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ORIGINAL ARTICLE

Effect of Humic Fertilizer on Germination of Wheat Seeds under Drought Stress

Firozi Nazi[1*], Haghparast Reza[2] and Rajabi Rahman[2]
1- Department of Agronomy and Plant Breeding, Rasht Branch, Islamic Azad University, Rasht, Iran
2-Dry land Agricultural Research Sub Institute, Sararood Station, Kermanshah, Iran
*Corresponding Author, Firozi Nazi E-mail: nazi_firoozi@yahoo.com

ABSTRACT
In order to study effect of grain dressing with humic acid fertilizer on germination rate and initial growth of wheat seeds an experiment was carried out in Dry land Agricultural Research Sub Institute, Sararood Station, Kermanshah, Iran as laboratory study. The experimental design was factorial as RCB with two factors as a. five wheat variety and b. six combinations of grain dressing including distillated water, Humica, Humix, Poly Ethylene Glycol, Humica+PEG and Humix+PEG, each treatment has three replicate. The results showed that priming wheat seeds with PEG decreased percent seed germination and initial growth of wheat compared to humic matters. A positive effect of the preparation on the germination and growth of wheat seedling was observed with application of humic acid under drought stress.
Keywords: *Humic acid, Germination, Wheat, Drought Stress*

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INTRODUCTION

Percentage and rate of seed germination and seedling growth, is an important factor in increasing the yield per unit area. Increase the amount and percentage of germination; make better use of resources such as light, water and nutrients [1]. Humic substances influence on the physical, chemical and biological Properties of soil, and consequently, they indirectly affect the growth and development of plants. The research of the application of these substances to soil or on leaves indicated that they have also a direct effect, positive or limiting. The effect on metabolism is not well known and it may refer to both respiration and photosynthesis [2]. Humic substances have also an effect similar to that of hormones, whereas it is not clear whether it depends on their chemical structure or the molecular mass [2]. Using them at various developmental stages stimulates rooting [3], as well as the growth of aboveground parts [4]. They can also have a positive effect on nutrient uptake [3, 5] and yielding of field crops, e.g. potatoes or grasses [6]. In many parts of the world, especially in rainfed agriculture, poor crop establishment is a major problem [7]. Vigor can be improved using various priming methods .

Due to the low cost, farm priming widely used. In farm priming, the seeds are placed in tap water or nutrient solutions for a certain period. Harris et al [8] reported that wheat seed priming resulted in faster germination, emergence, higher, stronger seedlings, better tillering, early maturity, yield was higher. In some species, seed priming with growth substances, have been shown to have detrimental effects on the growth and yield. Humic acid due to hormonal effects in improving nutrients absorption and increasing root and shoot biomass, such as an organic acid derivative of humus acts [9]. The objective of this study was to find out the effect of two humic acid sources on germination of wheat seeds.

MATERIALS AND METHODS

Germination test to determine the best wheat variety dressed with humic organic matter (Humix and Humica) in response to drought stress, a laboratory test at Dry land Agricultural Research Sub Institute, Sararood Station, Kermanshah, Iran was done. The factorial experiment in a randomized complete block design (RCB) with two factor and three replications was used. Factor A including 5 bread wheat (Azar,

Ouhadi, Ryzhav, Karim and Bouma) and Factor B at 5 levels as control(distilled water), PEG, Humica, Humix with distilled water, Humica with PEG, and Humix with PEG)). Polyethylene glycol 6000 (PEG) with -0.8 MPa used for testing drought Stress. A 10% concentration of Humix and Humica solution was used for dressing seeds. Laboratory procedures were done according to Sapra et al [10] and Buslama and Shapag [11] respectively.

The results obtained were test for normality and subject to the analysis of variance using the computer software MSTATC, The significance of differences was determined with Tukey's confidence half-interval at the significance level P = 0.01

RESULTS

Percent Germination of wheat seeds

The percent of germinated seed significantly different between wheat varieties, also the percent of germinated seed significantly responded to seed priming (Table 1). Higher and lower percentage of seed germination 41.23% and 33.56% respectively observed at Azar and Bouma(Fig.1). The wheat seeds primed with Humix+ water gave higher percentage (52.49%) of seed germination as compared to other treatments but the lower observed with PEG (22.33%).

