PHYSIOLOGICAL RESPONSE OF COTTON CROP, ASSOCIATED WEEDS AND THE FOLLOWING CROPS TO SOME HERBICIDES

BY

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1953

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1964

Thesis submitted in partial fulfilment of the requirement for the degree of

DOCTOR OF PHILOSOPHY

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1971

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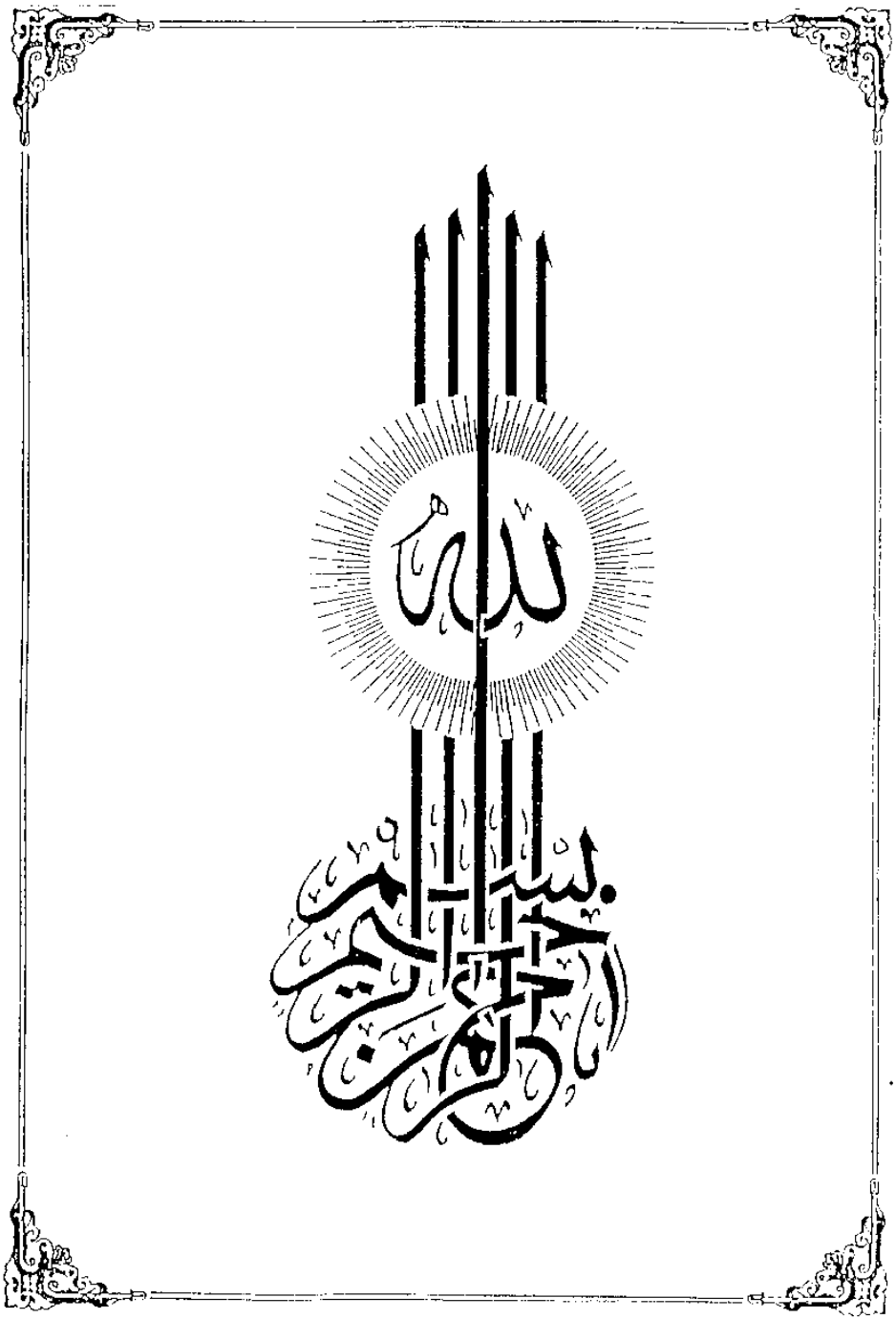

ACKNOLEDGMENT

The writer wishes to express his sincere appriciation and gratitude to Dr. M. A. Moursi, Professor of Agronomy and Head of Agronomy Department, Dr. T.Y. Rizk Lecturer in Agronomy Department under whose guidance these investigations were conducted, for their valuable criticism, fruitful help and advise. Appreciation is extended to Dr. A.A. Abd El-Gawad Assist. Prof. in Agronomy Department, Ain Shams University for his supervision and willing help before his travelling to Libya. The writer also wishes to acknowledge his appriciation to the Head of Weed Control Research Department at Ministry of Agriculture for making land and herbicides available for this study.

