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Study on the competition between maize and barnyardgrass (*Echinochloa cruss-galli* (L.) P.B.)

Éva Lehoczky

University of Veszprém, Georgikon Faculty of Agronomy, Keszthely, Hungary

Maize is grown in Hungary on more than 1 million ha. Yield is influenced by several factors besides ecological conditions, according to Győrffy (1976) fertilization, crop density, variety, weed control and other factors influence yield by 30%, 21%, 28%, 18% and 3% respectively.

Barnyardgrass *(Echinochloa crus-galli (L.)P.B.)* is an annual grass weed, which is a well-known dangerous weed of many crops. In 61 countries of the world it causes problems in 36 different crops. It has some eco-types (Yabuko 1966), four was described in Japan and five in the USA. In Hungary it is one of the most important weeds of maize, during the 3rd national weed survey (1987-88) it was the No. 1. Maize monoculture has helped its dissemination. At the 4th national weed survey, in 1996-97 it has reached the 2nd place among weeds (Tóth et al. 1997). *Echinochloa crus-galli* has come originally from marshy areas and developes the best under such conditions. Due to wide adaptantion ability it can grow under dryer conditions as well (Ujvárosi 1973). The photo periods highly influence its competitive ability while temperature has significant effect on the vegetative growth.

The process where plant populations may influence each other is called interaction between populations. This influence can be neutral, negative or positive. The last one is *Echinochloa crus-galli* symbiosis, the negative is concurrence. Concurrence is the competition for factors available (De Wit 1960). If there is a back of a factor, competition starts (Juhász-Nagy 1978). In the literature Donald's (1963) definition is often quoted: Competition occures when two or more organisms are looking for their specific weeds from a given factor and the supply of this factor is lower than the common weed of organisms.

The competition between plants is for essential resources, such as water, lighrt and nutrients which are in interaction. (*Echinochloa crus-galli* in high crop density photosynthesis decreases and consequently it means less growth and water, nutrient uptake (Pozsgai 1988)).

Our aim was to study the early competition between *Echinochloa crus-galli* and maize with special respect to the biomass production. From the factors influencing the strength of competition weed density and the period of competition were studied.

E-mail: lehoczky@georgikon.hu

Materials and Methods

The experiment was set up according to the additive competition experimental method. The experiment was carried out under green house conditions in pots with soil culture, it has hasted for 8 weeks after germination and control of plant density. Pioneer 3779 Carla maize hybride was sown in treatments as follows in 4 replications:

m	weedless maize 5/pot
$m+w_1$	maize 5 + ECHCG 20/pot
$m+w_2$	maize 5 + ECHCG 40/pot
w_1	ECHCG 20/pot
w_2	ECHCG 40/pot
$m-w_1$	in the 4th week the 20 ECHCG were cleaned
$m-w_2$	in the 4th week the 40 ECHCG were cleaned

The experimental soil was a brown forest soil and 5,5 kg soil was put into each pot. Nutrient supply was the same in each pot as follows: 160 mg P_2O_5/kg soil, 240 mg K_2O/kg soil, 200 mg N/kg soil.

The biomass weight of maize and weeds was measured in two sampling dates, on the 4th and 8th week.

Results and Discussion

The dry weight of maize after the 4-week competition was less than in the weedless control, however the difference was not significant (Fig. 1)

The effect of weed density in this early period was not significant. The common mass of maize and weeds was higher in treatments with double weed density than in the case of lower weed density and control. The biomass production in weeds grown separately was consequent with plant density, it was double in the case of double plant number. This results show that nutrients were available thus competition was not significant. The interaction of the two species could be defected at this stage, since the biomass production of maize grown with weeds and especially the mass of weeds grown with maize was lower than grown

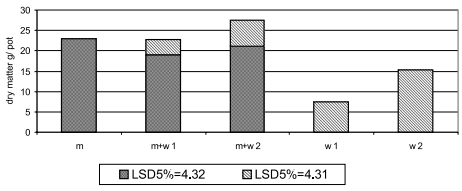

Figure 1. The biomass production of maize and ECHCG on the 4th week.

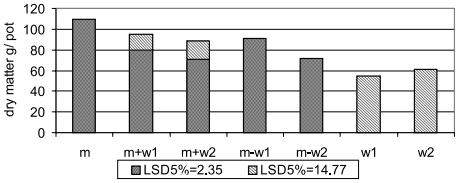

Figure 2. The biomass production of maize and ECHCG in the 8th week.

individually.

Results from the 8th week show that the effect of the early competition increased (Fig. 2).

In the 4th week the decrease of maize biomass was not significant, but by the 8th week it was significantly lower compared to control in pots where weeds were taken off in the 4th week.

In pots with double weed density the biomass of maize was nearly equal for 8 weeks in the weedy and cleaned (4th week) pots. The effect of the early competition appeared stronger in the 8th week than earlier.

The interaction of the two plants in competition was mutually negative. Similar to maize the dry biomass production of weeds grown with maize was significantly lower (25%) than weeds grown alone.

In the case of weeds the intraspecific competition within the species could also be seen. In the 8th week the decreasing nutrient supply has limited growth. The earlier density proportionate biomass production at this period was nearly equal in treatments with lower and higher weed density.

In treatments, where weed density was lower for 4 weeks and pots were cleaned, maize growth was higher than in weedy treatments for 8 weeks.

Results show that in the case of the ”lower” weed density of the experiment the early competition occurred in the biomass production of the maize crop still when competition was stopped, although the decrease was less than in the case of double weed density.

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