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Research Article

IN SEMI-ARID REGIONS PRODUCED VETCH (*Vicia Sativa* L.) OF YOUR PLANTS WATER STRESS REACTIONS

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Abstract

Depending on the seasonal precipitation regime of long years in the Southeast Anatolia Region, droughts occur in agriculture due to irregularities in precipitation. Annual average the amount of precipitation is approximately 600 mm. With the temperature of the air, water in the dams except for its use, we lose about half of this precipitation with the most evaporation. In general, the use of water in our country is around 1500 tons per person per year. It is twice the water consumption rate per capita in the world. This is the water consumption in our country, indicates serious problems. However, if we look at water use again, the irrigated agricultural area in our country is around 20%. Therefore, in agricultural production using water effectively, adapted to arid and arid regions, tolerant to water stress, there is a need for product varieties with superior yields. Animal nutrition in our country is largely based on natural meadows and pastures, stubble and cereal straw, a few traditional forage crops such as sainfoin, common vetch and vetch are cultivated. In recent years, the obligation of the state to plant forage crops in semi-arid regions with the introduction of the plantation, an increase has been achieved in the cultivation areas, especially in our province. The most important cause of water stress in the plant, in arid regions with annual precipitation below average values, it is associated with the negative impact of our land and water resources. Drought tolerant in the area alternative plant forage crops especially physiologically the water needs of the plant, irrigation method and suitable for efficient water use cultivation of varieties is important for the region.

YARI KURAK BÖLGELERDE YETİŞTİRİLEN FİĞ (*Vicia Sativa* L.) BİTKİSİNİN SU STRESİNE VERDİĞİ TEPKİLER

Anahtar Kelimeler
Kuraklık, su stresi, fiğ, yağış, verim.

Özet

Güney Doğu Anadolu Bölgesinde uzun yıllara ait mevsimsel yağış rejimine bağlı, yağışlardaki düzensizlikler nedeniyle tarımda kuraklıklar yaşanmaktadır. Yıllık ortalama yağış miktarı yaklaşık olarak 600 mm'dir. Havanın sıcaklığı ile birlikte, barajlarda su kullanımı dışında en fazla buharlaşma ile bu yağışın yaklaşık yarısı kadarını kaybetmekteyiz. Genel olarak ülkemizde suyun kullanımı kişi başı yıllık 1500 ton civarında olmakla birlikte, dünya kişi başı su tüketim oranının ortalama iki katı kadardır. Bu ülkemizde su tüketimde ciddi problemlerin olduğunu gösterir. Bununla beraber yine su kullanımına bakacak olursak, ülkemizde sulanan tarım

alanı yaklaşık %20 civarındadır. Bundan dolayı tarımsal üretimde yarık kurak ve kurak bölgelere adapte olmuş, su stresine dayanıklı suyu etkin kullanarak üstün verim elde edilecek ürün çeşitlerine ihtiyaç vardır. Yurdumuzda hayvan beslenmesi, geniş ölçüde doğal çayır ve meralara, anızlara ve tahıl samanına dayanmakta olup, yonca, korunga, adi fiğ ve burçak gibi geleneksel bir kaç yem bitkisinin tarımı yapılmaktadır. Yarı kurak bölgelerde son yıllarda yem bitkileri tarımına devlet tarafından ekim zorunluluğu getirilmesi ile, özellikle ilimizde ekim alanlarında artış sağlanmıştır.
Bitkilerin yaşamlarını etkileyen ve bitkilerde değişik tepkilere neden olan etmenlerle ifade edilen stres, bitkide önemli fizyolojik ve metabolik değişimlere yol açarak, büyüme ve gelişmeyi olumsuz şekilde etkiler. Kuraklık, tarımsal üretimde ciddi verim kayıplarına neden olan etmenlerin başında gelmekle beraber tarladaki ürünün miktar ve kalitesini düşürmektedir. Kuraklık, tuzluluk, yüksek ya da düşük sıcaklık, bitkide fiziksel olarak abiyotik stres olarak kendini gösterir. Bitkideki su stresinin en büyük nedeni, kurak bölgelerde yıllık yağışın ortalama değerlerin altında seyretmesiyle, arazi ve su kaynaklarımızın olumsuz etkilenmesi sonucu ile ilişkilidir.
Bölgede kuraklığa dayanıklı alternatif bitki olan yem bitkilerinin, özellikle fizyolojik olarak bitkinin su ihtiyacına, sulama yöntemine ve etkin su kullanıma uygun çeşitlerinin yetiştirilmesi bölge için önem arz etmektedir.
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Introduction

