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

11 JUL 1989

OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: REVIEW OF DATA ON APPLICATOR AND MIXER/LOADER EXPOSURES TO TRIADIMEFON DURING GROUND-SPRAY APPLICATION OF BAYLETON FUNGICIDE TO WHEAT FIELDS.

TO: Lois Rossi, Product Manager 21
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Please find below the NDEB review of.....

HED Project #: 9-0148

Reg File/Rec #: 232630

Registration #: 3125-GUA

Caswell #: 862AA

Company Name: MOBAY CORPORATION

Date Received: 10/12/88 Action Code: 101

Monitoring Study Requested: _____ Reviewing Time: 4 weeks

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I.0 INTRODUCTION

Registration Division has requested that NDEB review a mixer/loader-applicator exposure study on triadimefon (Bayleton), which was submitted in connection with 6(a)2 data that identified this chemical as a possible oncogen. The study submitted by Mobay Corporation monitors worker exposure during ground-spray application of BAYLETON-50-DF fungicide to wheat fields in California.

The test substance is a soluble granular product that disperses readily in water. The formulation contains 50% by weight of triadimafon (1-(4-Chlorophenoxy)-3,3-dimethyl-1-(1H-1,2,4 triazol-1-yl)-2-butanone) as the active ingredient. More than 98% of the dry product consists of particles in the 600-2000 micron size range. BAYLETON is used for the control of certain rust, rot, blight, blotch, scald, speck, spot and scab diseases in field, fruit and vegtetable crops and is applied by ground-spray boom. Treatment is usually performed by a one or two-person crew. A two-person crew consists of a mixer/loader and an applicator. The mixer/loader usually mixes the dry product in either the application vehicle tank or a separate tank, connects transfer hoses if needed, activates pumps and disposes of containers. The applicator drives the application vehicle and operates the spraying system controls. Either worker may perform minor maintenance and clean-up tasks as required. A one person crew would perform all of duties for both mixer/loader and applicator.

The following worker protection statement appears on the label for Bayleton 50% Wettable Powder Fungicide: NOTE TO USER: For worker protection during mixing, loading, and during application, wear a hat, long sleeve shirt, and long legged trousers or overalls. In addition, during mixing and loading, wear rubber or neoprene gloves and dust mask. Protective clothing should be laundered separately following application.

2.0 MATERIALS AND METHODS

BAYLETON was applied to 4-10 inch tall wheat at a rate of 3.6 oz ai/20 gal water/acre in the Imperial Valley of California on February of 1988. The exposure to six workers (three crews of one mixer/loader and one applicator each) was monitored. Sixteen replicates were run for each task (mixer/loader and applicator): ten for closed-cab application and six for open-cab application. Four of the workers alternated between mixer/loader and applicator tasks. The two crews using closed cabs used identical equipment and procedures. The rig was a Spra-Coupe Model 220, with a particulate/charcoal filtered air system for the driver. The spray boom was 33 ft long and 3 ft above the ground. There were 21 Spraying Systems Model 8004 LP nozzles operating at a

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pressure of 30 lb/square inch, allowing it to treat a swath 33 ft in width at a ground speed of 7.5 miles per hour. Mixing was done in a 200 gallon mix tank mounted on a nurse trailer which also carried a 1000 gallon water tank. The mixer loader emptied two boxes (4 lb) of BAYLETON 50-DF into the mix tank, closed the lid and pumped in water; he then connected a hose to the Spra-Coupe and transferred the mixture. The applicator drove the rig across the field, operated the spray nozzles and performed minor maintenance. A third crew sprayed with a 1968 International Harvester open cab tractor equipped with a 25 ft spray boom at a hight of 2 ft above the ground. The boom had 32 T-Jet Model 8002 fan-jet nozzles operating at a pressure of 60 lb/in^2 ; swath width was 27 feet and ground speed was 8 mi/hr. Loading was done into the tractor tanks with the mixer/loader emptying 4 lbs of product into one saddle tank and 2 lbs into the other. Mixing was accomplished by pumping from one tank to the other. When the mixing was completed, the applicator drove to the work site, operated the spray controls, and performed minor maintenance such as cleaning clogged nozzles. All workers wore denim trousers, cotton shirts (either long or short-sleeved), leather boots and baseball caps. In addition, they wore long-sleeved polyester/ cotton work shirts and coveralls and chemical-resistent nitrile gloves. The times for application were reported to range from 1.63 to 3.22 hours per replicate. From six to fourteen pounds of active ingredient were applied during each replicate.

