



## TRANSPIRATION DIURNAL EVOLUTION OF FOREST SEEDLINGS INSTALLED ON DEGRADED LANDS IN WESTERN PLAIN

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### Abstract

Western Plain is one of the most affected regions from Romania by land degradations process. In the same time, this area is also vulnerable area to aridity and drought, having a low coverage of forests. Afforestation of degraded lands shows a lot of characteristics and numerous forms depending on field conditions. The researches during 2008-2012 had one of the purposes to establish the transpiration diurnal evolution, because it is very important in the seedlings growth and their vegetation stage. The experience acquired in the improvement through forest cultures for the protection of the degraded lands is very useful.

**Keywords:** transpiration, forest seedlings, diurnal variation, soil, humidity.

### INTRODUCTION

The process highlights the most direct relationship with plant transpiration factor is water. This is not a "necessary evil" as sometimes claimed, but a natural and normal process that is subject a number of other processes essential for life, such as photosynthesis, cell construction, energy consumption, waste disposal, etc. to avoid overheating. Physiological aspect sweat indicates health of plants, meaning that a good sweat, carried free, unrestrained, high parameters is a sign of normal functionality in satisfactory environmental conditions. That is why our research to test for significance perspiration. It is the process that can indicate the measures introduced species are adapted or pedohidric factor in using available water regimen, you have chance of survival in case of prolonged droughts.

### MATERIAL AND METHODS

Study area is the central part of the Western Plain, the low plain (altitude below 100 m) between Chisinau-Cris and Secusigiu localities. The sections in the basin of three rivers: Cris White, Mures and Teuz (tributary of Körös). In this stretch of land were set up 10 blocks of improvement, totaling an area of 679 ha.

The research included 10 species of forest, part of the two main phytocenotic categories: basic species (oak, ash meadow, black walnut and white poplar) and species auxiliary mixing (Malin, maple, apple, pear and *Prunus cerasifera*). The method used was that recommended by Boysen Jensen, with subsequent changes Huber - Ivanov: fast weighing detached plant leaves (individual) to a torsion balance, by repeating the weighing after sun exposure for 3 minutes, in three repetitions. Where appropriate, have been carried out a series of determinations on 6-8 day (between 8 and 18)

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. Results are given in mg H<sub>2</sub>O removed / g leaf green / hour.

## RESULTS AND DISCUSSIONS

Each species has a specific model of transpiration, water suitable vehicular speed root path - strain - stalk - leaf and its rate of loss through stomata. Any interruption of the circuit, any deficiency is corrected by stomatal control. Intensity of sweat appears as an accommodation, the balance between human needs and available soil water reserve.

Our research leading to the following results:

English oak (Fig. 1.) Has an intensity of sweating more differentiated according to soil type: high intensities of 700 mg · g<sup>-1</sup> · h<sup>-1</sup> on vertisol amfigleizat, moderate brown soil eutricambosol (eutricambosol) (intensity up to 550 mg · hr · g<sup>-1</sup> · h<sup>-1</sup>) and small on the alluvial soil stabilized Meadow Mureșului (intensity of 300-475 mg · g<sup>-1</sup> · h<sup>-1</sup>). Are values showing reactivity to factor water oaks and that the species uses "rational" soil resources, adapting to the situation: more water (higher humidity) on vertisol, sweating increased, less water followed by sweating less than the other types of soil.

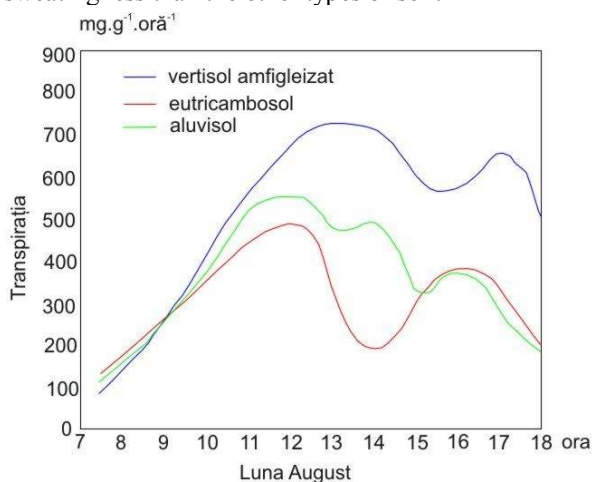


Fig.1. Diurnal intensity of transpiration for pedunculate oak considering different soil types

