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EVALUATION ON DEVELOPING OF NEW VARIETIES AND LINES OF BREAD WHEAT TOLERANT TO DROUGHT AND HEAT ON THE RAINFED AREAS OF UZBEKISTAN

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ABSTRACT

The high correlations are studied between the productive elements of the spike and the yield on the researches. It was studied that in different years, under the influence of weather conditions, the productivity of bread wheat varieties and lines. It was found that dry weather conditions, low rainfall and lack of soil moisture lead to a decrease in wheat yields on dry lands. Due to low rainfall in autumn and winter, lack of soil moisture, seeds germinate in spring time and prolongs the growing season was heat and drought conditions.

KEYWORDS: Bread Wheat, Rainfed Lands, Rainfall, Vegetation Period, Heading, Spike, Spikelets, Drought, Heat, Heat And Drought Tolerant, Unfavorable Factor, Valuable Traits, Yield, Variety, Samples.

INTRODUCTION

The total area of arable land in Uzbekistan is 754,000 hectares. All arable lands in the country are divided into 4 zones according to altitude, soil and weather conditions: **1. Plain flat region**. This region is not provided with precipitation, and the annual rainfall is 250-300 mm. Strong weather and soil drought occur in the region in spring and summer. **2.The hill step regions.** Annual precipitation in this area is 300-350 mm.**3.Foothill region.** The annual rainfall in this region is 400-450 mm.**4. Mountainous region.** Annual precipitation in this region of dryland is 450-500 mm and more.

Today in Uzbekistan there is a low yield and grain quality of wheat varieties grown on more than 220.0 thousand hectares of dry land. Due to climate change in recent years, hot and dry weather conditions, low rainfall have a negative impact on the cultivation of grain crops on rainfed lands.

Low soil moisture in the autumn is observed in the sparse germination of seeds sown in the fall in the winter or spring, as well as the thinning of strong and dry cold wheat grasses that occur in some years during the winter months. These unfavorable factors lead to low wheat yields and poor grain quality.

Global climate change, rising air temperatures require the creation of wheat varieties for the soilclimatic conditions of rainfed lands, tolerant to biotic and abiotic stresses, and high grain quality content. The creation of bread wheat varieties with an early ripening, short grain-filling phase (25-30 days) provides an increase in grain yield on dry lands and a stable grain yield even in adverse weather conditions such as heat and drought. The duration of wheat vegetation on dry lands depends not only on the genetics of the variety, but also on soil and climatic conditions, care agrotechnology, sowing time, the time of emergence of seeds in autumn.

The duration of the germination period is important in determining early maturation. In Central Asia, the early ripening of a wheat crop is largely determined by the germination phase. Drought-resistant varieties of wheat accumulate less, late stems are not formed, the leaf surface is small, thin and twisted. The awned (spike with awn) wheat varieties are more drought and heat tolerant on rainfed lands. The generative organs of the wheat are susceptible to drought and heat. Lack of moisture in the soil during the formation of plant reproductive organs and during flowering, dry and high air temperatures during pollination lead to incomplete fertilization, and therefore the number of grains in the spike is reduced.

According to the researchers, the occurrence of high air temperatures during the grain filling period in hot weather with garmsel(dry and hot wind) reduces wheat yield by 30-50% even when the soil is sufficiently moist. Drought tolerant varieties have a shorter ripening period than drought-tolerant varieties. The greatest damage from drought is observed in the heading-ripening phase of wheat. Bread wheat samples belonging to the Central Asian Genetic Center (Uzbekistan and Kazakhstan) were found to be drought-resistant, while wheat varieties belonging to the Minor Asian Genetic Center and the Caucasus were found to be heatresistant. Drought tolerance has been proven by researchers to vary in wheat varieties.

Under drought conditions, changes in the water regime in the wheat crop disrupt the metabolism and lower yields are observed due to the number of grains, the number of grains in the grain and the weight loss of 1000 grains.

