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Insecticide-Fertilizer Mixtures Effectively Control Insects

Urea-formaldehyde fertilizers provide controlled nitrogen availability for plant growth . . . Surface active agents expedite fertilizer manufacturing processes

CHICAGO.—Chlorinated hydrocarbons are creating considerable interest in the fertilizer industry, reported F. B. Folckemer and E. S. Loeffler of Julius Hyman and Co. to the Division of Fertilizer & Soil Chemistry at the ACS meeting here. Due to their general effectiveness against soil-infesting insects, mixtures of insecticides with commercial fertilizers enable the farmer to perform two jobs in one application, thus achieving considerable saving in time and money.

Incorporating insecticides with commerical fertilizers presents certain practical problems. The manufacture, storage, and application of fertilizers are so well established that the pesticide, being the newcomer, must adapt itself to the established pattern. If the insecticide can be added during one of the normal steps in preparation of the fertilizer, a real economic advantage will be shown for the combined product. One of the greatest potentials for insecticide combinations is with the widely used inorganic type fertilizers, said Folckemer. Addition of insecticides during blending and ammoniation of these compounds has been suggested. However, it is probable that the alkali-unstable insecticides such as DDT, benzene hexachloride, toxaphene, chlordan, and heptachlor would be decomposed by the strong ammoniating solution. Even aldrin, which is stable to alkali, has been found to suffer a loss when applied experimentally during the ammoniation process, probably due to volatilization from the excessive heat in the mixer. A more satisfactory place for the addition of insecticides is during the blending and grinding operation after the fertilizer has been cured, and just prior to bagging.

In order for any given insecticide-fertilizer mixture to be of value, it is essential that the insecticide be compatible with the fertilizer. According to Folckemer, there must be no chemical

A. L. Mehring, chairman of the Division of Fertilizer and Soil Chemistry, discusses the paper on surface active agents in fertilizers with the author, E. J. Fox of USDA

action between the various components, resulting in deactivation of the toxicant. This is a matter of prime importance to the fertilizer manufacturer, as he cannot afford to prepare mixtures which will decompose in storage. A second aspect of compatibility is the effect of combinations of insecticides and fertilizers on the germination of seeds and growth of plants. It is highly important that the use of the mixtures shall not result in any unfavorable alteration of growth response. The available data indicate that those insecticides which are safe to plants when used alone in the soil are also safe to plants when used with fertilizers, and may even have a stimulating action.

The increasing acceptance of insecticide-fertilizer mixtures is evidence that they are proving economically effective for control of insects in the soil. The practicability of such combinations has been fully proved, although a number of problems relating to their manufacture and storage remain to be solved. It is expected, said Folckemer, that experiments now in progress and the practical experience gained by fertilizer manufacturers will provide the needed answers, and will aid industry to meet the growing demand in this interesting new field.

Urea-Formaldehyde Fertilizers

Novel and useful nitrogen fertilizers with controlled availability for plant growth can be made by the acid catalyzed condensation of urea with formaldehyde. These products contain about 38% nitrogen. They can be prepared with three quarters of the nitrogen in the slowly available form, generally referred to as water-insoluble nitrogen. According to R. D. Kralovec and W. A. Morgan of Du Pont, a product can be obtained that exhibits 55 to 60% nitrafication of the water-insoluble nitrogen in six months in an average soil.

Urea-formaldehyde condensation products are exceptionally safe nitrogen fertilizers, said Mr. Kralovec. With them, single applications may be made at higher nitrogen levels than are possible with the soluble sources; a full year's nitrogen supply may be added at one time. They are ideally suited for turf and other long season crops, greenhouse floral plants, ornamentals, tobacco, hay, and those crops such as corn, cotton, citrus, and pineapple which are grown in irrigated or heavy rainfall areas. Field tests demonstrate that the slow, uniform nitrogen response required for turf can be obtained with a single application. Four pounds of nitrogen per 1000 square feet applied in this form will supply an average turf with sufficient nitrogen for a full year's growth. From five to 10 times this amount can be applied at one time without injury to the turf. The efficiency of a single application equals or exceeds that of multiple applications of the soluble nitrogen fertilizers. High quality U-F compounds are equal or superior to the other forms of slowly available nitrogen such as natural organic materials, sewage sludges, and tankages.

