Available online at www.elixirpublishers.com (Elixir International Journal)

Agriculture

Elixir Agriculture 100 (2016) 43751-43753

ISSN: 2229-712X

# Effect of Cytokenin Application on Yield and Yield Component of Wheat under Drought Condition

Ghasem Roosta
Agriculture Bank, Ghir Branch, Fars Province, Iran.

**ARTICLE INFO**

**Article history:**
Received: 11 October 2016;
Received in revised form:
12 November 2016;
Accepted: 23 November 2016;

**Keywords**
Cytokenine
Drought stress
Wheat

**ABSTRACT**

This study was conducted to evaluation of wheat application on barley yield under drought condition at RCBD design with 3 replications. First factor included wheat (application of cytokenin and control) and second factor was drought stress (control, mild stress, sever stress). At the end of experiment some properties were studied such as height, spike length, number of seeds per spike, 1000seed weight and yield. SAS statistical software was performed for analysis and by Duncan's multiple range test used at the level of 5% for mean comparisons. Totally, results showed that drought stress had significant effect on studied traits, so severe stress led to 31, 38, 34, 37 and 60% reduction of height, spike length, number of seeds per spike, 1000seed weight and yield in compare to control, respectively. Also cytokenine led to 21, 20, 21, 22 and 40% increasing of height, spike length, number of seeds per spike, 1000seed weight and yield in compare to control, respectively.



## Introduction

Water deficit is considered to be among the most severe environmental stresses and the major constraint on plant productivity; losses in crop yield due to water stress probably exceed the loss from all other causes combined (Kramer 1980). This deficit has an evident effect on plant growth that depends on both severity and duration of the stress (Araus et al. 2002; Bartels & Souer 2004). Tolerance to this abiotic stress is a complex phenomenon, comprising a number of physio-biochemical processes at both cellular and whole organism levels activated at different stages of plant development. Drought stress brings about a reduction in growth rate, stem elongation, leaf expansion and stomatal movements (Hsiao 1973). Furthermore, it causes changes in a number of physiological and biochemical processes governing plant growth and productivity (Daie 1988). Under field conditions plants usually experience several stresses simultaneously. The stresses may cause a variety of plant responses which can be additive, synergistic or antagonistic. Drought can also cause pollen sterility, grain loss, accumulation of abscisic acid in spikes of drought-susceptible wheat genotypes, and abscisic acid synthesis genes in the anthers (Ji et al., 2010). According to the study of Rucker et al (1995), drought can reduce leaf area which can consequently lessen photosynthesis.Moreover, the number of leaves per plant, leaf size, and leaf longevity can be shrunk by water stress. Singh et al. (1973) observed that leaf development was more susceptible to water stress in wheat. Root is an important organ as it has the capability to move in order to find water. Also, Wheat is one of the world's major crops, In 2013, world production of wheat was 713 million tons, making it the third most-produced cereal after maize (1,016 million tons) and rice (745 million tons) (FAO, 2015), The aim of this study was evaluation of cytokenin application on yield and yield component of wheat under drought condition.

## Material and Methods

This study was conducted to evaluation of wheat application on barley yield under drought condition at RCBD design with 3 replications. First factor included wheat (application of cytokenin and control) and second factor was drought stress (control, mild stress, sever stress). At the end of experiment some properties were studied such as height, spike length, number of seeds per spike, 1000seed weight and yield. SAS statistical software was performed for analysis and by Duncan's multiple range test used at the level of 5% for mean comparisons.

## Result and discussion

**Height**: according to result, it was founded that application of cytokenin led to 21% increasing height in compare to control, also it was determined that drought stress had significant effect on height so, mild and sever stress led to 9 and 31% reduction of height in compare to control. According to researchers, there is a relationship between different physiological responses of crops and their resistance functions under drought such as high amount of relative water and potential water and integrity of membrane (Sairam et al., 1990). According to the study of Dencic et al. (2000) wheat is paid special attention due to its morphological traits during drought stress including leaf (shape, expansion, area, size, senescence, pubescence, waxiness, and cuticle tolerance) and root (dry weight, density, and length).

**Spike length**: according to result, it was founded that application of cytokenin led to 20% increasing spike length in compare to control, also it was determined that drought stress had significant effect on spike length so, mild and sever stress led to 28 and 38% reduction of spike length in compare to control. Evidences suggest that drought causes oxidation damage from increased production of ROS with deficit defense system of antioxidant in plants (Smirnoff, 1993).

