Effect of Some Cultural Practices on growth of barnyardgrass and it's inter-and intraspecific Competition with Rice.

Degree : DOCTOR OF PHILOSOPHY IN AGRONOMY

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V. Summary

Effect of Some Cultural Practices on Growth of Barnyardgrass And It's Inter-and Intraspecific Competition With Rice.

Four experiments were established in 2001-2002 Rice growing seasons at Rice Research and Training Center (Sakha - Kafr El-Sheikh – Egypt). The experiments were conducted in order to study the effect of some cultural practices on growth of barnyardgrass and it's inter-and intraspecific competition with rice using one greenhouse and three filed experiments.

A-First Study:

Effect of water depth, *Echinochloa spp.* on emergence and growth of *Echinochloa spp*.

This study aimed to elucidate the effect of irrigated water depth on the emergence and some growth characteristics of three *Echinochloa species*. (*Echinochloa crus-galli, Echinochloa oryzoides* and *Echinochloa phyllopogon*) A split plot design with four replicates was used. The main plots were developed to five water levels (saturated, 2, 4, 6 and 8 cm depth) while sub-plots included the three *Echinochloa species*. The period of this study was 30 days.

Results could be are summarized as follows:

A-1-Growth measurements:

1- *Echinochloa phyllopogon* recorded the highest emergence percentage and plant height following by *Echinochloa oryzoides* while *Echinochloa crus-galli* had the lowest emergence percentage and plant height.

2- Saturated treatment resulted in the highest percentage of emergence followed by 2 and 4 cm water depth and the three species were failed to emerge under 6-and 8-cm water depth.

3- Saturated treatment with *Echinochloa crus-galli* had the highest emergence percentage, fresh weight and plant height compared to other.

B-Second Study:

Effect of planting date, *Echinochloa* species, and interaction on growth and yield components of *Echinochloa spp* .

The study aimed to detect the role of planting date on growth, yield and its components of three *Echinochloa species*. A split-plot design with four replications was used. *Echinochloa species* were arranged at random in the main plots while planting dates were assigned at random in the sub-plots.

The following measurements were recorded:

b-1- Growth measurements:

1-Planting date of *Echinochloa species* had significant effects on the periods of emergence for first, second and third leaf. Barnyardgrass planted in May 20th recorded the longest periods while 1st of July showed the shortest period in this respect. *Echinochloa crus-galli* had the longest periods for the emergence of first, second and third leaf as compared to the other two *Echinochloa species*. The emergence of first three leaves of barnyardgrass did not affect by the interaction between planting dates and *Echinochloa species*.

2- Planting barnyardgrass on May 20th delayed the emergence of the first tiller. The second and third tillers emergence were delayed when barnyardgrass plants were planted on June 20th while first and second tillers emerged earlier when *Echinochloa* species were planted on June 1st .

3- Planting date of June 1st recorded the shortest periods of emergence for the second and third tillers of *Echinochloa crus-galli* while the longest periods were observed with *Echinochloa phyllopogon* when planted at May 10th.

4- Planting date of May 20th recorded the longest period for heading while planting barnyardgrass on July 1st exhibited the shortest one. The tallest plants of *Echinochloa spp.* was pronounced with planting date of May 10th while the shortest were observed with June 10th planting date.

5- *Echinochloa phyllopogon* recorded the longest period to heading and *E. crus-galli* recorded the least. However, plant height and panicle length did not affect by the *Echinochloa spp*.

6-The shortest period for heading was recorded by *Echinochloa phyllopogon* when planted at June 20th while the longest period was observed with *Echinochloa crus-galli* under planting date of July 1st.

b-2- Yield components:

The largest magnitudes for grains/panicle and panicle weight was achieved by planting date of May 10th while the lowest figures were recorded with planting date after June 10th. Planting date had no significant differences on 1000-kernel weight due to planting dates. *Echinochloa species* had significant effects on number of filled grains/panicle, panicle weight and 1000-grain weight *Echinochloa crus-galli* showed its superiority in number of filled grains/panicle and panicle weight, while *Echinochloa oryzoides* and *Echinochloa phyllopogon* recorded the higher weight of 1000-kernel.

Planting date and *Echinochloa species* interaction greatly influenced number of grains/panicle and panicle weight. The highest number of grains/panicle and panicle weight were achieved by *Echinochloa crus-galli* when planted at May 10th. *Echinochloa phyllopogon* recorded the least number of grains/panicle and panicle weight when planted at July 1st.