MAIN PART

The main direction of wheat selection in the development of drought-resistant varieties in Uzbekistan is the creation of early-maturing varieties, as the period from grain filling to ripening must pass in early varieties before the onset of adverse conditions such as heat and drought. However, in years with good moisture supply, the yield of early varieties was found to be lower than that of medium and late varieties. At the Lalmikor Agricultural Research Institute, research was conducted to create new varieties of bread wheat with high grain quality, resistant to unfavorable environmental conditions and disease-resistant conditions for the rainfed regions of Uzbekistan.

In the experiments conducted in 2020, favorable weather conditions, high rainfall compared to many years, led to high productivity and productivity of bread wheat varieties on dry lands.

RESULTS AND DISCUSSION

According to weather data, the amount of precipitation during the vegetation period of plants in 2020 was 391 mm, which is 29 mm more than the average perennial (362 mm). The relative humidity was also an average of 71%, which can be seen to be favorable in the ripening phases of the wheat vegetation, and the air temperature was also normal (Table 1).

Changes in weather conditions during the growing season of cereals (data from Gallaaral meteorological station in 2020).

TABLE 1

Indicators	Months									Total or average
	X	XI	XII	I	II	III	IV	V	VI	
Precipitation, mm										
Average multi-year, ±	17,1	35,0	55,0	40,4	52,0	65,0	53,6	35,4	8,4	362,0
2019-2020	5,3	32,2	16,3	57,8	61,3	39,5	91,5	87,0	0	391,0
Compared to the average multi-year, ±	-11,8	-2,8	-38,7	+17,4	+9,3	-25,5	+37,9	+51,9	-8,4	+29
Air temperature,ºC										
Average multi-year, ±	12,1	5,9	0,3	1,7	0,9	6,8	14,1	19,6	22,5	9,3
2019-2020	13,2	3,7	3,5	1,4	4,6	4,6	9,4	19,6	26,8	9,6
Compared to the average multi-year, ±	+1,1	-2,2	+3,2	-0,3	+3,7	-2,2	-4,7	0	+4,3	+0,3
Relative air humidity, %										
Average multi-year, ±	32	52	69	72	66	60	48	35	23	51
2019/2020	55	78	80	88	78	70	73	67	51	71
Compared to perennials, ±	+23	+26	+11	+16	+12	+10	+25	+32	+28	+20

During the research, the length of the spike, the number of grains in the spike and the weight of the grain in the spike, as well as the 1000 kernelweight were determined in the varieties and lines, high-yielding varieties and new lines were identified. According to him, the standard early-ripening varietyTezpishar has a plant height of 109 cm, the main spike length is 9,6 cm, the

number of spikelets is 17, the number of grains in the spike is 34 and the grain weight is in the spike1,30 g, 1000 kernel weight 38 g and the total grain yield is 2, 6 t/ha.

The highest yields are observed in the new lines ICA2017 / 23, KP-2016/88, KP-2016/89, SP-2016/303 (IKARDA) and, accordingly, the grain yield are 3,26 t/ha, 2,94 t/ha, 2,93 t/ha and 2,81 t/ha, respectively. In the early-ripening variety, the number of grains in the spike and the grain weight in the spike were 33,9 pieces and 1,3 g, respectively, in the KP-2016/5 line 41,6 pieces and 1,5 g, in the KP-2016/88 line 41,4 pieces and 1,5 g, 45,7 piecesand 1,7 g on the KP-2016/89 line.

Varieties and lines of bread wheat in the RNS nursery, Gallaaral 2020.