**Number of seeds per spike**: according to result, it was founded that application of cytokenin led to 21% increasing number of seeds per spike in compare to control, also it was determined that drought stress had significant effect on number of seeds per spike so, mild and sever stress led to 23 and 34% reduction of number of seeds per spike in compare to control

**1000seed weight**: according to result, it was founded that application of cytokenin led to 22% increasing of 1000seed weight in compare to control, also it was determined that drought stress had significant effect on 1000seed weight so, mild and sever stress led to 23 and 37% reduction of 1000seed weight in compare to control. Sink strength can be reduced in drought stress during early grain filling which results in reducing endosperm cell number and metabolic activity (Ho, 1998 ).

**Yield**: according to result, it was founded that application of cytokenin led to 40% increasing of yield in compare to control, also it was determined that drought stress had significant effect on yield so, mild and sever stress led to 39 and 60% reduction of yield in compare to control.

Totally, results showed that drought stress had significant effect on studied traits, so severe stress led to 31, 38, 34, 37 and 60% reduction of height, spike length, number of seeds per spike, 1000seed weight and yield in compare to control, respectively. Also cytokenine led to 21, 20, 21, 22 and 40% increasing of height, spike length, number of seeds per spike, 1000seed weight and yield in compare to control, respectively.

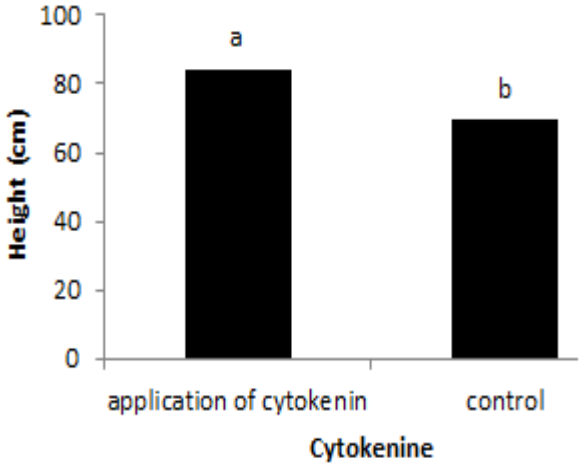


**Fig1.effect of cytokenine on height**

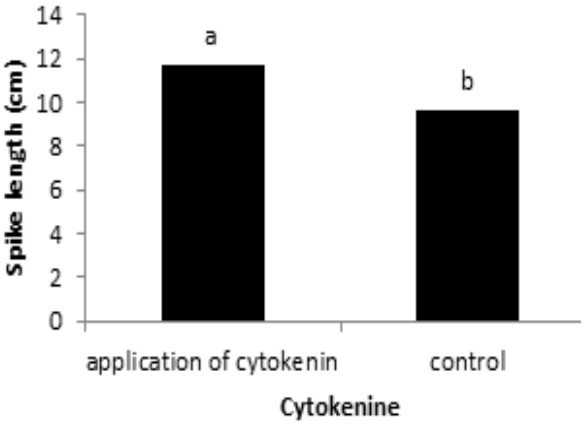


**Fig2. effect of cytokenine on spike length.**

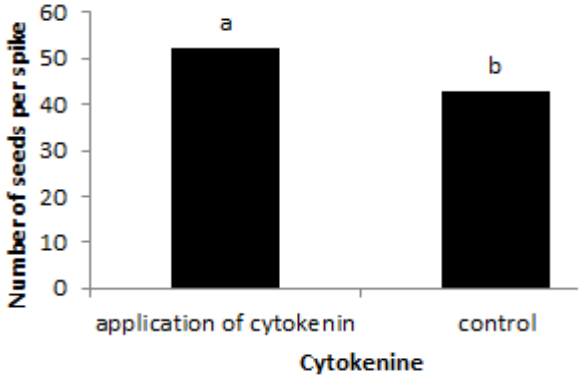


**Fig3. effect of cytokenine on number of seed per spike.**

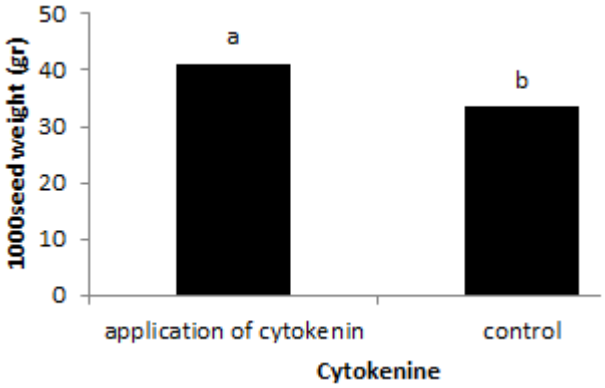


**Fig4.effect of cytokenine on 1000seed weight.**

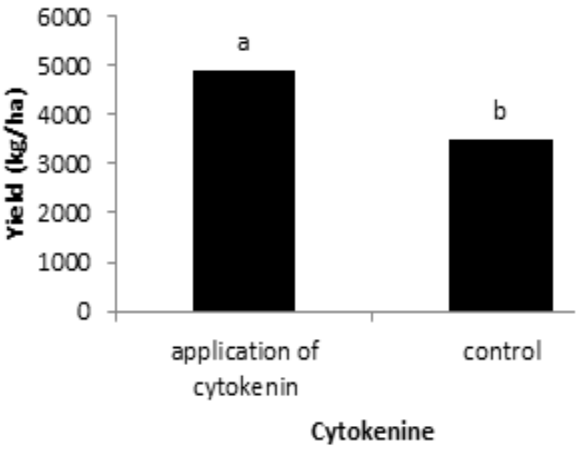


**Fig5. effect of cytokenine on yield.**

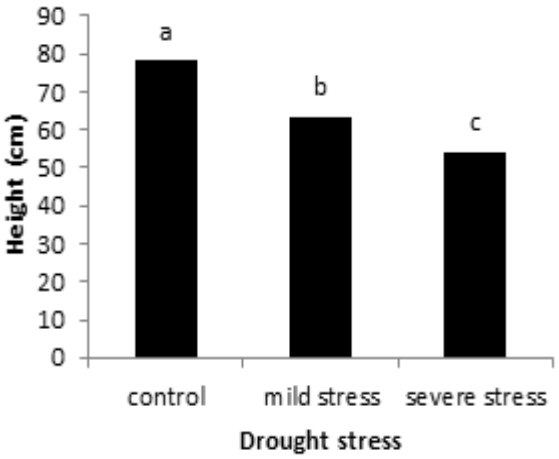


**Fig 6. effect of drought stress on height.**

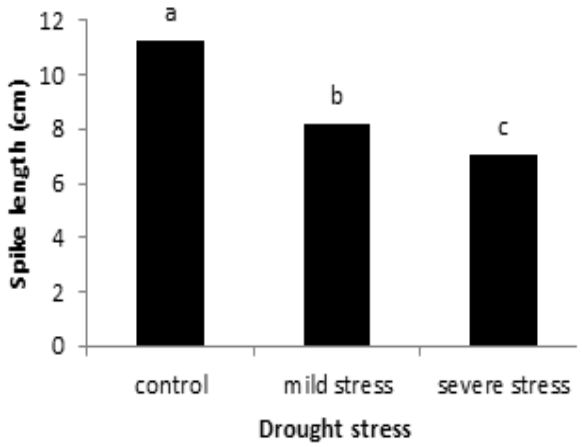


**Fig 7. effect of drought stress on spike length.**

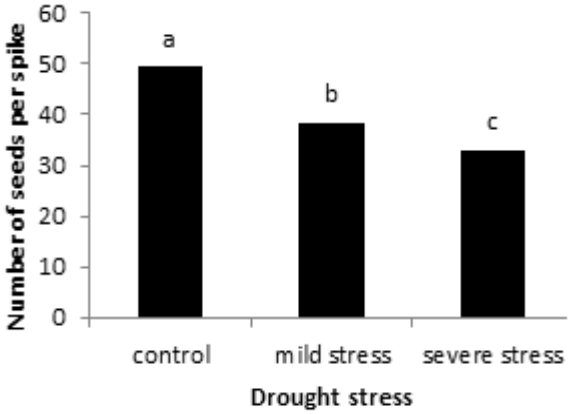


**Fig 8. effect of drought stress on number of seeds per spike.**

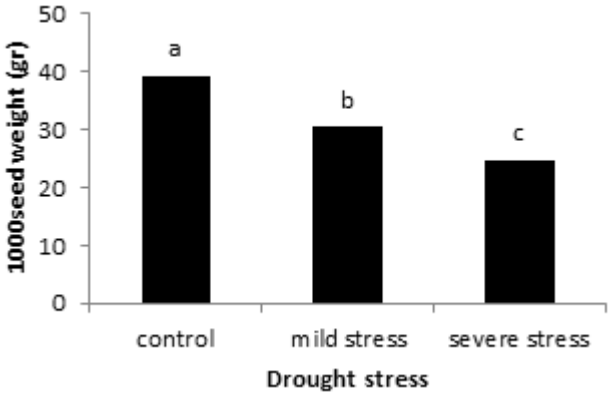


**Fig 9. effect of drought stress on 1000seed weight.**

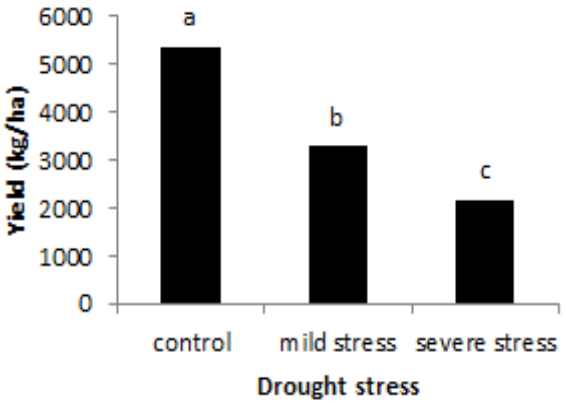


**Fig 10. effect of drought stress on yield.**

**References**

1. "FAOStat". Retrieved 27 January 2015.
2. . Ho L. C, (1988). "Metabolism and compartmentation of imported sugars in sink organs in relation to sink strength," Annual Review of Plant Physiology and Plant Molecular Biology, vol. 39pp. 355–378,.
3. Araus J.L., Slafer G.A., Reynolds M.P. & Royo C. (2002) Plant breeding and drought in C3 cereals: what should we breed for? Annals of Botany 89, 925–940.
4. Bartels D. & Souer E. (2004) Molecular responses of higher plants to dehydration. In Plant Responses to Abiotic Stress (eds H.Hirt & K.Shinozaki), pp. 9–38. Springer-Verlag, Berlin and Heidelberg, Germany.