Surface Active Agents

The effect of surface active agents on reaction phenomena in phosphate rock acidulation aroused considerable interest during the meeting. A paper on this subject by E. J. Fox, H. E. Batson, Jr., and A. V. Breen of USDA indicated that both anionic and nonionic agents tended to soften the dried product. Representative types of anionic surface-active agents had no significant effect on the extent or rate of reaction between ground phosphate rock and sulfuric acid. Proof of this was indicated by the rise in temperature during acidulation and by residual free acid being present immediately after mixing and after denning 20 hours at 70° C. Some of the nonionic types tested caused increased bloating of the charge during mixing operations but had no permanent effect on the volume of the raw mix.

In the discussion which followed his paper, Mr. Fox remarked that a small group of manufacturers told of their experiences in a private gathering earlier in the day. The more they discussed the subject, the more the listeners became confused. He believes that most of the controversial points arise from the fact that the effects of a surface active agent are influenced markedly by the nature of the phosphate rock. The problem is not merely one of reducing surface tension.

The most consistent and best results, said Mr. Fox, are obtained by putting the surface active agent into the superphosphate before the addition of rock, thereby gaining a more complete and faster wetting of the rock. A much greater initial evolution of gas is obtained. Some phosphate rock is floated at the mines with surface active agents; and in many cases the rock is not washed afterwards. However, Mr. Fox does not think that the residual amount of surfactant present after flotation accounts for some of the wide deviations in results.

Ammoniation of Superphosphates. Under ideal conditions, the maximum amounts of neutralizing ammonia which react with superphosphates are 9.6 pounds per 20-pound unit of P_2O_5 in ordinary superphosphate and about 6.0 pounds per unit of P_2O_5 in triple superphosphate. In the early days manufacturers hesitated to ammoniate beyond three pounds of ammonia per unit of P_2O_5 because of possible losses of nitrogen and available phosphorous during ammoniation and during subsequent storage of the ammoniated product. More recently, increasing demands for high-analysis fertilizers and the comparative low cost of neutralizing ammonia have led the mixed fertilizer producer to attempt higher and higher rates of ammoniation.

According to R. Kumagai, H. F. Rapp, and J. O. Hardesty of USDA, high ammoniation rates are not conductive to efficient ammonia absorption, Denseness and hardness of superphosphate particles also contribute to poor absorption. On the other hand, absorption efficiencies are materially increased by an increase in moisture content and a decrease in particle size. An increase in the moisture content from 1 to 7% increased the ammonia absorption efficiency of ordinary superphosphate from 70 to 96%. A decrease in particle size of the superphosphate from 10 to −80 mesh increased the absorption efficiency from 84 to 100%. A rise in temperature (for triple superphosphate only) from 150 to 215° F. increased absorption from 79 to 90%.

Food Packages Reflect Needs of Ultimate Consumer

Rodenticides, large outlet for chemical products, need more attention from chemical industry . . . Photosynthesis studies of sugar cane aided by radioactive tracers

CHICAGO.—Food stores and supermarkets today are dependent on the availability of packaged retail units which make possible improved efficiency and consumer service. This has made more important than ever the attention given by food packers to the selection of the proper packaging materials.

Current food packaging problems can be classified readily according to types of containers, reported L. W. Elder, General Foods Corp., to the ACS Division of Agricultural and Food Chemistry in a Symposium on Technology of Food Packaging Materials. Attention was directed primarily to materials required for preserving food quality over long shelf life periods.

F. T. Nielsson points out to F. G. Heil, L. F. Roy, and L. D. Yates where the carbon dioxide is evolved from the water scrubbers at the TVA ammonia plant. Work was discussed before Division of Fertilizer and Soil Chemistry

Tinned cans are the time-honored container for practically all types of foods. For economic reasons their use has been largely restricted to the "wet packs" such as fruits and vegetables. Glass bottles replace tin cans in many food packs where visibility of the contents develops consumer appeal. Among the new developments to be watched is the polyethylene "squeeze" bottle. Its unique utility for such foods as catsup and table sirup will certainly be further exploited as volume production reduces cost. Folding boxboard carbons may be rightfully called the backbone of the packaged food industry.

Recent statistics show that about 14 million tons of paper and paperboard are used annually for all types of packaging, of which possibly a third is used by food packers. It is impressive that more paper is used for packaging than for all printing papers, including newsprint. Bags, envelopes, and tubes appeal to food packers for many reasons, including substantial economies in many cases. Regardless of how they are produced, retail food packages are themselves further packed for shipment and han-