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I- INTRODUCTION

Weeds cause a great loss to farmers by lowering the selling value of the land, reducing crop yield, increasing the expense of cultivation and harvest, reducting the market value of crop and in certain cases by poisining or otherwise injuring man, livestock or livestock products. Weeds have a marked effect on both yield and quality of cotton.

Egyptian farmers used to control weeds by cultivation. The number of herbicides recommended for weed control in cotton (Gossypium sp) has increased greatly in the last decade, and chemical weed control already has become a usual practice in cotton cultivation in some Egyptian farms. However, the basis for the differential action of most of the compounds on cotton as compared with that on weeds is still unclear. It should be kept in mind that selecting the best herbicide for weed control in cotton field implies choosing herbicides having no deleterious residual effect on crops that follow cotton crop.

The objectives of the present research were to determine:

(a) the effect of weeds on the growth and yield of cotton at Sakha,

(b) the effect of soil mulch on the growth and yield of cotton,

(c) to compare phytotoxicities of the four selected herbicides namely "Cotoran, linuron, monuron and LFA" on cotton and weeds infesting cotton crop, and

(d) to investigate the different residual effects of these herbicides on crops following cotton crop.

II- REVIEW OF LITERATURE

Weed competition with cotton

A great number of weeds are present in cotton fields. Winter weeds are predominated during the early growth period of cotton plant and then summer weeds become great. Weeds compete with cotton plant for light, moisture, nutrients and other environmental factors not great enough to provide both cotton plants and weeds with their requirements.

The time during which cotton plants suffer competition has a marked effect on the cotton plant. Clean weeding was of greatest importance at the early stages of cotton plant development (9, 41, 65 and 66). Cotton Yield was critically affected when the season, initial weeds were allowed to grow for longer than two weeks after crop emergence (65). On the contrary, perdoma et al (54) showed that during the first 20 days of cotton planting, weeds did not grow vigorously enough to effect the crop. Where cotton field was clean weeded for 40 or more days after sowing, there was practically no weed reinfestation, (66).

The competition for light was the main factor which influenced crop yields, while competition for moisture and plant nutrients were of secondary importance (65).

The labor requirement is greatly influenced by the kind of weeds prevailing in the field and degree of weed infestation. When the weeds are small, one faddan requires 3 to 4 labourers and 8 to IO labourers in heavy weed infestation (25). Delaying the first weeding from IO to 30 days resulted in an increase of labor requirement from 25 to IOO hours per acre and following weedings from I5 to 50 hours per acre (24) . Hand weeding increased the seed cotton yield (25). Cultivation caused an increase in cotton yield (I4, 22 and 49). Early cultivation increased the yield more considerably than late one (22, 24). Although weeds compete less with cotton after the beginning of the flowering stage, than during the initial period of growth, they reduce the yield and hamper harvesting and reduce the fiber quality as the green material connot be removed from the fiber during ginning (63).

Hoeing increased the cotton yield in Egypt (2,7). Similarly cultivation caused an increase in cotton yield (I4, 49). Hoeing gave slightly higher seed cotton than cultivation in georgia (5) while in south Carolina there was no difference in yield between hoeing and cultivation treatment(4).

Chemical control of weeds

Hoeing is the usual cultural practice used in weed

control in Egyptian cotton field but it is slow and tedious process. Recently; the chemical weed control has been used in weed control in cotton field. A great number of herbicides have been used, but urea compounds are the most important.

A. Cotoran

Cotoran used as pre-emergence herbicide at a rate of 2.4 kg / ha. gave satisfactory control to Bidens pilosa, Richardia brasiliensis, Ipomeasp., Portulaca oleracea, Acanthos permum hispidum and reasonable control of Cenchrus echinatus, whereas Euphorbia geniculata was resistant (28). Also when used at a rate of 2 lb / a cotoran gave good to excellent control of both grasses and broad-leaved weeds (33, 47). Meanwhile when cotoran used at lower rates ranging from I.0 to 2.0 lb/ a. it controlled most small-seeded annual grasses and broadleaved weeds (64). Cotoran at a rate of I.5 to 3.0 lb/a. showed that E.colonum and C. distans were fairly resistant, whereas P.oleracea was well controlled (6). Cotoran at 4.5 Kg / ha. was effective against annuall weeds but not perennial (48).

Cotoran effect against weeds lasted for 6-II weeks (30) or for 9 weeks or more, (32).

In Egypt, Zahran et al (74) noted that application of

cotoran either pre-emergence or post-sowing at 3 Ib/faddan (4200 m^2) resulted in a satisfactory weed control.

Cotoran activity differs greatly depending upon the method of application. Rizk et al (56) showed that cotoran at the rate of 2 Ib/ 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 invistigators (30) found that when the soil remained dry for 6 days after cotoran application, weed control was very poor. Savage and Bardsley (58) showed that cotoran was more effective against weeds in limed soil as compared with unlimed soil. On the other hand, cotoran at a rate of 2.4 to 3 Kg/ha. gave effective control of weeds irrespective of the texture or organic matter of the soil (20).

