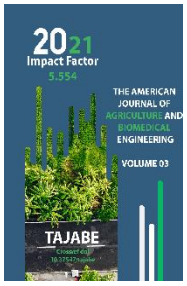
The American Journal of Agriculture and Boimedical Engineering
(ISSN – 2689-1018)
Published: May 31, 2021| **Pages:** 28-35
Doi: https://doi.org/10.37547/tajabe/Volume03Issue05-06

IMPACT FACTOR
2021: 5. 554

OCLC - 1121105746



Journal Website: http://usajournalshub.com/index,php/tajabe

Some Characteristics Of Transpiration Of Promising Soybean's Varieties

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ABSTRACT

The article presents data obtained from the study of the daily intensity of transpiration during the flowering stage of soybean varieties. According to the data on the diurnal variation of transpiration intensity, this process was accelerated in Vilana and Ustoz MM-60 varieties of soybeans, and a relative decrease in intensity was observed in Baraka and Tomaris man-60 varieties. Different variations in the intensity of transpiration in the cross section of the studied varieties may depend on the biological characteristics of the varieties as well as the air temperature and its relative humidity level.

KEYWORDS

Soybean varieties, transpiration rate, temperature, humidity, water exchange, productivity.

INTRODUCTION

Water is a major part of plants and they play an important role in life activities. The role of water in plant life is extremely important, as 70-95% of the composition of plant tissues consists of water, the amount of which in the seeds decreases sharply and ranges from 5 to 15%. Water is the main mass in all organs of the plant: 90% in the leaf, 70-80% in the branch, 50-60% in the root, 10% in the seed, 98% in the vacuole, 80% in the cytoplasm, 50% in the bark.

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Some wet fruits contain a lot of water: tomatoes - up to 94%, watermelons-up to 92% [1].

To increase plant biomass to 1 gram, approximately 500 g of water must be absorbed by the root system, assimilated by the plant, and released into the atmosphere from the surface of its vegetative organs. Due to its unique properties, water is of great importance in all processes of cell life. Even a slight violation of the water regime causes significant changes in metabolic processes [2].

It is known that transpiration is one of the most important and necessary physiological processes in plants, protecting plants from overheating and dehydration in dry and hot weather, as well as the movement of water and water-soluble substances throughout the plant body, gas exchange [3]. The temperature of a highly trans pirated leaf is about 7 °C lower than that of a non-trans pirated withered leaf [4].

The water consumption of a plant for transpiration is mainly determined by solar energy and soil moisture. The intensity of transpiration varies depending on the time of year and day, meteorological conditions, biological properties of plants, cultivation technology and other factors [5].

It is known that transpiration in leaves is one of the important physiological processes, especially in the study of plant growth and development in areas where water scarcity is observed. Transpiration ensures not only the evaporation of water through the leaf, but also the adsorption of water and the movement of water and dissolved substances throughout the plant [6].

The water supply activity of plants is directly related to the intensity of transpiration. 0.2% of the water taken in by the plants is assimilated and the rest is evaporated through the leaves during transpiration. In determining the nature of the water balance in plants, it is also important to determine the rate of water consumption depending on environmental factors. An increase in water scarcity in the soil leads to a decrease in transpiration intensity. Otherwise, the inverse law is observed [7].

In plants with moderate humidity, the total amount of water was found to fluctuate throughout the day. This is inextricably linked to the intensity of transpiration. Depending on the amount of water consumed during transpiration, it is possible to determine the water requirements and needs of a particular plant. A number of factors need to be considered when determining the amount of water used for transpiration. These include the mass and volume of the root system, the mass of the plant surface organs, the osmotic pressure of the stem cell sap, depth of groundwater, amount of precipitation, air temperature and relative humidity, soil moisture reserve, the value of water potential of plants, etc. The intensity of transpiration determines the condition of the mouthparts and the amount of water in the leaves as well as the level of water supply to the plants. In some cases, as a result of rapid dehydration of the leaves, the mouthpieces become unable to control water consumption. As a result, the photosynthetic activity of the leaves decreases [8].