Table 1 ANOVA of wheat variety and pre-treatment effects on root properties

MS					DF	S.O.V
Weight of Shoot	Weight of Root	Length of Shoot	Length of Root	Germ.		
0.004	0.001	1.4	3.9	20.64	2	Rep.
$0.002^{n.s}$	$0.001^{n.s}$	5.2^{**}	64.3^{**}	146.9^{**}	4	Variety
0.10^{**}	0.03^{**}	5.2^{**}	70.5^{**}	2040.1^{**}	5	Pre-treatment
$0.002^{n.s}$	$0.001^{n.s}$	$1.1^{n.s}$	11.6^{**}	230.8^{**}	20	Variety*Pre-treatment
0.002	0.002	0.66	4.9	43.8	58	Error

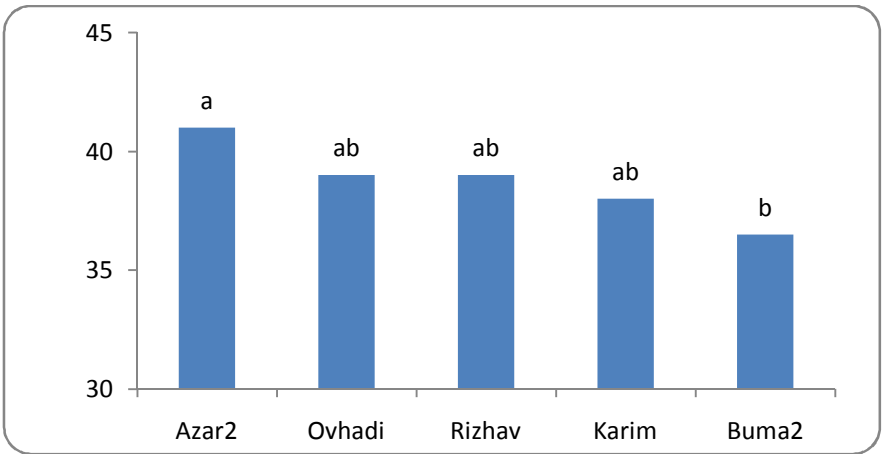

Figure 1 Effect of Wheat Variety on Seed Germination (%)

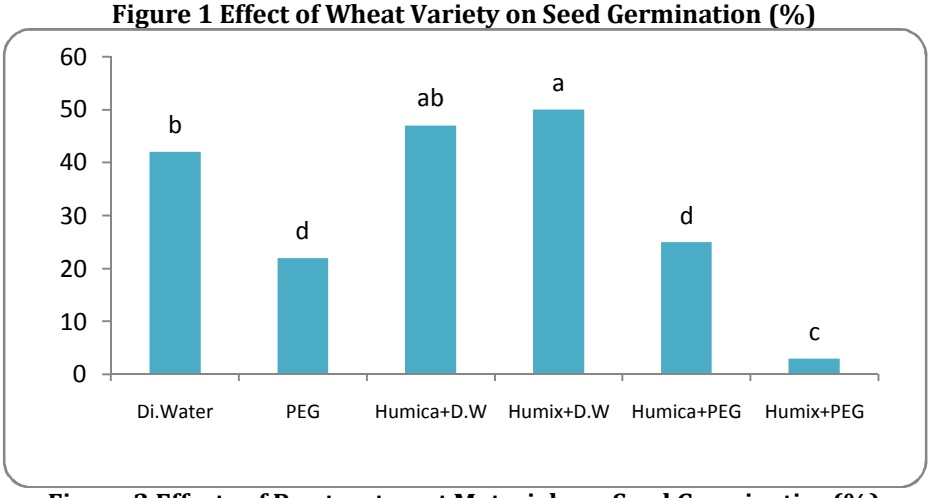

Figure 2 Effects of Pre-treatment Materials on Seed Germination(%)

Root Elongation

The table 1 showed that wheat variety and priming of seeds had significant effect on root elongation. Higher and lower elongation of roots with 11.3 cm and 6.05cm respectively observed at Azar and Bouma (Fig.3). The wheat seeds primed with Humix+ water gave higher root (10.80cm) elongation while the lower observed with PEG (5.35cm) (Fig.4).

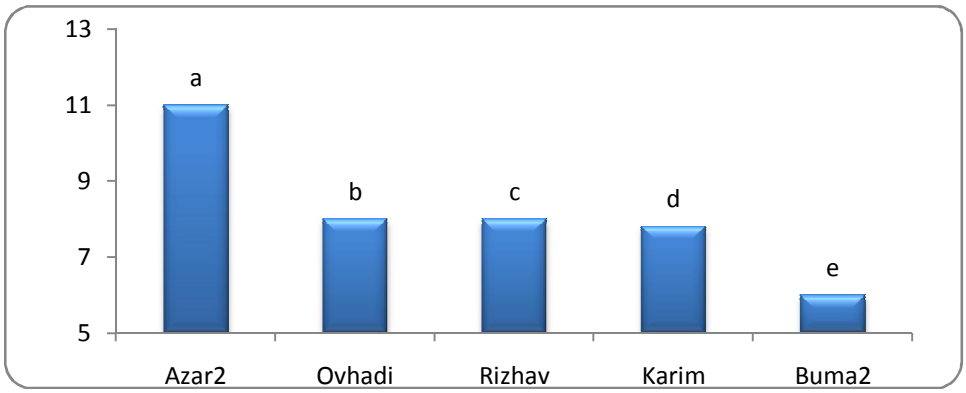

Figure3. Effect of Wheat Variety on Root Elongation (cm)

