ECOLOGICAL STUDIES FOR SOME DOMINANT WEEDS IN EGYPT

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Abstract

Series of trials in laboratory, pots and field were undertaken during the period from 2002 to 2005 in Weed Research Central Laboratory, Agriculture Research Center Giza, to study the effect of temperature degrees, planting depths and cutting intervals on the regrowth % of the for the perennial weeds i.e., cogongrass "*Imperata cylindrica* (L.) pers.", bermudagrass "*Cynodon dactylon* (L) pers.", nutsedge "*Cyperus rotundus* L." and field bindweed "*Convolvulus arvensis* L.". The temperature degrees used in germination experiment were as follow: (15, 25 and 35°C), the planting depths 2, 5, 10, 15 and 20 cm and cutting intervals every one, two and three weeks. The main results indicated that, increasing percentage of germination %, germination speed, plumle length, redicale length and dry weight of seedlings for cogongrass, bermudagrass, nutsedge and field bindweed with increased temperature from 15 to 35 °C. Progressive and consistent reduction in the germination %, length of the above ground parts, length of the under ground parts and dry weight of the whole plant of all weeds studied occurred with increasing planting depths from 2 to 20 cm. The reduction percentage of the dry weight of the above ground parts of seedlings of cogongrass, bermudagrass and nutsedge increased with decreasing the cutting intervals from three to one week, respectively.

However, differences between one and two weeks were significant with respect to cogongrass.

INTRODUCTION

The pervious experiments indicated that nutsedge can germinate from tubers buried into clay soil a depth more than 20 cm and vice versa with bindweed, which can't enable to germinate below 5 cm (King, 1944). Under field conditions only 0.75 % of recently harvested seeds of *Cynodon dactylon* germinated when buried at 10 or 15 cm and germination was nill at 0 and 5 cm and bud growth was more successful for rhizomes and stolens led to on the soil surface or buried at 5 cm than at 10 and 15 cm. They also reported that maximum sprouting of rhizome and stolon buds occurred at 16-30 days after planting and the period of sprouting was longer for stolons than for rhizomes (90and 60 days, respectively) (Pere-Montesbravo *et al.*, 1985). The emergence of cogongrass was reduced when rhizomes are buried deeper than 4 cm.

They added that did not produce axillary buds along most of the rhizome nor regenerate when apical six nodes-long rhizome segments were buried deeper than 8 cm. It is postulated that cogongrass spread is limited by lack of axillary buds formation on most of the rhizome and the inability of rhizomes to send up new shoots if buried deeper than 8 cm. These factors could account for the intolerance of cogongrass to cultivation (John *et al.*, 1988). *Imperata cylindrica* seeds germinated from April to September (32.6-36.2° C) (Tripathi *et al.*, 1995). Nutsedge *(Cyperus rotundus)* tuber sprouting was more rapid and complete with alternating than constant temperatures. Increasing temperature fluctuation from 0 to 6 for 12 hours daily linearly increased total tubers sprouting. As little as 30-min exposure to high temperature per day provided nearly the same level of sprouting as a 12 hours alternating temperature cycle. This phenomenon should be considered when conducting studies to describe tuber temperature responses or when predicting tuber sprouting and emergence (Joll *et al.*, 1996). The control of field bindweed by cultivation operation should be preformed every two weeks during the first, two and three months of the treatment or until field bindweed weakened and emerges more slowly than before. The interval may be safely lengthened to three weeks (Philips and Thimmons, 1954). Slashing/cutting followed by burring should be effective and exhaust carbohydrates reserves in the rhizhome and must be applied at an interval of two weeks over a period of three years (Soerjani, 1970). Cutting interval had little effect on rhizome production of *Cynodon dactylon* except on 2 of the genotypes cut at 1or 2 weekly intervals. The mowing at 4 and 8 weeks caused 8 and 21 % decrease in foliage dry weight of *Imperata cylindrica,* grown in pure stand respectively. (Willard and Shilling, 1990). Without herbicide, two mowing or discings were generally more effective on the control cogongrass *(Imperata cylindrica)* than a single mowing or discing treatment (Thomas *et al.*, 1996). The percentage sprouting of *Cyperus esculentus* increased with increasing temperature within the range of 12°C to 38 °C, while no sprouting occurred at 10 °C and few tubers sprouted at 42°C. Also, the rate of sprouting increased with temperature up to 35° C and a base temperature of 11.4 °C was determined for bud sprouting of tubers in this species, so higher temperature led to larger sprouts and greater survival rate (Li *et al.*, 2000).

