Laboratory Assessment of Drought Tolerance in Chickpeas Varieties and Lines

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ABSTRACT

The creation of productive chickpea varieties and lines, selection materials that are resistant to the current global drought remains an urgent issue. For this purpose, the drought tolerant of chickpea lines brought from the international centers of ICARDA was analyzed in laboratory conditions and the results of the analysis are presented in this article.

Keywords: drought, water scarcity, water storage capacity, tolerant, turgor

Enter. Chickpeas are distinguished from other leguminous crops by their resistance to drought. These features of the plant are very suitable for the natural climatic conditions of Uzbekistan. In recent years, chickpeas have been planted on irrigated lands, because their yield is much higher on such lands than on dry land. Planting chickpeas on wet land ensures a regular and high yield.

High temperature is an important factor affecting the growth, development and productivity of chickpeas. Chickpea (Cicer arietinum L.) is now widely cultivated in more than 50 countries. Ripening of crops takes 80 to 180 days, depending on the genotype, soil moisture, planting time, latitude and altitude. However, in at least two-thirds of the chickpea-growing area, the growing season of existing crops is shortened (90-120 days) due to late-season drought or extreme temperature effects (grain formation stage). About 73% of the global area under chickpea cultivation is in South and Southeast Asia, where chickpea is mainly grown with rainfed soil moisture in the post-monsoon season and often drought and heat, experiences stress.

Lack of water, that is, drought, first of all, negatively affects the water exchange processes of plants, and other physiological processes of the plant (photosynthesis, respiration, assimilation of mineral fertilizers through the roots, in the body of plants transport of substances, etc.) also appear. As a result, the growth and development of plants slows down or stops.

Method of doing work. 50 foreign and local varieties and lines of chickpeas were planted and studied in the experimental field of the Southern Agricultural Scientific Research Institute. Polvon, Zumrad and Obod varieties were taken as model varieties. Samples of plants selected from the studied varieties and lines in the podding phase were brought to the "Plant Physiology and Biochemistry" laboratory of the institute in order to study the properties of drought tolerance. Water deficit in plants was analyzed according to the method of L.S. Litvinov (1988). The procedure is as follows.

--plants are sampled 30 minutes before sunrise;

--leaves are cut and transferred to the laboratory in closed glasses;

--the base of the leaves is cut and quickly weighed;

--leaves are soaked in full water for 2 hours;

--after being saturated with water, the leaves are dried on filter paper;

--leaves are re-weighed;

--dried at 105°C for 6 hours. Then the dried leaves are weighed again.

Formula for determining water deficit in leaves:

WD=(A2-A1) /B * 100%, where:

A2 - amount of water after saturation; A1 - amount of water before sunrise; B is the initial weight of the sample.

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Water content was determined by the difference between the wet and dry weight of the leaves (as a percentage of their wet or dry weight). The following table shows the level of drought resistance of varieties and lines. 39.1% water deficit was found in model varieties Polvon, 48,3 % in Zumrad variety and 42,0 % in Obod variety. In the KR20-LCPYT-RF-16 lines, the water deficit level was 33,8%. In 7 lines, the level of water deficit is up to 40 %, and it was found that the model is tolerant to drought compared to the variety

