J. Agric. Sci. Mansoura Univ., 27 (3): 1481 - 1486, 2002

INFLUENCE OF DENSITY AND DURATION OF INTERENCE OF PURPLE NUTSEDGE *(Cyperus rotundus*) ON RICE YIELD.

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ABSTRACT

Additive series of experiments were conducted under field conditions to detect the effect of duration of interference of different initial population densities(5,10,20and 30plants/m2) of purple nutsedges (*Cyprus rotundus* L.)on the yield losses of drill-seeded rice(Giza 178). Increasing weed population or/and the duration of interference increased reduction of rice grain yield. The severe reduction due to weed population of 30 plants/m2 recorded 31and 27% for the first and second seasons, respectively. The highest reduction due to duration of interference recorded 53 and 39% when purple nutsedge was allowed to compete for 120 days with rice during first and second seasons, respectively. Moreover, the interaction between weed densities and duration of interference showed severe reductions under the high populations(20 and 30 plants/m2) when interfered with rice 40 days or more

INTRODUCTION

Purple nutsedge(*Cyperus rotundus L.*) is a problem weed in crops in many parts of the world (Hikino *et al.,*1971). Purple nutsedge is a perennial which rarely reproduces by seeds(Thullen and Keeley,1979) but extensively by rhyzomes resulting from the basal bulbs and tubers (Hauser,1962). This weed posses the highly efficient C4 dicarboxylic acid photosynthetic pathway (Chen *et al.,* 1970). Plants with C4 pathway can assimilate CO2 at higher temperatures and light intensities than plants with C3 pathway. These species coupled with characteristics such as rhyzomatous spreading have the potential of being serious weed plants (Black *et al.,*1969). Purple nutsedge is considered to be the worst weed in the world (Holm *et al.*,1991 and 1997). This weed is well suited to compete for nutrients, water, and an early growth stages, for light because it emerges and grows more rapidly than most crops. While it is a weed of small stature relative to most crops, it can cause serious losses. It is a strong competitor for N and it can remove many kilograms of nutrients from the soil . Over 50% of these elements are stored in the tubers(Bhardwaj and Vernam,1968).

Competitation begins early in the crop cycle and there fore the yield reduction is related to the long duration of competition. A 10-day delay between planting and the first weeding of maize resulted in a 19% yield loss while 30-day delay caused a 27%crop loss and full season competition reduced yield by 40% (Cruz and Cardenas,1974). Season-long interference of purple nutsedge has been reported to reduce the yield of cabbage (*Brassica oleracea L.*) by 41% , bean(*Phaseollus vulgaris* L.) by 41%, cucumber(*Cucumis sativus* L.) and rice (*Oryza sativa* L.) by 43%(Okafor and De Datta,1976, William and Warren,1975), while the reduction in dry bean

yield was 81% (William,1973). On the other hand, *C. rotundas* often appears as pure stands of moderate to heavy infestation, even when no weed control measures are used, this is probably due, in part, to its allelopathic properties whereby chemicals produced by this weed inhibit the growth of plants in the immediate vicinity(Friedman and Horowitz, 1971).

The negative effect of purple nutsedge on crops is density-dependant (Morales-Payan *et al.,1998).* Radosevich(1987) reported that the negative effect of specific weed on a given crop is frequently studied using additive series, of treatments in which crop is planted at a constant density and different weed densities. The above-cited studies allow the conclusion to be drawn regarding the extent of yield losses and weed density thresholds for the crop(Santos *et al.*,1998). The objective of this study was to determine the influence of interference of different densities of purple nutsedge with drill-seeded rice.

MATERIALS AND METHODS

A field experiments were carried out during 1998 and 1999 seasons at Rice Research and Training Center, Sakha, Kafr El-Sheikh.

Rice cultivar Giza 178 was drill - seeded at the rate of 120 kg seeds/ha. , on May 15 , 20 in the first and second seasons, respectively in plots of 10 m2 area.

The homogeneous purple nutsedge tubers were collected from a tilled area heavely infested with the weed. The tubers were planted according to the desired density at 5cm depth after rice drilling. The tested weed densities were 5, 10,20 and 30 plants /m2 while the periods of interference were 10,20,40,60, 80 and 120 days after planting(DAP). A split plot design with four replicates was used, where weed densities were distributed in the main plots and durations of iterference were allocated to the sub-plots.

C. rotundus plants were completely removed manually from the infested plots according to the duration of interference for each treatment. After rice maturity, the central $5m^2$from each plot were manually harvested (on Sept 20 and 25 for first and second season) , threshed and cleaned. Grain yield was weighed and recorded as kg/m^2 at 14% moisture content.

Data were statistically analyzed and DMRT was used at 5% level for comparison between treatments. Yield losses were calculated as % percent as compared to the weed free plots.

