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Effect of planting date on growing degree days, growth and productivity of some maize hybrids

BY

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SUMMARY

Two field experiments were carried out at the Experimental Farm of Giza Agricultural Research station, Agricultural Research Center (A.R.C.), Egypt, during summer 2017 and 2018 seasons to investigate the effect of different planting dates on the growth, physiological parameters, phenological stages and their growing degree days, yield and quality of some white maize hybrids. Every experiment included 21 treatments which were the combinations of three planting dates and seven maize hybrids.

The experimental treatments were as follows:

Planting dates:

- 15 May
- 1 June
- 15 June

Maize hybrids:

- Single Cross 10 (S.C 10)
- Single Cross 128 (S.C 128)
- Single Cross 131 (S.C 131)
- Single Cross Hi-Tech 2031 (S.C 2031)
- Three way cross hybrid 321(T.W.C 321)
- Three way cross hybrid 324 (T.W.C 324)
- Three way cross hybrid 329 (T.W.C 329)

Maize hybrids seed (white color) in this study were obtained annually from Agricultural Research Center, Egypt except S.C 2031 which obtained from Hi-Tech Co.

The tested treatments were arranged in a split plot design with four replications, the planting dates in the main plots while, maize hybrids were occupied the sub-plots.

The obtained results could be summarized as follows:

A- Growth analysis:

- 1- Early planting (May 15) gave the highest values of all growth characters (number of leaves/ plant, leaf area /plant, leaves dry weight / plant, stem dry weight / plant and shoot dry weight / plant) at the three growth ages (40, 55 and 70 DAS) in both seasons. Delaying planting up to June 15 caused significant reduction in all growth characters.
- 2- Single cross 2031 significantly surpassed the other hybrids in all growth characters (number of leaves/ plant, leaf area /plant, leaves dry weight / plant, stem dry weight / plant and shoot dry weight / plant) at the three growth ages in both seasons followed mostly by S.C 131 and S.C 128 hybrids.
- 3- The interaction between sowing dates and maize hybrids indicate that planting S.C 2031 hybrid in early sowing (15 May) was the most effective interaction treatment for increasing number of leaves /plant (70 DAS), leaf area /plant (70 DAS) and shoot dry weight (55 and 70 DAS) in both seasons.

B- Chlorophyll content

- 1- Planting maize in early sowing date recorded the highest values of total chlorophyll (55 DAS) in both seasons, while planting in late sowing recorded the lowest values.
- 2- There are significant differences among the tested hybrids in their total chlorophyll. S.C 2031 followed by S.C 128, S.C 131 and T.W.C 321 had higher significant values of total chlorophyll, without significant among them, than the other tested hybrids.

- 3- The interaction between sowing dates and hybrids indicate that planting S.C 2031 surpassed the other hybrids and possessed their higher mean values when planted in early sowing. On the other side, the lowest values were achieved by T.W.C 329 when planted in the late sowing during both seasons.

C- Physiological parameters:

- 1- The results clearly indicate that CGR, RGR and NAR were significantly affected by tested sowing dates especially during the second period (55-70 DAS) in both seasons. There were constant decreases in CGR, RGR and NAR with delaying sowing date from May 15 to June 15.
- 2- There are significant differences among the tested hybrids in their physiological parameters. The highest values of CGR, RGR and NAR were mostly recorded by planting S.C 10, S.C 128, S.C 131 and S.C 2031 hybrids.
- 3- The interaction data refer to that S.C 2031 hybrid followed by S.C 128 hybrid gave the best performance for CGR when it planted in May 15 in the first season, while S.C 10 followed by S.C 2031 recorded the highest CGR at the same sowing date in the second season. However, S.C 2031 hybrid and S.C. 10 planted in May 15 produced the greatest values of NAR in the first and second seasons, respectively compared to the other interaction treatments.

D- Phenological stages and growing degree days

- 1- The results showed that early sowing significantly increased days to 50% tasseling and silking, days from 50% silking to maturity and days to maturity while planting maize in June 15 decreased this abovementioned flowering characters. Planting maize in June 1 significantly accumulated more GDD for 50% tasseling and silking. However, early sowing accumulated more GDD to maturity.

- 2- Flowering characters and GDD were significantly differed by the tested maize hybrids. The earliest hybrid was S.C 2031 for 50% tasseling, while T.W.C 321 for 50% silking and physiological maturity in both seasons. On the contrary, highest days to 50% tasseling were obtained by T.W.C 324, while the highest days to 50% silking and physiological maturity were obtained by S.C 128. Concerning GDD, the data took the same trend of flowering characters in both seasons.
- 3- The interaction data indicated that the earliest hybrid in tasseling was T.W.C 321 when it planted in the late sowing date. However, the plants of S.C 128 hybrids recorded the highest significant values of days to 50% silking and maturity in each sowing date especially early planting than those obtained by the rest interaction treatments. Similar trend were obtained by tested hybrids for GDD in the different flowering characters.

E- Yield and its components

- 1- Early sowing exhibited the highest significant values of yield and its components (plant height, ear height, ear length, ear diameter, number of rows / main ear, number of grains / row, grains weight/ ear, grain yield/fed, stover yield /fed, biological yield/fed and harvest index). Delaying sowing up to June 15 caused great reduction in all these characters. On the other hand, 100- grain weight, number of ears/ plant did not significantly affected by tested sowing dates.
- 2- Significant differences among maize hybrids were detected in yield and its components. S.C 2031 hybrid generally outyielded the other hybrids in number of ears/plant, 100-grain weight, grain weight/ear and grain yield/fed. Moreover, S.C 131 exceeded the other tested hybrids in ear

diameter, stover yield/fed and biological yield/fed. On the other hand, the highest values of plant height and ear height were recorded by S.C 10.

- 3- The interactions between sowing dates and maize hybrids showed increasing in plant height and ear height when S.C 10 planted in early date. On the other hand, S.C 2031, S.C 131 and T.W.C 321 hybrids surpassed the other maize hybrids in the grain weight per ear and grain yield/fed when their plants were planted in the first, second and third sowing dates, respectively in both seasons.

F- Heat use efficiency

- 1- Early planting (May 15) recorded the highest values of HUE for grain and biomass production in both seasons. Delaying planting up to June 15 caused significant reduction in both traits.
- 2- Single cross 2031 and Single cross 131 significantly surpassed the other hybrids in HUE for grain and biomass production, while T.W.C 324 and T.W.C 329 recorded the lowest values in both growing seasons.
- 3- The interaction between sowing dates and maize hybrids indicate that planting S.C 2031 followed by S.C 131 in early sowing (15 May) was the most effective interaction treatments for producing the highest values of HUE for grain and biomass production in both seasons.

G- Grain quality

- 1- The result showed that there was a decrease in the concentration of protein and oil by delaying sowing dates from May 15 to June 15
- 2- The highest values of grain quality were obtained by S.C 131 (for oil %) and S.C 3021 (for protein %). However, the lowest values of oil and protein obtained by planting T.W.C 329 and T.W.C 324, respectively.

- 3- The interaction data indicated that the plants of S.C 131 and S.C 2031 hybrids that planted in early sowing date produced the highest significant values of oil and protein percentages, respectively.

Final recommendation:

The response of maize hybrids significantly differed under various planting dates. From the abovementioned results, it can be concluded that planting S.C 2031 or S.C 128 which the best hybrids under early planting (May 15) condition, while S.C 131 hybrid showed the best performance under mid planting (June 1) condition compared to other hybrids. However, T.W.C 321 exhibited the maximum grain yield /fed under the late planting (June 15) in comparison with other hybrids under the environmental conditions of this experiment.