Accelerated transpiration in conditions of water scarcity leads to the appearance of water deficiency in the body of plants. As a result, plant growth and productivity are reduced. Under such conditions, the use of transpiration is recommended to prevent water loss by plants [9].

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Under conditions of sufficient water, open mouths characterize the resistance of plants to atmospheric drought. At the same time, transpiration is accelerated, which strongly protects plants from water shortages.

When there is a lack of water, the pores close and the level of turgor and transpiration of the leaves decreases, including photosynthesis. As a result, overall productivity decreases. The productivity of drought-tolerant plants was higher than that of drought-tolerant ones [10,11].

Based on the above data, we studied the intensity of transpiration during the flowering phase of promising soybean varieties.

OBJECT AND METHODS OF RESEARCH

The research was conducted at the Surkhandarya Scientific Experimental Station of the Scientific Research Institute of Cotton Breeding, Seed Production and Agrotechnology. 4 promising soybean varieties (local Baraka, Tomaris man-60, Ustoz MM-60 and foreign Vilana) were used as the object of development. Experimental experiments were carried out in field conditions on four rotating, 15m2 plots. The number of sown seeds was 350,000 per hectare, and sowing was carried out using pneumatic seeders. Placement of experimental plots was carried out according to the method of B.A. Dospekhov[12]. Crop care was carried out in accordance with the measures recommended in the region.

The transpiration intensity of soybean leaves was determined by the method of rapid pulling on a torsion balance (L.A. Ivanov method)[13].

Determination of transpiration intensity was performed on the basis of three repetitions from 8 a.m. to 8 p.m. Mathematical and statistical processing of the obtained experimental data was carried out using modern computer programs.

Research results and its discussion. In the early stages of growth, evaporation from the soil surface predominates, after which most of the water is assimilated by plants for transpiration. The soybean consumed during the flowering, legume formation and ripening stages accounted for 60-70% of the water consumed during the entire growing season. Violation of the water regime during this period leads to the shedding of buds, flowers and fruits, especially in the period of gross flowering drought leads to a decrease in soybean yield by 50% or more.

According to information scientists, transpiration rates are lower in drought-tolerant varieties than in non-drought-tolerant varieties. Increased water supply to plants also increases water consumption through transpiration. Lack of water in the soil reduces the rate of transpiration in plants. In plants with moderate humidity, transpiration rates are higher than in water-deficient environments, and transpiration productivity is also higher [14].

Studies have shown that the intensity of transpiration of soybean leaves depends significantly on the phases of plant development, with development being maximized during the period of formation of generative organs, i.e., periods of gross flowering and fruiting (Table 1).

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Table 1.

Daily variation of transpiration intensity in leaves of different soybean varieties, g/m² h

№		8:00	10:00	12:00	14:00	16:00	18:00	20:00	Average
	Air temperature, ^{0}C	26 ^{0}C	32 ^{0}C	34 ^{0}C	36 ^{0}C	37 ^{0}C	36 ^{0}C	30 ^{0}C	33^{0}C
	Air humidity, %	27 %	20 %	14 %	10 %	9 %	14 %	17 %	16%
1	Baraka	82,6	114,3	140,6	162,6	189,3	126,2	115,2	132,97
2	Tomaris man-60	57,6	100,6	125,8	146,5	164,8	118,2	98,5	116,0
3	Ustoz MM-60	78,5	110,5	133,4	158,4	171,6	120,7	108,4	141,45
4	Vilana	86,4	125,4	168,9	177,3	197,4	136,5	125,8	145,38

In contrast to other crops in the shade plant, the plant is characterized by long flowering and ripening of legumes. From the data obtained, it was observed that the transpiration intensity of soybean varieties varies depending on the variety characteristics and air temperature. In all shade varieties studied, transpiration rates were low in the morning, highest in the afternoon, and low again in the evening.