RESULTS AND DISCUSSION

a-Effect of *C. rotundus* densities:

Data cited in Table(1) revealed that the reduction in grain yield of rice was increased by increasing purple nutsedge populations. This reduction ranged from 17 to 31% and from 12to 27% as compared to the weed free plots during first and second season, respectively. The average grain yield losses due to a full-season interference of 5, 10, 20 and 30 plants/m^2 of purple nutsedge were 14.3, 20, 26.6 and 28.9, respectively. These results are confirmed by those obtained by Dusky and Jones(1996). Who found that rice yield losses increased with in creasing yellow nutsedge population.

b-Effect of duration of interference:

Data in Table (2) revealed that, 10 to 20 days of interference of 5 to 30 plants/m^2 of purple nutsedge has no significant effect on rice grain yield. Purple nutsedge has its pronounced adverse effects beyond 20 DAP of drill-seeded rice. Increasing period of purple nutsedge competition up to 80age substantially decreased rice grain yield. Grain losses of 40, 60, and 80of competition were 21.7, 35.5 and 43.4%, respectively. Increasing period of purple nutsedge after 80 days did not cause considerable reductions in grain yield compared to that at 80 days of interference. These results cleared at that drill-seeded rice had to be free of *C.rotundus* before 40DAP to avoid severe reductions in grain yield. The obtained results are confirmed by Dusky and Jones (1996) . who reached the same conclusion.

Table(1): Reduction of Giza178 rice grain yield as affected by interference different densities of *Cyprus rotundus* in 1998 and 1999 seasons.

***C. rotundus* densities (plnts/m2)**	**Yield reduction (%)**	
	1998	**1999**
Weed free	0	0
5	16.71	11.81
10	22.88	17.06
20	30.47	22.80
30	30.56	27.20

Table (2): Reduction of Giza178 rice grain yield as affected by duration of interference of *Cyprus rotundus* in 1998 and 1999 seasons

Duration of interference (DAP)*	**Yield reduction(%)**	
	1998	**1999**
Weed free	0	0
10	0	0
20	1.85	1.41
40	29.58	13.89
60	42.61	28.45
80	51.01	35.69
120	52.69	38.85

*** DAP= Days after planting.**

c-Interaction effects of weed population and the duration of interference.

Data presented in Tables (3 and4) pointed out that, at the same density of purple nutsedge, rice grain yield losses was increased as the period of interference increased from 40 to 120 days. For example, the average yield losses (of the two seasons) of 5, 10, 20 and 30 plants/m^2 of purple nutsedge were 12.3, 18.1, 29.8 and 26.9%, respectively at 40 days of interference or 35.7, 41.1, 49.9 and 56.6%, respectively at 120 days of interference was recognized. Greater increase in grain yield losses with increasing period of interference from 40 to 80 days. However, a slight

increase in grain yield losses were observed with increasing period of interference from 80 to 120 days. This indicated the importance of keeping rice fields free from purple nutsedge during the period between 40 to 80 days after planting. The increased losses of yield due to increasing nutsedge population and /or duration of interference may refer to an allelopathic potential and competition for light and soil resources as reported by Keely (1987) . The obtained results are in agreement with those recorded by Dusky and Jones (1996) and Okofor and De Datta(1976).

Table (3):): Reduction of Giza178 rice grain yield as affected by duration of interference of different densities of *Cyprus rotundus* in 1998 season.

Duration of interference (DAP)*	Weed densities (plants/m2) 5	10	20	30
Weed free	0	0	0	0
10	0	0	0	1.68
20	1.68	0.0	4.20	1.68
40	21.85	29.41	37.82	29.41
60	26.89	42.86	49.58	51.26
80	36.97	48.74	57.98	60.50
120	42.02	45.38	59.66	63.87

*** DAP= Days after planting.**

Table (4): Reduction of Giza178 rice grain yield as affected by duration of interference of different densities of *Cyprus rotundus* in 1999 season.

Duration of interference (DAP)*	Weed densities (plants/m2) 5	10	20	30
Weed free	0	0	0	0
10	0	0	0	0.67
20	0.17	1.00	1.83	2.66
40	2.66	6.82	21.80	24.29
60	15.14	25.96	24.28	38.44
80	22.63	31.78	39.28	49.25
120	29.28	36.77	40.10	49.25

*** DAP= Days after planting.**

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تأثير الكثافة وفترة التداخل لحشيشة السعد على محصول الأرز

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أجريت تجربتان حقليتان لدراسة تأثير الكثافات المختلفة وفترات التداخل لحشيشة السعد على اتلفاقد فى محصول الحبوب فى الأرز التسطير. استخدمت من الحشيشة كثافات ٥، ١٠، ٢٠،٣٠ نبات /م^{٢} لتنافس محصول الأرز جيزة ١٧٨ لفترات ١٠، ٢٠ ، ٤٠، ٦٠، ٨٠، ١٢٠يوما من الزراعة اضافة الى المعاملة الخالية من الحشائش.

أدت زيادة كثافة الحشائش أو فترة التداخل الى زيادة الفاقد فى المحصول الناتج من الأرز. سجل التداخل الناتج من ٣٠ نبات /م^{٢} من السعد أعلى انخفاض فى محصول الحبوب من الأرز حيث كان ٣١،٢٧% لموسمى الدراسة على التوالى. كما أدى زيادة فترة التداخل الى زيادة الفاقد من محصول الأرز من الحبوب وكانت أعلى خسارة بسبب بقاء الحشيشة لفترة ١٢٠ يوما مصاحبة للمحصول حيث سجلت ٥٣، ٣٩% خسارة خلال موسمى الدراسة على التوالى. هذا وقد كان التفاعل بين الكثافة العددية وفترة التداخل للسعد موضع اعتبار حيث كانت أعلى خسارة فى محصول الأرز ناتجة من تداخل ٢٠ نبات أو أكثر لفترة ٤٠ يوم أو أكثر.