Effect of drought stress on stomata resistance changes in corn

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Abstract: To evaluate the effects of drought stress in different periods growth stomata behavior, research using factorial experiment design, randomized complete block with four replications and two factors with four levels of water stress as the first factor and three levels of growth periods As the second factor in the three crop years (1999-2000 &2000-2001 and 2001-2002) the Islamic Azad University Research Station at 3 km south of Ahwaz, Ahwaz city was designed and executed. Analysis of variance at 1% showed in all three years of water stress treatment, periods of growth and interaction of these two stomata resistance and lower leaf surface supernatant separately showed significant effect. by applying different levels of water stress, stomata resistance and lower leaf surface increased supernatant Duncan test was at 5% level in three years of the three groups presented mean that treatment (severe water stress treatment) and the highest treatment (control, no water stress) the lowest stomata resistance showed. Duncan test at 5% level one to two average growth for the period presented the highest stomata resistance in all three years and the treatments were obtained and lowest stomata resistance was observed in treatment. Duncan test at 5% level interactions show treatments with treatments that apply the lowest stomata resistance values were the other words in the early stages of plant growth when water is enough to provide resistance, stomata express that little but more severe stress in the course of Growth stomata resistance was .increased considerably, the underside of leaf stomata resistance levels much higher than the leaf supernatant [Tayeb Saki Nejad, Effect of drought stress on stomata resistance changes in corn. Journal of American Science 2011;7(6):27-31]. (ISSN: 1545-1003). http://www.americanscience.org.

Key words: corn, stomata resistance, drought stress

1. Introduction

Regulation of osmotic pressure, ions entering K +, increased Considerably finds that this increases the potential for pressure cells, particularly cells such protective stomata than cells around them and opening holes the search is, although under non-stress, entering the water, transport of ions K + into cells protection and stimulation causes stomata opening is. (14)

vegetative growth stage, on corn and sorghum low water potential could be in the leaf which in light are located, the openings to close, but close as complete is not conducted and resistance openings in bar 20 - = ten seconds cm was calculated, the reproductive stage, resistance to pore leaves in maize and sorghum with fluctuations water potential did not change, the openings in the reproductive stage to water stress, showed no sensitivity in maize stomata closure in bar 8 - = was starting. Stomata opening and closing of water stress, 15 to 20 minutes Smokes, compared to the effect of CO2 concentration on stomata opening and closing, which is very fast and nearly 2.5 to 5 minutes, the time allocated to longer does. (19)

General hypotheses stomata opening and closing by different researchers has reported as follows:

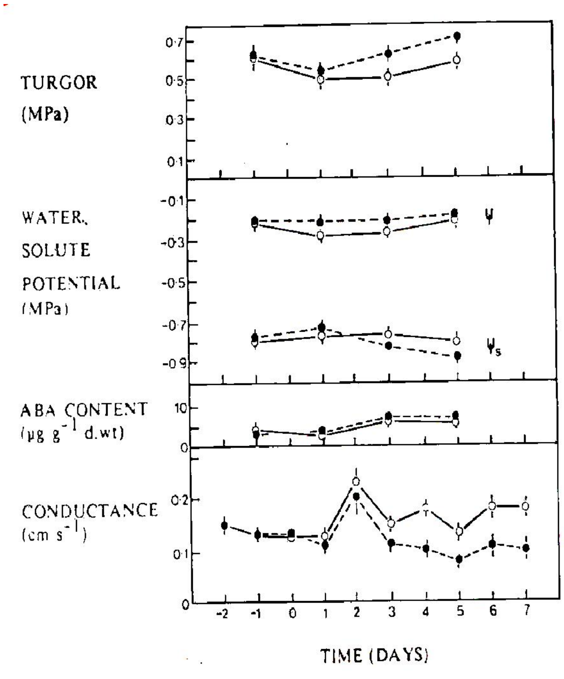

Figure 1: Changes in water potential, stomata conductance and ABA concentration of corn leaves in water available (0) and no water available (*) (15)

1 - Hypothesis converts starch to sugar in photosynthesis and accumulation of carbohydrates, causing water entry to openings that this phenomenon is the disappearance of starch and increase in the first hours of the day happens (Mansfield and Jones 1971)

2 - Active proton transport hypothesis, increasing the ion K +, causing the water entering the guard cells and open cells is (Fisher 1968, 1969 Sleet, Mac Liam 1965
3 - Proton transfer hypothesis (Van Kirk and Rashke 1978)

Stomata opening and closing the water affected if this expression that the synthesis of ABA prevents absorption of + K and H + release was followed by packing the holes are getting. Water deficit, ABA stimulates the synthesis and stomata closure is exacerbated (Figure 1).

the opening and closing holes on the effect of drought stress before flowering period, compared to other periods of corn growth was more complete and because of water shortage in this period, the CO2 entering for photosynthesis greatly reduced. (16)

