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# PECULIARITIES OF THE INTENSITY OF PHOTOSYNTHESIS AND TRANSPIRATION OF SOY LEAVES

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**Annotation:** The paper presents the results of field and vegetation experiments on the study of the relationship of photosynthetic and transpiration activity of soybean leaves in Surkhandarya region.

**Key words:** soybean varieties, photosynthesis, leaves, transpiration, tiered variability

**Introduction:** Adaptation plays a huge role in plant resistance to various climatic factors. To study the mechanisms of plant adaptation, it is necessary to take into account not only morphological, but also physiological properties. The intensity of transpiration and photosynthesis, the work of the stomatal apparatus are the most important physiological processes that contribute to the adaptation and protection of the plant organism from adverse environmental conditions. It is known that transpiration provides cells with water and facilitates the movement of minerals absorbed from the soil by the roots. In addition, transpiration protects plants from overheating. [1].

Photosynthesis and transpiration of leaves are two of the most important physiological processes that are closely related to each other, and they ensure the ability of plants not only to survive in difficult conditions, but also to develop fully. It is known that transpiration is one of the important and necessary physiological processes in plants, which protects plants from overheating and dehydration in dry and hot weather conditions, as well as the movement of water and substances dissolved in water throughout the plant body, it is important in gas exchange [2]. A highly transpiring leaf has a temperature about 7 °C lower than a non-transpiring wilting leaf[3].

It has been found that the total water content in plants with modeintensity humidity varies throughout the day. It is closely related to the intensity of transpiration. Depending on the amount of water spent in the process of transpiration, it is possible to determine the water demand and need of one or another plant. When determining the amount of water used for transpiration, it is necessary to take into account several factors. Including the mass and volume of the root system, the mass of the above-ground organs of the plant, the osmotic pressure of the root cell juice, the depth of underground seepage, the amount of precipitation, the temperature and relative humidity of the air, the moisture reserve in the soil, the value of the water potential of plants, etc. The intensity of transpiration determines the position of the stomata and the amount of water in the leaves, as well as the degree of water supply of plants. In some cases, as a result of rapid dehydration of the leaves, the stomata are unable to control water consumption. As a result, the photosynthetic activity of leaves decreases [4].

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The role of photosynthesis is that it is the main natural source of renewable energy, as a result of which up to 95% of organic matter is formed in crops [5]. This process is associated with the entry of carbon dioxide and water molecules through the stomata of plant leaves and transpiration [6].

The intensity of photosynthesis in the leaves of the studied soybean varieties was determined three times during the day, that is, at 900 in the morning, at 1300 in the afternoon, and at 1700 in the evening. The results of the experiments revealed that the speed of photosynthesis in the leaves of soybean plants grown in vegetative containers changes depending on the new characteristics of the plant, development periods and changes during the day. Also, it was observed that there is a difference in different levels during the flowering period (in the leaves of the upper level compared to the lower level, the intensity of photosynthesis is higher).

Taking into account the above, we conducted studies aimed at determining the specific characteristics and interrelationships of the appearance of photosynthesis and transpiration intensitys in soybean plants.

**Research object and methods**. Research work was carried out in the conditions of field and vegetation experiments. Researches were carried out in the fields of Surkhondarya Scientific Experimental Station of the Scientific Research Institute of Cotton Selection, Seeding and Cultivation. 4 promising (domestic Baraka, To'maris Man-60, Ustoz MM-60 and foreign Vilana) soybean varieties were used as objects of research. Experimental experiments were carried out in field conditions in 24 $m^2$ plots with four returns.

Determining the speed of photosynthesis was determined by the half-leaf method of determining the dry matter formed in the process of photosynthesis recommended by Yu.Saks [7].

The transpiration intensity of soybean plant leaves was determined by the method of rapid withdrawal on a torsion balance (L.A. Ivanov's method) [8]. Determination of the intensity of transpiration was carried out on the basis of three repetitions from 8 am to 8 pm. Mathematical and statistical processing of the obtained experimental data was carried out using modern computer programs.