According to the data obtained, 145.38 grams of water evaporated in 1 hour at the level of 1 m2 of leaves of Vilana variety, while 116 grams of water evaporated from the leaves of Tomaris man-60 variety during this period, that is, during this period, Vilana evaporated 29.38 grams less water than Tomaris man-60 navigator. The remaining varieties also took intermediate positions, evaporating less water than the Vilana navigator, that is, Baraka variety evaporated 12.41 grams, Master MM-60 variety evaporated 3.93 g less water. It was

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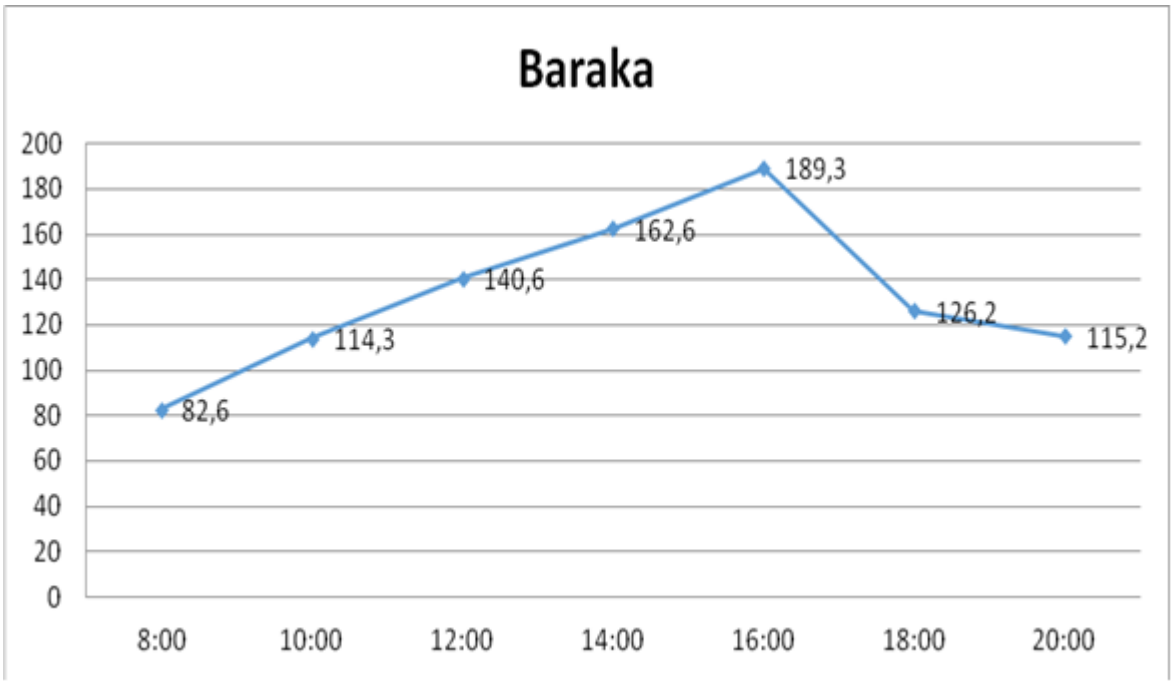
noted that this indicator differs sharply from each other in terms of transpiration intensity of varieties.

As the level of water supply increases, so does the rate of transpiration and water consumption of plants. Decreasing the soil moisture level from optimal to minimum sharply reduces the transpiration rate, resulting in reduced plant growth and productivity [15,16].

According to the results, it was observed that the intensity of transpiration of the leaves of the studied soybean varieties varies throughout the day. In the Baraka variety, the transpiration intensity varied significantly over the range of change during the day, that is, it was found to be 82.6–189.3 (Figure 1).

Figure 1.

Range of change of transpiration intensity during the day in Baraka variety, g/m² hour



As the temperature rose and the relative humidity decreased, the intensity of transpiration gradually increased from morning to noon. This can be seen in the Tomaris man-60 variety, as in all varieties. It was noted that the range of transpiration intensity during the day in the Tomaris man-60 variety was around 57.6-164.8 (Figure 2).

