ВЛИЯНИЕ КАЛИЙНОГО ОБРАБОТКИ НА ФОТОСИНТЕТИЧЕСКУЮ АКТИВНОСТЬ БОБОВ, ПОДВЕРГНУТЫХ СТРЕССУ ЗАСУХИ

EFFECTS OF POTASSIUM TREATMENTS ON THE PHOTOSYNTHETIC ACTIVITY OF BEAN EXPOSED TO DROUGHT STRESS

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In this study, we determined the recovery effects of potassium applications on stress tolerance of bean plants exposed to drought conditions by measuring the basic growth parameters and photosynthetic activity values. Photosynthetic rates of plants under drought stress were found to be lower than the control group. However, this decrease in photosynthesis was optimized to control levels with high K application (K 100 ppm). This suggests that suitable application of K has stress-relieving effects on drought-stressed plants.

В этом исследовании мы определили эффекты восстановления калийных приложений на устойчи-вость к стрессу у бобовых растений, подвергнутых воздействию засухи, путем измерения основных пара-метров роста и значений фотосинтетической активности. Установлено, что темпы фотосинтеза растений при стрес-се засухи ниже, чем в контрольной группе. Однако это уменьшение фотосинтеза было оптимизи-ровано для контроля уровней с высоким применением K (100 ppm). Это говорит о том, что подходящее применение K оказывает ослабляющее стресс воздействие на засухоустойчивые растения.

Keywords: drought, potassium, bean, photosynthesis.

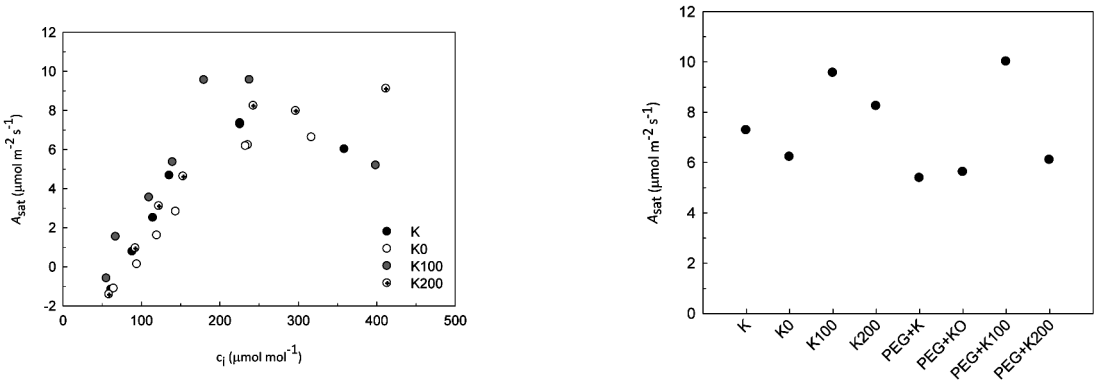
Ключевые слова: засуха, калий, бобовые, фотосинтез.

Drought is one of the most crucial environmental factors affecting the agricultural production [2, 4–6]. Drought stress being one of the most relevant stress factors present on the earth, holds the largest share of 26 % among abiotic stress conditions. In this situation, drought stress is one of the most common environmental stresses affecting crop growth and yield [3]. It has been reported that climate changes due to phenomenon called global warming will lead to a dry and warmer climate by 2030 in Southern Europe including Turkey. Drought is a danger to all the living things on earth, causing a decrease in the efficiency of natural resources in the world in fulfilling the nutritional requirements of huge populations causing death of millions of people due to hunger. Thus, identification of the plant species resistant to drought stress, understanding their tolerance mechanisms, determination of factors increasing crop durability will play a role in preventing drought that is increasing as a result of global warming especially caused by humans. As compared to other species, legumes are one of the most vulnerable plant groups, and amongst that, beans are the most sensitive species towards drought [1].

In this study, drought tolerance levels of bean plants had been determined. Moreover, effect of potassium application on stimulation of plant germination and growth, behavior of growth hormones, increment in water use efficiency and photosynthetic activity of the bean plants exposed to drought stress conditions has been determined.

Experimental Phaseolus genotypes were grown in hydroponic system under controlled conditions. In the study, osmotic and ionic stress tolerance of bean plants grown as a control group (containing 39 ppm K in Hoagland Solution) and a treated group exposed to drought conditions caused by PEG 6000 developing –0,42 MPa osmotic pressure has been estimated. Moreover, effects of different potassium concentrations (control, K 100 ppm and K 200 ppm) on photosynthetic activity of these two groups were assessed using a Li-CoR 6400 XTQ instrument.

A decrease in the photosynthetic activity of plants on decreased K supply and consequently, less K concentration in leaves were observed. Potassium affects the photosynthetic activity of plants by opening and closing of stomata. There is an increase in the permeability, photosynthesis and rubisco carboxylase activity of stomata along with an increase in the K concentration of leaves. In fact, in this study, it was found that the photosynthetic rate of plants treated with K_{100} and K_{200} was higher than that of the plants treated with K and K_0. Plants under drought stress showed a decrease in photosynthetic rates as compared to control plants. However, the decrease in photosynthesis reached to the control levels with high level K application (K_{100}). This suggests that K applied at a certain level has stress-relieving effects on drought-stressed plants.



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ОЦЕНКА ГЕНЕТИЧЕСКОГО РАЗНООБРАЗИЯ ПОПУЛЯЦИИ ДИКОРАСТУЩЕГО НУТА, СВЯЗАННОЙ С НЕПРЕРЫВНЫМ ИЗМЕНЕНИЕМ ОКРУЖАЮЩЕЙ СРЕДЫ

GENETIC DIVERSITY ASSESSMENT OF A COLLECTION OF WILD CHICKPEA POPULATIONS AIMING TOWARDS CONTINUOUSLY CHANGING ENVIRONMENT

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Climate change is one of the most challenging issues that has motivated the scientific community to utilize wild genetic resources. Wild species provide a rich source of potential traits to breed into cultivated varieties, including biotic and abiotic stress tolerance. Hence, we collected the morpho-genetic variation data of newly collected approximately 502 wild chickpea accessions belonging to 31 distinct populations. Here, we present the variation in days to flowering, days to maturity and seed weight per plant of the collected wild germplasm grown in plastic house conditions. Statistical analysis revealed significant variation among the collected wild populations. Variability in the studied traits suggests the potential exploitation of these wild germplasm resources in future breeding programs for the genetic improvement of cultivated varieties.

Изменение климата является одной из наиболее сложных проблем, которые побуждают научное сообщество использовать дикие генетические ресурсы. Дикие виды обеспечивают бо-гатый источник потенциальных признаков для разведения в культивируемые сорта, включая биотическую и абиотическую устойчивость к стрессам. Таким образом, мы собрали данные морфо-генетических вариаций вновь собранных примерно 502 проб дикорастущего нута, при-надлежащих 31 различным популяциям. Здесь мы приводим вариацию в днях к цветению, дням к зрелости и весу семян на растение собранной дикой зародышевой