Climate change, which varies according to years, is not caused by natural causes, but by fossil fuels, improper land use, due to the destruction of trees and industrial development in developing regions this is due to the greenhouse effect created by the gases released into the atmosphere. Linked to climate change as, the annual precipitation average in our country is 646 mm, 13% compared to the general in 2013, Compared to 2012, it decreased by 24% and became 564 mm. Least precipitation our area, with a decrease of 27%, it became the Central Anatolia Region, which is the grain store of Turkey [1]. Generally, depending on rising temperatures and decreasing precipitation the every year, an increasing drought effect is observed. To reduce the effect of this drought, using existing underground or surface water resources, Irrigation has been applied to reduce the impact of drought, especially in dry farming areas. However, due to the limited available water resources and the decrease in the

amount of precipitation, In order to reduce the effects of agricultural drought, measures should be taken as soon as possible and appropriate plants should be grown.

Agricultural drought, rather than the total amount of precipitation during the whole year, It is related to the amount of water that the plant planted in the field that year can get from its roots exactly during the growth period. Significant losses occur in terms of development and especially yield in plants that experience water deficiency during the growth period [2-3]. Organic fertilization is also important to eliminate drought effects in this non-irrigation agriculture soils. Soil organic matter was determined to be 2.28% with organic fertilizer helps while it was 0.95% with traditional application [4].Farmers must use water carefully in agricultural production areas, under dry conditions. Small amount of rainfall can storing in the soil, it will increase the crop yield in these arid areas [5]. One of the biggest problems our world is experiencing today, by making the best use of limited natural resources, adequate and balanced nutritional conditions for humans cannot be created [6]. Some varieties of field crops, which differ in their tolerance to drought, are drought tolerant, that is, they can continue to grow and develop in arid environments and be productive, other plant varieties belonging to the same species but sensitive to drought can be damaged enough to cause serious yield losses even in small amounts of water loss. Therefore, It is always more advantageous to use varieties with higher drought tolerance in the production of field crops. Most of the plant varieties used in agricultural production are forage plants that are very tolerant to arid conditions.

In parallel with the support of forage crops in our country in recent years, although the rate of forage crops planting in field agriculture has increased from 2-3% to 7.40%, This rate remained at 1.57% in the Southeast Anatolia Region. Total roughage production obtained from forage plantings and natural meadow pasture areas of the region is enough for only 33.39% of the animal wealth of the region in its current situation [7].

The roughage needed in animal production in the Southeast Anatolia Region is supplied from three main sources. These resources are; natural meadow-pastures, forage crops and plant production residues. However, when we look at the roughage production balance, we see that our livestock is still largely dependent on pasture and is covered by large amounts of crop production residues (grain straw and stubble) and concentrated feed, which increases the cost of feeding. In dry agricultural areas where irrigation is not possible practicing a rational crop rotation and drought tolerant forage plant species should be included in planting systems. Due to the fact that rainfall and soil moisture are not sufficient to produce crops every year, 3,512,773 ha of agricultural land is left fallow every year in our country [8]. Drought tolerant forage crops it is possible to evaluate some of these areas and to help reduce the roughage deficit in our country. From pulses chickpea and lentil, alfalfa from forage crops, sainfoin and vetch to be produced in fallow fields are suitable plants [9]. Forage crops, in addition to providing feed, which is one of the most important inputs of animal production, they have positive effects on the physical and chemical properties of the soil, the yield and quality of the crop plants that follow it. Especially in the vetch like regionsuitable forage legumes, It can meet the nitrogen need of the main product grown in the organic farming system with green manure.

To take the feed plants with high tolerance to drought in our region, especially to evaluate the land as intermediate plants and to protect the soil, the necessary responses in terms of resistance to other abiotic stress, such as salinity caused by temperature and excessive irrigation. Finally, combating drought and water stress due to climate change is very important in terms of maintaining the continuity of our quality of life by protecting alternative forage plants adapted to the region and increasing production.

Material and Metod

Research it was conducted by evaluating the data and recorded results in a total of 60 farmer lands living in 8 villages of Şanlıurfa, namely Umut, Günbalı, Yenisu, Mehmetçik, Güçlü, Akpınar, Güzel, Anaz in 2018-2019.

Table. Average hay yield (kg/da) of vetch

	Hay yield (kg/da)		
Treatments	MF HuV	TF HaV	ORT. Mean Sowing
time	425,2	361,7	393,4

Values with the same letter (within a column) do not differ significantly (P<0.01) according to LSD test.

The highest hay yield was achieved with of vetch planted in autumn (425.2 kg/da).