C-Third Study:

Effect of intraspecific competition of *Echinochloa species*, spacing and their interactions on growth and yield components of *Echinochloa spp*:

This study was initiated to investigate the effect of the intraspecefic competition between three *Echinochloa* species as influenced by *Echinochloa* species and plant spacing .The experimental design was split with four replicates. *Echinochloa* species (*Echinochloa crus-galli* , *Echinochloa oryzoides* and *Echinochloa phyllopogon*) were arranged in the main plots while the sub-plots were devoted to eight different spacing (10x10 ,10x20 ,20x20 ,20x30 ,30x30 ,30x40 ,40x40 and 40x 50 cm). Results are summarized as follows :

C-1- Growth measurements:

1- Increasing planting space greatly increased number of tillers/hill at 40 and 60 DAP. *Echinochloa crus-galli* showed its superiority in dry weight/hill at 30 DAP. No significant effects were observed on this character at 45 and 60 DAP du to *Echinochloa* species .

2-Plant spacing considerably affected dry weight/hill at 30, 45and 60 DAP. Increasing planting space greatly increased dry weight/hill of *Echinochloa* species up to 30x40 cm .

3- The highest dry weight/hill was recorded by *Echinochloa crus-galli* under plant spacing of 40x40 cm, and *Echinochloa phyllopogon* planted at 30x40 cm spacing, while *Echinochloa oryzoides* recorded the lowest dry weight/hill under plant spacing of 10x10 cm . plant height at 45 , 60 and at harvest were not significantly affected by *Echinochloa* species while heading date was affected . The longest period to heading was recorded by *E. phyllopogon* followed by *E. oryzoides*.

4- Taller plants were observed under closer spacing (10x10 cm up to 20x30 cm)while shorter ones were pronounced under 50x50 cm spacing . Plant density also significantly affected heading date where wider spacing (40x40 and 50x50 cm) resulted in the longer period to heading and closer ones recorded the shorter periods in this respect .

5- *E. crus-galli* showed its superiority in plant height under 10x10 up to 20x20 cm while the lowest figure was recorded by *E. phyllopogon* with 50x50 spacing .

6- *E. crus-galli* recorded the longest panicles while no significant differences between *E. oryzoides* and *E. phyllopogon* in this respect .

7- The wider spacing 20x30 up to 50x50 cm produced the longer panicles and heavier 1000-kernels while the lowest figures were found with the closer ones (10x10 up to 20x20 cm).

C-2- Yield components:

1- *E. crus-galli* achieved the largest number of panicles/hill.50x50cm spacing while its plant spacing of 10x10 cm recorded the least values.
2-The largest number of filled grains/panicle was recorded by *E. crus-galli* under plant spacing of 20x30 cm while *E. phyllopogon* produced the lowest number of filled grains/panicle under 10x10 spacing .

D-Fourth Study:

Interspecific competition between rice and different species of *Echinochloa* as influenced by duration of competition and nitrogen levels.

The study aimed to investigate the competition between rice and *Echinochloa species* as influenced by duration of competition and nitrogen levels. A split-split plot design with four replicates was used. The three *Echinochloa species* (*E. crus-galli, E. oryzoides and E. phyllopogon*) were allocated at main plots. Four nitrogen levels (0, 30, 60 and 90 kg N/ha) were assigned to the sub-plots, while five durations of *Echinochloa spp.* competition (weed free, 20 DAT, 40 DAT, 60 DAT and full season competition) were distributed in the sub-subplots. Results are summarized as follows:

D-I- Growth characteristics:

1- Nitrogen level of 60 kg N/ha significantly surpassed other N levels in tillers number/hill at harvest and dry weight/hill of rice at complete flowering. 90 kg N/ha ranked second in this respect while the unfertilized plots ranked the least. Duration of competition considerably affected number of rice tiller/hill at harvest and dry weight/hill. More than 20 days

of competition significantly reduced all recorded traits where 60 days of competition equaled the effects of full season competition in this respect.

2-The interaction between *Echinochloa species* and nitrogen levels significantly affected number of tillers/hill at harvest and dry weight of rice hill. *Echinochloa crus-galli* recorded the highest values of number of tillers/hill and dry weight of rice, when 90 kg N/ha was used. The lowest figures were observed with zero N under the three *Echinochloa* species. The interaction between *Echinochloa* species and duration of competition had significant effect on number of rice tillers and dry weight/hill. *E. phyllopogon* exhibited sever reduction under competition period of 40 DAT or more comparing to *E. oryzoides or E. crus-galli*.

3-The interaction between nitrogen levels and duration of competition showed significant effects on number of rice tillers and dry weight/ hill. Increasing nitrogen levels up to 60 kg N/ha under weed free plots increased number of rice tillers/hill. The severity of competition increased by increasing nitrogen levels where the reductions in number of tillers and dry weight/hill decreased severely under full season competition with the highest level of nitrogen than that recorded under zero nitrogen treatment as compared to weed free plots under both N treatments.

D-2- Yield and its components:

1- *Echinochloa* species recorded significant reduction effects on number of rice panicles/hill and number of filled grains/panicle. While no significant effects were observed on panicle weight, panicle length and 1000-grain weight. The largest number of panicle of rice/hill and filled grains/panicle were recorded, when *E. oryzoides* competed with rice, while competition of *E. crus-galli* caused the lowest values. Nitrogen levels showed significant effects on number of rice panicles/hill and filled grains/panicle, while panicle weight, panicle length and 1000-grain weight didn't affect. Increasing nitrogen level up to 60 kg N/ha

significantly increased number of rice panicles/hill while the largest number of filled grains/panicle was obtained under 90 kg N/ha.