Dermal exposure was monitored by dosimeters attached to the workers' coveralls at 10 locations: both upper arms, both palmar forearms three inches above the wrists, right chest just above the pocket, left back at the shoulder blade, the front of both thighs, and both shins. An additional dosimeter was attached to the worker's cap just above the bill. Dosimeters consisted of a 3x3 inches square 12 ply surgical sponge enclosed in an aluminized paperboard holder having a circular opening 5.6 cm in diameter. The gauze sponges were treated with a proprietary sunscreen formulation since it was found that significant amounts of triadimaform were lost from untreated gauze sponges when exposed to sunlight. Recoveries of 79-128% were reported for field-fortified samples treated with sunscreen. A second set of dosimeters was attached to the worker's clothing inside the coveralls (outside of the inner clothing) at the following locations: both upper arms, both palmar forearms, left chest, right back, both thighs and both shins. The dosimeters were arranged so that the inner dosimeters were not occluded by the outer ones. At the end of the monitoring period the sponges were removed from the dosimeters, placed in one-ounce glass bottles, capped and stored on frozen gel blocks.

Hand exposure was measured by the hand rinse method at the completion of all work for the monitoring period using 200-ml of absolute alcohol in a 42-oz Whirl-Pak bag. Each hand was washed separately. Two washings, with the hand shaken 50 times in the

solvent, were performed on each hand. A portion of each washing solution was used to fill two labeled one-once bottles which were capped and stored on frozen gel blocks. On six occasions, the outside of a mixer/loader's gloves were washed by the same method, to provide a comparsion of the amounts of triadimafon on hands and gloves.

Inhalation exposure was monitored by a personal sampling device using a quartz microfiber (QMA) filter in a polystyrene cassette attached to the worker's lapel. Air was drawn through the filter at approximately 1 l/min by a portable battery-powered pump. After sampling was completed, the cassette was removed, capped and placed in a Whirl-Pak bag and stored on frozen gel blocks.

Recovery experiments were performed with all three sampling media prior to the commencement of field work. Analyses of fortified samples were conducted immediately and up to 59 days after fortification to determine stability during storage. Control and fortified control samples of each media were prepared in the field. Five QMA filters were fortified each day with 0.2 ug each of triadimafon in [redacted] and exposed to ambient sun and wind conditions for three hours. Five ethanol hand rinses were fortified each day at 100 ug and 1000 ug. Five gauze sponges were fortified each day at: 0.5, 1.0 or 2.0, 10, 100 and 1000 ug. After fortification and exposure to the elements, all control samples were stored in ice chests on frozen gel blocks for 8-10 hours, until they were transferred to dry ice storage for transport to the analytical laboratory. Five blank samples of each medium were prepared, exposed and stored each day in the same manner as the fortified samples. In addition, a set of blank samples composed of one QMA filter, one ethanol hand wash, and two gauze sponges was prepared each day and stored, shipped and analyzed with the other samples. Average % recoveries were: 85.6 to 91.4 % for the QM-A filter samples, 98.2 to 109 % for the ethanol handwashes and 78.9 to 128 % for the gauze patches (see Tables 1 and 2).

All samples were stored in ice chests on frozen gel blocks for 8-10 hours until daily field activities were completed. Samples were then repacked on dry ice for shippment to the laboratories where they were stored in freezers at -7 degrees Celsius prior to analyses. The gauze-sponge samples from day one, including the control samples, were analyzed at the Bayer environmental laboratory in Monheim, West Germany. All other samples were analyzed by Mobay Environmental Analytical Laboratory in Kansas City, MO.

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(3) RESULTS AND DISCUSSION

The investigators reported the following results for this study based on total daily exposures calculated by adding exposures from monitored replicates of less than full-day length. As stated above, all workers wore denim trousers, cotton shirts (either long or short-sleeved), leather boots and baseball caps. In addition, they wore long-sleeved polyester/ cotton work shirts and coveralls and chemical-resistent nitrile gloves. The reported results reflect exposure to face and neck (exposed body areas), hands and body areas covered by protective clothing (patches on the outside of inside clothing).

Job Class	Full-Day Exposure, mg/day
Open-Cab Mixer/Loader	2.4
Open-Cab Applicator	2.6
Closed-Cab Mixer/Loader	0.38
Closed-Cab Applicator	0.44

Full-day exposures for the four job classes monitored were estimated by assuming that a crew could routinely complete two of the replicates monitored per day. The higher exposures for the open-cab crew were claimed to be not exclusively due to the type of equipment. The investigators stated that field notes showed that workers in the open-cab crews were less careful than those in the closed-cab crews. For example, in replicate 3, the applicator unplugged the sprayer without gloves; in replicate 4, tank mix dripped on both men while they raised the spray boom manually; in replicate 10, both men cleaned clogged nozzles filters and screens without gloves. Mixer/loaders occasionally spilled BAYLETON while adding it to the spray tank and in two instances, walked close to the spray boom when it was operating. Similar incidents were not noted for the closed cab crew.