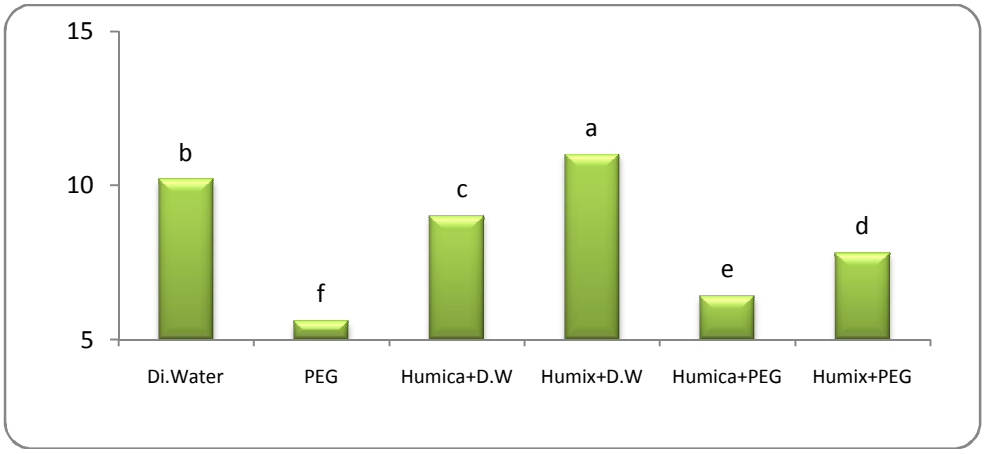

Figure 4. Effects of Pre-treatment Materials on Root Elongation(cm)

Shoot Elongation

Same as root elongation, shoot elongation also significantly responded to wheat variety and seed priming. Higher and lower elongation of shoot with 4.37 cm and 3.0cm respectively observed at Karim and Ryzhav (Fig.5). The wheat seeds primed with water gave higher shoot (4.36cm) elongation while the lower observed with Humica+PEG (3.03cm) (Fig.6).

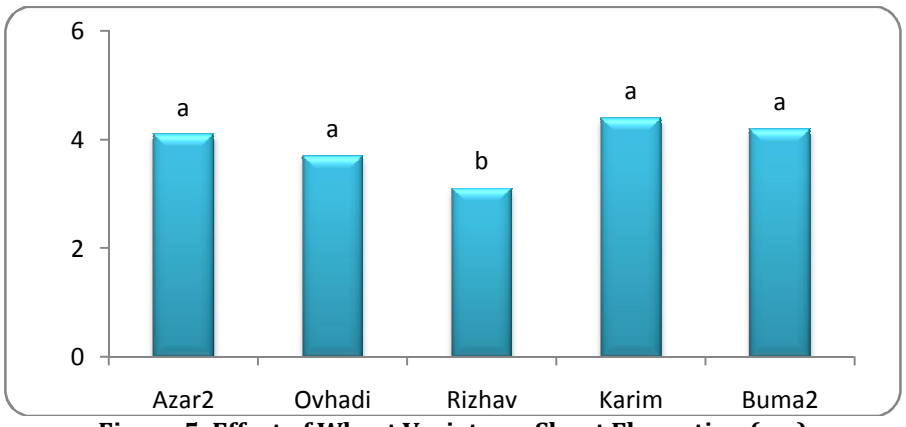

Figure 5. Effect of Wheat Variety on Shoot Elongation (cm)