Reactivity of the species seen and how resulting diurnal variation of transpiration: in all cases there is a depression (decrease) sweat in the afternoon, more pronounced in aluvisol and eutricambosol more modest in vertisol, leading the appearance of two peaks daytime. Minima which are located between the maximum gap is explained by which naturally occurs between absorption and elimination: at a time when air temperature reach or approach the maximum

perspiration increases so much that exceeds the rate of water absorption from the soil, causing an "empty" supply. Consequently sweat drops, but recovers back to normal as soon as the temperature drops, leading again to a maximum.

This eco-physiological behavior with promptly and appropriately adjusting resource called "poikilohidru" where plant relationship - water is found in both plant and animal world and represents a specific adaptation to the environment. The poikilohidria is higher, the opportunities to use and integrate in a given environment are higher and increase adaptability. From this point of view (pedohidric) oaks presents as a potentially adaptable species, which shows that its introduction into the perimeters of improvement is welcome.

Interestingly, it is found that the timing of the minima of sweat does not coincide with the maximum temperature (diurnal) and is offset to the right (in the evening) with 0.5-1.5 hours, as seen from the comparison of the change in (curve)(Fig. 2.). The explanation given is that before: the gap between absorption and elimination.

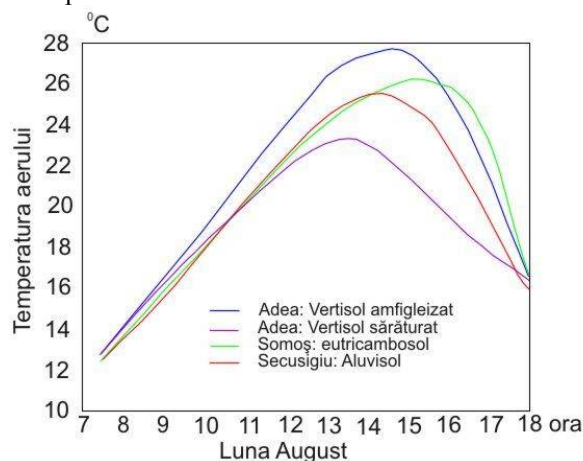


Fig. 2. Air temperature of the regions considered to perform transpiration determinations depending on station (amelioration perimeters)

Turkey oak like other species of oak show great differences in sweat on soil types (Fig. 3.), But there is a new element to be noted: the curve of the seedlings from eutricambosol presents one maximum diurnal depression of missing afternoon but present in the other two cases (the vertisolul vertisolul amfigleizat and salty). What is the cause of this anomaly does not know, but it shows a poor poikilohidrie, which results from the fact that the other two biotypes lows are poorly expressed, with low intensity.



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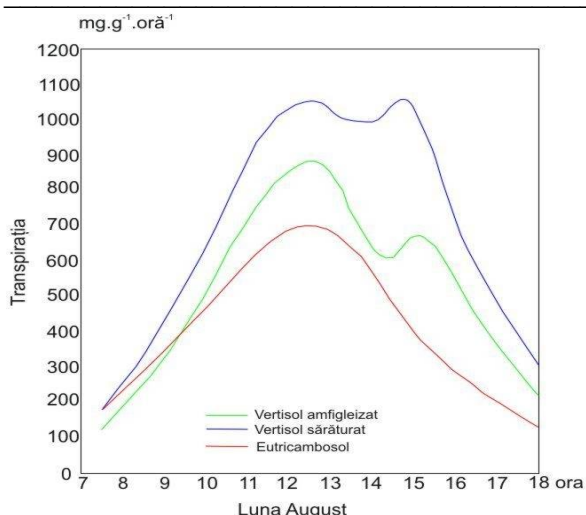


Fig.3. Intensity of transpiration in case of turkey oak considering different soil types

The result is approaching, to a certain extent by other authors findings were found to require a unimodal perspiration (with a single peak), as opposed to other oaks from which it is bimodal. It seems that setting (control) on water consumption is lowering sky of the entire value of sweat, which is preferably performed by decreasing circulation apoplasmatică. This explains why else dehydration (drying) leaves of this species in the case of detachment from the stalk is slower than the flasks and oaks [2,3].