TABLE 2

№	Varieties and lines name	Heading days, day, month	Plant height, cm	Spike length, cm	Number of spikelets per spike, pieces,	Number of grains per spike,pieces	Grain weight per spike, g	1000 kernel weight, g	Yield, t/ha
1	Tezpishar (st)	01/V	109	9,5	16,8	33,9	1,3	37,6	2,63
2	Bakhmal-97	12/V	122	10,7	16,9	30,1	1,3	43,4	1,93
3	Sanzar-6	5/V	104	10,0	17,6	39,8	1,5	37,6	2,44
4	Istiklol-6	11/V	128	11,7	21,0	37,3	1,5	41,4	2,85
5	Sogdiana	9/V	102	9,7	17,6	37,5	1,5	40,0	2,35
6	Nushkent	3/V	134	10,5	17,3	38,1	1,7	45,2	2,60
7	Kizildon	4/V	103	9,4	17,6	37,0	1,4	38,8	2,50
8	SP-016/303	15/V	133	9,8	19,0	33,4	1,3	38,0	2,81
9	IKA2017/23	12/V	123	8,4	19,5	34,8	1,3	36,4	3,26
10	DNS2013/26	11/V	119	10,9	18,1	34,0	1,4	40,0	2,66
11	KP-2016/5	08/V	93	10,4	19,6	41,6	1,5	37,0	2,60
12	KP-2016/88	15/V	108	9,6	19,9	41,4	1,5	36,1	2,93
13	KP-2016/89	15/V	114	9,4	21,6	45,7	1,7	36,9	2,94
14	KP-2016/58	10/V	125	9,2	18,2	32,2	1,3	40,3	2,62
15	KP-2016/97	14/V	115	10,2	17,2	32,6	1,2	35,5	2,69
16	KP-016/117	05/V	120	8,9	19,7	35,7	1,4	38,1	2,73
17	NSR_{05}								3,6

The generative organs of the wheat plant are susceptible to drought and heat. According to A.I.Nosatovsky, the lack of moisture in the soil during the formation of plant reproductive organs and during flowering, dry and high air temperatures during pollination lead to incomplete fertilization, and therefore the number of grains in the spike is reduced. According to researchers, the drought-tolerant varieties have a shorter ripening period. The second half of the wheat growing season in Uzbekistan takes place in the context of increasing drought and heat. Under natural conditions, high temperatures slow down the accumulation of dry matter and drastically reduce grain quality. High temperatures affect the reproductive organs of the plant, leading to incomplete fertilization during flowering. When high temperatures occur during the filling period, grain failure is observed, 1000 grains lose weight, and yields are low.

In 2021, the amount of precipitation compared to other years was 133.7 mm, which is 257.3 mm less than in 2020 (391 mm). (Table 3). Extreme drought conditions in 2021 caused wheat varieties to germinate in the spring. Under such conditions, a decrease in the number of seedlings in many winter wheat varieties, a sharp decline in yield was observed due to the fact that the drought continued with high temperatures in the spring.

Changes in weather conditions during the growing season of cereals (data ofGallaaral meteorological station, 2021).

TABLE 3

Indicators	Months									Total or average
	X	XI	XII	I	II	III	IV	V	VI	
Precipitation, mm										
2021 йил	1,1	1,8	1,4	3,2	10,5	95,7	5,7	14,7	0	133,7
Average multi-year, ±	18,0	38,3	54,2	39,7	48,2	65,7	58,2	36,2	8,1	362,0
Compared to the average multi-year, ±	-16,9	-36,5	-52,8	-35,8	-37,7	+30,0	-52,5	-21,5	-8,1	-228,3
Air temperature,ºC										
2021 йили	12.3	6,5	-5,5	-4,3	5,3	7,4	14,3	22,0	26,6	11,9
Average multi-year, ±	11,8	5,8	0,5	-0,8	1,2	7,0	13,5	18,7	24,4	9,1
Compared to the average multi-year, ±	+0,5	+0,7	-4,0	-3,5	+4,1	+0,4	+0,8	+3,3	+2,2	+2,8
Relative air humidity, %										

2021 йил	52	68	72	79	71	76	56	49	29	60
Average perennial	59	73	81	83	80	74	67	59	45	63
Compared to the average multi-year, ±	-7	-5	-9	-4,0	-9,0	+2,0	-11,0	-10,0	-16,0	-3,0

In grain crops, the growth period of the plant is divided into two: 1. Seeds germinate-heading 2. Heading-ripening(maturity). The duration of the ripening period depends on air and soil temperature and humidity conditions. When the air temperature is high, the grain filling period and grain ripening time are shortened. In Central Asia, including the dry lands of Uzbekistan, the early ripening of wheat is determined by the time of vegetation.