The aim of this study, is to evaluate the effect some ecological factors: i.e. temperature, planting depths and cutting intervals on the germination and growth of four dominant perennial weeds i.e., bermudagrass *(Cynodon dactylon* L. *pers.*), cogongrass *(Imperata cylindrica* L. *Beauv.)* purple nutsedge *(Cyperus rotundus* L.) and field bindweed "*Convolvulus arvensis* L.".

MATERIALS AND METHODS

Series of experiments (laboratory, pots and field,) were carried out in wire house and Weed Research Central Laboratory, Agriculture Research Center, Giza, to study the effect of temperature, planting depth and cutting intervals on the growth of cogongrass "*Imperata cylindrica* (L.) pers.", bermudagrass "*Cynodon dactylon* (L) pers.", nutsedge "*Cyperus rotundus* L." and field bindweed " *Convolvulus arvensis* L." perennial weeds during the period from 2002 to 2005 summer season.

A- Effect of temperature on perennial weeds:

Four laboratory experiments were performed in growth chamber at Weed Research Central Laboratory, Giza, to investigate the effect of temperature degrees on sprouting % of nutsedge, bermudagrass and cogongrass and on germination % of field bindweed seeds during the period from January to May 2005. Plants received 12-hours light and the same in dark. Every experiment included three temperature degrees being 15, 25 and 35 °C. 20 seeds of cogongrass, 20 seeds of each of cogongrass and field bindweed, 50 seeds of bermudagrass and 10 tubers of nutsedge, were planted in sterilized petri dishes (12.5 cm in diameter) on a filter paper (Whatman No.2) and moistened with 10 ml of distilled water and added as needed. The experiments were conducted according to a complete randomized design with four replicates. The following data were recorded: at the end of the experiments: germination percentage, germination speed, length of radical (cm), length of plumule (cm), dry weight of seedling (g).

B- Effect of planting depth on perennial weeds:

Four pot experiments were conducted in wirehouse of Weed Research Central Laboratory, A. R. C., Giza 2002, 2003 and 2004 summer season to evaluate the effect of different] planting depth on the germination % and growth of nutsedge, bermudagrass, cogongrass and field bindweed. Five propagate parts for each of the three monocotyledonous were sown at 5 and 28 June 2002 and 2003 summer season respectively, while five seeds of field bindweed were sown at 28 and 10 June 2003 and 2004, respectively. Each experiment comprised five planting depths as follow: 2, 5, 10, 15 and 20 cm which distributed in a randomized complete block design in four replicates.

The following data were recorded at 45 days from planting: germination percentage, length of aerial ground parts (cm), length of under ground parts (cm), dry weight of aerial ground parts (g/pot), dry weight of under ground parts (g/pot).

C- Effect of cutting intervals on growth of perennial weeds:

Three field experiments were conducted in Giza Farm during from 2004 and 2005 season. One experiment for each of bermudagrass, cogongrass and nutsedge, to

study the effect of cutting intervals on the dry weight of these weeds. Randomized complete block design was used with four replicates. 30 vegetative structures for each species were planted in plots (0.4m length x 0.4 m width), at 5/6/2004 and 10/4/2005 and harvested depending on the weed species. Each experiment included three cutting intervals i.e., every one, two weeks and three weeks

One month from bermudagrass and nutsedge planting and 45 days from cogongrass planting were considered the time of cutting for control treatments. At every cut dry weight of above ground parts (g/plot) were recorded .

Statistical Analysis

The pervious data were exposed to the proper statistical analysis of variance according to the procedure described by (Steel and Torrie, 1980). The least significant difference (L.S.D) at 5% level of significance was used to compare the treatment means.

