INTERACTION BETWEEN CERTAIN HERBICIDES AND SOIL INSECTICIDES

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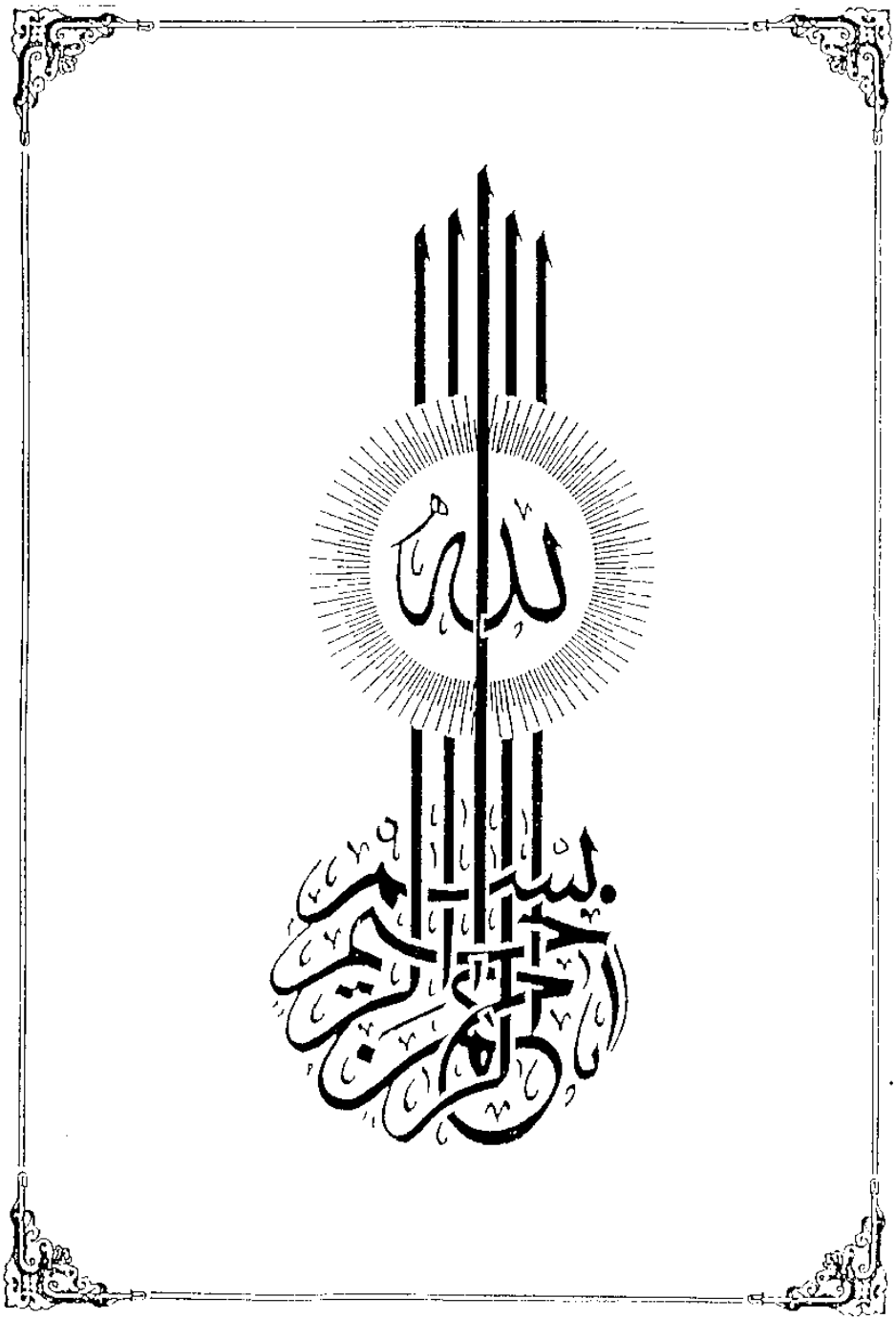

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Part (I)

Review of Literature

(1) Effect on weeds

Counselman et al. (1964) studied the herbicidal activity of chloroxuron (N-4(chlorophenoxy)-phenyl-N,N-dimethyl urea and C-2059 (N'-3-trifluoromethyl-phenyl) N,N-dimethyl urea) in seven areas of the united states. The herbicides were incorporated to a depth of 2 in just before sowing cotton, maize, groundnuts, soybeans, sugar beet, peas, beans, oats and wheat. Pre-emergence and post-emergence treatments were respectively applied 2 and 21 days after sowing. Chloroxuron achieved good control of broad leaved weeds, but not grasses. Better control of grasses than that obtained with either herbicide applied alone was given by chloroxuron 4 # t either CDEC 4.5 # or linuron 1 #, applied pre-emergence, and chloroxuron 4 # t either trifluralin 4 # or norea 2# incorporated, without injury to the crop. C.2059 applied post-emergence showed particular promise for use in cotton and was tolerated by cotton, sorghum, maize and soybeans at rates higher than these required for weed control. C.2059 at 2 # applied pre-emergence gave adequate weed control, whereas cotton and maize tolerated rates up to 15 #.

