

SEED TREATMENTS: PAST, PRESENT, FUTURE

Kyle W. Rushing ^{1/}

Seed treatment technology, as it has been known, is presently undergoing dramatic changes. We have entered a "new era" in seed treatment. No longer can seed treatment be considered just as "cheap" insurance for the grower. For the next few minutes I would like to briefly review the past, discuss present and future trends in the seed treatment industry, and broadly define the "new era" for seed treatment.

After World War II, agriculture in the United States underwent dramatic transformation. A rapid decline in rural population eliminated the working manpower required to produce food and fiber for the country; therefore, a transition to mechanization and chemical control agents was mandatory in filling this void so that crop production could increase to support a growing population. In addition, hybridization and genetic improvement of many crops greatly improved yield by providing varieties with superior disease and insect resistance and improved ability to utilize fertilizers and minor elements.

Many organic chemicals entered the agronomic market during the 1950's and 60's. The seed treatment fungicide and insecticide chemistry available was, in general, very broad spectrum in activity and had multiple crop application. In 1968 the enactment of E.P.A. and new legislation regulating the use of pesticides, resulted in the loss of many of the older compounds from the marketplace. The registration process for new chemicals became extremely difficult and costly because of the additional toxicology research required. As a result of these changed circumstances, the number of new seed treatment compounds; i.e., fungicides and insecticides, entering the marketplace has been limited. During the past fifteen years many compounds were lost in the re-registration process; consequently, voids presently exist in some crop areas. The trend of the major chemical suppliers during this period was to invest in research in areas which offered the highest potential for success and profit (e.g., herbicide and foliar insecticide markets). As these markets became saturated, however, many companies began to consider or reconsider the fungicide and seed treatment areas. Since 1978 tremendous developments have occurred and we in the seed industry will benefit greatly from the new chemistry being developed.

In 1976, Gustafson, Inc., initiated a research and development program to investigate potential candidate materials which might have application in the seed treatment area. The objective of the work has

^{1/}Vice-President, Research and Development, Gustafson, Inc., Dallas, TX.

been to bring to the industry new replacement products with increased performance in the case of existing problems, and to find solutions for new problems. We recognized immediately that the new chemistry being invented was very active, yet very specific in the spectrum of activity. Thus, combinations of the new products will be required to replace the old broad spectrum compounds. At this time I would like to discuss several of the new products which have recently been approved for use by E.P.A. and a few that are nearing approval. These compounds represent the new chemistry which will take us into the "new era" in seed treatment - an era that will be characterized by an integrated control approach involving a balance of chemical, genetic and biological approaches. The use of the seed as the carrier for the new generation of chemicals is also important because it greatly simplifies application, permits uniform and accurate application rates of the treatment on each seed, and eliminates and/or minimizes the exposure of the grower and environment to the pesticide and/or treatment.

Over the past three years we have worked with several proprietary companies around the world in seeking out new compounds that exhibit systemic activity against specific pests, both disease and insect. During the 1982-1983 seed treating season a number of these compounds entered the market, either as a federal registration or under a special registration. I will now discuss these and then mention several other products which are nearing registration.

Products With Federal Registration

APRON[®]

Apron is a highly systemic fungicide from Ciba-Geigy Corporation which is very specific in controlling the Phycomycetes class of fungi (Pythium, Phytophthora and downy mildew). The early season control of Pythium spp. and Phytophthora can be accomplished at .25 to .50 ounces active ingredient per hundredweight of seed. Systemic and secondary downy mildew infections can be suppressed to non-economic levels at 1.0 - 2.0 ounces active ingredient per hundredweight. These rates are dependent on the crop being grown. Due to the specific activity of Apron, Ciba-Geigy and Gustafson, Inc., recommend that it be used in combination with a protectant fungicide, i.e., captan, thiram or Vitavax 200. Apron is available as a flowable 2.67 pounds per gallon from Gustafson, Inc., or as a 25% wettable powder. The labeled crops are numerous and additional crop usage is presently pending at E.P.A.