5. Daie J. (1988) Mechanism of drought induced alteration in assimilate partitioning and transport in crops. Critical Reviews in Plant Science 7, 117–137.
6. Dencic,R.Kastori, B.Kobiljski, and B.Duggan, (2000) "Evaluation of grain yield and its components in wheat cultivars and landraces under near optimal and drought conditions," Euphytica, vol. 113, no. 1, pp. 43–52,.
7. Hsiao T.C. (1973) Plant responses to water stress. Annual Review of Plant Physiology 24, 519–570.
8. K. S. Rucker, C. K. Kevin, C. C. Holbrook, and J. E. Hook (1995). "Identification of peanut genotypes with improved drought avoidance traits," Peanut Science, vol. 22, pp. 14–18,.
9. Kramer P.J. (1980) Drought, stress, and the origin of adaptation. In Adaptation of Plants to Water and High Temperature Stress (eds N.C.Turner & P.J.Kramer), pp. 7–20. John Wiley and Sons, New York, NY, USA.
10. Sairam, P. S. Deshmukh, D. S. Shukla, and S. Ram (1990) "Metabolic activity and grain yield under moisture stress in wheat genotypes," Indian Journal of Plant Physiology, vol. 33, pp.226–231,.
11. Singh T. N., L. G. Paleg, and D. Aspinall, (1973)"Stress metabolism. I. Nitrogen metabolism and growth in the barley plant during water stress," Australian Journal of Biological Sciences, vol. 26, pp. 45–56,.
12. Smirnoff, H. (1993). "The role of active oxygen in the response of plants to water deficit and desiccation," New Phytologist, vol. 125, pp. 27–58,.
13. X. Ji, B. Shiran, J. Wan . (2010), "Importance of pre-anthesis anther sink strength for maintenance of grain number during reproductive stage water stress in wheat," Plant, Cell and Environment, vol. 33, no. 6, pp. 926–942.