On the other hand, it is noted that in all cases we investigated compared with the other species, the sky appears transpirație values of the larger the maximum of 700, 900 and 1000  $\text{mg} \cdot \text{g}^{-1} \cdot \text{h}^{-1}$ , which justifying the inclusion of the species' megahidre "with the addition of the adjective" subpoikilohidric "(or" semihomeohidre ")", marks that characterize species consuming water constantly argued powered transpiratoriu imperfect. It's typical behavior, might say normal water species consuming sufficient soil moisture conditions, but substantial discount, making the economy severe deficiency if pedohidrică (stress). Prudence requires that such a species (with special sensitivity to water) to be used only in biotypes with extra moisture [9, 11].

Ash meadow was introduced widely in plantations, given the wide spread in the area, which is justified and eco-physiological, because it has a higher average level transpiration (Fig. 4.) Bimodal type. Note minimum tendency to form two afternoon, the first nearest one of the temperatures (see also Fig. Two.), The second most distant (after 2-2.5 hrs), which shows a high sensitivity thermal-hydr, and that the type of soil differences are

not too large. It seems that pedohidric soil feels best, reverse the previous species is eutricambosol, the opposite is vertisolul amfigleizat, which means that the species does not like argilozitatea too high, which as noted in the area is usually accompanied hydromorphic phenomena.

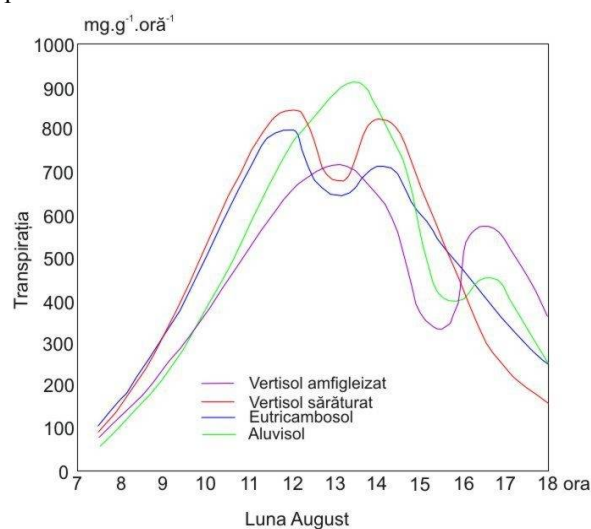


Fig. 4. Intensity of transpiration in case of ash meadow

In terms of the relationship with water factor species can be used on all soils, but the best are types except clay.

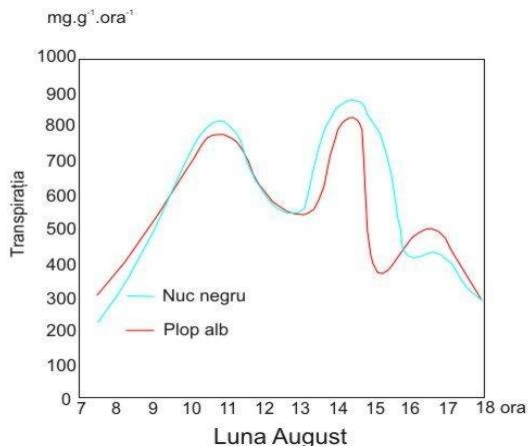
Black walnut (Fig. 5) shows great similarities in terms of transpiration with ash floodplain, including with regard to the three maximum daytime (last low, barely sketched). This species is under intense poikilohidre (with high reactivity to water factor), with relatively high water consumption [14, 5, 12].

They are qualities that make it suitable for all soil types in the region, regardless of the argilozitate, among others due to poor rooting depth and very penetrating.

White poplar (Fig. 5.) is very much like the sweating black walnut, with a curve almost identical, with the same ups and downs. Overall, values are high species, but the species of meadow habitat with abundant resources pedohidrică would expect them to be even higher. Perhaps this comes as a moderator factor special leaf hairiness on the dorsal side. More intense is the sweat of black poplar (I. Chisalita, 2001), which, as we know, has leaves without bristles.



