Introduction to triazine-soil interactions

By

Peter Dubach*

Contents

I. Introduction .................................................. 19
II. The triazines .................................................. 20
III. The soil ...................................................... 20
IV. Triazine-soil interactions ................................... 21
   a) Distribution of the triazines in the open soil system .......... 22
   b) Transformation or degradation processes ...................... 24
   c) Transformation of soil system due to biological activity of triazines . . . 24
V. Other features of use ......................................... 25
Summary .......................................................... 25
Résumé ........................................................... 26
Zusammenfassung ............................................... 27
References ....................................................... 28

I. Introduction

The more man's technology develops, the more important it becomes to study its influence on the environment: on the soil, water, and air, and on the flora and fauna. This is mainly a matter of public concern, questioning whether or not human habitats will not be changed too much by technology to allow a healthy and worthwhile living. On the other hand, technology itself has to cope with the elements of the environment and their influence on technological installations or operations therefore must be considered, too. Indeed, today's studies on interactions between environment and technology constitute a substantial part of the total worldwide research efforts.

The technology of controlling weeds by chemical means instead of by expensive and tiresome mechanical and manual methods is of rather recent origin, especially the sophisticated use of the preventive application of herbicides on the still weed-free soil. From the very beginning of the use of such pre-emergence herbicides it was recognized that the nature of the soil greatly influences the general and selective phytocidal activity of these chemicals. Recognizing also the fact that the soil, as

* Research Department, Agro-Chemicals, J. R. Geigy S.A., Basle.
the producer of man's food, is a very vital element of our environment, interactions between herbicides and soil have immediately found considerable worldwide attention.

After about 15 years of practical experience with the triazines, which are among the first and most widely used soil-applied herbicides, a symposium specifically oriented to review the interactions of this class of compound with the soil is certainly justified, although many of the problems are not yet solved. However, research in the field of triazine-soil interaction has now reached a point where we can sit together and consolidate our findings, formulate more clearly the still open questions, and discuss appropriate ways and means to make progress in this field.

A prerequisite in the study of any interaction is a thorough knowledge of the specific nature of the participants, i.e., the triazine herbicides on one side and the soil on the other side.

II. The triazines

The triazines are particularly suited for study due to the fact that the biologically active derivatives can vary quite extensively in the nature of their substitution. They are weakly basic herbicides and their physicochemical properties are very variable, even within the restricted, most interesting group of the marketed derivatives:

Solubility in water from five p.p.m. (simazine) to 1,800 p.p.m. (atratone)
pK from 1.65 (simazine) to 4.20 (atratone)

It is hoped that as a result of this symposium the physico-chemical properties of the triazines may be ranked more clearly in relation to their importance in regulating soil interactions.

Some of the physico-chemical properties along with chemical structure, main use, trademark, common name, and code number are listed in Reference Tables I and II of the Foreword. The wide range of derivatives offers a fascinating opportunity to study extensively relationships between structure and behavior in the soil. In this connection it should perhaps be stressed that soil interaction studies with biologically less interesting derivatives are necessary and fruitful if these derivatives are members of a structurally related series of compounds. It may lead to a better understanding of the interactions, which again would help to make a better choice amongst similarly interesting derivatives. Having thus discussed the triazines in a few words, we should now focus briefly on the other partner of the interplay.

III. The soil

Using different soils, it has been shown that, under controlled greenhouse conditions, herbicide activity was reasonably well correlated with