

Memorandum**HSM-94008**

(Numbered after original issuance)

To: James Herota, Registration Specialist
Pesticide Registration Branch**Date:** April 12, 1994**Place:** Sacramento**Phone:** 445-4207**From:** **Department of Pesticide Regulation** - Michael H. Dong, Staff Toxicologist
Worker Health and Safety Branch**Subject:** **PRODUCT NAMES:** DIMENSION®
ACTIVE INGREDIENT: Dithiopyr
COMPANY NAME: Monsanto
I. D. NUMBERS: 131942-N
DOCUMENT NUMBER: 51643-042
EPA REGISTRATION NUMBER: 524-431
TITLE: Ground Water Protection Data - Henry's Law Constant, Worker Exposure Data, and Chronic Toxicity Data

This document is submitted in support of the registration of dithiopyr used as a pre- (and sometime also as a post-) emergence herbicide for control of crabgrass and broadleaf weeds. It mainly contains the report and the data of a telephone survey in which 200 lawn care companies in California were interviewed for information concerning the duration and frequency of use with pre-emergence herbicides. As discussed below, this type of information is useful in that it allows more accurate estimation of lifetime exposure for lawn care specialists applying dithiopyr for more than one season. Also included in the document are new data on the Henry's Law constant for dithiopyr, which has no direct relevance to worker exposure assessment.

The survey was conducted in 1993 by the Plexus Market Group in behalf of Monsanto. It consisted of telephone interviews with representatives (primarily owners) of 200 California lawn care companies for research into the amount of time that professional operators would spend over a lifetime applying pre-emergence herbicides for weed control. Numbers were dialed from a Standard Industry Classification list which was based on yellow page listings under the lawn care services category. Of the 2,250 companies in the original list, only 812 were later found to be qualified for interviews. There were 612 refusals among those who were qualified, thus resulting in a total of 200 companies interviewed. Results from the 200 interviews indicated that an applicator on the average would spend 23.8 days per year (= 2.9 days/week x 2.1 weeks/month x 3.9 months/year) applying pre-emergence herbicides for weed control. Two additional crucial findings were that over 90% of the 517 applicators working in the 200 companies have been so employed for 10 years or less, and that a professional applicator on the average treats 1.1 acres of lawn per day. This latter finding suggests that the amount of dithiopyr active ingredient (A.I.) applied daily on the average would be ≤ 0.55 lb, since the maximum label rate for Dimension herbicide is 0.5 lb A.I. per acre.

A biomonitoring study was submitted earlier [1] in which the average absorbed daily dosage (ADD) measured for 18 lawn care specialists applying dithiopyr to turf was 1.2×10^{-4} $\mu\text{g}/\text{kg BW}/\text{lb A.I.}$, with an upper bound of 2.2×10^{-4} $\mu\text{g}/\text{kg BW}/\text{lb A.I.}$ These average and maximum ADD were calculated after correction with a factor of 2.7 (192 h/72 h) for the oversight that the human urine samples were not collected beyond 72 h [2], and also for other methodological inconsistencies (e.g., volunteers wearing more protective clothing) noted in the same earlier review [3]. It appears that the above ADD had been over-estimated substantially with this correction factor, since most (> 90%) of the dithiopyr and its major metabolites were shown to be excreted in monkey urine within 48 - 60 h following the administration of a single iv dose [4]. With the new survey finding on average daily usage of dithiopyr (i.e., ≤ 0.55 lb), the average ADD for Dimension herbicide applicators can now be expressed as 6.6×10^{-5} $\mu\text{g}/\text{kg BW}$.

The other survey findings also suggest that for Dimension herbicide applicators, the expected lifetime absorbed daily dosage (LADD) would be 6.1×10^{-7} $\mu\text{g}/\text{kg BW}$ ($= 6.6 \times 10^{-5}$ $\mu\text{g}/\text{kg BW} \times 23.8$ work days/365 annual days $\times 10$ work years/70 lifetime years). This LADD should be considered to be quantitatively insignificant with respect to cancer risk, since the implicated *critical* cancer potency factor Q^* for dithiopyr is > 16 ($= [\text{regulatorily-acceptable occupational cancer risk of } 1 \times 10^{-5}] \times [\text{LADD}^{-1}]$). Available sources [5,6], including the oncogenicity data submitted for registration of all products in California, all point to the same assertion that the Q^* calculated for pesticides thus far have rarely, if ever at all, exceeded 10. Neither do the physico- or bio-chemical properties of dithiopyr support an unusually high(er) Q^* .

It is important to note that the critical Q^* calculated above is likely to be much > 16 . Although from the survey it was shown that 8 % of the applicators have been employed in lawn care companies for more than 10 years, the LADD was still likely to be overestimated (and hence the implicated critical Q^* to be under-estimated) since in the calculation Dimension herbicide was assumed to have a 100% market penetration. In addition, it is likely that those applicators who have been employed in lawn care companies for more than 10 years would eventually assume a supervisory position and hence would not be actively engaged in the actual herbicide application in their later work years. Animal studies submitted for registration of dithiopyr [7] also show no acute or other (sub)chronic effects that theoretically could be induced from the maximum or average ADD as measured in the biomonitoring study. The no observable effect levels determined from these studies for the various (noncarcinogenic) toxicities were well above 0.5 mg/kg/day.

Recommendation/Conclusion

This survey submitted in support of the registration of dithiopyr is considered to be fairly adequately designed (for its type) and its report, well documented. With its findings on use duration and frequency for Dimension herbicide applicators, the worker exposure to dithiopyr as measured in the biomonitoring study earlier can now be shown theoretically to pose no significant risk of acute or long-term adverse health effects. Whether further (chronic) toxicity data are still required is primarily a regulatory or registration-related issue which is beyond the purview of this scientific review on worker exposure.

References

1. Cowell JE, Manning MJ, Lottman CM (1990). Assessment of worker exposure to dithiopyr from the lawn care application of Dimension herbicide. California Department of Pesticide Regulation Registration Document No. 51643-025.
2. Cowell JE, Manning MJ (1993). Response to the State of California review of the biomonitoring and the passive dosimetry portions of the previously submitted study. California Department of Pesticide Regulation Document No. 51643-040.
3. Dong MH (1993). Document review: Assessment of worker exposure to dithiopyr from the lawn care application of Dimension herbicide. Worker Health and Safety Branch, California Department of Pesticide Regulation, dated 02/23/93.
4. Couch RC, Erickson MK (1990). A pharmacokinetic study of ^{14}C -Mon-15100 in male rhesus monkeys following intravenous administration: Part I. excretion of ^{14}C -activity in urine and feces. California Department of Pesticide Regulation Registration Document No. 51643-025.
5. Office of Environmental Health Hazard Assessment (1991). Expedited cancer potency values and proposed regulatory levels for 138 Proposition 65 carcinogens. Reproductive and Cancer Hazard Assessment Section, California Environmental Protection Agency.
6. National Research Council (1987). Regulating Pesticides in Food - the Delaney Paradox. (Washington DC: National Academy Press).
7. Medical Toxicology Branch (1993). Data package summary and recommendation sheet - new active ingredient (dithiopyr). California Department of Pesticide Regulation.

cc: Joshua Johnson (1 original and 5 copies); John Ross