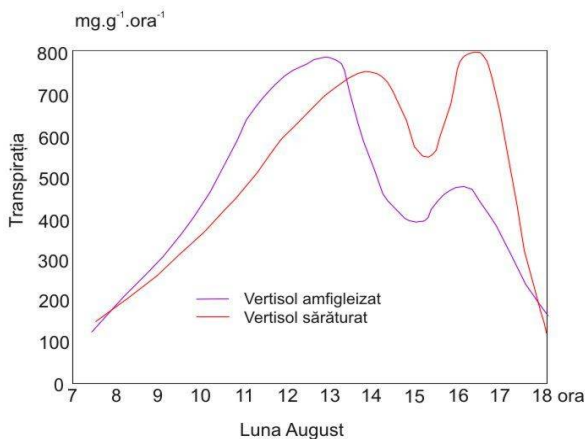
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**Fig.5.** Intensity of transpiration for white poplar and black walnut on alluvial soils found in Mures meadows (the area dam-river-bank)

Bird cherry is highly reactive in the sweat, showing large differences between maximum and minimum (very deep depressions lunch), which demonstrates great sensitivity to factor water (Fig. 6.). Unlike the other cases investigated Malin values on salty vertisolul are higher, but actually a little smaller than other types of soil.

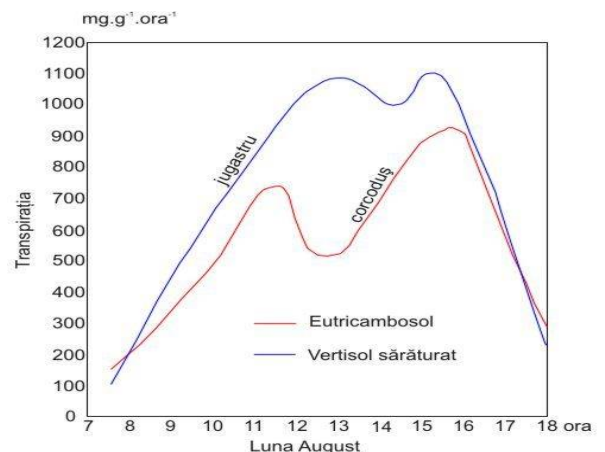
Perhaps this species does not support the presence of salts in the soil, even in small quantities, showing a different sensitivity as important: the chemical. That can better accommodate Malin soils pedohidric alternating regimen, but rich in the first half, but avoids the concentration of soluble salts, toxic. Mollie indicated soils, drafts and clay illuviated without or with moderate hydromorphism [7, 15, 16].



**Fig. 6.** Diurnal intensity of transpiration for bird cherry considering to soil types

Hedge maple presents an extremely high intensity sweating of the sky, or even higher (Fig. 7.), falling among species typical megahidre. Taking and poikilohidrie reduced species can be considered consuming water, so should be used with caution in resorts with addition of moisture (usually with pronounced hydromorphism) and close to the natural rate (10-20%).

Cherry plum (Fig. 8.) also contains sweat more, given that we are on a eutricombosol, you know that this process resulting in a lower intensity. Great depression poikilohidrie afternoon show a pronounced, hence the species is quite adaptable and can be used successfully resorts pedohidric regime variable, as most of the Western Plain [17, 13].



**Fig. 8.** Diurnal intensity of transpiration for hedge maple and cherry plum on different soils

Forest pear (Fig. 9.) after sweating intensity is moderate among species and poikilohidrice megahidrice with some consistency (with little differentiation) on different types of soil: approaching curves (overlap) mostly. In general, the values are higher than we would expect from a species known as the least demanding factor to water (traces of steppe), especially if eutricambosol that other species investigated we had a sweat at least moderate [1, 8, 4].



