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TRANSPIRATION

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У статті детально розглянуто процес транспірації рослин. Транспірація – це фізіологічний процес випаровування рослиною води, це важливий компонент верхнього кінцевого двигуна і являє собою фізіологічний

процес випаровування води рослиною. Як відкриваються продихи у листків, яким чином вода пересувається до поверхні листка. Розкрито механізми транспірації та її види. Розглянуто витрати води на транспірацію, які чинники впливають на транспірацію. Як впливає температура повітря, інтенсивність освітлення, вологість і швидкість повітря, забезпеченість рослин водою, температура листкової поверхні на процеси випаровування води. За рахунок високої сисної сили клітин листкової паренхіми забезпечується пересування води уверх по рослині. Таким чином, сила верхнього кінцевого рушія буде більша і активніша транспірація.

The article deals with the process of plant transpiration in detail. Transpiration is a physiological process of evaporation of water by a plant, it is an important component of the upper end engine and is a physiological process of evaporation of water by a plant. As breaths are opened in leaves, how water moves to the surface of the leaf. The mechanisms of transpiration and its types are disclosed. The costs of water for transpiration, which factors affect transpiration, are considered. The effect of air temperature, light intensity, humidity and air velocity, water supply to plants, leaf surface temperature on water evaporation processes. Due to the high suction power of the cells of the leaf parenchyma, the movement of water up the plant is ensured. Thus, the force of the upper end mover will be greater and more active transpiration.

Key words: *water balance, transpiration, evaporation of water, Environmental Factors*

The wet walls of mesophyll cells are constantly exposed to air in intercellular spaces. Accordingly, water evaporates from the wet walls, accumulates as vapor in the air spaces, and diffuses out of the leaf. This loss of water as vapor is referred to as transpiration. Most of the vapor escapes through open stomata, but some may diffuse through the cuticle. If the water escapes through stomata, the process is known as stomatal transpiration, whereas if it

diffuses through the cuticle, it is referred to as cuticular transpiration. Transpiration is not limited to leaves; twigs, fruits, flowers, tubers, and other plant parts also transpire.

Transpiration can be easily demonstrated by placing an inverted flask over a plant shoot with the cut end extending through a hole in a piece of cardboard into a beaker of water. A similar setup without a shoot serves as a control. In a short time drops of water condense on the inner wall of the flask which surrounds the plant, but not on the control flask. The water is given off as vapor from the leaves and then condenses on the flask.

An amazing amount of water passes through a plant in a season, absorbed by its roots and much of it lost as vapor through the leaves. A tree may transpire 50 gallons in a day. One large apple tree transpires 1800 gallons (close to seven tons) in its growing season. In nature it sometimes happens that springs tapped by the roots of large trees dry up when the leaves come out. A single corn plant may transpire 400 pounds of water during the growing season and an acre of corn plants 1200 tons. This vast amount of water is absorbed by roots and moved through the stem into the leaves.

Weeds, like crop plants, transpire rapidly. One of the major reasons for cultivation is to eliminate the competition for water between weeds and crop plants. In some areas the annual precipitation is not sufficient for crop production. However, crops may be raised in such regions by summer fallowing and eliminating weeds. When the land lacks plants, water accumulates in the soil. In this system crop plants have one full year's precipitation plus that stored in the soil while the land was fallow.

The lavish use of water by plants is further evident from a consideration of the number of pounds of water used to form one pound of dry weight. Sorghum plants use 250 pounds of water for every pound of dry matter accumulated. The amount of water used by some other plants to accumulate 1 pound of dry matter follows: corn, 350 pounds; wheat, 500; potatoes, 636; alfalfa, 900. The units of water (in pounds, grams, tons, etc.) required to form a unit weight of dry matter (in

the same system of measurements) is known as the water requirement or the transpiration ratio. For example, the water requirement of alfalfa, as seen above, is 900. The water requirement varies to some extent with environmental conditions because the rate of transpiration is influenced by a number of surrounding factors.

Let us see if the plant benefits from transpiration. The evaporation of water lowers the temperature of leaves 2° to 6° C. This may be of some value on very hot days. When leaves are exposed to bright sun, their temperature may be 10° C., or even more, above that of the surrounding air, in spite of transpiration. Though transpiration plays ole in Jowering leaf temperatures, other factors that of the surrounding air, in spite of transpiration. Though transpiration plays a role in lowering leaf temperatures, other factors are far more important. When the temperature of a leaf is above that of the surrounding air, the leaf loses heat by conduction, convection, and radiation. If a leaf exposed to full sun did not give off heat by these means, its temperature would be at the boiling point in a few minutes.

It has been suggested that transpiration plays a role in bringing minerals and water to the leaves, but the evidence for this is not clear-cut. It may, at first thought, seem strange that the process of transpiration is of little value to the plant, but it should be recalled that leaves are primarily food-manufacturing organs. If leaves are constructed for efficient food manufacture, the loss of water is in evitable because walls of mesophyll cells must be wet, and stomata must be present in order for photosynthesis to occur.

Environmental Factors Affecting Transpiration. Factors which affect evaporation influence the rate of transpiration. Clothes on a line dry rapidly when the relative humidity is low, the temperature high, and the day windy. Likewise, transpiration in plants is rapid under such conditions. The rate of transpiration is also influenced by light and soil factors.

RELATIVE HUMIDITY. When air is dry the relative humidity is low, when moist it is high. Relative humidity is the amount of water the air actually has in it compared to the amount it could hold vapor at that temperature. The result is given as a percentage. If the relative humidity is 100 per cent the air is saturated, and if a

leaf is at the same temperature as the air, transpiration does not occur. If other environmental conditions remain constant, the rate of transpiration is inversely proportional to the relative humidity. Transpiration is rapid at low relative humidities and slow at high ones.

TEMPERATURE. Because evaporation occurs more rapidly at high temperatures than at low ones, transpiration increases as the temperature rises. Furthermore, air at high temperatures can hold more vapor can hold about twice as much water vapor as air at 70° F. If the air at 70° F. is completely saturated, the relative humidity is 100 per cent. But if the temperature rises to 90° F., that amount of water than air at low temperatures. For instance, air at 90° F. water is no longer enough to saturate the air; in fact, it will result in a relative humidity of approximately 50 per cent. For every rise of 20° F., the relative humidity is about halved, provided no moisture is added to or subtracted from the air. Conversely, as the temperature goes down, the relative humidity increases. During the day when temperatures are high, the relative humidity is low and transpiration is rapid. As the temperature decreases during the night, the relative humidity increases and transpiration diminishes. If the drop in temperature is great enough, the relative humidity becomes 100 per cent; fog or dew will then form and transpiration will cease.

WIND. If the air is still, the relative humidity of the air immediately outside the stomata is higher than the surrounding air. If the day is windy, the moister pockets of air are replaced by the drier air of the atmosphere and transpiration is augmented. The wind velocity in an orchard or other place may be reduced by planting trees along the border, that is, by a windbreak. The windbreak not only lessens transpiration but also reduces the injurious effects of wind action on growth.

LIGHT. Light brings about the opening of stomata and furnishes the for evaporation. Furthermore, light increases leaf tem energy perature, which results in a greater diffusion gradient. Hence, transpiration is more rapid during the day than during the night.

SOIL FACTORS. Transpiration is reduced when water is not available to the plant, such as during periods of drought and when the soil is frozen or at a temperature so low that water is not absorbed by roots. The resulting water deficit brings stomata and, in certain plants, an increase in the water-holding capacity of protoplasm.

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