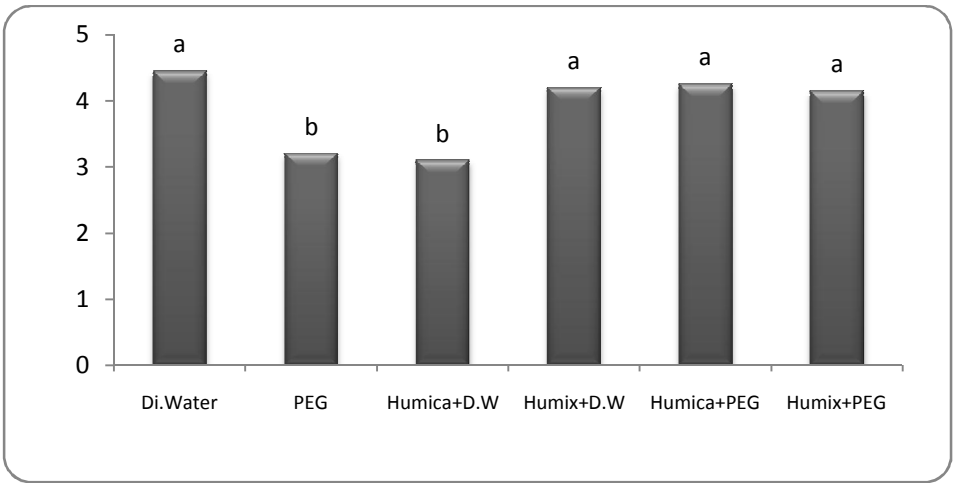

Figure 6. Effects of Pre-treatment Materials on Shoot Elongation(cm)

Dry Weight of Root

The table 1 showed that wheat variety had not significant effect on dry weight of root. But priming of seeds had significant effect on dry weight. The wheat seeds primed with Humix+ water gave higher root (0.22) while the lower observed with PEG (0.1g) (Fig.7).

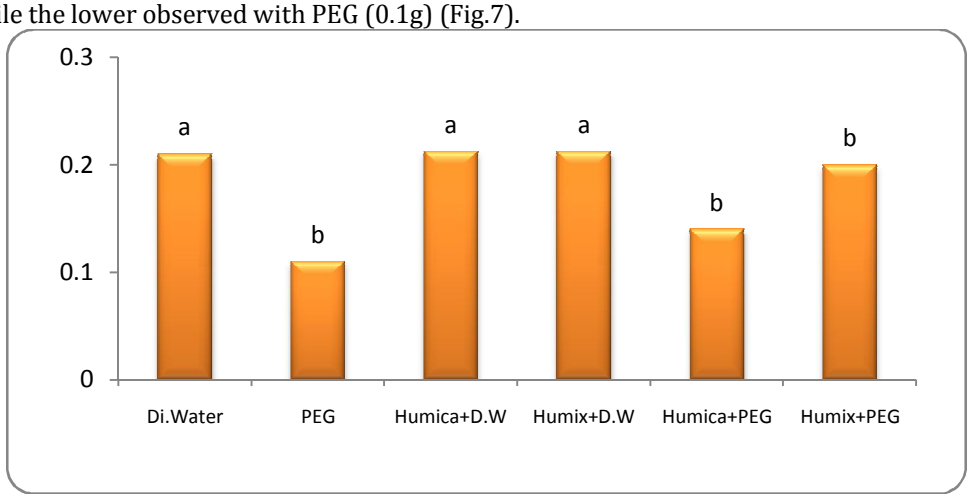

Figure 7. Effects of Pre-treatment Materials on Dry Weight of Root (g)

Dry Weight of Shoot

The table 1 showed that wheat variety had not significant effect on dry weight of Shoot. But priming of seeds had significant effect on dry weight. The wheat seeds primed with water gave higher shoot weight (0.34) while the lower observed with PEG (0.14g) (Fig.8).

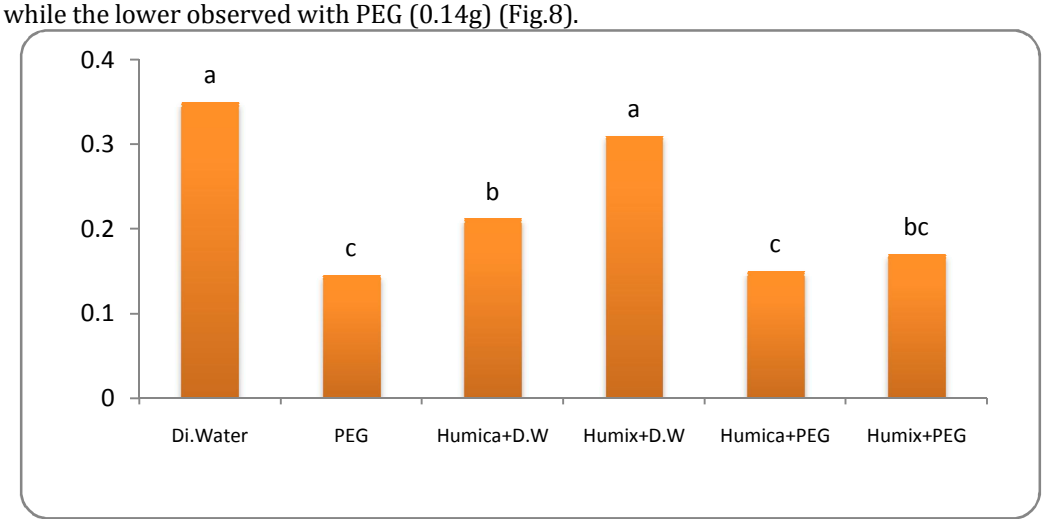

Figure 8. Effects of Pre-treatment Materials on Shoot Weight (g)

