HERBICIDAL EFFECTS AND ITS METHODS OF APPLICATION FOR CONTROLLING COTTON WEEDS UNDER EGYPTIAN ENVIRONMENTS

By

GABER ABD EL-LATIF SARY

B. Sc. Alexandria University (1961)

M. Sc. Ain Shams University (1968)

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This dissertation for the Ph.D.
degree has been approved by :

A. A. M. Kamel

Bakr M. A

M. A. [illegible]

Date : ----/------/ 1973.

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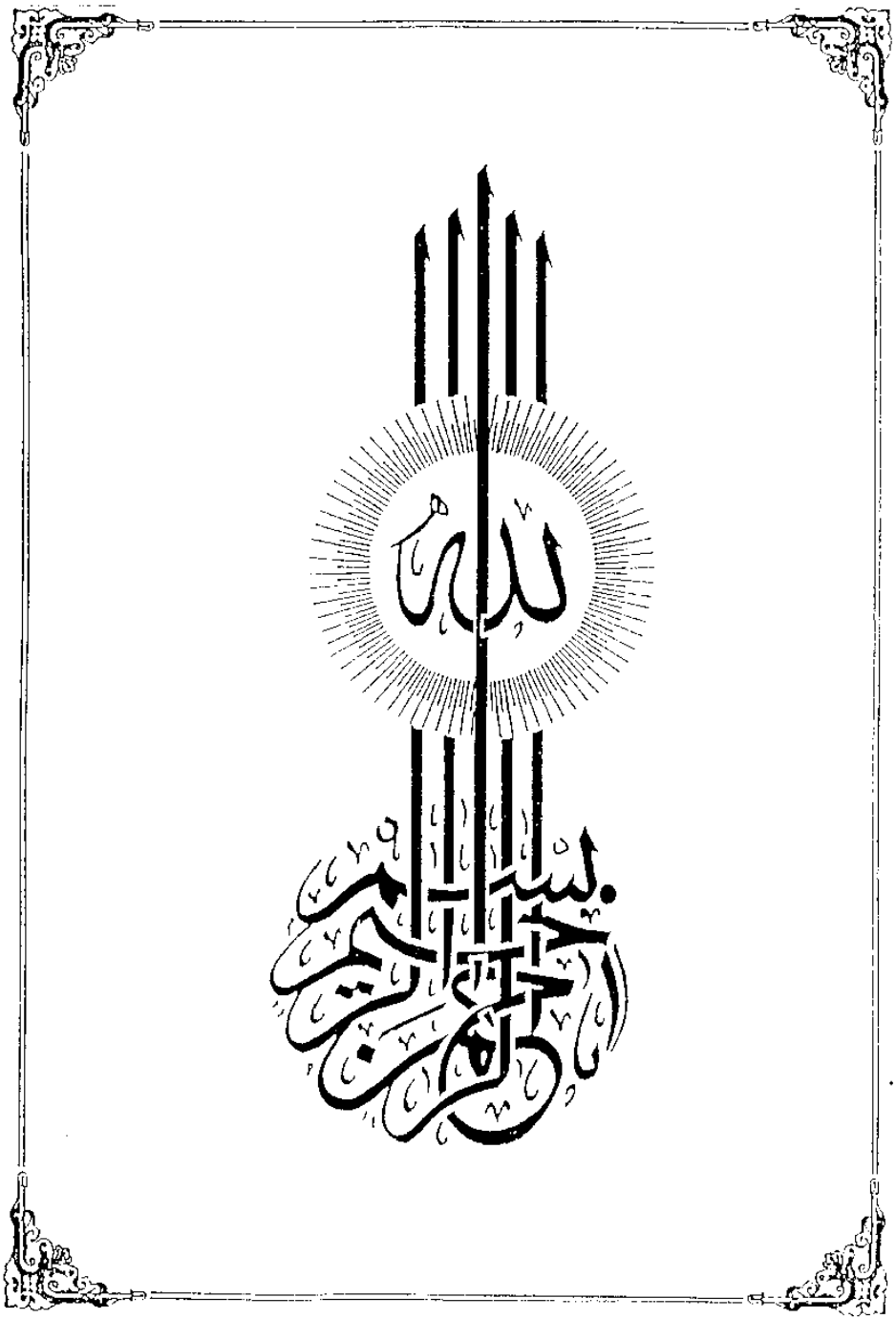

