Advances in Bioresearch
Adv. Biores., Vol 6 (1) January 2015: 119-122
©2015 Society of Education, India
Print ISSN 0976-4585; Online ISSN 2277-1573
Journal's URL:http://www.soeagra.com/abr.html
CODEN: ABRDC3
ICV 7.20 [Poland]

Advances in Bioresearch

ORIGINAL ARTICLE

Study the effect of Nitrogen Fertilizers and Plant Growth Promoting Rhizobacteria (PGPR) for Protein yield, relative water content, cell Membrane Stability and Chlorophyll Content in Barley under Drought Stress

Ehsan Rezaei[1*], Alireza Pazoki[1]
Department of Agronomy, Yadegar-e-Imam Khomeini (RAH) Branch, Islamic Azad University, Tehran, Iran

ABSTRACT

To study the effect of water stress, nitrogen fertilizer and plant growth promoting rhizobacteria (PGPR) on some physiological and agronomic traits in barley Nosrat cultivar , A field experiment using a split plot design based on statistical factorial randomized complete block design with four replications in crop year 2012-2013 was conducted at the research farm of University Rey. Analysis of variance for traits relative water content, cell membrane stability of protein and chlorophyll a, b and a + b was at the one percent level of statistical significance. Dual interaction of drought stress on characteristics of nitrogen fertilizer cell membrane stability and chlorophyll a and b in a statistically meaningful and to attribute a percentage of chlorophyll a + b in the five percent level of was statistical significance, This suggests that drought stress reduces the levels of the attributes listed on the other hand consumption of nitrogen fertilizer showed for a positive impact on the measured traits. The dual effect of stress on bacterial growth only at the level of cell membrane stability characteristics were statistically significant at one percent. This suggests that drought stress increases cell membrane stability and concluded, resulting in decreased membrane stability and decrease in plant efficiency. These results indicate that drought stress increases cell membrane stability was the addition of nitrogen fertilizer increased cell membrane stability resulting in decreased stability of the cytoplasmic membrane. Also, the use of PGPR in the applied stress leads to increased stability of the membrane and thus reduces the cell membrane stability, which increases the efficiency of the plant.

Keywords: *Drought stress, nitrogen fertilizer, plant growth promoting rhizobacteria, chlorophyll*

Received 01/10/2014 Accepted 20/12/2014

How to cite this article:
Ehsan R, Alireza P .Study the effect of Nitrogen Fertilizers and Plant Growth Promoting Rhizobacteria (PGPR) for Protein yield, relative water content, cell Membrane Stability and Chlorophyll Content in Barley under Drought Stress. Adv. Biores. Vol 6 [1] January 2015: 119-122. DOI: 10.15515/abr.0976-4585.6.1.119122

INTRODUCTION

The scientific name barley is *Hordeum Vulgare* L. and this plant is family of grasses. Barley culture probably started in Ethiopia and Southeast Asia., In Iran after wheat cultivation in the second place, because it requires less water resistance and very good resistance to cold and salinity [1].

Water deficit stress in plants is one of the important factors in reducing product is semi-arid and dry. Water and nitrogen fertilizer are important factors that limit plant growth and are often interact. Therefore expressed sufficient fertile soil, one of the main needs is to increase grain production and grain yield nitrogen fertilizer, the most limiting factor is the food. Reduce water absorption, thereby reducing the amount of nitrogen fertilizer reduces the influence [2].

On the other hand the reduction of organic matter in soil and environmental pollution caused by chemical fertilizer caused Especially in recent years due to the use of bio fertilizers and PGPR as a supplement to fertilizers to be explored further. The Bio-fertilizers and in some cases as an alternative to chemical fertilizers can supplement most agricultural systems to ensure product stability [3].

Bio-fertilizers composed of microorganisms that are useful for any specific purpose, such as nitrogen fertilizer fixation, release of phosphate ions; potassium, iron, etc. are produced. These microorganisms are usually deployed around the roots of the plant will help nutrient uptake [4].

Now obviously these bacteria have more than one role that in addition to helping attract specific uptake of other nutrients, reduce disease, improve soil structure, and increased further stimulate plant growth and increase crop quality and quantity of plant resistance to environmental stresses [5].
On the other hand Azotobacter able to produce antifungal compounds against plant diseases and also strengthen the germination and seedling vigor that ultimately improve plant growth follows [6].
Reduce the effect of water stress on leaf relative water content were found. As the result of this experiment is estimated to lead to increased use of nitrogen fertilizer relative water content of the plant and the results are consistent with other published research [8].
Showed that water stress causes breakdown of chloroplasts and chlorophyll content is reduced. Plastid new form of stress, chlorophyll a and chlorophyll b decreased chlorophyll a to b ratio also varies [7].

