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Selection of wheat genotypes for end drought tolerance at presence of potassium humate

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ABSTRACT

Potassium humate increases crop quality and tolerance of plant to stresses such as drought. An investigation was conducted for study on contribution of stem reserves in winter wheat yield against end drought at presence of potassium humate. This research was done by split plot on the basis of completely randomized block design with three replications. Main factor was with stress and without stress at presence or lack of potassium humate; and sub factor was genotypes. Under study characters were included maximum stem dry weight after anthesis, stem dry weight at maturity, remobilized assimilates from stem to grain, relative contribution of stem reserves in yield and grain yield. Results showed that different conditions of this experiment had significant differences for maximum stem dry weight after anthesis and grain yield. But, there weren't significant differences between other characters. Wheat genotypes had significant differences for maximum stem dry weight after anthesis, remobilized assimilates from stem to grain and relative contribution of stem reserves in yield. Potassium humate decreased relative contribution of stem reserves in yield by 6.18 %, and increased grain yield by 45.8 % in normal irrigated condition. And, decreased stem reserves by 5.34 %, and increased grain yield by 50.4 % in drought condition.

Key words: Drought, Wheat, Potassium humate, Stem reserves, Remobilization

1. INTRODUCTION

During the dry wheat aggregation, occurs one of the important traits of drought resistance of wheat which affects the transfer material stored in the flowering stems before the seed is (1-3). This level of impact that drought has a negative effect on photosynthesis, are higher. There is much information on grain and shows that the grain growth through the transfer of materials stored in the stems can be effectively supported (4-6). When photosynthetic production under the influence of drought stress is placed, the role of storage material stems, especially as a source of carbohydrates in grain filling increased (7). Evaluation which was conducted on spring wheat has shown that up to twelve to fourteen days after flowering, stems and storage materials are then exporting assimilates (5). Significant positive correlation between the ratio of shoot dry matter and grain production capacity under drought stress conditions at the time of flowering in wheat has been reported (7). Potential storage materials stem photosynthesis and then transfer them to the performance characteristics affecting both the stability of grain yield under drought stress. These characteristics were under genetic control (2) and therefore the revised figures for the various parts can vary. *Papakosta* and *Gagyanas* (8-10) in a study on four varieties of wheat dry performance transmission, the stem part of the grain weight spread between the 2.3 to 36.4 percent share of photosynthetic material before pollination between 6 to 73% have mentioned. *Ravson* and *Evans* (quoted source No. 1) non grain structures share a spike in performance 3.2 percent reported also stated that the transmission efficiency of shoot dry matter, shoot dry weight depends on the pollination stage. More dry pollen stage to participate in the dry matter remobilization to grain yield in water stress conditions lead. humic material decomposition of organic material was the result, natural organic compounds that are 50 to 90% of peat organic matter, Lignite, the Saproil non-alive and organic matter in soil and water ecosystems make up. Scientists believe that humic materials can be one of the following which will be useful for living things: the development of organisms (as a food source or substrate material, or enzyme-like activity), as carriers of food, catalysts of biochemical reactions; and antioxidant activity (9). It was known that potassium humate plant tolerance against stresses living and non-living increases (11). *Shahriari et al* (11) concluded that potassium humate as a natural compound can increase the amount of wheat stem assimilate in flowering stage drought tolerance in coping with drought early grain filling increases. Therefore it was suggested that dehydration could be in crisis situations, particularly in the grain filling stage, through this increase. The study to determine the contribution of potassium humate photo assimilate wheat yield in the face of the drought last season, Ardabil region has been carried out.

2. MATERIALS AND METHODS

To determine the effect of potassium on the transfer of this material, Hvmat photosynthesis Azsaqh wheat seeds drying conditions last season in the experimental research farm Islamic Azad University, Ardabil were performed. Split plot design experiment based on randomized complete block in three replications. Original invoice and the environment sub-factor genotypes (Gascogen, Sabalan, 4057, days -84, -29 Gobustan and Saratovskaya), respectively. Environmental conditions were: full irrigation, irrigation + humate sprayed with potassium, drought, drought + humate sprayed with potassium. In order to apply the final dry season, irrigation after flowering again failed. Ml of a liquid fertilizer humic (humate potassium Saproil origin) in a liter of water was a solution. We Use this solution as a seed treatment prior to planting; sprayed at the tillering stage, shoot and grain filling on the aerial plant parts was done. Stage of pollination distance of about 20 days apart in maturity stage samples randomly from each plot was harvested. Samples incubated for 72 hours were dried. Transfer this material to calculate photosynthesis and stem reserves in grain portion of the following relations were used:

Maximum shoot dry weight at flowering stage - shoot dry weight at maturity stage of seeds =

remobilization of storage material stems to seeds (yield / remobilization ofρ100 stored material to the seed stalk) = the relative contribution of stem reserves in grain yield (%)

Data analysis software SPSS-11 and MSTAT-C, and Comparison with Duncan test was performed.