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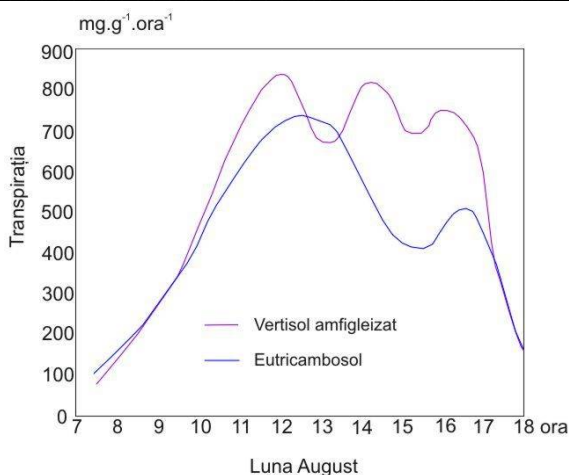


Fig. 9. Diurnal intensity of transpiration for forest pear considering different soil types

Crab apple (Fig. 10.) has a strong sweat differentiated by soil type variations small twelve o'clock position, which means weak pedohidric reactivity, but fails to ground differentiated according to their potential biogeochemical: large, soil rich in clay with hydromorphic transformation and small, soil with lower clay aggregation. Emphasized that the species is almost the lowest intensity of transpiration determined by our research cambic soils (eutricambosols), which recommends being introduced resorts drier longer moisture deficit [6, 10].

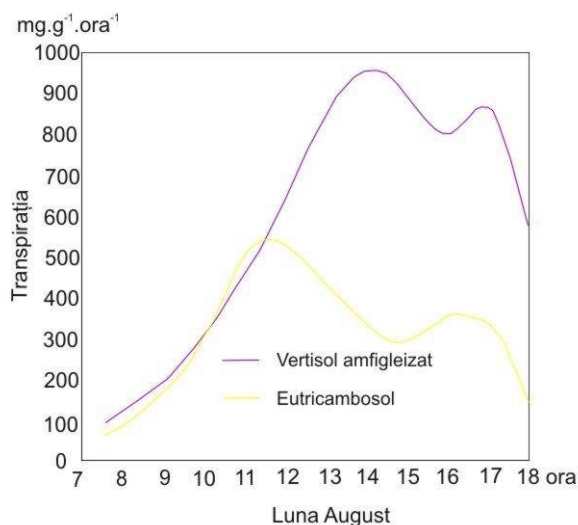


Fig.10. Diurnal intensity of transpiration for crab apple considering two soil types

## CONCLUSIONS

Transpiration, the process that best reflects the state of hydraturare soil was conducted after two daytime maximum intensity in all species taken in research (English oak, Turkey oak, meadow ash, black walnut, white poplar, maple, Prunus cerasifera, apple wild and wild pear), which demonstrates a good stomatal control in seedlings and sufficient reserves of water in the soil, but at a reduced accessibility.

After adjusting intensity and separated groups:

- Species with high intensity of sweating (over 550 mg / g · h) and large hourly variations (poikilohidre): the Turkey oak, maple, Prunus cerasifera;
- Species with lower intensity (mean) hourly variations too large (poikilohidre) meadow ash, black walnut, white poplar, Malin, wild hair and wild apple;
- Species with relatively low intensity (below 450 mg / g · h) and moderate oral variations (mezohomohidre) oaks.

A similar classification is obtained as a medium for soil plant that provides a quantity of available water:

- Soils that seedlings had a sweating high (over 550 mg / g · h average daytime) salty soil, wet aluviosol groundwater;
- Soils with relatively low sweat seedlings (less than 400 mg / g · h) eumezobazicul brown.

## REFERENCES

- Banu C., Crăciunescu A., Chisăliță I., Ștefan Carolina, Moatăr Mihaela, 2011, Area improvements with forest vegetation and sustainable development environment, Journal of Horticulture, Forestry and Biotechnology, vol. XV (4), 124-127;
- Banu C., Crăciunescu A., Chisăliță I., Ștefan Carolina, Moatăr Mihaela, 2011, Elements for the determination best age (age exploitability) which table can be harvest in stands wood household under regular forest treatment, Journal of Horticulture, Forestry and Biotechnology, vol. XV (4), 124-127;
- Chisăliță I., 2000, Probleme actuale și de perspectivă privind conservarea, protejarea și dezvoltarea fondului forestier din județul Caraș-Severin, Pădurea românească la cumpăna mileniilor", Facultatea de Silvicultură și Exploatarea forestiere, Universitatea Transilvania, 33-36;