MATERIALS AND METHODS

To study the effects of water stress, nitrogen fertilizer and plant growth promoting rhizobacteria on crop physiological traits of barley (Nousrat cultivar) Rey in a split plot experiment in randomized complete block design in four replications. The investigation crop year 2012-2013 at the Agricultural Research Station, University Rey, located at latitude 35 degrees and longitude 51 degrees with an average altitude of 1100 meters above sea level and was conducted during a crop year.
Irrigation operations in mid-March, according to the amount of evaporation from class A pan evaporation rate of 80, 130 and 180 mm evaporation occurred. The nitrogen fertilizer in three stages: before tillering, stem elongation and flowering before the start based on three levels (not used), 75 and $Kg.ha^{-1}$ 150 was applied to each plot and plant growth promoting rhizobacteria in the biology laboratory of the Institute of soil and Water Research was formulated and developed treatments, seeds should be inoculated with the bacteria. Characteristics relative water content, cell membrane stability, and protein, chlorophyll a, chlorophyll b, chlorophyll a + b was measured.
Minitab and SAS programs for statistical analysis using the charts as well as statistical program were used to Excel.

RESULTS AND DISCUSSION

Relative Water Content

Analysis of variance with respect to relative water content showed that the effect of water stress, nitrogen fertilizer and PGPR was statistically significant at the 1% level and double interactions were not significant (Table 1).
In comparison with dual interaction of drought stress and nitrogen fertilizer on growth and nitrogen fertilizer bacteria in bacterial growth was not statistically significant in any of the levels (Table2).
These results indicate that the effect of drought stress has to be efficient plant operation but the plant has not had any feedback for the binary interaction (Table 1,2).

Cell Membrane Stability

Analysis of variance showed that the effect of cell membrane stability in addition to the meaning of the simple effects, Interaction of nitrogen fertilizer and interactive effects of drought stress on the bacteria growth was significant at the 1% level (Table 1).
These results indicate that drought stress increases cell membrane stability was the addition of nitrogen fertilizer increased cell membrane stability, resulting in decreased stability of the cytoplasmic membrane (Table 2). Also, the use of PGPR in the applied stress leads to increased stability of the membrane and thus reduces the cell membrane stability, which increases the efficiency of the plant (Table 3).

Protein percent

Analysis of variance showed that the Percent protein associated with the effect of water stress, nitrogen and PGPR was statistically significant at 1% level, and other interactions there was a significant dual (Table 1). In comparison with dual interaction of drought stress and nitrogen fertilizer on growth and nitrogen fertilizer bacteria in bacterial growth was not statistically significant in any of the levels. These results showed indicate that the effect of stress applied to the efficient operation of the plant has the plant has not had any feedback for interaction between the two (Table 2).

Chlorophyll a

Analysis of variance showed that the chlorophyll a in the different levels of water stress and nitrogen fertilizer are significant at 1% and dual interaction of drought stress and nitrogen fertilizer was significant at the 1% level (Table 1).
The results of this study showed that drought stress leads to a reduction in the amount of chlorophyll a but the use of different levels of nitrogen fertilizer increases the yield stress and the ultimate balance of performance effects (Table2).

Chlorophyll b

Analysis of variance showed that the chlorophyll b at different levels of water stress and nitrogen fertilizer are significant at 1% and dual interaction of drought stress and nitrogen fertilizer was significant at the 1% level (Table 1). The results of this study showed that drought stress leads to a reduction in the amount of chlorophyll b but the use of nitrogen fertilizer at different levels of drought stress increased the amount of chlorophyll b and the balance of plant performance (Table2).

Chlorophyll a + b

Table 1 Analysis of variance showed that the chlorophyll a + b in the different levels of water stress and nitrogen fertilizer are significant at 1% dual interaction of drought stress and nitrogen fertilizer was significant at the 5% level (Table 1). The results of this study showed that drought stress leads to reduced levels of chlorophyll a + b but the use of different levels of nitrogen fertilizer increases the yield stress and ultimately lead to optimum sustainable yield in the plant (Table2).

Table 1. Analysis of variance for traits in barley

S.O.V	DF	Relative water content	cell membrane stability	Protein percent	Chlorophyll a	Chlorophyll b	Chlorophyll a+b
Repeat Irrigation	3	30.1620	0.00294	0.51587	0.0000017337546	0.000002031731	0.00001
Nitrogen	2	3615.4305**	1.06390**	32.84198 **	0.00040607138**	0.00040879317**	0.00664**
Irrigation * nitrogen	2	407.5138**	0.0819**	8.49426 **	0.00044166529**	0.00044965014**	0.00707**
Error	4	121.2638ns	0.00700**	0.90056 ns	0.000059865167**	0.000058791804**	0.00083*
Bacteria (PGPR)	24	58/6412	0.0019	0.57500312	0.0000026653796	0.000002633774	0.00003
irrigation * Bacteria	1	284.0138*	0.03336**	3.7128*	0.000017515681**	0.000017767162**	0.00211**
Nitrogen * Bacteria	2	64.2638ns	0.00830**	0.3896 ns	0.0000003150139ns	0.0000001599561ns	0.00003ns
Cycle	2	48.5138ns	0.00110ns	0.47115 ns	0.0000025475139ns	0.0000024755219ns	0.00019ns
Irrigation * Nitrogen * Bacteria	4	60.5138ns	0.00058 ns	0.70114	0.0000026360972ns	0.0000026810113ns	0.00002**
Error	27	61.9213	0.00079	0.63036	0.0000019154213	0.0000019095911	0.00002
Total	71	92.0833	0.00563	2.422373	6.31E-06	6.58E-06	0.00006

ns, * and ** : Not significant, significant at 5% and 1% probability levels, respectively

