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The Influence of Herbicides on Major Field Crops in the Newly Reclaimed Areas of Egypt.

II. Effect of Postemergence Application of Herbicides on Wheat, Cotton, Maize, and Rice Seedlings.

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ABSTRACT

The effect of seven herbicides, applied as postemergence treatments, was evaluated in pots on the seedlings of wheat, cotton, maize, and rice at the Faculty of Agriculture Experimental Farm, Alexandria, in 1971. The herbicides were Atrazine, Linuron, 2,4-D, Trifluralin, Fluometuron, Molinate, and Propanil. Five concentrations of each herbicide were applied. A numerical grade scale (from zero to ten) was used in evaluating the various effects on crop seedlings.

Maize seedlings did not resist the postemergence application of Trifluralin, Fluometuron, Molinate, Propanil, and Linuron at all concentrations, except the lowest rate (0.5 kg/f; f = faddan = 4,200 m^2) of Linuron and Fluometuron. The seedlings resisted 2,4-D and Atrazine at the low rate but died after fifteen days when higher rates were used.

Wheat seedlings failed to resist all concentrations of Trifluralin, Propanil, Molinate, Fluometuron, Linuron, and Atrazine (except the lowest rate of 0.5 kg/f.). The seedlings differed in the degree of resistance to 2,4-D; i.e., they were completely resistant at the rates of 0.5, 1.0, and 2.0 l/f, but were completely killed after fifteen days at the rate of 4.0 l/f.

Propanil, Molinate, 2,4-D, Trifluralin, and Linuron had no effect on rice seedlings at all concentrations except the high ones (12.0 l/f, 7.5 l/f, 4.0 l/f, and 4.0 kg/f, respectively). However, rice seedlings did not resist all concentrations of Atrazine and Fluometuron, applied postemergence, except at the lowest rate.

Cotton seedlings were injured by Propanil, Molinate, 2,4-D, and Atrazine at all concentrations. On the other hand, they resisted Trifluralin (at the rates of 0.5 and 1.0 l/f) and Fluometuron (at the rates of 0.5 and 1.0 kg/f.) but were severely injured by the higher rates. The rates higher than 0.5 kg/f of Linuron injured cotton seedlings.

INTRODUCTION

Recently, chemical weed control started to be of major importance in Egyptian agriculture. For wheat, 2,4-D,Trifluralin and Fluometuron for cotton, Atrazine and Linu-

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ron for maize, and Propanil and Molinate for rice are being used. The application of these herbicides in the newly reclaimed land necessitates investigations since the agricultural environmental conditions in these areas are different from those in the Nile Valley of Egypt. Therefore, it is important to test the efficiency of these herbicides in order that recommendations as to their rates and methods of application may be made for the major field crops grown in these new reclaimed areas.

Several investigators evaluated the effect of different herbicides on crop seedlings when used as postemergence treatments. Hafner (1) found that the tolerance of winter wheat to Atrazine depended upon the stage of plant growth, being the highest at the three to four leaf stage. Pinthus and Natowitz (6) reported that the most sensitive stage of spring wheat to 2,4-D was at spike initiation, and the most resistant stage was after the completion of spike differentiation. Miller *et al.* (4) concluded that the foliar application of 2,4-D, and other related herbicides, at low concentrations caused severe damage to cotton plants. Kappelman and Buchanan (3) found that the postemergence treatment of Trifluralin and Fluometuron reduced the seedling growth of cotton in the greenhouse. Zahran *et al.* (10) indicated that the postemergence application of Fluometuron (3.0 lb/f) were satisfactory for weed control without injury to Egyptian cotton. Rubins and Gritsaenko (7) reported that the herbicides: 2,4-D, Simazine, and Atrazine considerably changed the anatomical structure of maize stalks when applied at different doses and times. Nair *et al.* (5) indicated that rice seedlings did not suffer from Propanil (36%) at the four to five leaf stage except that a few isolated chlorotic scorched spots appeared on leaf blades. Kale *et al.* (2) reported that the leaf-tip burning and leaf yellowing of rice seedlings, caused by Propanil, disappeared within seven or eight days after treatment. Smith (9) found that rice satisfactorily tolerated Molinate treatment with different rates and at different times after emergence.

