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Original Article

The Research of some Elements from Climate Regime with the Influence of the Forests from River Somes upon Vegetation Condition

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Abstract

According to the definition, the forests are the landscape's product and essentially depend on climatic factor. The geographical distribution of forest species and formations is determined, with some exceptions, by this complex factor, mainly by the thermal and fluid component of it. Corroborating the climatic conditions with the sensitivity of forest species and the adaptability of phytophagous agents, given the lack of some strong and concentrate actions to combat, it can be explain the long presence of some pathogens and attacks in some areas and stands.

Keywords: stands, climate regime, ecometric indices, temperature, rainfall, annual, multi annual

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1. Introduction

One of the main factors of landscape and also the most dynamic component of it is the climate, which is considered today one of the natural prim-order resources of our planet. The climate is a complex notion, which has the entire metrological elements (radiant energy, air temperature, air humidity, precipitation wind) in different values, named by specialized literature climatic elements and more often climatic factors. The climatic changes from the landscape and implicit the impact which these changes have upon the vegetation condition and the health of forests is a current and a high complexity issue.

These changes are part of the global context, but with the particularities of the landscape where is situated our country [4].

According the definition, the forests are the landscape's product and depend essentially on climatic factor. The geographical distribution of forest species and formations is determined, with some exceptions, by this complex factor, mainly by the thermal and fluid component of it. This is why, this extinction has a clearly zonal character, just like the climates, while in this zone is usually appreciate the regional differences of temperature and precipitations [6, 7].

Some forests from the studied area, like turkey oak stands, Hungarian oak stands and mixed oak forest limited in extinction by some thermal and edific conditions, where their aerials follow closely areas with an extra heath and hard soil, which the other formations (sessile oak stands, plain and hill mixed harwood forest) cannot find enough ecologic conditions to resist the entrant of those two species

Practically, to express the climate of an area, it would be necessary to describe the multiannual conditions of all the meteorological elements closely related with the physical-geographic modifying factors. Knowing the fluctuation of the physical-

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geographic conditions from place o place (the relief, the vegetation), all the meteorological elements and also the variety way how they can connect with each other, it results that a climatic reference of a long region can have serious difficulties [3]. To avoid this situation I tried to connect the general and particular climatic regime with stationary conditions of the area stands and by an ecometrics climatic index series which can show better some certain health problems of the stands [15]. Corroborating the favorable climatic conditions with the forest species sensitivity and adaptability of phytopathogenic agents, on the lack of some strong and concentrate actions to combat, it can be explain the long presence of different attacks in some areas.

2. Material and Method

To highlight the main features of climate order and their influence, generally upon the forests and oak stands, the climatic data from the Metrological Stations from Cluj and Satu Mare have been examined, processed and interpreted in particular, from 2005-2010, and also the multiannual values from 1900-2000, using data from the NMA archive, information provided by various of major sites, reports from National Institute of Statistic, etc.

Since the average monthly or annual data (especially temperature and rainfall regime) only define climate pleasure, without making differences on various situations encountered in various trees located in different geographical areas, at different altitudes and under different stationary, I appeal to other indicators that reflect better the influence of climatic conditions on forest vegetation.

For example, the effect on the heat factor is more pronounced due to exhibition stands (shaded, sunny semi shade), altitude, micro relief (slope, valley, plateau) etc.

Since the heat and rainfall factor have the most significant and visible influence upon the growing conditions of forests, I will stop in the paper over them.

3. Results and Discussions

3.1. Elements of the thermic regime

Temperature is one of the most important ecological factors in plant life.

All biophysical and biochemical processes of plants (uptake's water, gas and mineral salts, their movements in plants, respiration, photosynthesis, etc.) and also the growth and development are influenced by the ambient temperature (air and ground). At the same time, the temperature is a limited factor in plant distribution and productivity of favorable areas or brushes.

In the period 2005 - 2006 annual average temperature ranged between 8.4 ºC and 10.1 ºC in Cluj-Napoca and 9.5 ºC and 11.2 ºC in Satu Mare.

Monthly and annual average temperatures during that period, but also the extreme heat values are presented in the following tables.