Table 2. The mean interaction effect of irrigation and nitrogen traits tested

Irrigation intervals	Nitrogen	Relative water content %	Membrane stability Cytoplasmic	Protein percent	Chlorophyll a (mg/cm2)	Chlorophyll b (mg/cm2)	Chlorophyll a+b (mg/cm2)
80 mm	0 kg/ha	77/25 b	99/545 g	12/76 e	0/09885 d	0/0315875 de	0/131287 de
80 mm	75 kg/ha	84/5 ab	130/681 f	13/46 de	0/1891625 b	0/058975 b	0/249775 b
80 mm	150 kg/ha	86/00 a	187/571 e	13/82 d	0/2156375 a	0/0672875 a	0/284815 a
130 mm	0 kg/ha	65/62 c	147/860 e	13/50 d	0/0761375 e	0/0250375 ef	0/101812 ef
130 mm	75 kg/ha	77/62 b	228/803 f	14/16 cd	0/1494875 c	0/046725 c	0/197513 c
130 mm	150 kg/ha	78/75 b	306/075 c	14/92 c	0/168075 bc	0/052425 bc	0/221961 bc
180 mm	0 kg/ha	57/875 e	289/423 c	14/91 c	0/070125 e	0/02335 f	0/09405 f
180 mm	75 kg/ha	61/12 d	347/334 c	16/29 b	0/0989875 d	0/0316375 de	0/131463 de
180 mm	150 kg/ha	64/00 c	481/176 a	16/61 a	0/1060 d	0/03370 e	0/1406 d

Table 3. The mean interaction effect Irrigation intervals and plant growth promoting rhizobacteria (PGPR) traits tested

Irrigation intervals	Bacteria (PGPR)	Leaf relative water content (percent)	Cytoplasmic membrane stability (µs / Cm)	Extinction coefficient Light (K)	Protein percent	Chlorophyll a	Chlorophyll b	Chlorophyll a+b
80 mm	None use	81/58 b	187/482 d	0/33 c	13/21 c	0/15191667 ab	0/04768333 ab	0/200927 a
80 mm	Use	83/58 a	170/403 d	0/32 c	13/48 c	0/18385 a	0/05755 a	0/242992 a
130 mm	None use	72/91 d	241/742 c	0/49 b	14/02b	0/12005833 b	0/03801667 c	0/159107 b
130 mm	Use	75/08 c	229/469 c	0/44 b	14/36 b	0/14240833 b	0/044775 b	0/188417 ab
180 mm	None use	59/75 f	330/618 a	0/56 a	15/84ab	0/083625 c	0/02720833 d	0/111533 c
180 mm	Use	62/25 e	319/264 b	0/58 a	16/03 a	0/09978333 c	0/03191667 cd	0/132542 c

REFERENCES

1. Imam Yahya. (2007). Cereal crops., Shiraz University Press. Pp129.
2. Yoshida, S. (1975). The physiology of silicon in rice. Technical Bulletin No. 25. Food Fertilization Technology Center, Taipei, Taiwan.
3. Han, X. Z., Wang, S. Y., Veneman, P. L. M., Xing, B. S.: (2006). Change of organic carbon content and its fractions in black soil under long-term application of chemical fertilizers and recycled organic ma- nure, Commun. Soil Sci. Plan., 37, 1127–1137.
4. Wu SC, Caob ZH, Lib ZG, Cheung KC, Wong MH (2005). Effects of biofertilizer containing N-fixer,P and K solubilizers and AM fungi on maize growth : a greenhouse trial. Geoderma. 125:155-166.
5. Nagananda, G.S., A. Das, S. Bhattacharya and T. Kalpana, (2010). *In vitro* studies on the effects of biofertilizers (*Azotobacter* and *Rhizobium*) on seed germination and development of *Trigonella foenum-graecum* L. using a novel glass marble containing liquid medium. Int. J. Bot., 6: 394-403.
6. Chen J (2006).The combined use of chemical and organic fertilizers and/or bio fertilizer for crop growth and soil fertility. International Workshop on Sustained Management of the Soil-Rhizosphere System for Efficient Crop Production and Fertilizer Use.16-20 October, Thailand.
7. Misra, A.N. & Biswal, A.K. (2000). Thylakoid membrane protein kinase activity as a signal transduction pathway in chloroplasts, Photosynthetica, 38, 323-332.
8. Zahir, A. Z., Arshad, M. and Khalid, A. (1998).. Improving maize yield by inoculation with plant growth promoting rhizobacteria. Pakistan J. Soil Sci., 15.7-11