Fig. An overview of the experimental field, vetch (Vicia L. cv. Adi) were used as plant materials (Photo A. Çalık)

The data were obtained by arranging them in accordance with the purpose of the study. In the formation of the questions directed to our farmers, the results obtained about the subjects and the evaluated field observations were made according to the national and international research findings. As of 2018 in Şanlıurfa, in the examinations and samplings made in the villages, the researchers have the initiative to choose how many farmers with their knowledge, experience and experience. The average temperature and relative humidity

of the years in which the experiment was carried out were above the averages of temperature and relative humidity for many years. The total amount of precipitation (681.20 mm) in the first year of the study was lower than the average of long years (713.10 mm), and in the second year (725.80 mm) it was [10]. Since the summer months of Şanlıurfa are hot and dry, the trial plots needed to be irrigated 3 times in the first year and twice in the second year until harvest. Yield will increase in years with high precipitation, and higher production compared to years with less precipitation shows the precipitation-yield relationship. It has been determined that the soil properties in the region are generally clayey-sandy textured, neutral in character and without salinity problems, varying between medium and very calcareous, organic matter content is low, available phosphorus content is very low, and available potassium amount is sufficient. Analyzes were made in Harran University Central Laboratory.

Used in the study process and method

In determining the producers participating in the questionnaire, the following ‘was used in order to determine the number of producers who are included in the sample and the probability of being an example for all producers [11].

Formula 1

Proportional Sample Volume Formula $n = \frac{Np(1-p)}{(N-1)O-2Px+p(1-p)}$

Results and Discussion

Effects of Climate Change on Fodder Crops and Field Agriculture in the Region in Recent Years

Climate is a dynamic system that appears over the years. Climate change, as observed over the average years of the preferred climate, under suitable conditions [12]. Climate change in recent years has turned into serious agricultural yield losses in arid and semi-arid transitional regions. While the necessary steps are taken by the authorities to ensure the highest and most effective use of existing water and its sustainability in agriculture, plant-water relations have become more important today. In arid regions, we can use rainwater to reduce the damage caused by drought. Using rainwater in agricultural production is an economical and useful method [13]. Water harvesting techniques can be supported with mulching and fertilizing practices in order to crop yield increasing [14]. As a result, it is necessary to change and develop production and irrigation methods suitable for the region, depending on the type of drought and water stress in the region and the physiological needs of the forage plant grown.

Year 2019 in Turkey as of about forage crops are cultivated on an area of 2.1 million hectares [15]. The development of new varieties that are tolerant to drought and suitable for the region with biotechnological methods is important in ensuring food supply for the coming years. On the other hand, in order to obtain more efficiency and continuity from the unit area in agricultural lands, especially drought-tolerant, soil-protecting legume forage crops such as vetch should be grown.

Yield of Vetch Plant and its Response to Water Stress in Regional Conditions

Climate change and rainfall shortages limit agricultural production. Especially, due to the 2008 and 2010 droughts in the southeastern Anatolia region, agricultural production has been decreased. The average 30-year rainfall in this semi-arid region was 344.1 mm. The lowest

rainfall, between 1982 and 2011, was 227.3 mm in 2008 and the highest rainfall was 573.1 mm in 1996 [16]. According to the species and variety characteristics suitable for our region, roughage equivalent to 350-800 tons of dry grass is produced from forage plants grown in our region under hot and dry conditions. In the years 2018-2019, when the study was carried out, the total annual precipitation in Şanlıurfa was 681.20, 474.7 mm, which was close to the long-term average, the annual average temperature was 12.7 °C, and 19.9 °C below the long-term average [17]. In Şanlıurfa province, it was determined that the green grass yield values between 1763.8-2947.5 kg/da per decare and the hay yield ranged between 762.81-1478.8 kg/da with appropriate fertilization in mixed cultivation, which is one of the varieties tolerant to water stress in arid conditions [18]. Probably one of the most important reasons why sainfoin cultivation could not increase despite the supports in the region is that rootworms cause early thinning of this plant. Due to this sparse problem in the sainfoin, our farmers probably prefer alfalfa and vetch according to the field and climatic conditions [19]. In order to prevent yield losses and similar negativities that occur under water stress of the vetch plant, if the year has been dry and there has been no precipitation, the soil should be given annealing water before planting. Arid region farmers must know soil water conservation with vertical tillage to slope thus, protected soil moisture, soil organic matter and olive yield can increase in their olive orchards. Additionally organic manure using provided that soil and water conservation in semi-arid region. It was benefit to sustainability in non-irrigation agriculture areas [20].

In high temperature and dry conditions, plants generally reduce the amount of water lost by transpiration in order to survive; It tries to absorb the water in the soil with a higher force with its roots. However, under drought stress, photosynthesis slows down in the plant, the upper parts of the plant, that is, the growth of the shoot weakens, while the root development of the

plant increases. Most of the photosynthesis products are spent for root development and it is more in the plant than in the root body.