**The purpose of the research** is to reveal the characteristics of photosynthetic and transpiration activity of soybean leaves during the growth and development period (flowering phase) and according to the location of the stalks (tiers).

**Research results and its discussion.** Studies have confirmed that there is a close positive relationship between photosynthetic and transpiration intensitys of soybean leaves. This relationship was clearly visible in all new plants during the flowering phase of their development. The results of observation are listed in Table 1.

**Table- 1**

**Indicators of transpiration intensity (TI) and photosynthesis intensity (PI) of soybean plant leaves during the flowering phase**

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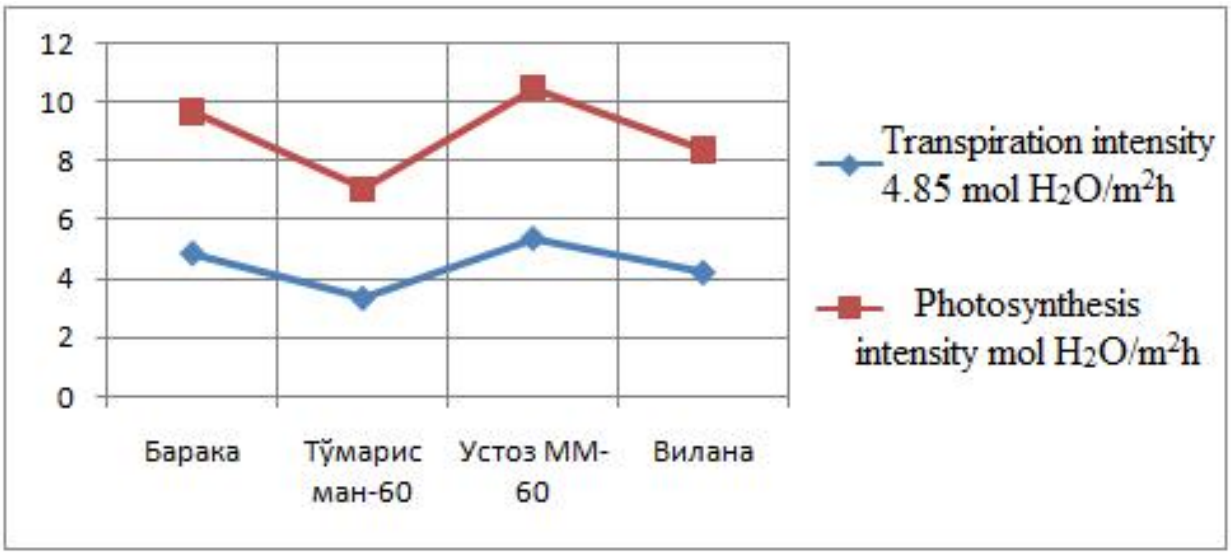


According to the data obtained on the basis of vegetative experiments, when the plants entered the flowering period of development, it was observed that the intensity of transpiration of the leaves increased sharply in the variety Ustoz MM-60, and it was relatively low in the variety To'maris MAN-60. Similarly, a change in the intensity of photosynthesis was observed. That is, at the flowering stage, the value of these parameters is 4.85 mol $H_2O/m^2h$ and (PI) 9.7 $mg/m^2h$ in Baraka variety (TI); In Tomaris MAN-60 variety (TI) 3.35 mol $H_2O/m^2h$ and (PI) 7.1 $mg/m^2h$; Ustoz MM-60 variety (TI) 5.35 mol $H_2O/m^2h$ and (PI) 10.5 $mg/m^2h$; In the Vilana variety, it was noted that (TI) was 4.21 mol $H_2O/m^2h$ and (PI) was 8.42 $mg/m^2h$.