RESULTS AND DISCUSSION

1- The effect of temperature on perennial weeds:

Data in table (1) showed that the highest germination % of the four studied weeds namely cogongrass, bermudagrass, field bindweed and nutsedge were obtained under 35 °C i.e., 82.5, 97.5, 88 and 85 % , respectively, in first experiment and 90, 100, 88.5 and 90 % in second experiment for the previous respective weeds. The inferior values were obtained under 15°C especially with cogongrass and field bindweed . The highest germination % under35 °C for these weed species were accompanied by highest values of germination speed, length of plumule or radical and seedling dry weight. These results suggest that both cogongrass and field bindweed stay dormant during winter and became active during summer.

Similar results were also reported by (Tripathi *et al.* 1995), who reported that *Imperata cylindrica* seeds germinated from April to September (32.6-36.0 °C). (Jodie *et al.* 1996) reported that yellow nutsedge had the lowest temperature thersholds (6 °C) but the upper temperature thersholds were ranged from 42-44 °C. Also, (John *et al.* 1988), found that growth of cogongrass *(Imperata. cylindrica)* was greater with day/night temperature regimes of 30/25 than 27/22 or 24/18°C. They indicated that apical six-node-long rhizome fragments of all three species were killed by the 24-h exposure to - 4.5°C. (Uygur and Koch, 1990), showed that the highest germination percent of *Cynodon dactylon* of approx. 50% was in the alternating temperature regime, while rhizome emergence was maximum at 20-30 °C. Shen and Shen (1995), reported that the germination of *Cynodon dactylon* in the Shanghai region begins in

early April and culminates during mid-April to May. Rhizome shooting was observed at 10-46° C but was highest at 30-40° C.

2- The effect of planting depths on perennial weeds:

Data in Table (2) showed decreased germination % of aerial and dry weight under ground parts length of cogongrass, bermudagrass, nutsedge and field bindweed with increasing planting depths from 2 cm to 20 cm. The results suggest that nutsedge tubers can persist soil than the other studied weeds (up to 15 -20 cm or more) and need to tillage deeper than the other weeds.

Pere-Montsebravo *et al.,* (1985) found that in 5 cm depth bermudagrass buds growth was more successful for rhizomes and stolons laid on the soil surface or buried at 10 and 15 cm. Also Mohamad *et al.,* (1989) reported that *Imperata cylindrica* fragments planted at 2 or 5 cm depth showed greater survival and regeneration than those which were surface planted or planted more 5 cm deep, Shen and Shen (1995), reported that *Cynodon dactylon* rhizome shooting was good at a soil water content of 15-20 % and soil depth of 0-3 cm. Also King (1944) reported that nutsedge can germinate from tubers buried into clay soil a depth more than 20 cm and vice versa with bindweed, which can't enable to germinate below 5 cm.

3- The effect of cutting intervals on perennial weeds:

Results in Table (3) and Fig. (1) showed that the differences in the dry weight of cogongrass, bermudagrass and nutsedge were not significant in first season.

Results in the above table and in Fig. (1) showed that frequent cutting (every one week) as well as every two weeks significantly decreased the dry weight of cogongrass when compared with cutting every three weeks.

It means that cutting every two weeks gave similar good results as cutting every one week when cogongrass is concerning. As for bermudagrass and nutsedge dry weight for cutting every one week was significantly lower that every two week and of cause than every three weeks in most cuts.

In this connection, Dominguez and Hardy (1988) and Beyrout *et al.* (1990) found that dry weight matter of nutsedge increased with later cutting of *Synodon dactylon.*

Table 1. Effect of temperature on cogongrass, bermudagrass, nutsedge and field bindweed germination % in the first and second experiments at 15 days from sowing.