Aperture size and number of plant species in very different and variable declared and measured the number of openings in the supernatant and lower levels in leaves of different plants, no significant difference demonstrated. (22)

2. Material and Method

2.1. Design model

Research was performed in Islamic Azad University research farm in southwest and 3 kilometers away from the city of Ahwaz factorial experiment in randomized complete block design. Research projects in the form of factorial experiment with the basic design with two randomized complete block with four replications factor and mathematical model was performed following a three-year basis;

$$X_{ijk} = \mu + \delta_i + \delta_j + \delta_k + \delta_{jk} + \varepsilon_{ijk}$$

In this model, each view X_{ijk} value, the average population, the effect of first factor, the effect of the second factor, the effect of blocks, Interaction first and second factor and the effect of experimental error is. Because the use of a factorial

Experiment to prevent mixing of (soil × irrigation) and complete separation from the plot, to prevent water penetration to the adjacent plots and also the importance of the same first factor and the second is (Table 1).

Table 1: Review of different treatments tested

Main plot: Drought stress Levels	Sub-plots: Different growth phases
I_0 : Full irrigation point of FC, control, without water stress	**S_0**: growing phase, the establishment of the plant stem to the emergence
I_1 : 75% of the amount of irrigation treatments I_0, mild stress	**S_1**: natal phase: to stem the rise of coffee being resilient and end silk pollination
I_2 : 50% of the amount of irrigation treatments I_0, severe stress	**S_2**: grain filling phase: the end of pollen grain maturity and the emergence of black layer
I_3 : 25% of the amount of irrigation treatment I_0, very severe stress and point of PWP	-

2.2. Stomata resistance

Stomata resistance measurements as recorded in the field was conducted by device Prometer lower and upper levels of the three parts of each leaf base, middle and top leaf stomata resistance was measured

3. Result

Analysis of variance at 1% showed that the three years of water stress treatment, periods of growth and interaction of these two stomata resistance and lower leaf surface supernatant separately showed significant effects .

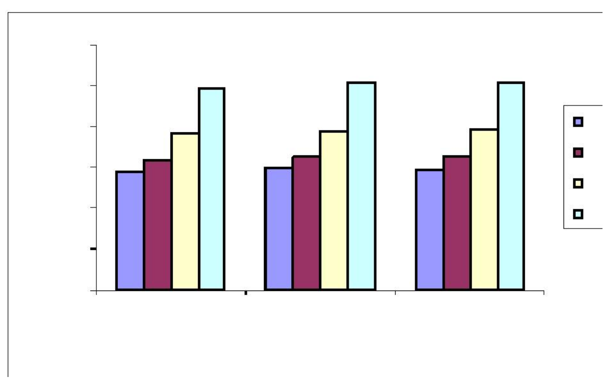

Fig2: Effect of drought stress on stomata resistance value (S / cm) of leaf area in 3 years

Applying different levels of water stress, stomata resistance and lower leaf surface increased supernatant and Duncan test at 5% in each experiment, three groups of three years provided that the average treatment (severe water stress treatment) and the highest treatment (control, without water stress) the lowest stomata resistance showed. Duncan test at 5% level one to two average growth for the period presented the highest stomata resistance in all 3 years and the treatments were obtained and lowest stomata resistance was observed in treatment .

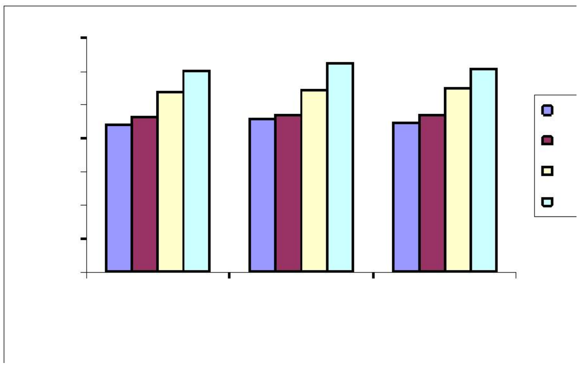

Fig3: Effect of drought stress on stomata resistance value (S/cm) in 3 years leaves behind the experiment.

Duncan test at 5% level interactions showed that treatment with low doses applied treatments stomata resistance had the other words in the early stages of plant growth when enough water is available, stomata resistance from its incidence was slightly But imposing severe stress during growth and stomata resistance was increased considerably, the underside of leaf stomata resistance levels much higher than the leaf supernatant .

Plants during vegetative behaviors such as being tube leaves, stomata resistance than the other courses was less a result, any stress modulates the incoming water could not be done.

Growing plant root system had not found a perfect result and limit the spread radius of the water absorption was very low, but the osmotic pressure regulating growth stages and appeared fully supported in terms of water supply for root shoots increased physiological behaviors such as percentage of the tube to increase leaf stomata resistance decreases in the intensity of stress was imposed, leaves and leaf water potential than the end of the primary leaves showed severe reduction of leaf relative humidity by applying different levels of water stress decreased leaf lowest percent relative humidity treatments and 75 percent were compared to control treatment, water stress decreased approximately 20 percent(21).