In addition, during this period, the highest transpiration activity occurs in the leaves located in the upper layer(s) of plants, such as the youngest leaves. Their transpiration intensity (from the top to the 3rd joint of the main stem) is from 5.35 to 3.35 mol $H_2O/m^2$ hour, in the middle layer - from 4.1 to 2.8 mol $H_2O/m^2$ hour, and in the lower layer - from 3.5 to 2 The intensity of transpiration was observed up to . 6 mol $H_2O/m^2$ hour. That is, it was noted that the transpiration activity of the upper leaves was on average 1.5 times higher than that of the lower leaves (Table 2).

**Dependence of the transpiration intensity (TI) of soybean leaves on the arrangement of tiers during the flowering phase. mol $H_2O/m^2h$**

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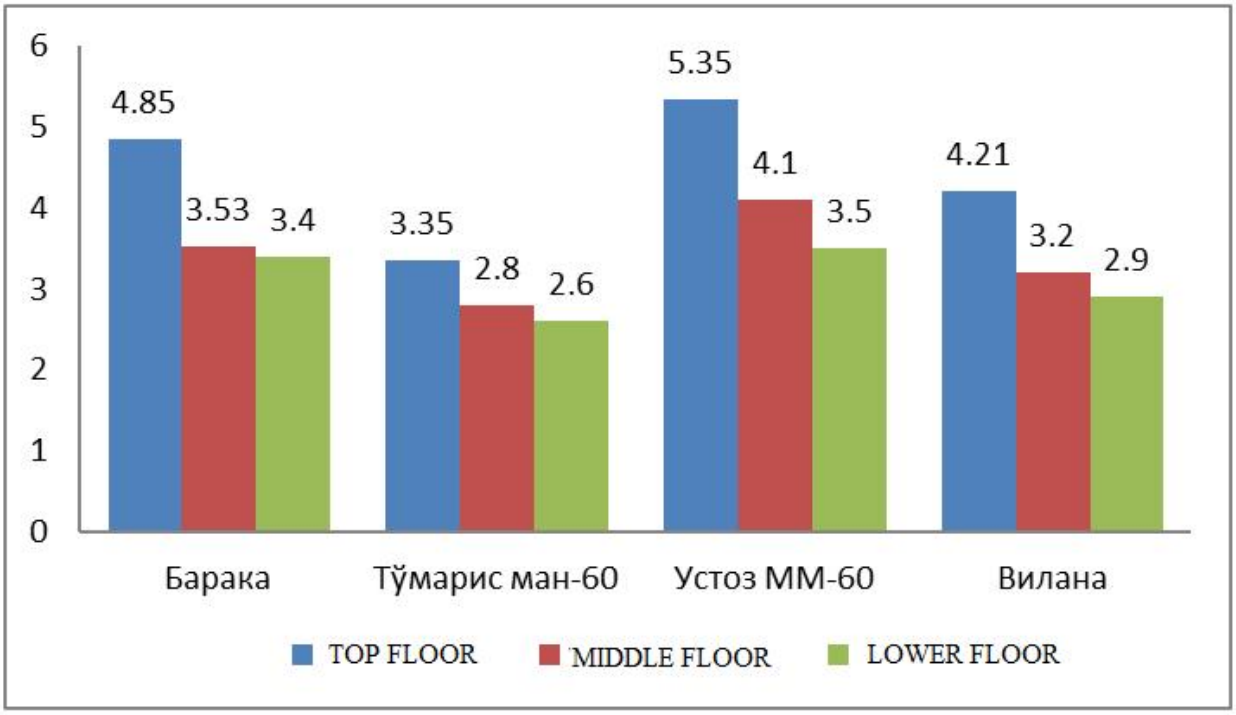


According to long-term field studies, it was found that the speed of photosynthesis of the leaves located from the top to the 3rd generation differs from the lower levels, as well as the speed of transpiration. That is, the intensity of photosynthesis in the upper tiers is from 10.5 to 7.1 mg/m$^2$h, in the middle tier - from 7.95 to 5.82 mg/m$^2$h, and in the lower tier - from 4.28 to 3.21 mg/m$^2$h. observed (Table 3).