The purpose of the present investigations is to study the effect of some herbicides on the seedling growth of wheat, cotton, maize, and rice when different concentrations of the herbicides were applied as postemergence treatments under the soil conditions of the North Tahreer Province in Egypt.

MATERIALS AND METHODS

A pot-experiment was carried out in 1971 at the Faculty of Agriculture Experimental Farm, Alexandria, to study the effect of the postemergence application of the following seven herbicides:

1. Trifluralin (alpha, alpha, alpha, trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine).
2. Fluometuron [1,1-dimethyl-3-(a,a,a-trifluoro-m-tolyl)urea].
3. 2,4-D (2,4-dichlorophenoxyacetic acid).
4. Molinate (5-ethyl hexahydro-1H-azepine-1-carbothioate).
5. Propanil (3,4-dichloropropionanilide).
6. Linuron [3-(3,4-dichlorophenol)-1-methoxy-1-methylurea].
7. Atrazine (2,chloro-4-ethylamino-6-isopropylamine-5-triazine).

on wheat, cotton, maize, and rice seedlings. Five concentrations for each herbicide were used as shown in Table 1. The solution was prepared by mixing the proper amount of the herbicide with 400 liters of water. Fifteen crop seeds were sown in a plastic pot, 8 cm in diameter, filled with 250 g of the North Tahreer Province soil (fine sandy loam). After fifteen days from emergence, the seedlings were thinned to ten in each pot and the herbicide solutions were then sprayed. The pots were irrigated as needed.

Table 1 Concentrations of the herbicides applied on the different field crops.

Herbicides	Concentrations
Atrazine	0.0, 0.5, 1.0, 2.0, and 4.0 kg/f[a]
Linuron	0.0, 0.5, 1.0, 2.0, and 4.0 kg/f
Molinate	0.0, 1.25, 2.5, 5.0, and 7.5 l/f[b]
Propanil	0.0, 3.0, 6.0, 9.0, and 12.0 l/f
Trifluralin	0.0, 0.5, 1.0, 2.0, and 4.0 l/f
Fluometuron	0.0, 0.5, 1.0, 2.0, and 4.0 kg/f
2,4-D	0.0, 0.5, 1.0, 2.0, and 4.0 l/f

[a] kg/f = kilograms per faddan (one faddan = 4200 m^2).
[b] l/f = litres per faddan.

In this work, data were taken only on the herbicidal action as determined by the visual observation of different symptoms which appeared on crop seedlings. A numerical grade scale was used to facilitate the classification of different reactions. This scale ranged from zero (very high susceptibility) up to ten (very high resistance). The varying degrees between these two extremes were determined as shown in Table 2. The readings were recorded daily for the first fifteen days following the treatment.

Table 2 Numerical grade scale of different effects on wheat, cotton, maize, and rice seedlings after treatment with the herbicides.

Scale	Effect on Crop
0–3	Susceptible
4–5	Moderately susceptible
6–8	Moderately resistant
9–10	Resistant

RESULTS AND DISCUSSION

Visual effect of herbicides

1. Effect of Trifluralin

Chlorotic areas appeared first around leaf blade tips and progressed towards the marginal, central, and basal parts of the leaves. Dark and pale green spots intermingled with the chlorotic areas. After a few days, the leaves were scorched then wilted and died. These symptoms were observed on the seedlings of the four crops, especially at high concentrations.

2. Effect of Fluometuron

A narrow border of chlorotic areas appeared around the whole margins of leaves immediately after the treatment. These areas uniformly progressed from the leaf edge inward with a slight scorching of leaves. After a few days, the leaves were wholly scorched and then died. These symptoms were observed on the four crop seedlings. At the lower concentrations, however, cotton seedlings recovered and became normal later on.