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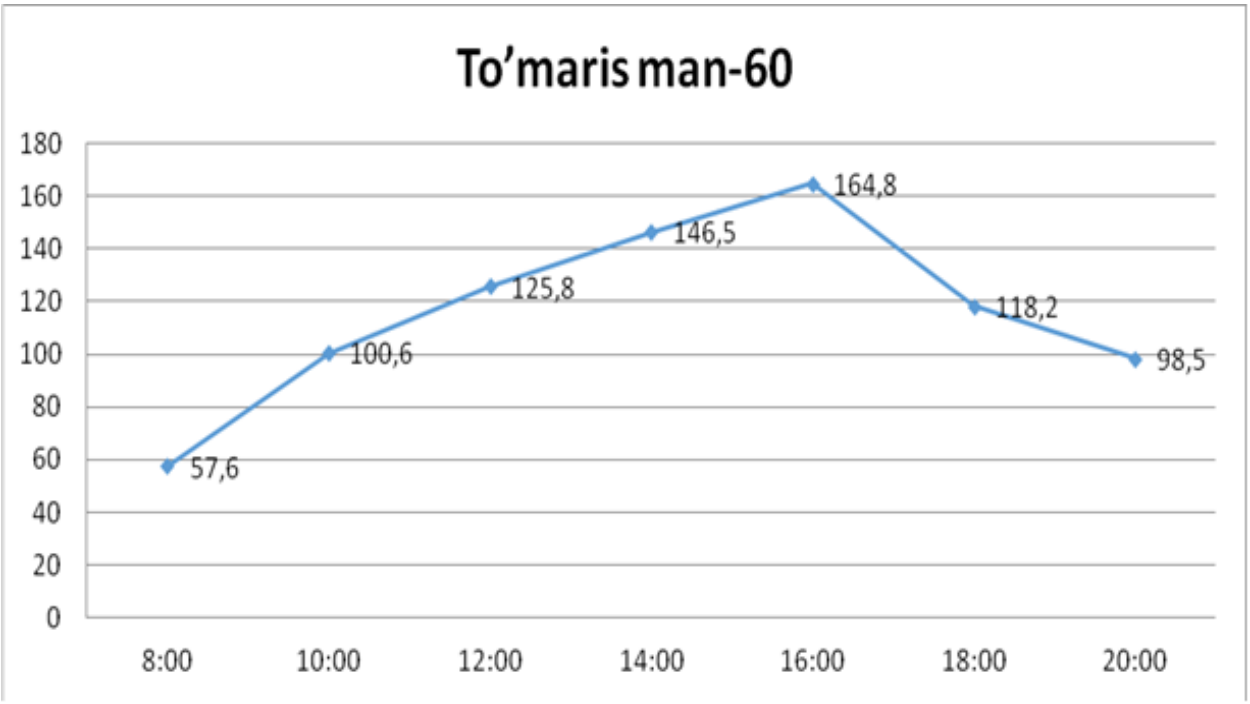
Figure 2.

Range of change of transpiration intensity during the day Tomaris man-60, g/m² h



Because the highest transpiration was observed at 2–16 p.m., the highest air temperature and lowest relative humidity were observed at these times of the day. With the decrease in temperature in the afternoon until the evening, the intensity of transpiration also gradually decreased in all varieties and fell to a minimum in the evening. This is especially evident in the Master MM-60 and Vilana varieties (Figure 3).

Water supply conditions for plants can have a major impact on transpiration intensity, increasing transpiration intensity and physiological processes associated with water exchange by 1-2 times by increasing soil moisture levels. According to plant experiments, transpiration intensity was directly related to soil moisture levels and meteorological factors, especially the amount of free water in the leaves [17,18].