The plant sends soluble carbohydrates from the above-ground organs to the roots under water stress conditions. Thus, the osmotic pressure of the roots increases and their water absorption rate increases. In general, the greater the leaf surface width in plants, the greater the water loss. In order to reduce water loss, plants try to reduce the amount of leaves by closing the stomata and shedding their leaves when necessary. Another method of protection against drought is to cover the leaves with dense hairs. These hairs reduce transpiration, so water loss, in the plant. Again, in water stress, in order to reduce water loss, in some plants, the leaf surface area is reduced and protected against drought.

Measures to be Taken Against Water Stress in Vetch Plant Produced for Forage

Vetch plant is a mesophyte plan like many cultivated plants in terms of water requirement, and the lack or excess of water affects the yield very much. It is a legume forage plant that can be grown all over the world with a temperate climate and is not tolerance to cold and drought [21]. In our region, the water requirement of forage crops varies depending on the amount of rainfall that year. The vetch plant, which requires precipitation during the pod formation period within the growth period, absolutely needs water in order not to decrease the yield in the absence of precipitation. The region is located in the semi-arid climate zone. Summers are hot and dry, winters are mild and less rainy. Climate characteristics are the most important determinant of the products to be grown in a region [21]. As the vegetation period in the plant passes, the water requirement of the plant increases and this situation reaches its maximum during the flowering and pod filling period [22]. In order to eliminate the lack of water during these periods, irrigation should be done in the evening when the stomata are closed [23].

In vetch plant, it is tolerant to water stress in early varieties suitable for the region. In order to spread vetch cultivation in our region where precipitation is low, early species should be selected. The amount of nitrogen stored in vetch and the rate of photosynthesis in leaves decrease under drought stress. For this reason, nitrogen fixation under drought stress can be suggested in terms of developing drought-tolerant vetch varieties. Again, in terms of water stress, nodule formation activity in vetch plant during drought and when plants experience water stress in different growth periods, it was observed that nitrogen fixation and transpiration rate in the plant decreased in general.

Combining high productivity and drought tolerance in a single cultivar has always been a desirable goal for vetch. For this reason, in the surveys conducted in our region, our farmers do not prefer irrigation to solve the drought problem, even during periods when irrigation is needed to prevent yield loss. However, there is an increasing interest in cultivars that are tolerant to arid conditions and have the capacity to produce high yields. Completion of work to ensure that surface storage facilities and groundwater reservoirs are kept at the highest level with maximum feeding, proper water collection application methods and effective water use methods must be developed according to land use types [24]. With an effective and correct education, the importance of drought and water stress tolerant varieties, forage crops that protect the soil and increase yield should be explained to the regional farmers, and the regional farmers should be encouraged to plant forage crops with the support of forage crops.

Results

In arid regions, studies to prevent the decrease in yield due to insufficient precipitation due to climate change and water stress in plants and to increase yield are important. There are serious problems in the production and evaluation of forage crops in Turkey, as well as many opportunities for improvement. For this purpose, according to the data and recorded results of

a total of 60 farmer lands living in these 8 villages of Şanlıurfa, 37% of our producer farmers use legumes such as vetch, which is resistant to drought and protects the soil, in order to obtain more efficiency from the unit area and to ensure continuity. preferred to grow forage crops. Şanlıurfa province is still in arid conditions from water stress resistant varieties in mixed farming, with appropriate fertilization applied, 68% of the farmers in the study the fresh grass yield values per decare from their lands are between 1500-2700 kg/da, on the other hand, the hay yield varied between 600-1100 kg/da determined. The vetch plant, which requires precipitation during the flowering and pod filling period, which is the period when the plant needs water the most, absolutely needs water in order not to decrease the yield in the absence of precipitation. In order to prevent yield losses and similar negativities that occur under water stress of vetch plant, 32% of the farmers added tempering water to the soil before planting. Again, 70% of vetch farmers used early cultivars that are resistant to water stress. First of all, the problems in grass production in forage crops for the future must be correctly identified. The complexity of these plants' responses to drought stress is due to the similarity of their responses to other stresses such as temperature and salinity in the region. We see that drought, temperature and salinity stress factors occur at the same time in field conditions, and therefore, the mechanisms of plants to combat these stresses are at the same time. Therefore, in studies to increase plant stress tolerance, it is necessary to investigate not only a single stress response of the plant, but also to investigate the effects of many stresses and to reveal how much they affect the yield. For this reason, realistic and sustainable solutions should be developed in the medium and long term with the studies carried out.

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