The effect of humic acid on increasing growth at early stage of plant development couple with its beneficial effect on various soil properties [13]. Turkmen et al. [12] also reported accelerated root growth and germination of various seeds when treated with humic acid.
Humic acid affect on root enzymes and rhizosphere soil then increases in plant growth [14]. Several finding have also reported increases in plant growth and yield with application of HA [15, 16]. The higher increase in seed germination with humic acid can explains the higher yields of various crops with humic acid in the field.

CONCLUSIONS

Due to our results can concluded that priming of wheat seed with humic matters accelerated the germination percentage and initial growth as compared to priming seeds in water.

REFERENCES

1. Foti, S., Cosentino, S. L., Patane, C., Agosta, G. M. D. (2002). Effects of osmoconditioning upon seed germina tion of sorghum (Sorghum bicolor L.) under low temperatures. Seed Sci. Technol. 30: 521-533
2. Nardi S., Pizzeghello D., Muscolo A., Vianello A., (2002). Physiological effects of humic substances on higher plants. Soil Biol. Biochem. 34, 1527-1536.
3. Cooper R., Chunhua L., Fisher D., (1998). Influence of humic substances on rooting and nutrient Content of creeping bentgrass. Crop Sci. 38, 1639-1644.
4. Ayuso M., Hernandez T., Garcia C., Pascual J., (1996). Stimulation of barley growth and nutrient absorption by humic substances originating from various organic materials. Biores. Technol. 57, 251-257.
5. Asik B., Turan M., Celik H., Katkat A., (2009). Effects of humic substances on plant growth and mineral nutrients uptake of wheat (Triticum durum cv. Salihli) under conditions of salinity. Asian J. Crop Sci. 1(2), 87-95.
6. Verlinden G., Coussens T., Vliegher A., Baert G., Haesaert G., (2010). Effect of humic substances on nutrient uptake by herbage on production and nutritive value of herbage from sown grass pastures. Grass Forage Sci. 65, 133-144.
7. Heydecker, W., Higgins, J., Gulliver, R. L. (1973). Accelerated by osmotic seed treatment. Nature. 246: 42-46.
8. Harris, d., Raghumanshi, B. S., Gangwar, J. S., Singh, S. C., Joshi, K. D., Rashid, A., 26-26-Hollington P.A. 2001. Participatory evalution by farmers of on-farm seed priming in wheat in India, Nepal and Pakistan. Exp.Agric. 37: 403-415.
9. Nikbakht, Ali and kafi, Mohsen. (2008). Effect of humic acid on plant growth; Journal of plant nutrition, 31: 2155-2167.
10. Sapra, V.I., E. Savage. A.O. Anale, and C.A.Bryl. (1991) . Varic differences of eheat and tritical to water Stress-J. Agron Crop. Sci. 167: 23-28.
11. Bouslama, M., and Schapaugh, W. T. (1984). Stress tolerance in soybean. I: Evaluation of three screening techniques for heat and drought tolerance. Crop Science 24: 933-937.
12. Turkmen O, Dursun A, Turan M, Erdinç C. (2004). Calcium and humic acid affect seed germination, growth, and nutrient content of tomato (Lycopersicum esculentum L) seedlings under saline soil conditions. Acta Agriculturae Scandinavica, B, Volume 54, Number 3,August 2004, pp. 168-174(7).
13. Khattak RA, Muhammad D. (2008). Increasing crop production through humic acid in rainfed and salt-affected soils in Kohat division. Final Technical Progress Rep. ALP-PARC, Islamabad Proj. Deptt. Soil & Environ. Sci. The Univ. of Agric. Peshawar, Pakistan.
14. Malcolm RE, Vaughan D. (1979). Humic substances and phosphate activities in plant tissue. Soil Biol. & Biochem. 11:253-259.
15. Brannon CC, Sommers LE. (1985). Preparation and characterization of model humic polymers containing organic P. Soil Boil and Biochem,17:2, 213-219..
16. Hai SM, Mir S. (1998). The lignitic coal derived HA and the prospective utilization in Pakistan's agriculture and industry. Sci, Tech. & Dev. 17:32-40.