A C K N O W L E D G M E N T

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C O N T E N T S

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I N T R O D U C T I O N

The economic value of cotton as a source of fiber, cellulose, and edible oil is great. In A.R.E., cotton is the most important cash crop; as it is also the chief fiber crop commercially available throughout the world. Accordingly great efforts were carried out in assistance to cotton growers in their attempts to increase quality and yield of cotton. Much of this effort was through chemicals in the form of fertilizers, defoliants, desiccants and pesticides.

Chemical weed control originally was adopted in cotton production as a means of :

a) improving labour efficiency,

b) maintaining an economical production cost,

c) aiding in other phases of production efficiency such as, mechanization, mechanical harvesting, improved utilization of plant nutrient and water, and,

d) minimizing trash, stains, moisture content in the seed cotton.

The comparison of the efficiency of the chemical weeding methods with that of the traditional hand-weeding of cotton illustrates clearly the superiority of the chemical

methods in use at present. However, herbicidal treatments do not control a number of perennial weeds adequately. Moreover, the cotton herbicides on the market to-day were developed several years ago before the weed problem changed for the worse. This degeneration of cotton weed control led to attempts to combine herbicides to improve their effectiveness. On the other hand, the most advantageous placement of a soil-applied pre-emergence herbicide depends on the chemical and physical properties of the herbicide, soil characteristics, climatic factors, and site of uptake for the plant species.

The objective of the present investigation was to study the efficiency of the five leading cotton selective herbicides, "Trifluralin, Diuron, Fluometuron, Norea and EPTC", and their combinations on weeds as well as yield, and some agronomic characters of cotton plant. Also, to evaluate the effectiveness of these herbicides which were applied at different rates by two different methods under the three common methods of cotton planting. Moreover, effectiveness of these herbicides in controlling purple nutsedge was investigated. The work was extended to study the residual effect of these herbicides on crops that would follow cotton in a rotation.

REVIEW OF LITERATURE

The present review is confined mainly to the five cotton leading herbicides namely; trifluralin, diuron, fluometuron, norea and EPTC, which are used in the present investigation. Also the review is divided into three main parts as follows :

I) Effect of herbicides on cotton weeds

II) Effect of herbicides on cotton plant

III) The residueal effect of herbicides on crops following cotton crop.

I) Effect of herbicides on cotton weeds :

1- Trifluralin (Treflan) :

Hamilton and Arle (61) studied the effect of trifluralin on cotton weeds; they used three levels of trifluralin, i.e., 1.5, 3.0 and 6.0 lbs/acre and three times of application namely; before the first irrigation, before the second irrigation and before the third irrigation. They found that all treatments controlled annual grasses better than broad-leaved weeds. Trifluralin application before the first irrigation gave better control of weeds compared with other applications.

Trifluralin incorporated at a rate of 1.5 lbs/acre to the top 2-3 inches of soil improved the control of annual and seedling of perennial weeds (71, 75). Trifluralin application at a rate of 0.75 lb./acre gave excellent control of weeds throughout the growing season, while diuron at the rate of 1.6 lbs/acre gave satisfactory control of weeds(103); Trifluralin at 0.5 - 1.5 lbs/acre gave long-term control of susceptible weeds in cotton (14, 132).

Albert (2) and Grover (59) reported that trifluralin did not affect the germination of weed seeds, but retarded their subsequent growth. Trifluralin controlled weeds in cotton when applied at a rate of 1.25 kg./ha. on sandy soil and 2.0 kg./ha. on clay soil, and was better than diuron and prometryne. Trifluralin gave excellent initial control of grasses such as Digitaria sanguinatis and Eleusine indica , good control of broad-leaves weeds, e.g. Portulaca oleraceae, Glinoga parviflora and Amaranthus viridis and had a residual effect on the grasses (91). The control of annual weeds was adequate with applying trifluralin at a rate of 0.5 lb. per acre and excellent with rates greater than 1.0 lb./acre (108, 148, 154).