2-Duration of competition significantly affected number of panicles/hill, filled grains/panicle, panicle weight and 1000-grain weight. Duration of competition for more than 20 DAT severely reduced the mentioned traits especially with prolonged periods more than 40 DAT of competition. The largest number of panicles/hill and filled grains/panicle of rice were recorded under *E. oryzoides* when rice fertilized with 60 and 90 kg N/ha respectively.

3-The interaction between *Echinochloa* species and duration of competition significantly affected number of panicles/hill, number of filled grains/panicle and panicle weight. *E. phyllopogon* exhibited the lowest figures of the above mentioned yield components when competed all season with rice. The highest value of panicles/hill was recorded under weed free plots received 60 kg N/ha, while number of filled grains/panicle showed the highest figure under weed free plots with the highest level of nitrogen (90 kg N/ha). Interaction of *Echinochloa* species x nitrogen levels x duration of competition recorded significant reduction effect on number of panicle/hill. The largest number was recorded by weed free plot when fertilized with 60 kg N/ha while the lowest numbers were observed with duration of competition all-season as well as 40 DAT duration when *E phyllopogon* and rice plots received 30 kg N/ha.

4- *E. crus-galli* competition recorded the highest harvest index and rice grain yield as compared to infestation of other species while *E. phyllopogon* ranked the least. Nitrogen levels greatly affected harvest index, straw and grain yield of rice. Application of 60 kg N/ha achieved the highest magnitudes of harvest index, straw and grain yields. While zero N/ha produced the lowest values.

5-Increasing duration of competition over 20 DAT significantly reduced harvest index, straw and grain yields of rice. Full season competition resulted in the lowest values of the harvest index, straw and grain yields. *Echinochloa crus-galli* with 60 kg N/ha produced the highest harvest index and grain yield, while the competition of *E. oryzoides* under 90 kg N/ha produced the lowest harvest index and rice grain yield. The highest straw yield of rice was recorded under *E. phyllopogon* competition when pots fertilized with 60 kg N/ha. *Echinochloa* species x duration of competition had significant effects on harvest index, straw and grain yields of rice. Weed free plots recorded the highest values and full season competition showed the lowest values. *E. phyllopogon* showed severe competition after 40 DAT duration. where caused great reduction in grain yield of rice.

6- The maximum potential of rice grain yield was obtained in weed-free rice plots received the highest nitrogen level (90 kg N/ha). At the same nitrogen level application, crop yields reduced significantly with increasing period of *Echinochloa* spp. competition. At the same duration of competition, crop yield increased significantly with increasing level of nitrogen application.

7- The harvest index was decreased gradually with increasing duration of competition of the three species of *Echinochloa,* regardless of the level of nitrogen. Regarding the competition of the three species of *Echinochloa,*, the season-long duration of competition of each species resulted in non-significant reduction in the harvest index.

8-The variance in the harvest index of rice in plants suffered only from 20 days duration of competition of the three species of *Echinochloa* was not significant at all nitrogen levels as compared with the harvest index of the weed-free plots. At zero level of nitrogen fertilizer and the same duration of competition, harvest index of rice was significant higher when *E.*

oryzoides was grown with rice, except for season-long duration of competition. *E. oryzoides* reduced the harvest index significantly more than others. When nitrogen was applied at 60 kg N/ha, harvest index of rice crop suffered from 40 and 60 days period of competition of *E. crus-galli* was significantly higher as compared with *E. phyllopogon*.

9-The interaction effects between duration of competition of *Echinochloa* species and nitrogen levels significantly influenced straw yield of rice. Increasing nitrogen application from zero up to 90 kg N/ha did not change the values of rice straw yields significantly when the comparison is made between the same duration of competition of each weed species. The differences between the effects of the three species of *Echinochloa* occurred during the same period of competition at any levels of nitrogen were not clear in most cases, except for 40 days and season-long durations at zero nitrogen levels, 60 days duration of competition at 30 kg N/ha, 20 days duration of competition at 60 and 90 kg N/ha.

10-The interaction effects between duration of competition of *Echinochloa* species and nitrogen levels significantly influenced grain yield of rice. Grain yields at all nitrogen levels significantly reduced gradually in the both seasons with increasing duration of competition from early duration of 20 days after transplanting to season-long duration. Among the effect of the three species, competitiveness of *E. crus-galli* was stronger at 40 days duration when no nitrogen was applied than the other two species. While, competitiveness of *E. oryzoides* was stronger in season-long duration at zero nitrogen fertilizer.

Conclusion

1- Continues flooding with water depth (more than 6cm) can successfully suppress *Echinochloa* species in rice fields.