A 2021 study found that full germination in the early ripening template variety was detected on May 10, while in other varietal samples and lines, the maturation date was later than in the template variety.

Varieties and lines of breaad wheat varieties in the RNS (yield trial) nursery, Gallaaral 2021.

TABLE 4

№	Varieties and lines name	Heading days, day, month	Plant height, cm	Spike length, cm	Number of spikelets per spike, pieces,	Number of grains per spike, pieces	Grain weight per spike, g	1000 kernel weight, g	Yield, t/ha
1.	Tezpishar (st)	10/V	69	8,3	13,0	25,0	0,8	31,6	0,46
2.	Sanzar-6	14/V	55	7,5	15,0	33,0	1,0	30,0	0,29
3.	Bakhmal-97	17/V	78	9,5	17,0	31,5	0,9	27,6	0,34
4.	Istiklol-6	16/V	76	8,8	17,5	37,5	1,2	33,0	0,37
5.	Sogdiana	15/V	60	9,0	16,7	39,0	1,2	31,2	0,47
6.	Nushkent	12/V	84	9,0	15,0	38,3	1,3	35,2	0,35
7.	Kizildon	12/V	65	9,5	16,0	42,5	1,3	29,6	0,36
8.	DNS2013/26	18/V	74	10,0	18,5	36,5	1,2	32,8	0,56
9.	Erytrospermum-40	11/V	70	9,5	16,0	37,0	1,1	30,0	0,54
10.	KP-2016/88	24/V	56	7,3	16,3	33,0	0,7	21,2	0,21
11.	KP -2016/89	24/V	56	8,0	17,0	28,5	0.6	22,4	0,30
12.	KP -2016/58	17/V	74	8,5	16,0	32,0	0,9	27,6	0,31
13.	KP -2016/97	23/V	57	8,5	16,5	34,0	0,7	20,8	0,24

14.	KP-2016/117	14/V	68	8,5	14,5	36,5	0,7	21,5	0,33
15.	KP 2016/303	20/V	72	9,0	15,0	35,5	1,1	30,8	0,35
16.	ICR.2017/23	24/V	64	8,8	17,5	33,0	0,8	24,4	0,23
17.	DNS-2020/2	16/V	63	9,7	16,0	47,3	1,0	21,6	0,24
18.	DNS-2020/4	14/V	62	10	17	55	1,2	21,2	0,42
19.	DNS 2020/6	13/V	74	9	17	40	0,9	24	0,33
20.	KP-2020/38	15/V	77,5	10,5	18	33	1,0	29,6	0,48
21.	KP-2020/126	15/V	66	10	16	53	1,1	21,6	0,28
	NSR_{05}								0,34

CONCLUSIONS

During the studies, heat resistance and productivity indicators were identified in local bread wheat varieties and new lines. Heat and drought resistant lines were selected. The duration of the germination period depends on the biological characteristics of the variety, in which air temperature and day length play an important role.

The duration of the germination period is important in determining early maturation. Studies have shown that there is a high correlation between productivity element performance in the spike and productivity. It was also found that favorable weather conditions lead to high productivity in soft wheat lines belonging to the IKARDA center. It was found that dry weather conditions, low rainfall and lack of soil moisture lead to a decrease in wheat yields on dry lands.

Low rainfall in the fall and winter months led to seed germination in the spring months as a result of a lack of moisture in the soil. It was found that this leads to a prolongation of the growing season, the passage of the ripening phases under strong thermal conditions, resulting in low yields without good filling of the grain.

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