Alves et al. (4) concluded that the pre-sowing application (incorporated in soil) of trifluralin at the rate of

.. k../fa. gave best result in grasses control but did not affect the dicotyledonous weeds. Trifluralin at the rate of 0.75 kg./fa. applied pre-sowing gave more than 90% control of Eleusine indica, Digitaria sanguinalis and Cechrus echinatus (34). Rizk et al. (121) studied the effect of diuron, trifluralin and cotoran on weeds under different levels of soil moisture. Three rates of each compound were used, namely, 0.5, 1.0 and 2.0 lbs./acre. They found that the effect of trifluralin appeared to be independent of soil moisture content and it was more effective when incorporated into the soil.

Knake et al. (88) showed that shallow incorporation, 1 inch deep increased the effectiveness of trifluralin at all moisture levels in controlling foxtail (Staria viridis).

On the other hand, Stikler et al. (141) showed that the effectiveness of trifluralin for giant foxtail (Setaria faberri Herrm.) control decreased linearly with increasing soil moisture. Trifluralin was effective in limed than unlimed soil (129). Results from field application at the recommended rates for weed control in cotton confirmed that neither DCPA, diuron nor trifluralin incorporated to a depth of 2 to 3 inches with different tillage implements gave good control of grasses in cotton compared with the untreated plot (36).

Thompson (Newcastle (148) found that trifluralin incorporated into the soil at 0.5 - 2.0 lbs./acre lacked selectivity in several instances and was inconsistent against weeds. Rotary cultivation appeared to be a more effective method of incorporation from the view point of selectivity than disk or spike-tooth harrowing. The early application of trifluralin was more effective against Digitaria sanguinalis than the late application (44). Trifluralin gave only modest increases in the control of large-seed weeds such as Datura stramonium L., Abutilon theopharsti Medic and Xanthium pennsylvaniem L., (49).

Goyne (51) reported that trifluralin at the rates of 0.75 and 1.0 lb./acre incorporated in the soil one week before sowing cotton gave satisfactory control of grasses including Echinochloa crus-galli, Eragostis spp., Urochloa spp. and Trianthema portulacastrum. The pre-emergence application of trifluralin at the rates of 2.0 and 3.0 kg./ha. gave 80% weed control (90).

Alkas'yants et al. (3) reported that trifluralin at the rates of 3.0 to 5.0 kg./ha. in band application after sowing showed great toxicity to Hibiscus sp., Solanum nigrum, Portulaca sp., Echinochloa crus-galli and Amaranthus sp. Moreover, the application of trifluralin at the rate of 4.0 kg./

[illegible] good control to annual and some perennial weeds. In a clay soil, trifluralin at a rate of 0.75 kg./ha. was moderately effective (33, 45). Trifluralin at the rate of 4.0 kg./ha. applied pre-emergence in bands 25 - 30 cm. wide on cotton planting ridges gave good control of several weeds , including Amaranthus sp., Echenochloa crus-galli, Portulaca oleracea and Solanum sp. (80).

Wiese et al. (152) indicated that trifluralin, DCPA and nitralin applied pre-planting and incorporated, gave excellent control of mixture of Amaranthus sp. and volunteer sorghum (Sorghum licolor L.) in cotton. Trifluralin and nitralin as pre-sowing herbicides soil incorporated at the rates of 0.25 and 0.5 lb./acre gave excellent control of weeds including, pig weed (Amaranthus spp.) and crab grass (Digitaria sp.) (111). The autumn application of nitralin and trifluralin at the rates of 1.0 and 1.25 lbs./acre incorporated into various clay soils to a depth of 2 and 4 inches gave excellent weed control (112, 115). Trifluralin and nitralin at the rates of 0.75 to 1.5 lbs./acre applied 81 days before sowing cotton gave complete control of Digitaria sanguinalis and Amaranthus spp. (128).

Thomas (147) in Sudan, found that the incorporated pre-sowing application of trifluralin at the rates of 0.55,