3. RESULTS AND DISCUSSION

Analysis of variance for wheat characteristics measured by experimental conditions studied in this study (Table 1) showed that maximum shoot dry weight, after pollination and grain yield in different conditions tested significantly (at 1% level) disagree. But in terms of characteristics significant difference was evident. Wheat genotypes in terms of maximum shoot weight after pollination (at 1% probability level) and the relative contribution of stem reserves in grain yield (at 5% level) differences were significant. But in terms of shoot dry weight at maturity stage was no significant difference in seeds. Genotype interaction in the experimental conditions for any of the properties measured was not significant.

Table 1. Analysis of variance for measured characteristics of wheat

Source	df	Mean of Squares				
		maximum stem dry weight after anthesis	stem dry weight at maturity	remobilized assimilates from stem to grain	relative contribution of stem reserves in yield	Grain yield
Replication	2	0.24*	0.253ns	0.36ns	0.98ns	0.554ns
conditions	3	0.418**	0.126ns	0.342ns	3.344ns	15.439**
Error a	6	0.033	0.067	0.259	6.766	0.676
Genotypes	5	0.114**	0.021ns	0.14ns	5.850*	1.970**
Condition × Genotypes	15	0.024ns	0.011ns	0.346ns	0.956ns	0.38ns
Error b	40	0.033	0.029	1.255	1.993	0.337
C. V %		15.47	20	21.33	38.28	26.06

* and ** Significantly at p < 0.05 and < 0.01, respectively.

Comparison of maximum shoot dry weight, after pollination and grain yield in different conditions of this study are presented in Table 2 . Potassium humate yield in terms of regular watering 1.14 ha and end-season dry conditions 0.71 ha increase. With Category Average yield of wheat genotypes revealed that genotype testing compared with others in 4057, with 4.2 tons per hectare in terms of regular irrigation with potassium humate has created the most product. Potassium humate increases the genotype yield from 3.8 to 4.2 tons per hectare in normal irrigation and in end season dry conditions; it increases from 1.7 to 2.3 tons per acre.

Table 2 . Comparison of maximum shoot dry weight after anthesis and grain yield for different experimental conditions

conditions	*maximum stem dry weight after anthesis (gr)*	*Grain yield (ton/ha)*
Normal irrigation	a 1.304	**2.49b**
Normal irrigation + Humic	1.284a	**3.63a**
Drought Stress	0.979b	**1.41c**
Drought Stress + Humic	1.125ab	**2.12bc**

Ahmadi et al (1) stated that the turnout had grain reserves in the stem from about three percent in the control conditions to about 70 percent in terms of stress has been reported and the researchers attribute this phenomenon to shoot named are buffered. Comparison of measured characteristics for wheat genotypes (Table 3) showed the highest relative contribution of stem reserves in grain yield Saratovskaya - 29 has, so that the yield is the lowest among other genotypes. Stem reservoirs high share because it could be high up the wheat. *Tahlan et al* (8) concluded that tall varieties, on average, at the time of pollination shoot biomass Cocker figures were higher than the results obtained from this test match. Researchers (9, 10) concluded that drought conditions end tall indigenous varieties of grain yield stability, better to have figures and half-Cocker Cocker, although their performance is less capable. Saratovskaya - 29 with 1.794 ha and 4057 performance with the least amount of 2.987 tons per hectare yield the highest allocated. Study showed that maximum shoot dry weight of the pollen to Saratovskaya was 29.

Table 3 . Comparison of genotypes of traits measured in this experiment

Genotypes	*maximum stem dry weight after anthesis (gr)*	*relative contribution of stem reserves in yield*	*Grain yield (ton/ha)*
Gascogne	1.08c	11.65bc	**2.40abc**
Sabalan	1.12bc	9.73c	**2.69ab**
4057	1.07c	11.49bc	**2.99a**
Ruzi-84	1.21abc	18ab	**2.35abc**
Gobustan	1.25ab	17.94ab	**2.25bc**
Saratovskaya-29	1.31a	24.22a	**1.79c**

4. CONCLUSION

This research results showed that different conditions of this experiment had significant differences for maximum stem dry weight after anthesis and grain yield. But, there weren't significant differences between other characters. Wheat genotypes had significant differences for maximum stem dry weight after anthesis, remobilized assimilates from stem to grain and relative contribution of stem reserves in yield. Potassium humate decreased relative contribution of stem reserves in yield by 6.18 %, and increased grain yield by 45.8 % in normal irrigated condition. And, decreased stem reserves by 5.34 %, and increased grain yield by 50.4 % in drought condition.

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AUTHORS CONTRIBUTION

This work was carried out in collaboration among all authors.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

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