraray developed EVAL in 1972 and has manufacturing sites in Pasadena, Texas in the U.S., Antwerp in Belgium and Okayama in Japan. EVAL has been providing paradigm shifting solutions in different markets including food packaging, automotive fuel systems, construction, and hazardous chemical packaging for nearly three decades.