Table 1. Monthly average temperatures, annual and multi-station weather Cluj and Satu Mare

Month	Average temperature (ºC)/year															
		2005	2006	2007	2008	2009	2010	1990-2000		2005	2006	2007	2008	2009	2010	1990-2000
Jan	Cluj-Napoca	-2.2	-5.0	2.1	-2.4	-2.0	-2.8	-4.2	Satu Mare	-1.5	-5.3	3.4	0.7	-2.1	-1.7	-2.8
Feb		-4.9	-2.5	3.1	1.3	-0.5	1.2	-2.1		-4.7	-2.4	3.8	2.5	-0.3	1.8	-0.6
Mar		1.9	3.3	7.1	5.7	3.6	4.4	3.6		2.5	3.4	8.0	5.9	4.6	5.5	4.5
Apr		9.6	10.3	10.2	10.3	12.8	10.2	9.2		10.7	11.5	10.8	11	13.5	11.2	10.4
May		15.7	14.0	16.7	14.9	15.5	15.1	14.4		16.2	15.3	18.1	15.9	15.8	16.0	15.7
Jun		17.1	17.1	19.9	19.2	18.3	18.4	17.4		18.2	19.3	21.6	20.1	18.9	19.7	18.8
Jul		19.7	20.7	21.4	19.4	20.8	20.1	19.1		20.8	22.7	22.7	20	21.8	21.7	20.4
Aug		19	18.0	19.8	20	19.9	20.1	18.4		19.8	19.2	21.6	20.5	21	21.2	19.8
Sept		15.7	15.1	13.0	13.8	16.5	13.8	14.2		16.6	16.1	13.8	14.4	17.2	14.4	15.5
Oct		9.3	9.6	8.8	10.1	9.5	6.7	8.8		10.5	10.0	9.3	11	10.3	6.9	10.1
Nov		4	3.6	1.9	3.5	5.5	6.6	3.3		4.8	5.7	2.9	5.8	7.4	8.3	4.9
Dec		-0.4	0.1	-2.6	1.2	0.5	-1.9	-1.4		0.1	1.9	-0.9	3	1.9	-0.5	0.1
Annual average		8.41	8.69	10.1	10.1	10.0	9.3	8.3		9.5	9.7	11.2	10.9	10.8	10.3	9.5

Table 2. The thermic regime of extreme values

Station	year/ data	T max	T min	First frost	The last frost	Station	year/ data	T max	T min	First frost	The last frost
Cluj-Napoca	2005	33.6	-17.2	-2	-1	Satu Mare	2005	35.5	-25.4	-3	-3
		31.jul	08.feb	20.oct	07.apr			31.jul	08.feb	29.oct	03.apr
	2006	32.3	-21	-4	-2		2006	35.1	-27.2	-4	-3
		29.jul	25.jan	07.oct	25.mar			29.jul	24.jan	17.oct	24.mar
	2007	37.9	-12.7	-1.4	-2		2007	38.2	-8.5	-1	-4
		22.jul	10.feb	15.oct	03.may			21.jul	19.feb	14.oct	23.apr
	2008	34.1	-25.4	-4.3	-2.5		2008	33	-16.4	-1	-1
		16.aug	04.jan	27.sep	11.may			15.aug	17.feb	10.oct	26.mar
	2009	33.2	-16.4	-23	-3.1		2009	34.7	-18.3	-1	-4
		23.jul	07.jan	03.oct	18.apr			23.jul	19.feb	17.oct	26.mar
	2010	32.6	-21	-2.3	-1		2010	35	-15.3	-1.3	-5
		27.aug	25.jan	10.dec	23.apr			14.aug	27.jan	10.dec	17.mar

An important element for the forest regeneration work or the one's from the forest nurseries is the soil temperature.