3. Effect of 2,4-D

Chlorotic symptoms were first initiated as marginal yellow areas near the middle and lower parts of the leaf blade of the four crop seedlings. Leaf tips remained unaffected at this early stage. Thereafter, chlorosis progressed into the interveinal areas, while the leaf veins remained green. Finally, the leaves were scorched and then wilted and died. However, the seedlings recovered and the chlorotic areas disappeared, especially at the lower concentrations of 2,4-D in the cases of wheat, maize, and rice.

4. Effect of Molinate

Visual symptoms on the seedlings of the four crops started with narrow chlorotic leaf areas which first appeared at the leaf blade tips and progressed towards the central and basal leaf parts. These yellow areas became brownish in colour and the leaf margins were twisted and scorched. A few days later, the leaves were totally scorched and then wilted and died. At the low concentrations, however, the seedlings recovered and the chlorotic spots disppeared, especially those of rice.

5. Effect of Propanil

Chlorotic areas appeared first around leaf blade tips and progressed towards the marginal, central, and basal leaf parts. Dark and pale green spots intermingled with the chlorotic areas. After a few days, the leaves were scorched and then wilted and died. These symptoms were observed on the seedlings of the four crops, especially at high concentrations.

6. Effect of Linuron

Visual symptoms on the four crop seedlings were similar to those observed with Trifluralin and the degree of seedling response differed among the four crops on the basis of resistance to Linuron treatment.

7. Effect of Atrazine

Symptoms first appeared on the seedlings of the four crops as pale green areas very close to leaf veins. Chlorosis started at the bases of veins and proceeded along the veinal network in the direction of leaf margins. The chlorotic areas were intermingled with dark green spots. A few days later, the leaves were scorched and then wilted and died. At the low concentrations, however, maize seedlings recovered and became normal later on.

Numerical effect of herbicides on crop seedlings

1. Effect on Wheat

This effect is shown in Table 3 which indicates that wheat seedlings were severely injured by most concentrations of Propanil, Molinate, Trifluralin, Fluometuron, and Linuron. In the cases of Atrazine treatments, wheat seedlings rated ten on the scale when sprayed with the lowest dose (0.5 kg/f). In the case of 2,4-D, however, wheat seedlings were almost completely resistant and rated from eight to ten at the concentrations: 0.5, 1.0, and 2.0 l/f. These results agreed with those reported by Hafner (1).

2. Effect on Cotton

The numerical reactions of cotton seedlings to herbicidal treatments are given in Table 4. The table shows that cotton seedlings were susceptible to all doses of 2,4-D, Molinate, Propanil, and Atrazine. The seedlings died after three to seven days with the lowest dose. The results obtained with 2,4-D agreed with those of Miller *et al.* (4). The

Table 3 Degree of seedling response of wheat to different concentrations of the herbicides after fifteen days from treatment.

Herbicides	Concent-rations	Days after spraying														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Propanil	3.0 l/f	8	7	6	5	3	0	0	0	0	0	0	0	0	0	0
	6.0 l/f	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	9.0 l/f	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	12.0 l/f	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Molinate	1.25 l/f	10	8	7	5	5	5	4	4	3	2	2	1	1	1	1
	2.5 l/f	10	7	6	3	1	0	0	0	0	0	0	0	0	0	0
	5.00 l/f	8	5	3	2	0	0	0	0	0	0	0	0	0	0	0
	7.50 l/f															
2,4-D	0.5 l/f	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	1.0 l/f	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	2.0 l/f	9	9	8	8	7	7	8	8	8	8	8	8	8	8	8
	4.0 l/f	8	8	7	7	6	6	6	5	5	5	4	4	4	4	3
Trifluralin	0.5 l/f	10	10	9	9	7	6	6	6	6	5	4	4	3	2	2
	1.0 l/f	10	10	8	8	6	5	5	4	4	3	2	1	0	0	0
	2.0 l/f	8	7	5	2	0	0	0	0	0	0	0	0	0	0	0
	4.0 l/f	8	6	2	0	0	0	0	0	0	0	0	0	0	0	0
Atrazine	0.5 kg/f	10	10	9	9	9	9	10	10	10	10	10	10	10	10	10
	1.0 kg/f	10	7	5	4	3	0	0	0	0	0	0	0	0	0	0
	2.0 kg/f	10	7	5	3	2	0	0	0	0	0	0	0	0	0	0
	4.0 kg/f	8	7	3	2	1	0	0	0	0	0	0	0	0	0	0
Fluometuron	0.5 kg/f	7	6	4	3	3	3	3	2	0	0	0	0	0	0	0
	1.0 kg/f	5	3	2	2	1	0	0	0	0	0	0	0	0	0	0
	2.0 kg/f	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0
	4.0 kg/f	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Linuron	0.5 kg/f	8	6	5	5	4	3	2	1	0	0	0	0	0	0	0
	1.0 kg/f	7	5	4	3	2	0	0	0	0	0	0	0	0	0	0
	2.0 kg/f	7	5	2	1	0	0	0	0	0	0	0	0	0	0	0
	4.0 kg/f	6	7	1	0	0	0	0	0	0	0	0	0	0	0	0