Temperature °C	Germination %	Speed of germination	Length of plumule (cm)	Length of radical (cm)	Dry weight of seedling (mg)	Germination %	Speed of germination	Length of plumule (cm)	Length of radical (cm)	Dry weight of seedling (mg)
	First experiment					Second experiment				
	Cogongrass									
15	2.5	0.2	1.3	0.1	2.0	7.5	0.4	1.6	0.2	3.0
25	48.8	0.4	2.6	0.3	4.0	56.3	0.5	2.3	0.3	4.0
35	82.5	0.6	2.8	0.3	6.0	90.0	0.6	2.7	0.3	5.0
L.S.D.	13.8	0.2	N.S.	0.1	0.2	14.5	0.1	0.6	0.1	0.2
Bermudagrass										
15	87.5	0.6	1.4	1.0	31.0	85.0	0.6	1.8	1.1	29.0
25	92.5	0.6	6.4	3.8	33.0	95.0	0.6	6.8	3.8	41.0
35	97.5	0.6	11.0	7.5	43.0	100.0	0.6	11.9	7.6	53.0
L.S.D.	N.S.	0.0	1.7	1.1	N.S.	N.S.	0.0	1.5	1.4	9.5
Field bind weed										
15	13.0	0.5	1.7	0.8	6.0	14.0	0.5	1.5	0.8	5.0
25	83.0	0.5	2.3	1.2	25.0	81.0	0.5	3.2	1.2	30.0
35	88.0	0.6	3.6	1.6	40.0	88.5	0.6	3.5	1.6	32.0
L.S.D.	7.7	0.0	0.4	0.2	8.2	5.6	0.0	0.7	0.2	6.7
Nutsedge										
15	52.5	0.5	4.0	9.0	29.0	57.5	0.5	4.9	8.6	29.0
25	81.3	0.6	7.5	11.1	33.0	80.0	0.6	7.9	9.8	35.0
35	85.0	0.6	9.5	13.4	41.0	90.0	0.6	10.2	12.3	39.0
L.S.D.	14.0	0.0	1.9	1.7	1.2	9.6	N.S.	1.4	1.4	4.0

Table 2. Effect of planting depth on cogongrass, bermudagrass, Field bindweed and Nutsedge germination and growth at 45 days after planting in 2002, 2003 and 2004 seasons.

Planting depth (cm)	Above ground parts		Under ground parts		Germination %	Above ground parts		Under ground parts		Germination %
	Length (cm)	Dry weight (g/pots)	Length (cm)	Dry weight (g/pots)		Length (cm)	Dry weight (g/pots)	Length (cm)	Dry weight (g/pots)	
	Cogongrass **2002 season**					Bermudagrass **2002 season**				
2	29.8	1.3	25.0	0.5	90.0	100.8	16.3	76.0	9.5	80.0
5	23.3	1.1	21.8	0.5	75.0	72.5	11.6	67.5	8.3	100.0
10	14.5	0.5	12.0	0.3	40.0	73.0	9.6	59.5	6.9	90.0
15	5.0	0.2	5.0	0.2	15.0	62.3	7.3	39.5	6.1	40.0
20	0.0	0.0	0.0	0.0	0.0	48.5	5.6	21.3	2.6	40.0
L.S.D.	4.7	0.5	5.2	0.4	29.4	32.3	4.4	20.3	3.8	44.3
	2003 season					**2003 season**				
2	32.3	1.0	15.3	0.8	100.0	100.3	16.8	79.5	13.5	100.0
5	20.8	0.4	13.0	0.3	90.0	76.7	11.0	53.8	5.5	95.0
10	19.0	0.3	11.0	0.2	40.0	53.1	4.0	41.6	2.8	45.0
15	17.3	0.2	6.8	0.1	50.0	33.8	1.9	22.9	1.5	25.0
20	3.9	0.0	1.8	0.0	10.0	0.0	0.0	0.0	0.0	0.0
L.S.D.	5.2	0.5	1.5	0.3	23.9	26.4	4.7	18.0	2.0	22.0
	Field bindweed					Nutsedge				
	2003 season					**2002 season**				
2	35.0	2.3	49.5	0.8	40.0	52.0	14.0	52.5	14.8	100.0
5	16.8	1.5	24.3	0.4	30.0	46.8	13.6	46.8	11.6	100.0
10	0.0	0.0	0.0	0.0	0.0	50.8	11.9	39.3	10.7	100.0
15	0.0	0.0	0.0	0.0	0.0	45.0	7.5	31.8	9.0	100.0
20	0.0	0.0	0.0	0.0	0.0	33.0	5.8	27.0	7.5	90.0
L.S.D.	10.3	0.9	20.4	0.3	28.1	10.7	2.7	5.3	2.1	N.S.
	2004 season					**2003 season**				
2	28.9	1.2	11.9	0.6	100.0	51.1	14.8	44.8	13.7	100.0
5	22.5	0.8	15.1	0.3	65.0	49.7	13.9	37.3	11.7	100.0
10	9.1	0.2	6.1	0.1	40.0	41.9	13.2	31.8	9.7	100.0
15	2.3	0.0	1.5	0.0	10.0	30.5	8.3	29.5	6.3	100.0
20	0.0	0.0	0.0	0.0	0.0	15.1	2.6	11.8	1.6	35.0
L.S.D.	9.7	0.7	7.6	0.2	44.7	9.2	2.3	7.3	2.6	23.6

