



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM:

SUBJECT: EPA No. 3125-96: S,S,S-Tributylphosphorotri-
thioate, (DEF); Additional residue data, new
analytical methods and additional data on
human exposure. Accession Nos. 254942 and
254947

FROM: J. Garbus, Chemist *JG*
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THRU: C. L. Trichilo, Chief *for, Edward Gager*
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TO: R. J. Taylor / J. Yowell PM-25
Registration Division (TS-767)

The Agricultural Chemical Division of the Mobay Chemical Company in order to comply with the State of California Administrative Code has reviewed its data base for the defoliant S,S,S-tributylphosphorotrithioate, (DEF). The company has submitted the additional data accumulated since the chemical was registered in 1969. Registration Division has requested that RCB review the pertinent residue data of this submission.

Background:

DEF is an organophosphate defoliant used, as is the related compound S,S,S-tributylphosphorotrithioate, (merphos, Folex), to defoliate cotton prior to mechanical picking. Folex readily oxidizes to DEF and it has been shown that DEF is the active material. Both DEF and Folex are registered for use only on cotton. DEF is applied to cotton plants at a rate of 1.5 to 2.25 lbs ai/A once or twice a season. The higher rate is to thin tall, rank, dense, unruly cotton plants by bottom defoliation.

In the early 1960's a tolerance was established for Folex at 0.25 ppm on cottonseed. In 1969, the tolerance for DEF on cottonseed was established at 4.0 ppm. Even though the application rates, the usage patterns and the analytical methods are nearly identical, the residue levels as submitted in the separate petitions for Folex and DEF differed by a factor of 50. The residue data submitted for DEF by Chemagro were inconsistent with those previously submitted and with those in the literature. Despite the lack of any adequate explanation for this discrepancy, and with the misgivings of the then RCB, the eight-fold higher tolerance for DEF was established and remains in effect.

One of the impurities in formulations of DEF is butyl mercaptan, a foul smelling, volatile liquid characterized in the submitted material as "elixir of skunk". In the late 1970's residential communities had penetrated into the agricultural areas of southern California and of Arizona. In the San Joaquin and Imperial Valleys and in the area around Phoenix where cotton is grown, residents of these new communities noticed a foul, pervasive odor at the time of the cotton harvest in the autumn. A considerable number of residents, especially school children, complained of respiratory and gastrointestinal distress, headaches, nervousness and dizziness and directly associated these symptoms with the foul odors emanating from the cotton fields. The residents held the defoliants responsible for the illness. Citizen groups were formed, petitions were circulated and hearings were held. As a result, the State of California imposed a restriction upon the spraying of DEF and Folex within 1 mile of schools and residential areas and ordered that the level of each impurity in DEF and Folex be brought below 0.1%. With the removal of the odoriferous impurities, the seasonal illness attributed to DEF and Folex has disappeared, even though the use of the defoliants has increased.

There was a more serious problem with the use of these defoliants. The dermal absorption had been underestimated and it was discovered through monitoring that applicators and cotton field workers were absorbing levels of DEF exceeding the margin of safety. Consequently, the State of California has imposed more stringent rules for the use and application of DEF.

New Data Submitted

The new data submitted by Mobay bears on all of the points discussed above. Report No. 66144 entitled "Conversion of Folex to DEF on Cotton Leaves" describes a GLC method for the determin-

ation of Folex in the presence of DEF. When used to follow the change in the levels of applied Folex, it showed that all of the Folex was oxidized to DEF a few hours after application. Report 86607 is a reprint [Tox. and Appl. Pharm. 73: 300-310 (1984)] that shows that the administration of DEF to chickens depresses serum and tissue cholinesterase activity and induces hepatic microsomal cytochrome P-450. Three reports are concerned with the stability and persistence of DEF in soil. Two reports deal with physical-chemical parameters of DEF, namely, volatility and water solubility. Three reports are concerned with drift of spray from treated fields, the odor of DEF, and the possible physical and psychological causes of the local outbreaks of the illnesses allegedly induced by the spraying of DEF. Item 69532 is a 1979 report of the California Department of Food and Agriculture on the monitoring of the potential exposure of applicators and field workers to DEF and Folex. It concludes that an adequate margin of safety did not exist for these workers.

Two reports are relevant to the concerns of RCB. One is a print-out of data showing recoveries of 97-102% from DEF-spiked cottonseed. The new residue data is contained in a published study, "Residues of Toxaphene, DEF, and Paraquat in Plant Parts and Gin Waste from a Treated Cotton Field." [Arch. Environ. Contam. Toxicol. 8: 125-137 (1979)].

The disposal of gin waste has become a formidable problem for gin operators. Each processed bale of cotton results in 150 lbs of waste. Burning is generally prohibited by air pollution regulations; use as a nutritive mulch or as livestock ration is not feasible due to the presence of high residue levels of insecticides, defoliants, and dessicants. The study was to determine these levels in cotton grown in California.

DEF was applied once at a rate of 0.76 lb ai/A, less than the registered rates of 1.5 to 2.25 lbs. Cotton plant parts were sampled at various times during cultivation and ginning. The item of interest, cottonseed, was found to contain 0.35 ppm 7 days after application and .09 ppm at 26 days. The gin trash other than lint contained 58 ppm.

Conclusions and Recommendations:

This submission of data by Mobay Chemical Company appears to be unsolicited and not in response to any request on the part of EPA concerning the defoliant S,S,S-tributylphosphorotrithioate, (DEF). DEF is not currently undergoing review for reregistration,

nor is such a review contemplated in the near future. The additional data do not alter any conclusions relating to residue levels, analytical methods or tolerances.

We recommend that the submitted data be accepted and held for any future requirements.

cc: S.F., R.F., Circ., Reviewer:S.F., S,S,S-Tributyl phosphorotrithioate (DEF)

RDI:A.R.Rathman:11/16/84:R.D. Schmitt:11/19/84

TS-769:RCB:CM#2:RM810:X74 84:J. Garbus:edited:wh:11/19/84