table also shows that cotton seedlings were resistant to Trifluralin and Fluometuron at the low concentrations (0.5 and 1.0 l/f).

3. Effect on maize

The effect of the seven herbicides on maize seedlings is summarized in Table 5. It is clear from this table that maize seedlings were susceptible to Propanil, Molinate, Trifluralin, Fluometuron, and Linuron when applied as postemergence treatments at all concentrations, except the lowest rate of Fluometuron and Linuron (0.5 kg/f) at which maize seedlings were resistant. As for Atrazine, maize seedlings resisted the harmful effects of the rates: 0.5 and 1.0 kg/f and were moderately susceptible or moderately resistant to the 2.0 kg/f rate, but they were quite susceptible to the highest rate (4.0 kg/f). Table 5 further indicates that maize seedlings were moderately resistant to the 2.0 l/f concentration of 2,4-D.

4. Effect on Rice

This effect, as numerically scaled, is presented in Table 6. The data showed that rice seedlings were almost completely resistant to Propanil and Molinate, especially in the cases of the recommended rates (6.0 1/f of Propanil and 5.0 1/f of Molinate). The seedlings rated almost ten on the scale during the fifteen days after spraying. On the

Table 4 Degree of seedling response of cotton to different concentrations of the herbicides after fifteen days from treatment.

Herbicides	Concentrations	Days after spraying														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Propanil	3.0 l/f	8	5	2	1	0	0	0	0	0	0	0	0	0	0	0
	6.0 l/f	6	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	9.0 l/f	6	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	12.0 l/f	6	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Molinate	1.25 l/f	8	7	6	4	4	4	3	3	2	1	1	0	0	0	0
	2.50 l/f	7	6	4	2	2	0	0	0	0	0	0	0	0	0	0
	5.00 l/f	4	3	2	0	0	0	0	0	0	0	0	0	0	0	0
	7.5 l/f	4	3	2	0	0	0	0	0	0	0	0	0	0	0	0
2,4-D	0.5 l/f	4	3	3	2	2	1	1	1	0	0	0	0	0	0	0
	1.0 l/f	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	2.0 l/f	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	4.0 l/f	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifluralin	0.5 l/f	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	1.0 l/f	10	10	9	9	9	8	8	8	8	8	8	8	8	8	8
	2.0 l/f	9	8	8	8	8	8	7	7	7	7	6	6	6	6	6
	4.0 l/f	9	8	6	6	5	4	4	4	3	3	2	1	1	1	1
Atrazine	0.5 kg/f	10	10	9	8	6	5	4	4	4	3	3	2	1	1	1
	1.0 kg/f	10	9	8	7	5	3	0	0	0	0	0	0	0	0	0
	2.0 kg/f	9	8	6	5	2	0	0	0	0	0	0	0	0	0	0
	4.0 kg/f	9	8	6	5	2	0	0	0	0	0	0	0	0	0	0
Fluometuron	0.5 kg/f	8	8	8	9	9	10	10	10	10	10	10	10	10	10	10
	1.0 kg/f	8	8	8	8	9	10	10	10	10	10	10	10	10	10	10
	2.0 kg/f	8	8	8	6	6	5	5	4	2	0	0	0	0	0	0
	4.0 kg/f	8	7	4	0	0	0	0	0	0	0	0	0	0	0	0
Linuron	0.5 kg/f	10	9	9	8	9	9	10	10	10	10	10	10	10	10	10
	1.0 kg/f	9	8	7	7	6	5	5	5	5	5	5	5	5	6	6
	2.0 kg/f	9	8	6	3	2	1	0	0	0	0	0	0	0	0	0
	4.0 kg/f	8	8	6	3	0	0	0	0	0	0	0	0	0	0	0