The persistence in soil of monuron, diuron and fenuron applied at 0.8 to 2 # furrow-irrigated cotton annually from 1954 to 61 was studied at several locations in Arizona and California by Aric et al. (1965). The average yield of seed cotton was not affected by repeated application of diuron and monuron whereas annual applications of fenuron at 1.6 # caused a significant reduction in yield for the 8-year period. Mild chlorosis of the foliage occurred in cotton seedlings sown on plots treated the previous four seasons with monuron at 1.6 # . Fenuron at 0.8 # caused similar symptoms for 4 to 5 weeks after treatment. Diuron caused no injury to cotton seedlings, but reduced the stand of oats.

It was concluded that diuron and monuron at 1 to 2 # may persist in small amounts from one annual application to the next, but that accumulation of these herbicides is unlikely in the silt loam and sandy loam soils tested. Harris et al. (1965) found that pre-emergence applications of chloropropham at 4 # and diuron at 2-8 # on soils varying between sandy loam and clay loam, and monuron at 2-8 # on heavy clay soils are recommended for the control of small seeded annual weeds. Directed sprays of diuron at 0.2-0.4 # + 0.5% W.P.

in 40 gal. water are recommended for the control of activity growing annual weeds not more than 2 in. high in cotton at least 6 in. high. Diuron may also be applied at lay by to control mid and late germinating weeds, though the full effects of his practice have not been evaluated.

Forester and Stripecke (1966), found that cotoran used as pre-emergence herbicide at a rate of 2.4 kg/ha. gave satisfactory control to Bidens pilosa, Richardia brasiliensis, Ipomea sp., Portulaca oleracea, Acanthospermum hispidum and reasonable control of Cenchrus echinatus, whereas Euphorbia geniculata was resistant.

Rizk et al. (1966) showed that cotoran at the rate of 2 lb/a. was less effective when sprayed on dry soil, while it was very effective when sprayed on moist soil or incorporated into soil under moist or dry conditions. Many investigators found that when the soil remained dry for 6 days after cotoran application, weed control was very poor.

Bradley (1968) stated that cotoran at a rate of 1.5 to 3.0 lb/a. showed that E. colonum and C. distans

were fairly resistant, whereas P. oleracea was well controlled.

Mikhailichenko and Faiziev (1968), concluded that cotoran at 4.5 kg/ha. was effective against annual weeds but not perennial.

In Egypt, Zahran et al. (1968) noticed that application of cotoran either pre-emergence or post-sowing at 3 lb/feddan resulted in a satisfactory weed control. Cotoran activity differs greatly depending upon the method of application.

(2) Effect on growth and development of plants.

In experiments with peas and eggplant Ashdown and Cordner (1952) observed enhanced growth and yields following applications of the diethyloxythio phosphoric acid ester of ethyl mercaptoethanol.

Casida et al. (1952) reported that available phosphorus in soils appeared to decrease the insecticidal effectiveness of Schradan on pea plants grown in soils or nutrient solutions. They also confirmed that plants grown on silica sand to which Schradan was added were more toxic than those grown on soils with smaller particle size than sand and with a higher content of organic matter.

Hasckaylo and Ergle (1955) reported that cotton plants grown in solution cultures containing Schradan, accumulated the insecticide in successively lower concentrations in leaves, roots, bolls, petioles and stems. Relatively low concentrations of Schradan stimulated vegitative development but higher concentrations were phytotoxic to both vegitative and fruitting activity. Increased concentrations of chlorophyll and carotenoid pigments were directly correlated with Schradan treatment.

Anderson et al. (1959) reported that soil treatments with Aldrin, Dieldrin, Endrin, Heptachlor, Chlordane, Trithion and Lindane, did not affect yields of butternuts, squash, cabbage, carrots, onions, radishes, sweet corn, tomatoes and turnips. DDT stunted butternut plants but yield reductions were not statistically significant.

Metcalf et al. (1959) conducted experiments using Thimet and Di-syston as dusts, granules, and emulsifiable concentrates applied at planting time or after emergence of pea nuts. They found that plants growing on treated plots yielded more peanuts, but the grains in the yield were most significant.

Everly and Pickett (1960) treated seeds of Sorghum, variety RS 610, with phorate at the rate of 0.5, 1.0, 2.0 and 4.0 pounds of active ingredient per 100 pounds of seed, with and without Arasan 75. They reported that plants produced from seed treated with 0.5 and 1.0 pound rates shed pollen earlier than the untreated plants. Highly significant differences in seed yield were associated with differences in stand. The plots receiving the Phorate treatments had significantly less yield than the untreated plants in the

green-house tests. Germination was reduced by the higher dosages and prolongation of storage for 3 days. Treated seeds, 10 months after storage, showed great reduction in germination. Per cent germination under green-house conditions was highly significantly correlated with the field stand.

Studies were conducted in the green-house by Kirk and Wilson (1960) to determine the relative effects of Phorate, Di-Syston and SD 3562 on the germination of wheat when applied as seed treatment. They reported that both Phorate and SD 3562 were seriously toxic to wheat seed. The latter being most toxic under the test conditions. Di-Syston did not significantly reduce seed viability with rates as high as 1.5 pounds per 100 pounds of seeds.

Allen et al. (1961) found that Heptachlor-fertilizer mixtures applied to the seed furrow for control of the Sugar-beet root maggot, Tetanopus myopaeformis, did not reduce sugar-beet stands significantly. Phytotoxic effects were not serious even under dry soil conditions. When insecticide-fertilizer mixtures were applied to the seed furrow at the rate of 80 pounds per acre.