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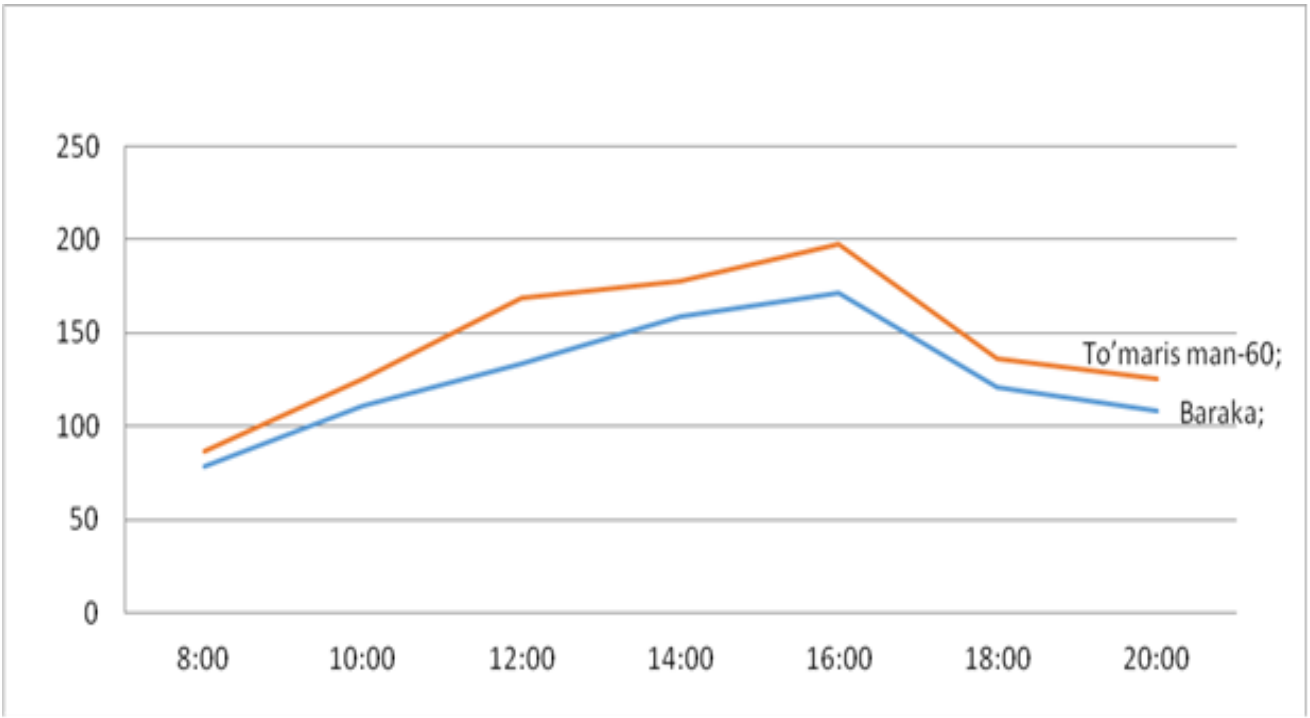
Figure 3.

The range of change of transpiration intensity during the day in Ustoz MM-60 and Vilana varieties, g/m² hour



The change in transpiration intensity during the day is affected not only by air temperature but also by the activity of the leaf axils, which open at sunrise, are open during the day and close again only at sunset, so transpiration occurs several times weaker at night than during the day. It was observed that air temperature and relative humidity varied during the measurement of transpiration during the day in different years and periods of the growth period, which affected the intensity of transpiration. Therefore, it was noted that the process of transpiration in the leaves of the studied soybean varieties varies depending on the conditions of their cultivation.

Hence, based on the above data, the transpiration process will be one of the important physiological indicators of plant life, it is one of the main criteria in determining the level of water exchange and resistance of plants to stressors.

CONCLUSION

Thus, the research conducted is the basis for our conclusion in soybean crops as well as in other agricultural crops. The transpiration intensity of the studied varieties was mainly directly related to the location of the leaves on the plant, the time of day, the increase in temperature, and the relative humidity.

The maximum point of the curve representing the intensity of transpiration occurred in all varieties between 14-16 hours. The intensity of transpiration in the leaves of local varieties of

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shade was 189.3 in Baraka variety at 1400-1600 hours; 164.8 in Tomaris man-60 variety; Teacher MM-60 navida 171.6; in the foreign Vilana variety 197.4 g/m2 h, minimum at 800 in the morning: 82.6, respectively; 57.6; 78.5 and 86.4 g/m2 per hour.

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