This variation in the intensity of photosynthesis and transpiration by tiers is undoubtedly explained by the fact that the lower leaves are older and the processes of changes in metabolism during the period of seed filling begin to be actively manifested in them, which, in particular, leads to a sharp deterioration of permeability in the stomata and, as a result, to a change and decrease in the activity of photosynthesis and transpiration.

**Table 3**

**Photosynthesis intensity (PI) of soybean leaves during the flowering phase depends on the arrangement of layers (mg/m$^2$h)**

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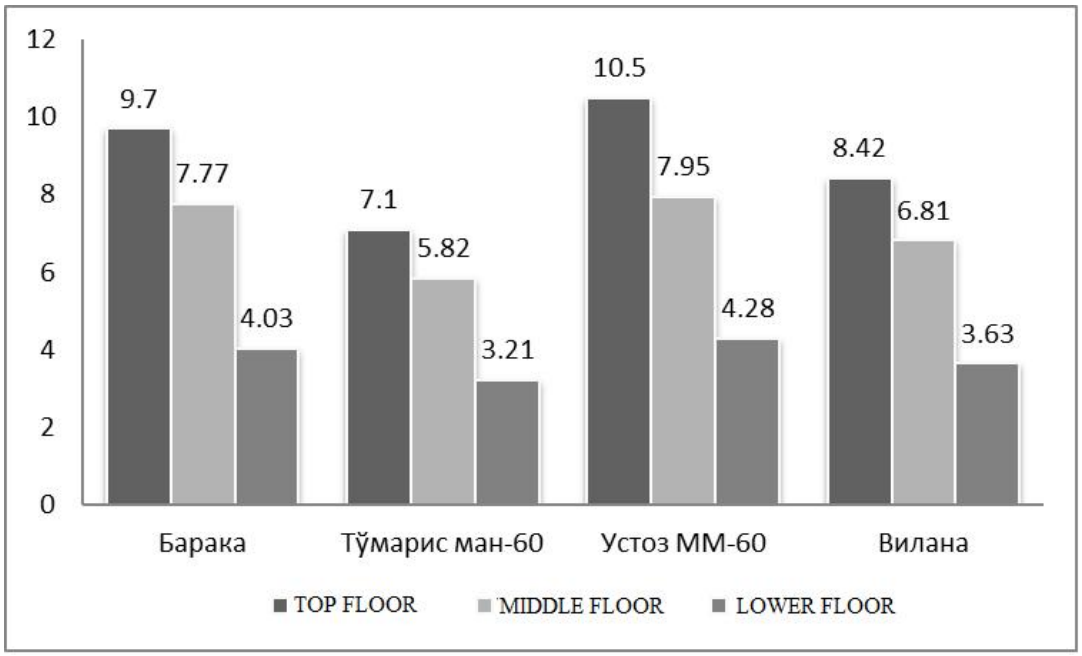
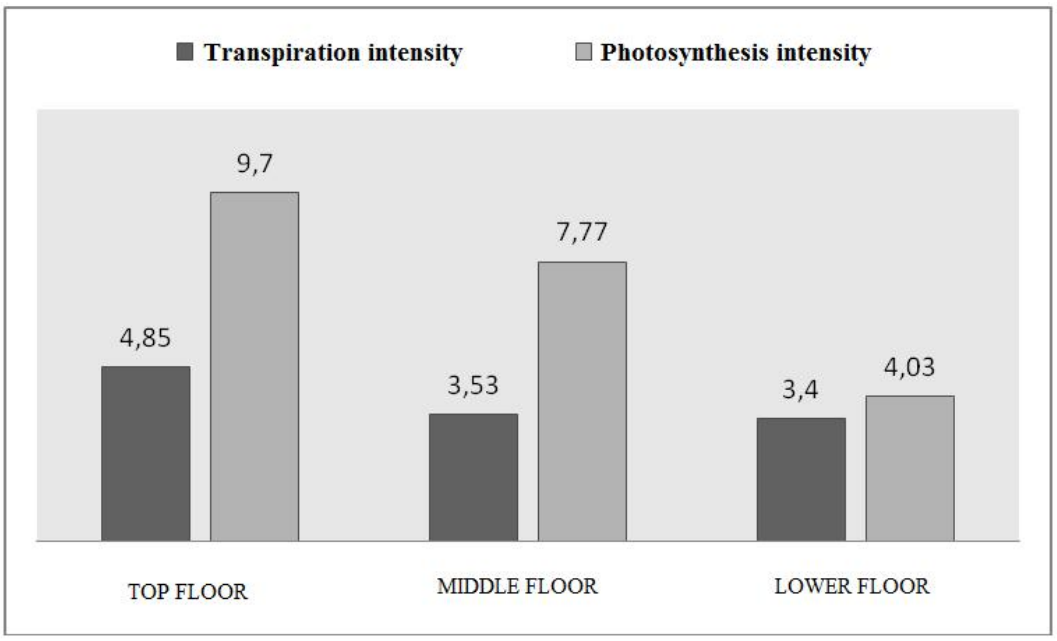