other hand, they were severely stunted and discolored at the higher concentrations. This means that rice is more resistant to Propanil and Molinate, if they are used as postemergence herbicides, than the other three crops. These results were in close agreement with the findings of Nair *et al.* (5), Kale *et al.* (2), and Smith (9).

Table 6 further shows that rice seedlings were almost completely resistant and rated from eight to ten on the scale when 2,4-D was used with the rates: 0.5, 1.0, and 2.0 l/f. As for Trifluralin and Linuron, rice seedlings were highly resistant at the low concentrations (0.5 and 1.0 l/f of Trifluralin and 0.5 and 1.0 kg/f of Linuron) since they rated from eight to ten on the scale. The seedlings were moderately resistant or susceptible at the high concentrations of all herbicides. The results also showed that rice resisted the harmful effects of the lowest concentration (0.5 kg/f) of Fluometuron and moderately resisted the second concentration (1.0 kg/f) to some extent.

According to these results, the following conclusions may be drawn under the conditions of the present investigations:

1. *For Wheat*
   a. The herbicide: 2,4-D may be used as a postemergence application at rates up to 2.0 l/f.

Table 5 Degree of seedling response of maize to different concentrations of the herbicides after fifteen days from treatment.

Herbicides	Concentrations	Days after spraying														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Propanil	3.0 l/f	5	3	2	1	0	0	0	0	0	0	0	0	0	0	0
	6.0 l/f	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	9.0 l/f	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	12.0 l/f	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Molinate	1.25 l/f	7	7	5	3	2	1	0	0	0	0	0	0	0	0	0
	2.50 l/f	6	4	3	1	0	0	0	0	0	0	0	0	0	0	0
	5.00 l/f	6	4	3	0	0	0	0	0	0	0	0	0	0	0	0
	7.50 l/f	5	3	2	0	0	0	0	0	0	0	0	0	0	0	0
2,4-D	0.5 l/f	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	1.0 l/f	9	9	8	8	8	9	9	9	9	9	9	9	9	9	9
	2.0 l/f	8	7	7	6	6	5	5	5	5	5	5	5	5	5	5
	4.0 l/f	7	6	5	4	2	0	0	0	0	0	0	0	0	0	0
Trifluralin	0.5 l/f	10	8	7	5	4	3	3	3	3	3	3	3	3	3	3
	1.0 l/f	8	6	5	3	1	0	0	0	0	0	0	0	0	0	0
	2.0 l/f	6	4	3	0	0	0	0	0	0	0	0	0	0	0	0
	4.0 l/f	6	4	1	0	0	0	0	0	0	0	0	0	0	0	0
Atrazine	0.5 kg/f	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	1.0 kg/f	9	9	8	8	8	8	7	7	7	7	7	7	7	7	7
	2.0 kg/f	8	7	7	7	7	6	6	6	6	6	5	5	5	5	5
	4.0 kg/f	8	8	7	6	6	5	3	2	1	0	0	0	0	0	0
Fluometuron	0.5 kg/f	10	10	8	8	8	8	9	9	9	10	10	10	10	10	10
	1.0 kg/f	8	7	5	4	3	3	3	2	2	2	1	1	0	0	0
	2.0 kg/f	8	7	4	2	1	0	0	0	0	0	0	0	0	0	0
	4.0 kg/f	6	3	1	0	0	0	0	0	0	0	0	0	0	0	0
Linuron	0.5 kg/f	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	1.0 kg/f	8	8	7	7	5	3	1	0	0	0	0	0	0	0	0
	2.0 kg/f	8	6	5	4	2	1	0	0	0	0	0	0	0	0	0
	4.0 kg/f	8	6	5	4	2	1	0	0	0	0	0	0	0	0	0

b. Propanil, Molinate, Trifluralin, Atrazine, Fluometuron, and Linuron are harmful postemergence herbicides at all rates used in these investigations.