Stomata resistance in the supernatant and the back surface of leaves with increased drought stress, which leaves behind the increase in stomata resistance, was higher than the leaf. Stomata resistance during growth in the supernatant and lower leaf surfaces were much less than the periods of growth and the opinion Hambl (1995) at the beginning of growth in terms of stomata physiology are the result of evolution without much resistance to water stress did not show, but with age and evolution of plant stomata guard cells, stomata resistance increased.

Stomata resistance in a combined analysis of variance and lower surfaces of leaves high in the three years of treatment effects, treatment year, in water stress, and periods of growth in the two year interactions were significant.

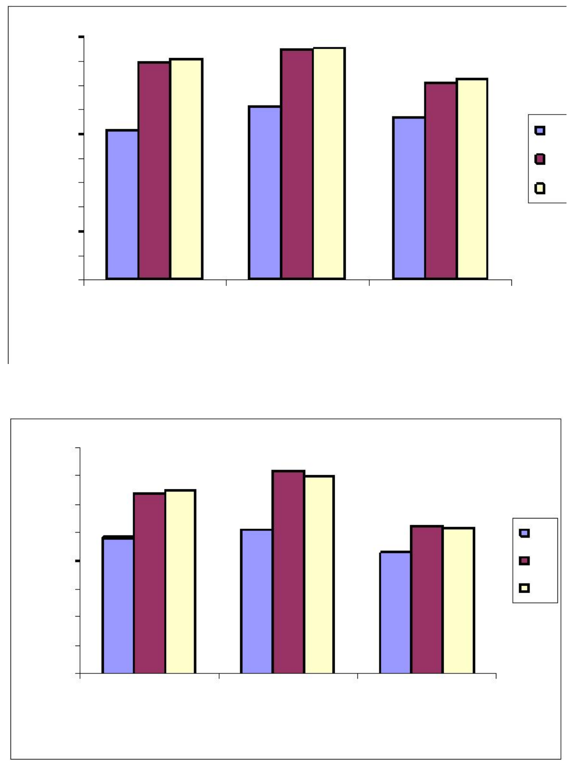

Fig4: the amount of stomata resistance (S / cm) on front and back of leaves in different periods of growth in three years

4- Discussion

With decreasing soil water potential, root and leaf water potential also decreased, soil water potential decreased in a constant process of different levels of water stress treatments showed root and leaf water potential against the resistance showed a decreasing trend of constant, although soil water potential decreased leaf water potential and root resistance to water stress treatments showed significant but become more severe water stress than leaf water potential root water potential, decreased more in the roots of resistance against soil water potential decreased more than shoot the especially the leaves(14),

The root can be adjusted decisive role for its effects on stress and actually gets created is the first organ that will be exposed to drought and can regulate their osmotic pressure to perform, he also believes that its root in some water Because the store and saves water and proximity to sources of water that changes in soil water potential is less than shoot and shoot in the most severe environmental changes are subject to the severe water stress (0.8 MPa) in the root resistance the potential loss of water ended and root water potential was significantly reduced (point 1.8 MPa) the doors yen Point plant became fully wilt mode, re-injecting water and soil water potential in roots and leaves showed some increase Plants wilt at this point not depending on external conditions were the permanent wilting point, were the result(13).

Most sensitive period of vegetative growth period was in corn, i.e. before the appearance of the double ring following reasons high resistance against drought could rise to self:

A- Set of osmotic pressure in other words, this period was observed with decreasing leaf osmotic potential, relative humidity decreased rapidly in plants result of a severe drought occurred.

B- plants during the vegetative practices, such as pipes to leaf stomata resistance than the other courses was less the result of any stress modulates the incoming water could not be done(4, 11 and 19).

A growing plant root system had not found a perfect result and limit the spread radius of the water absorption was very low, but the osmotic pressure regulating growth stages and appeared completely in terms of root support for water supply increased the shoot physiological behaviors such as percentage leaves to tubes and increased stomata resistance could regulate the intensity of stress was incurred, leaf water potential than leaves at the end leaves showed severe reduction of early relative humidity leaves with different levels of applied water stress decreased leaf lowest percent relative humidity treatments and 75 percent respectively compared to control treatment, water stress decreased approximately 20 percent. Stomata resistance in the supernatant and the back surface of leaves with increased drought stress, which leaves behind the increase in stomata resistance, was higher than the leaf. Stomata resistance during growth in the supernatant and lower leaf surfaces were much less than the periods of growth and the beginning of stomata development in terms of evolution have thus physiology little resistance to water stress did not show, but with age and evolution of plant stomata guard cells, stomata resistance increased(14, 18).

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