When comparing the intensity of transpiration to the intensity of photosynthesis in the Baraka variety, it is 4.85 mol $H_2O/m^2h$ - 9.7 $mg/m^2h$ in the upper layers, 3.53 mol $H_2O/m2h$ - 7.77 $mg/m^2h$ in the middle layer, and up to 7.77 $mg/m^2h$ in the lower layer. and in the layer - 3.4 mol $H_2O/m2h$ - 4.03 $mg/m_2h$ ratio was recorded (Table 4).

**Table - 4**

**Comparative ratio of transpiration intensity (mol $H_2O/m^2h$) and photosynthesis intensity ($mg/m^2h$) in Baraka variety**



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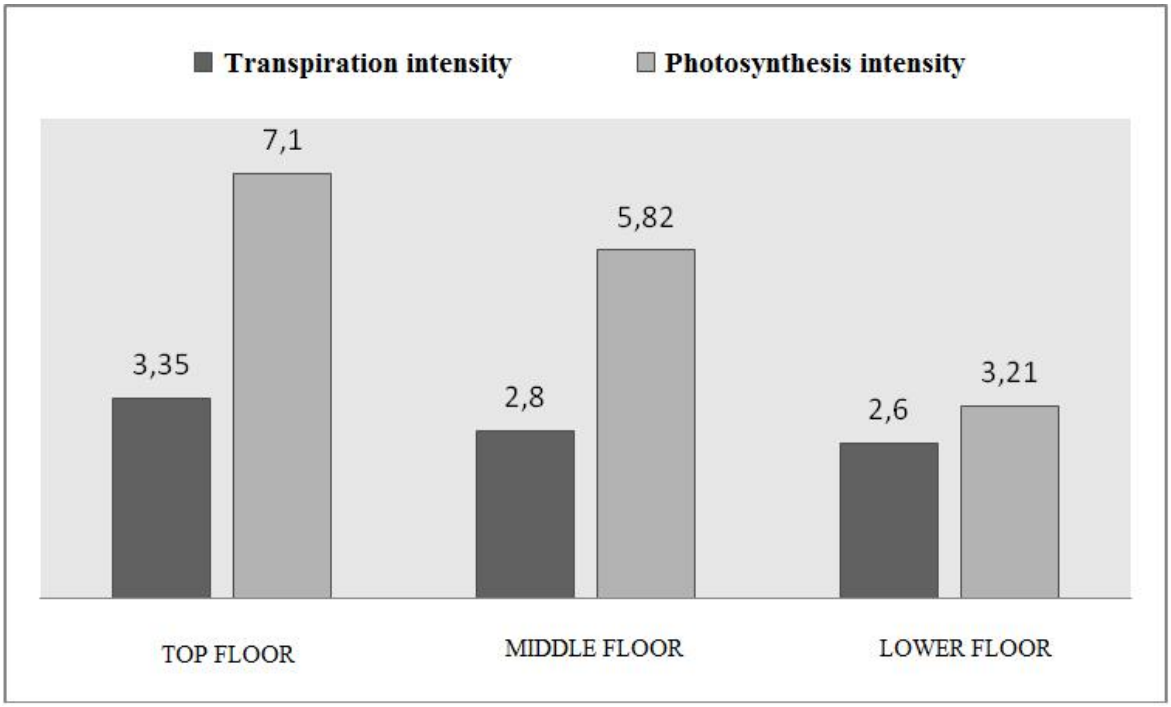
When comparing the intensity of transpiration to the intensity of photosynthesis in Tomaris MAN-60 by tiers, respectively, in the upper tiers it is 3.35 mol $H_2O/m^2h$ - 7.1 $mg/m^2h$, in the middle tier - 2.8 mol $H^2O/m2h$ - 5.82 mg/ up to $m^2h$, and in the lower layer - 2.6 mol $H^2O/m2h$ - 3.21 $mg/m^2h$ was recorded (Table 5).

