BOOK REVIEW

YOUR LAWN: HOW TO MAKE IT AND KEEP IT by R. Milton Carleton. 127 pages, illustrated. Retail price: $7.95.

About the Author: R. Milton Carleton is well-known as an author of books on gardening and as an editor of the periodical, **Chicago Today.** He has also pioneered in studies of new turf varieties and preemergence crabgrass controls. He is currently investigating the effects of artificial light and soil substitutes on plant growth.

About the Book: Your lawn consists of 14 chapters. Early in the book he answers the question, what is a lawn good for, by detailing the esthetic and environmental values. Chapter headings on drainage and grade and soil follow next. The next section deals with arriving at and maintaining a good nutritional balance. This is followed by a chapter on the importance of pH. Chapters 6-10 cover grass varieties, starting and maintaining your lawn, places where grass does not thrive, renovation, and rough lawns, respectively. The balance of the book involves discussions on pests—on and in the turf, weed control, lawn diseases and mechanical equipment. The book is well-written and easy to read. Maps and line drawings are interspersed throughout the book.

WEED CONTROL *(from page 16)*

decomposition by ultraviolet light has been suggested as an additional factor.

RESIDUES: The actual amount of herbicides in the environment has been studied in numerous monitoring surveys throughout the United States. We know, of course, that treated soils and waters contain herbicides for some period after treatment; otherwise we would not have weed control. Our concern is with the possibility of appreciable residues for long periods after treatment or the occurrence of herbicide residues in untreated or non-target sites.

Since residues are reported in terms of concentration — parts per million (ppm), parts per billion (ppb) and even parts per trillion (ppt)—it is important to recognize what these figures actually mean. The amount of soil covering an acre, one foot deep (usually called an acre foot of soil) weights about 3½ million pounds. Thus if we apply 3½ lbs. per acre of an herbicide and mix it throughout the upper foot of soil, the concentration will be 1 ppm. If we mix it only in the top 6 inches of soil the concentration will be higher — 2 ppm. It is the same amount of herbicide but mixed in less soil.

If we are concerned with water we should remember that water weighs 62.4 pounds per cubic foot and 8.33 pounds per gallon. Thus an acre foot of water (enough to cover an acre one foot deep) weighs about 2.7 million pounds and an herbicide application of 2.7 lbs. to an acre foot of water gives a concentration of 1 ppm. In terms of gallons, 8.33 pounds of herbicide are required to give a concentration of 1 ppm in a million gallons of water.

Some concept of the minuteness of 1 ppb can be obtained from a consideration of the population of the whole earth which is between 3 and 4 billion people. Thus 3 or 4 people represent 1 ppb of all the people on the earth today. Residue concentrations need interpretation in terms of amounts as well as concentrations!

Residues in soils have been monitored for some time. A detailed study in six areas over several years revealed only minor amounts of phenoxy herbicides. Out of 264 samples only 4 contained 2,4-D with an average concentration of 0.032 ppm. None contained 2,4,5-T. In none of these surveys has there been evidence of excessive accumulation of any herbicide in the soil environment.

Residues in water have likewise shown no evidence of accumulation. A monthly survey of 11 major streams in the Western U.S. in 1967 revealed no residues of 2,4-D, 2,4,5-T or silvex. A U.S. Geological Survey of 20 sites on Western streams using refined analytical methods showed only fractional parts per billion of 2,4-D, 2,4,5-T and silvex in a limited number of the several hundred samples analyzed. Again, there is no evidence of accumulation of phenoxy herbicides in any of the studies.

Residue data in plants are required for registration and breakdown curves and total amounts of residues are the bases for the tolerances set. There are pages of such data in every petition for a tolerance. Spot checks by regulatory agencies rarely reveal residues in crop plants in excess of established tolerance when the use pattern has followed label restrictions. There is no evidence of excessive herbicide residues in any of our food stuffs.

Residues in animal products have also been monitored. In 1969, the Consumer and Marketing Service, USDA, analyzed 240 samples of red meat fatty tissue from 44 locations across the U.S. for 2,4-D. More than 96% showed no residue, with only 3 samples showing more than 0.10 ppm and none as much as 1 ppm. There is also no evidence of accumulation in milk even when 2,4-D was fed directly to lacating cows.

Resides in the air have had only limited study, but as indicated earlier, drift or volatility may result in air contamination for brief periods. Usually the effects are evidenced on neighboring vegetation and rapidly diminish with distance.

EFFECTS ON ORGANISMS: An extensive bibliography on toxic effects of herbicides to a wide variety of organisms was published by the National Agricultural Library in 1968 and many publications cover effects of specific herbicides on specific organisms. Even extensive use of herbicides has produced changes in only limited areas and I know of no plant species that has been eliminated through the use of herbicides.

The majority of current herbicides must be fed in large quantity to produce any toxic symptoms. Extensive feeding tests are run on all herbicides prior to registration and the hazards, if any, are known. At normal rates of application our current widely used herbicides appear to have no direct effects on wildlife or farm animals. Residues have not appeared in milk or eggs. There is no evidence of wildlife destruction although changes in cover and possibly food plants on limited areas have caused population movements to other untreated areas.

For man, the only toxic effects have been from the direct ingestion of herbicides for intended suicide or accidental ingestion by children as the result of adult carelessness.

There is no evidence that the use of herbicides today contributes to deterioration of our environment.