B- Linuron

Hicks and Scott (35) found that post-emergence application of linuron at a rate of 0.25 to I.00 Ib/a. directed to weeds less than 2 inches high gave I0 - 85% control of annual grasses and brood leaved weeds. Similar conclusion was obtained by other workers (67). However, applying linuron at a rate ranging from 0.5 to I.6 Ib/a.when cotton plant was 20 or more inches tall controlled most small-seeded annual grasses and broadleaved

weeds if rain occured within IO days after treatment. Also young actively growing weeds, less than 3 inches tall would be controlled (64).

c. Monuron

Mormand et al (52) and Christidis and Harrison (I5) showed that pre as well as post emergence application of monuron to cotton gave satisfactory weed control. Monuron applied pre-emergance at I - 6 lb/a. controlled most small- seeded annual grasses and broadleaved weeds (64). Early application of monuron controlled the weeds effectively for a while but not later (26). Post-emergence application of monuron in cotton at I and 2 lb/a. gave better grass control than DNOSBP (7I).

D. LFA "I7,623BP"

Cooke and Simmonds (I8) reported that the useful levels of herbicidal activity of LFA lie between I and 3 lb/a. At 2 - 3 lb/a. good weed control can be achieved for IO weeks or longer. Pre-emergence application of LFA controlled a wide range of annual weeds except stellaria media (72). Wilson and Hutchison (72). found also that the rate of I.5 lb/a. was shown to be more effective than that of I lb/ a. Avena fatua, chenopodium album, Matricaria recutita, Polygonum ariculare, Polygonum convolvulus and Raphanus raphanistrum were all well controlled.

Growth And yield of cotton Plant

I. Cotoran

Many workers have showed that low levels of cotoran had no phytotoxic effect on cotton plant (30). In some experiments, high level of cotoran, i e 4 and 5 lb/a. showed slight damage to cotton plant (8, 35). However, Braddley (5) found that cotoran was the least harmful to cotton amongest other herbicides. Meanwhile cotton showed good tolerance to cotoran (28). A yield increase over the non-weeded control due to the application of herbicides from many official Research Institutes and Testing station all over the world was recorded. The results differ according to method of cultivation, the kind of weeds encountered and the level of weed infestation. In Uganda, the use of cotoran at I, 2 and 3 lb/ a. increased the seed cotton yield by 268, 315 and 318 percent (of the non-weeded check) respectively. In the Sudan, the use of cotoran at 0.8 and I.2 Kg/ faddan resulted in the increase of seed cotton yield by 188 and 169 percent respectively (13). Many other investigators reported an increase in seed cotton yield with application of cotoran (48, 69 and 74).

2. Linuron

The cotton tolerance to linuron was equal to that of diuron where linuron was applied at 0.5 to I.6 lb/a. as directed post-emergence broadcast spray (with surfactant added) when cotton

plants were I5 to 24 inches tall (38). However, De almeida (20) indicated that application of linuron at a rate of 0.8 to I.2 Kg/ ha. caused excessive injury to cotton with small variations in rate of application or soil type.

3. Monuron

Monuron had an adverse effect on the growth of cotton plant (55). Several investigators showed that it had a stunting and chlorosis effect, (26, 29, 42). Young cotton plants were liable to injury than old ones owing to their deeper root systems (26,29). There was no significant differences between cotton varieties in susceptibility to injury by monuron (52). Foy (29) showed slight reduction in seed cotton yield by applying monuron at a rate of 4 Ib/a.

4. LFA "I7,623 R P"

Burgaud et al (IO) showed that varying degrees of leaf scorch or local necrosis might occur particularly with liquid formulations of LFA herbicide, but the use of granules minimized this. The same authers noted that large seeded plants including cotton exhibited tolerance to such herbicide. Crops which can be regarded as resistant to preemergence application. On the bases of having large seeds or large reserves include sugarcane, groundnuts and cotton. Cooke and simmonds (I8) pointed out

that screening trials in the Sudan had indicated that up to 6.5 Ib/ a. of LFA was tolerated by cotton without visible signs of phytotoxicity. They noted that there were slight reductions in crop weight at 5 , 9 and I4 weeks after treatment and in seed yield with the lowest rate (I Ib/a.) as compared with the hand-weeded plots. They added that with the higher doses there were greater reductions, but without a marked dose response as between 3 and 5.5 Ib/a. The same authors mentioned that several screening trials in the U.S.A with LFA at doses varies from 0.5 to 3.0 Ib/a. showed that crop tolerance was more variable even at low doses. It is suggested that relatively cool conditions and hence slower germination of the cotton may have resulted in the germinating shoots being exposed for a longer time to the herbicide under the soil surface.

Residual effect of herbicides

I. Cotoran

Church (I6) reported that cotoran had a considerable residual effect. It may persist in the soil from one year to the next if rates of over 4Ib/ a. are used (I2). Martin (47) indicated that cotoran is of intermediate persistence with a half-life of 60 to 75 days according to soil conditions.