**Table -5**

**Comparative ratio of transpiration intensity (mol $H_2O/m^2h$) and photosynthesis intensity ($mg/m^2h$) in Tomaris MAN-60 Variety**




When comparing the intensity of transpiration to the intensity of photosynthesis in Ustoz MM-60 by tiers, respectively, in the upper tiers it is 5.35 mol $H_2O/m^2h$ - 10.05 $mg/m^2h$, in the middle tier - 4.1 mol $H_2O/m^2h$ - 7.95 mg/ $m^2h$, and in the lower layer - 3.5 mol $H_2O/m^2h$ - 4.28 $mg/m^2h$ (table 6).

**Table - 6**

**Comparative ratio of transpiration intensity (mol $H_2O/m^2h$) and photosynthesis intensity ($mg/m^2h$) in Ustoz MM-60 variety**

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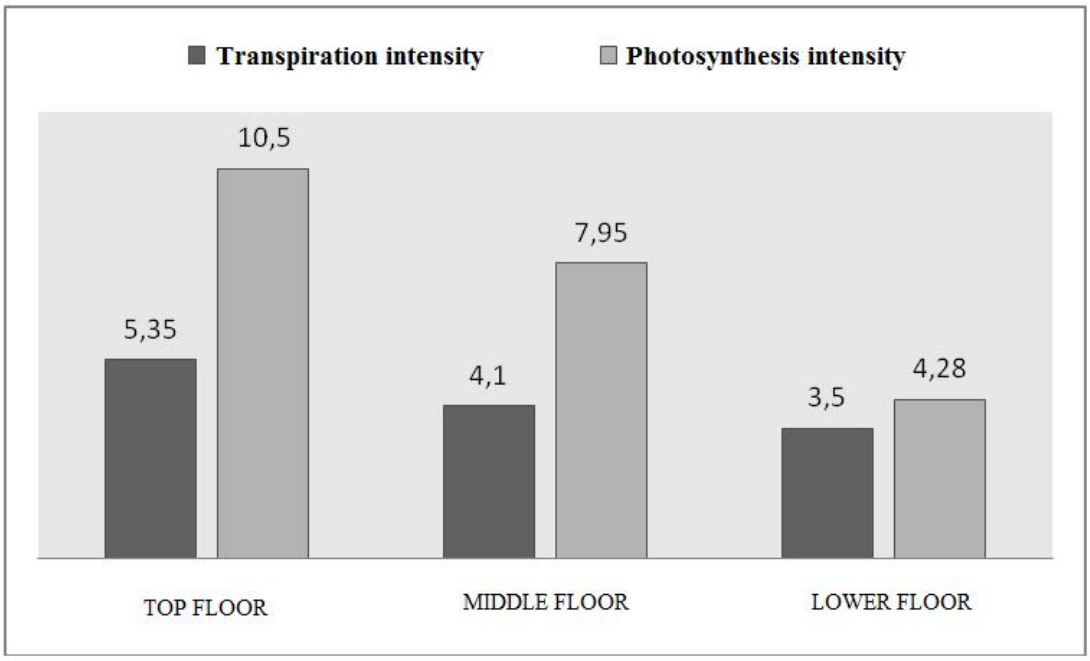