- Chisăliță I., 2005, Măsuri de combatere a poluării mediului prin instalarea vegetației forestiere pe haldele de flotare ale întreprinderii miniere Moldova Nouă, Cercetări științifice, vol. IX (2), 175-178;
- Chisăliță I., Crăciunescu A., Țenche – Constantinescu Alina, 2008, Research concerning the macro and micro fauna of the sterile dumps in Moldova Nouă after 10 years of forestation, Cercetări științifice seria a XII a, Horticultură-Inginerie genetică, vol. XII, 279-287
- Chisăliță I., Crăciunescu A., Țenche – Constantinescu Alina, 2008, Research concerning the coverage of sterile dumps in Moldova Nouă with forestry vegetation, Cercetări științifice seria a XII a, Horticultură-Inginerie genetică, vol. XII, 415-420;
- Crăciunescu A., 2004, Dezvoltarea și vitalitatea zonelor rurale din România, în contextul integrării în Uniunea Europeană, "Perspectivele economice ale francofoniei asupra dezvoltării durabile", Forumul Francofon al Afacerilor, Paris, 22-24;
- Crăciunescu, A., 2004, Pădurile și implicația fenomenului de desertificare, Workshopul tehnic privind preîntâmpinarea secetei în Balcani, Poiana Brașov, 56-59;
- Crăciunescu A., 2004, Diversitatea și polifuncționarea pădurilor românești, producția de lemn, conservarea biodiversității, gestiunea vieții sălbatice, Manifestări menite să promoveze imaginea valorilor tradiționale românești la cultura europeană", Universitatea Agronomică din Gambloux, Belgia, 67-69;
- Crăciunescu A., 2008, Research on seedling biomass on two soil types in the Crișului Alb Plain, Cercetări științifice seria a XII a, Horticultură-Inginerie genetică, 340-344;
- Ciolac Ramona, Csoz I., Pet Elena, Martin Simona, Dincu Ana Maria, 2011, Research on the features witch customize areas with developed agritourism from Central Region of Romania, Lucrări științifice Management Agricol, Seria 1, vol. XIII(4), 103-108;
- Iosim Iasmina, Iancu Tiberiu, Popescu Gabriela, Martin Simona Cristina, Marin Diana, Radac Bianca, 2013, The implementation of negotiating styles in agrotourism, Lucrări Științifice, Facultatea de Management Agricol, Seria I, vol XV (1), 123-1228;
- Lile Ramona, Calitatea și managementul calității, Ed. Mirton, Timișoara, 2010, 89-92;
- Moatăr Maria Mihaela, Lăzureanu A., 2010, Research on the measurements used in the test areas located in production Steierdorf III, Journal of Horticulture, Forestry and Biotechnology, Vol XIV (3), 168-171.
- Moatăr Maria Mihaela, Lăzureanu A., 2010, Research on the production arrangement applied Steierdorf Unit III, Journal of Horticulture, Forestry and Biotechnology, Vol XIV (3), 164-167.
- Moatăr Maria Mihaela, Lăzureanu A., Chisăliță I., 2011, Lucrări Științifice, Facultatea de Management Agricol, Seria I, Vol XIII (2), Forestry and Biotechnology, Vol XIV (3), 419-422.
- Orboi Manuela-Dora, 2012, Development of rural communities by diversification of rural economy in the context of sustainable development, Lucrări științifice, Facultatea de Zootehnie și Biotehnoogii, vol. 45 (1), 450-453;
- Solomonesc A., Chisăliță I., Moatăr Maria Mihaela, Ștefan Carolina, Foră G.C., 2012, Issues of forest management in Reșița County", Journal of Horticulture, Forestry and Biotechnology, vol. 16 (2), 243-246;
- Stanciu S., Tabără Amânar C., 2011, Comparative analysis of the offenses covered by forest legislation in Romania, Journal of Horticulture, Forestry and Biotechnology, vol. 15(1), 203-208.
- Stanciu S., Tabără Amânar C., 2011, Comparative analysis of the offenses covered by forest legislation in Romania, Journal of Horticulture, Forestry and Biotechnology, vol. 15(1), 187-190.