EPIC[™]

EPIC is a systemic fungicide from BASF-Germany and Gustafson, Inc. During 1983 a Federal experimental use permit (E.U.P.) was granted by E.P.A. which permitted a quantity of EPIC to be used in the cotton seed treatment area. This product has excellent systemic activity in controlling Rhizoctonia spp. (soreshin) on cotton and many other crops. A

petition has been submitted to E.P.A. for full federal clearance for the 1983-1984 treating season on cotton. Additional crops will be added to the label (sugar beets, beans, peanuts, etc.). EPIC is a flowable product of 4.16 pounds per gallon, with the optimum use rate of 1.5 ounces active ingredient per hundredweight for most crops.

Gustafson Tops 2.5 Potato Dust

Gustafson Tops 2.5 Potato Dust is a product being offered through Pennwalt Company, U.S.A. It has excellent activity against potato seed piece Fusarium and Rhizoctonia infections and acts as a local systemic providing early season protection from these diseases.

The products mentioned above have demonstrated superior disease control and suppression over standard treatments being used. For several crops, a new dimension of disease control is being offered by Apron, as it is the first chemical to systemically control Pythium, Phytophthora and downy mildew. Therefore, Apron will become a useful tool in an integrated chemical-genetic-biological control program.

Products Nearing Registration

Baytan®

Baytan is a highly systemic fungicide from Bayer-Germany. A Federal petition has been filed with E.P.A. for the use of the compound on small grain. Its activity is broad spectrum (covered and loose smuts, powdery mildew, rusts, barley stripe, and suppression of the "take-all" complex). Baytan is presently being widely used in Europe. Under similar U.S. growing conditions as those found in Europe, the product should have tremendous potential. Baytan will be marketed as a 2.67 pounds per gallon flowable. It is also being investigated as a potential control agent for the fescue fungal endophyte, Acromonium. To date, investigations have given positive results. As Baytan chemistry is known to exhibit plant growth regulator effects, accuracy in application is mandatory.

ABG-4000

ABG-4000 is a selected bacterial variant of the Bacillus subtilis bacteria from Abbott Laboratories which readily inoculates peanuts when applied as a seed treatment and enhances plant development and yield. Mode of action has not been specifically identified to date, but preliminary evidence of antibiotic and hormonal activity are under investigation. Demonstrations in 1982 on approximately 4,500 acres of peanuts showed an average thirteen percent (13%) yield increase, with a range from three to forty-four percent (3 - 44%). Extensive trials are planned for 1983. The bacterial isolates are compatible with the standard peanut fungicide seed treatments; therefore, an integrated chemical,

biological and genetic control program for peanuts is nearing reality.

Reldan[®]

Reldan is an organo-phosphate insecticide from Dow Chemical. This product has excellent activity as a stored grain insecticide with the potential of replacing malathion, which has been increasingly ineffective because of developing resistance by many problem insects. Reldan residual activity at six to twelve (6 - 12) parts per million (ppm) is very effective for one year. Reldan, as a seed treatment, would also replace methoxychlor. Approval by E.P.A. is expected in mid-1984.

In addition to the products discussed, numerous other compounds are undergoing investigation. We are most appreciative of the proprietary chemical companies who have awakened to this much neglected area of agricultural chemical use. We are also encouraged by recent developments at E.P.A. which have permitted some of this new chemistry to enter the marketplace.

One of the current major voids is the soil insecticide area. Heptachlor is presently in a phase-out program and its loss will leave a void in certain crops, particularly sorghum. Only three (3) products (Lindane, Lorsban and Diazinon) are in use and each has certain crop limitations. The industry desperately needs a broad spectrum insecticide for wireworm, seed corn maggot, cut worm, and thief ant control. A systemic for early season green bug, chinch bug, thrip, and aphid control would also have a tremendous potential.

I feel that we are now in the "new era" of seed treatment, and with forthcoming developments in genetic engineering, DNA transfer, fluid sowing, cloning, and new biological and chemical breakthroughs, the next five to ten years are going to be truly exciting. Seed treatment, the art of yester-year, has now become a sophisticated science.