	Varieties	Water shortage,%				Water storage capacity,%			
		Initial leaf water content, g	The amount of water lost by the leaf in 2 hours, g	**Dry mass, g**	**Water shortage,%**	Initial leaf water content, g	Leaf weight after withering, g	**Dry mass, g**	**Water storage capacity,%**
1	Polvon (st)	1,58	2,32	0,46	**39,1**	1,73	1,57	0,47	**12,7**
2	Zumrad (st)	1,32	2,18	0,40	**48,3**	1,43	1,19	0,35	**22,2**
3	Obod (st)	1,72	2,66	0,42	**42,0**	1,33	1,13	0,37	**18,2**
4	KR20-LCAYT-RF-2	1,42	2,36	0,38	**47,4**	1,32	1,16	0,36	**16,6**
5	KR20-LCAYT-RF-3	1,40	2,09	0,35	**39,7**	1,45	1,23	0,39	**20,7**
6	KR20-LCAYT-RF-5	1,59	2,64	0,44	**47,7**	1,66	1,44	0,47	**18,4**
7	KR20-LCAYT-RF-6	1,64	2,60	0,42	**44,0**	1,46	1,29	0,39	**15,8**
8	KR20-LCAYT-RF-8	1,93	2,83	0,63	**41,0**	1,43	1,30	0,47	**13,5**
9	KR20-LCAYT-RF-9	1,49	2,24	0,49	**42,8**	1,32	1,17	0,38	**15,9**
10	KR20-LCAYT-RF-10	1,65	2,52	0,5	**42,5**	1,91	1,78	0,64	**10,2**
11	KR20-LCAYT-RF-11	1,52	2,19	0,39	**37,2**	1,73	1,55	0,49	**14,5**
12	KR20-LCAYT-RF-13	1,66	2,63	0,45	**44,5**	1,69	1,54	0,5	**12,6**
13	KR20-LCAYT-RF-14	1,71	2,48	0,48	**38,5**	1,86	1,54	0,47	**23,0**
14	KR20-LCPYT-RF-3	1,35	1,91	0,39	**36,8**	1,59	1,46	0,45	**11,4**
15	KR20-LCPYT-RF-12	1,68	2,63	0,54	**45,4**	1,73	1,51	0,52	**15,8**
16	KR20-LCPYT-RF-15	1,93	3,07	0,48	**44,0**	1,63	1,41	0,42	**18,1**
17	KR20-LCPYT-RF-16	1,65	2,27	0,44	**33,8**	1,42	1,25	0,41	**16,8**
18	KR20-LCPYT-RF-18	1,52	2,23	0,34	**38,6**	1,48	1,32	0,35	**14,1**
19	KR20-LCPYT-RF-19	1,19	1,67	0,29	**34,7**	1,38	1,25	0,34	**12,5**
20	KR20-LCPYT-RF-22	1,81	2,73	0,42	**39,8**	1,24	1,04	0,29	**17,5**

In drought-resistant plants, it was found that water retention capacity and sorted water content in drought conditions are higher than in plants with low resistance properties [2]. Wilting of the plant leads to a violation of normal metabolism, osmotic properties in cells, loss of turgor state, cessation of synthesis of new substances, and intensification of hydrolysis and decomposition processes. In most cases, the lack of moisture has a negative effect on the photosynthesis process. Therefore, drought affects or stops the growth of plants. They reduce the total leaf area, which slows down the formation of organic matter in plants and reduces the yield. When the lack of water is long-term, even plants die [3].

Water storage capacity L.S. It was studied according to the method of Litvinov (1988) [4;5]. To determine the water retention capacity of leaves, fully formed leaves are taken in the morning between 8-9 am and brought to the laboratory wrapped in polyethylene bags or moistened cloth. The weight of the brought leaves (v) is weighed on a scale and left to dry in a thermostat at 30°C for 3 hours. The dried leaf mass (v1) is measured on a scale and dried in a thermostat at a temperature of 105°C for 6 hours. The dried leaf mass (b) is measured, and the water retention capacity is determined according to the following formula:

WRS=(v-v1)/(v-b)*100 %.

Summary. According to the results of the analysis, it was noted that the water retention capacity in the Polvon, Zumrad, and Obod varieties was from 12,7 to 22,2%, and from 15,8% to 18,4% in 9 lines. It was also found that KR20-LCAYT-RF-3 had a water retention capacity of 20,7% and KR20-LCAYT-RF-14 had a water retention capacity of 23,0% during the pod phase, and it was selected as a drought-tolerant strain for use in further selection processes.

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