The following comments are made on the reported results:

(1) Reported exposures reflect the application rate of 3.6 oz ai/acre and are not normalized to the one pound ai/acre rate used in the NDEB data base. To compare study exposures reported as mg/hour with the NDEB data base a factor of (16 oz per lb/3.6 oz per acre) 4.44 should be applied.

(2) Unit exposures reported as mg/hr appear to underestimate actual exposure rates because the time used for calculation does not reflect actual time spent in performing tasks, especially for mixer/loaders. For example, Mixer/loader-13 is reported to have spent 1.63 hours to perform his tasks while field notes for replicate 13 indicate that only 11 minutes were spent in mixing and loading. The same field notes report total application time of 97 minutes (1.62 hours) for Applicator-13 while an application

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time of 2.02 hours was used to calculate unit exposure. In addition, it is not clear from the field data whether ferrying time is included in application time.

(3) Field notes indicate that both mixer/loaders and applicators performed many activities that could result in significant exposure (especially hand exposure) without wearing their gloves (e.g. cleaning and adjusting nozzles in replicate-10) and that the mixer/loaders and applicators washed their hands during the test periods. These practices would cause reported underestimation of total exposure. Since the field notes are incomplete and in some instances illegible, the the full extent of these practices is not known.

(4) The number of acres of wheat typically treated per day with Bayleton is not indicated in the report. This information is needed to assess the usefulness and significance of exposure estimates based on the studies performed. Using the reported conclusions of mixer/loader exposure of 2.4 mg/day (open cab) and 0.38 mg/day (closed cab), estimates of the number of acres treated per day can be made: (mg per day/mg per lb x 16 oz per lb/3.6 oz per acre = acres per day).

0.38 mg per day / 0.023 mg per lb average (from Table 3) x 16 oz per lb/ 3.6 oz per acre = 73 acres/day for closed cab studies.

2.4 mg per day / 0.091 mg per lb (from Table 4) x 16 oz per lb/ 3.6 oz per acre = 117 acres/day for open cab studies.

It is important to know if these daily treatment rates are typical for Bayleton treatment of wheat.

(5) Protective clothing and gloves were worn by both mixer/loader and applicator in this study. The product label does not require protective clothing and only requires the use of gloves during mixing and loading.

(6) Inhalation exposure was found to be insignificant compared to dermal exposure.

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4.0 CONCLUSIONS

(1) The daily unit exposures reported in this study (listed below) are probably underestimations of actual exposures because of: (a) workers washing hands and other body parts during the study. (However, this appears to be ordinary and normal work practice not intended to deliberately reduce reported worker exposure and so can be accepted). (b) apparent overestimation of worker exposure time, (c) daily treatment of acreage that may be less than typical. Data defining typical and maximum numbers of acres treated per day were not presented in the study.

It is also noted that protective clothing and gloves were worn by all workers in the study. The label for Bayleton does not recommend use of protective clothing and the use of gloves is only recommended for mixer/loaders. (see DISCUSSION).
The reported exposures are for an application rate of 3.6 oz ai/ acre and cannot be directly compared with unit exposures in the NDEB data base.

Job Class	Full-Day Exposure, mg/day	mg/kg/day (calc)
Open-Cab Mixer/Loader	2.4	0.034
Open-Cab Applicator	2.6	0.037
Closed-Cab Mixer/Loader	0.38	0.005
Closed-Cab Applicator	0.44	0.006

5.0 RECOMMENDATIONS

NDEB cannot fully accept the results of the handler exposure studies as valid estimations of exposure to workers involved in the application of Bayleton to wheat. The results appear to underestimate actual exposure because of inaccurate or inconsistant timing of the exposure periods of work tasks (see RESULTS and DISCUSSION, comment 2). This should be explained by the registrant.

The studies performed also would not support current labelling for Bayleton since they were conducted with protective clothing and gloves worn by all workers. The label for Bayleton does not recommend use of protective clothing and recommends the use of gloves only for mixer/loaders. Therefore, labeling for products containing triadimafon should be revised to reflect only worker clothing requirements that are adequately supported by exposure data. NDEB believes, based on data in the published literature (1), that exposure to workers wearing protective clothing is approximately 50% of that to workers wearing normal work clothing.

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NDEB defers evaluation of a complete exposure assessment of Bayleton until the completion of review of the toxicology studies. Upon the request of the Toxicology Branch II, NDEB will require a usage analysis from BAB/BEAD and complete the exposure assessment of Bayleton.

REFERENCES

(1) Fenske R.A.,(1988) Comparative Assessment of Protective Clothing Performance by Measuring of Dermal Exposure during Pesticide Applications, Appl. Ind. Hyg. Vol 3, No.7, July 1988.

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Circulation
Bayleton file
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