Table 3. Effect of cutting intervals on dry weight (g/plot) of Cogongrass, Bermudagrass and nutsedege in 2004 and 2005 seasons.

Cutting intervals	2004 season																			
	Cogongrass							Bermudagrass							Nutsedge					
	1st	2nd	3rd	4th	5th	6th	7th	1st	2nd	3rd	4th	5th	6th	7th	1st	2nd	3rd	4th	5th	6th	7th
One week	1.9	1.4	1.2	0.8	0.7	0.5	0.3	30.1	27.7	24.7	15.9	12.7	9.3	4.2	2.8	2.3	2.0	1.6	1.5	1.3	0.5
Two weeks	2.0	1.6	1.3	1.0	0.9	0.5	0.4	31.6	28.1	25.0	18.2	16.0	12.8	7.9	2.8	2.3	2.0	1.7	1.5	1.3	0.5
Three weeks	3.2	2.1	2.2	1.8	1.5	1.1	0.8	36.2	29.7	25.9	22.5	19.3	15.6	11.0	4.0	2.9	2.5	2.1	1.7	1.4	1.0
L.S.D. at 0.05 level	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	0.24
2005 season																					
One week	3.4	2.8	2.2	1.7	1.2	0.8	0.6	4.1	3.4	2.8	2.2	1.4	0.9	0.5	2.8	2.4	1.9	1.4	1.0	0.6	0.4
Two weeks	3.7	3.4	2.8	2.2	1.6	1.2	0.8	5.4	4.7	3.6	3.2	2.5	1.7	1.3	3.3	2.7	2.2	1.8	1.4	0.9	0.7
Three weeks	4.8	4.2	3.4	3.0	2.3	1.8	1.3	6.5	5.6	4.6	4.1	3.4	2.7	1.8	3.6	3.3	2.6	2.1	1.7	1.2	0.8
L.S.D. at 0.05 level	0.8	0.8	0.6	0.6	0.6	0.3	0.1	0.9	0.5	0.4	0.4	0.3	0.2	0.2	0.5	0.3	0.2	0.2	0.2	0.1	0.2