When comparing the intensity of transpiration and the intensity of photosynthesis in Vilana variety by tiers, respectively, in the upper tiers, 4.21 mol $H_2O/m^2h$ - 8.42 $mg/m^2h$, in the middle tier - 3.2 mol $H_2O/m2h$ - up to 6.81 $mg/m^2h$. , and in the lower layer - 2.9 mol $H_2O/m2h$ - 3.63 $mg/m_2h$ ratio was recorded (Table 7).

**Table 7**

**Comparative ratio of transpiration intensity (mol $H_2O/m^2h$) and photosynthesis intensity ($mg/m^2h$) in Vilana variety**

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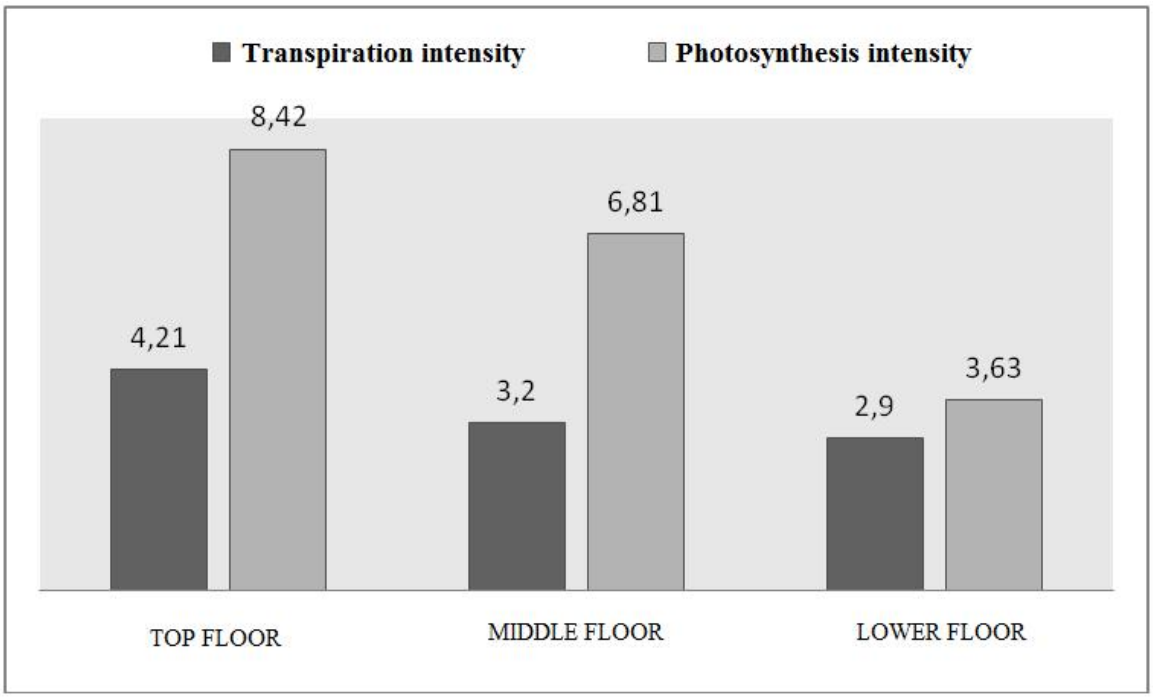


**Summary.** Thus, the conducted research gives us the basis to come to the same conclusion in soybean varieties, as in other agricultural crops. In soybean plants, the intensity of photosynthesis and the intensity of leaf transpiration are closely related to each other and mainly depend on the location of the leaves on the plant, the time of day, the increase in temperature and relative humidity.

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