2. *For Cotton*
   a. Trifluralin and Fluometuron may be used as postemergence herbicides with the same rates recommended for both as preemergence herbicides, as shown by Shaalan and El Khishen (8).
   b. Propanil, Molinate, 2,4-D, Atrazine, and Linuron are not recommended as postemergence herbicides at any concentration.

3. *For Maize*
   a. Propanil, Molinate, or Trifluralin are not recommended as postemergence herbicides at any concentration.
   b. Atrazine or 2,4-D may be used as postemergence treatments at doses up to 1.0 kg/f Atrazine or 1.0 l/f 2,4-D.
   c. Linuron or Fluometuron may be used as postemergence herbicides at concentrations up to 0.5 kg/f.

4. *For Rice*
   a. Molinate, Trifluralin, 2,4-D, or Linuron may be used in a postemergence treat-

Table 6 Degree of seedling response of rice to different concentrations of the herbicides after fifteen days from treatment.

Herbicides	Concentrations	Days after spraying														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Propanil	3.0 l/f	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	6.0 l/f	9	9	8	8	8	9	9	10	10	10	10	10	10	10	10
	9.0 l/f	7	6	5	4	2	1	0	0	0	0	0	0	0	0	0
	12.0 l/f	5	4	3	3	0	0	0	0	0	0	0	0	0	0	0
Molinate	1.25 l/f	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	2.50 l/f	9	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	5.00 l/f	9	9	9	10	10	10	10	10	10	10	10	10	10	10	10
	7.50 l/f	7	3	3	2	1	1	0	0	0	0	0	0	0	0	0
2,4-D	0.5 l/f	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	1.0 l/f	10	9	8	9	10	10	10	10	10	10	10	10	10	10	10
	2.0 l/f	9	9	8	8	8	9	9	9	9	10	10	10	10	10	10
	4.0 l/f	7	6	5	4	2	0	0	0	0	0	0	0	0	0	0
Trifluralin	0.5 l/f	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	1.0 l/f	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	2.0 l/f	10	10	9	7	5	5	5	5	4	4	4	4	4	4	4
	4.0 l/f	8	7	7	4	3	2	1	0	0	0	0	0	0	0	0
Atrazine	0.5 kg/f	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	1.0 kg/f	10	8	6	6	6	5	5	4	4	4	3	3	3	3	3
	2.0 kg/f	8	7	7	5	3	0	0	0	0	0	0	0	0	0	0
	4.0 kg/f	8	6	3	0	0	0	0	0	0	0	0	0	0	0	0
Fluometuron	0.5 kg/f	10	9	8	8	9	9	10	10	10	10	10	10	10	10	10
	1.0 kg/f	7	6	4	4	3	3	3	4	4	4	4	5	5	5	5
	2.0 kg/f	7	5	3	0	0	0	0	0	0	0	0	0	0	0	0
	4.0 kg/f	7	5	1	0	0	0	0	0	0	0	0	0	0	0	0
Linuron	0.5 kg/f	9	8	8	8	8	9	9	9	9	9	9	9	9	9	9
	1.0 kg/f	9	8	7	7	7	7	8	8	9	9	9	9	9	9	9
	2.0 kg/f	7	6	4	3	0	0	0	0	0	0	0	0	0	0	0
	4.0 kg/f	6	5	4	3	0	0	0	0	0	0	0	0	0	0	0

ment with the same concentrations recommended for the preemergence application reported by Shaalan and El Khishen (8).

b. Atrazine and Fluometuron are not recommended as postemergence herbicides at any concentration.

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