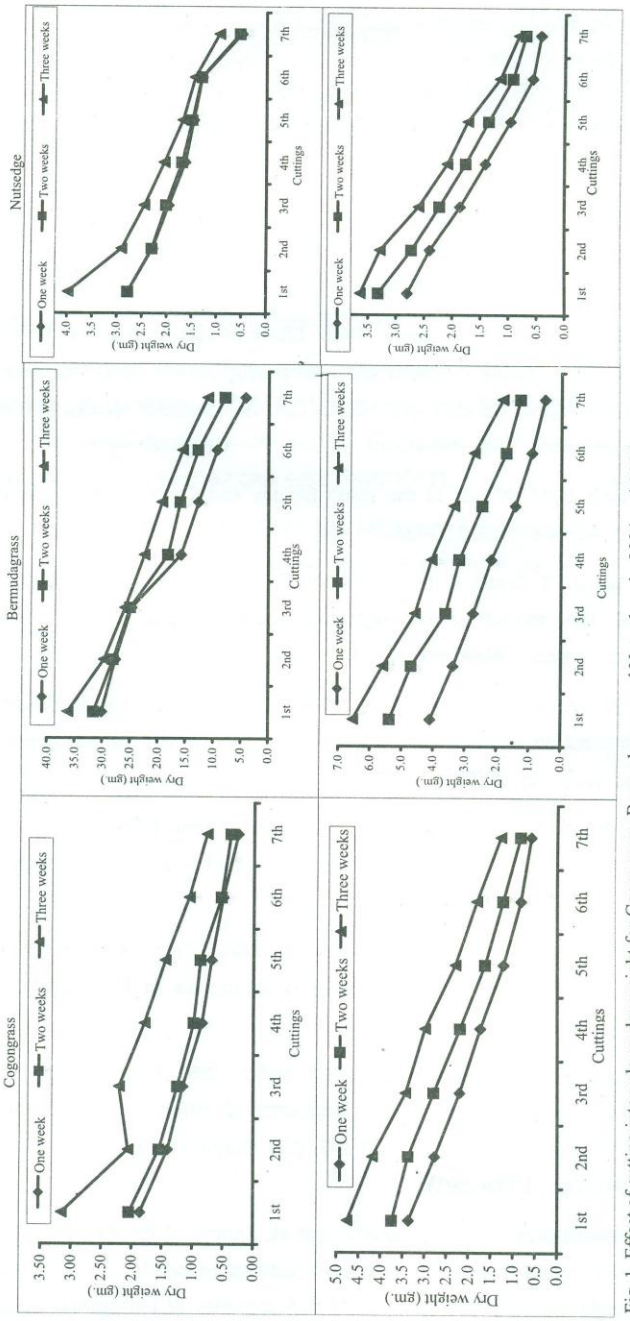

Fig. 1. Effect of cutting intervals on dry weight for Cogongrass, Bermudagrass and Nutsedege in 2004 and 2005 seasons.

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دراسات بيئية لبعض الحشائش المعمرة السائدة فى مصر

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أجريت مجموعة من التجارب فى الأصص والمعمل والحقل خلال مواسم ٢٠٠٢ و٢٠٠٣ و٢٠٠٤ و ٢٠٠٥ بالمعمل المركزى لبحوث الحشائش، مركز البحوث الزراعية، الجيزة. لدراسة تأثير أعماق الزراعة ودرجة الحرارة وفترات الحش على مكافحة حشائش الحلفا والنجيل والسعد والعليق.

أولاً: تجربة الإنبات:

أشتملت التجربة على ثلاث معاملات هى ١٥، ٢٥، ٣٥ °م وكان الهدف منها دراسة تأثير درجات الحرارة على إنبات حشائش الحلفا والنجيل والسعد والعليق. وكانت أهم النتائج:

* زيادة نسبة الإنبات وسرعة الإنبات وطول الريشة والجذير والوزن الجاف للبادرة للحشائش الأربعة بزيادة درجات الحرارة من ١٥ إلى ٣٥ °م.

ثانيا: تجربة أعماق الزراعة:

أشتملت التجربة على أعماق الزراعة الأتية: ٢، ٥ ، ١٠، ١٥ ، ٢٠ سم وكانت أهم النتائج:

* الانخفاض المستمر فى نسبة الإنبات وطول الأجزاء الهوائية أو الأجزاء تحت سطح التربة وكذلك الوزن الجاف للنبات بالحشائش الأربعة وذلك بزيادة أعماق الزراعة من ٢ إلى ٢٠ سم.

ثالثاً: تجربة الحش:-

أشتملت التجربة على ثلاث فترات للحش هى: أسبوع، أسبوعان، ثلاث أسابيع وكان الهدف من الدراسة، هو دراسة تأثير فترات الحش على مكافحة حشائش الحلفا والنجيل والسعد وكانت أهم النتائج ما يلى:

* تزداد نسبة الانخفاض فى نسبة التجديد والوزن الجاف للأجزاء الموجودة فوق سطح التربة للحلفا والسعد والنجيل بنقص فترات الحش من ٣ أسابيع إلى أسبوعان إلى أسبوع إلا أن هذه الفروق لم تكن معنوية بين معاملتى الحش كل أسبوع والحش كل أسبوعين بالنسبة لحشيشة الحلفا.