Because we don't have enough data for analyzing the thermal factor, but knowing the direct connection between these two components , based on some climatic data from different works or climatic archives, it was established the coefficient of correlation between air temperature and soil surface temperature:

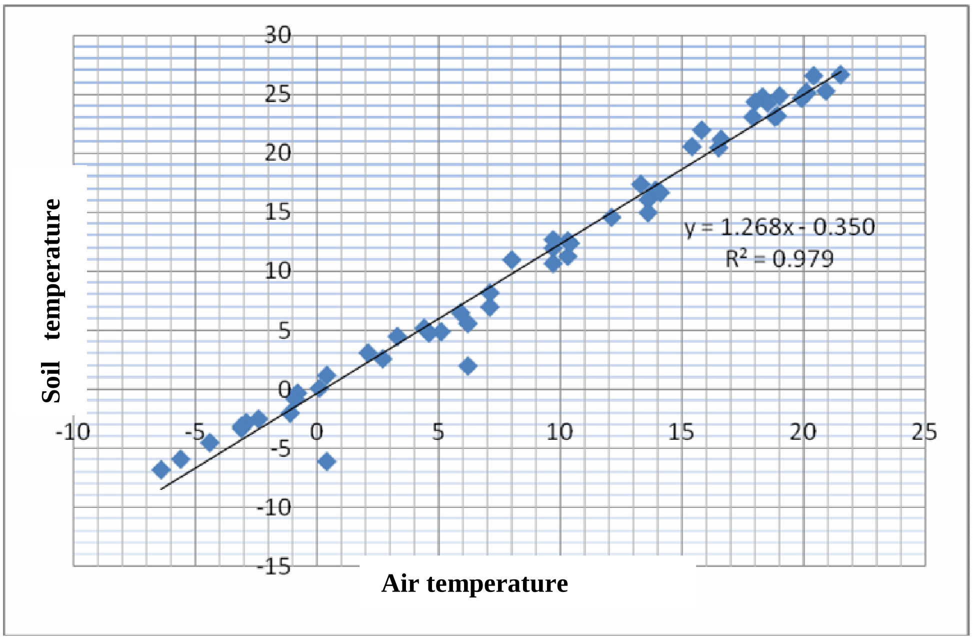


Figure 1. Correlation between air temperature and soil surface temperature

The thermal factor effect on stands is more visible because of his exhibition (shaded, sunny, semi-shaded), altitude, micro relief (slope, valley, plateau), etc.

From this reason the fundamental thermal characteristic - annual average temperature must be related to other characteristics, which can define exactly the isothermal potential of an area and to allow a closer climatic characterization on environmental requirements of studied forest species. For this we chose the the most representative thermal isometrics indices for the climatic forest:

The average temperature of this period with very favorable thermal conditions of forest vegetation (so called biological threshold temperature with daily average temperatures above 10 °C).

The length of this period, improperly called frequently, growing season “that begins and ends in the same region depending on the nature of wood species”. Thus oak stands need a period of 110 - 120 days for the vegetation in good condition and to realize potential gains as stationary timber.

Geothermal potential of the area determined by the average temperature for the period with t > 10°C and the length of this period. By multiplying these data, it is show what the literature called ”heat sum active” expressed in °C and helps at thermal characterization of some areas where heat is a factor in the limited spread of cvercinee (in FD3 floor for example).

Tetraterma Mayr or The average temperature range from May to August. This characteristic define the isothermal potential of different geographical areas for the period when is realized the most favorable conditions for growing timber species. Average amount of negative temperatures, significantly differentiate the regional areas of forest formations (turkey oak stands and sessile oak stands the most frequent case encountered in the studied area). The values of these indicators are presented in the following table:

Table 3. Ecometrics indices of the thermic regime

Meteo station	Year	$\bar{t}$>10°C	Period with $\bar{t}$>10°C	$\bar{t}$ V-VIII	Σt°≥10°C	Σ$\bar{t}$≤0°C
Cluj –Napoca	2005	17.4	177	17.9	2800	-7.5
	2006	15.9	172	17.4	2893	-7.5
	2007	16.8	171	19.4	3365	-2.6
	2008	15.4	174	18.4	3360	-2.4
	2009	17.3	198	18.6	3327	-2.5
	2010	16.3	184	18.4	3095	-4.5
	1900-2000	16.7	173	17.2	2763	-7.7
	2005-2010	16.1	179	18.3	3140	-5
Satu Mare	2005	18.8	172	18.7	3161	-6.2
	2006	16.3	182	17.4	3254	-7.7
	2007	18.1	186	21.0	3742	-1.0
	2008	16.1	206	19.1	3626	-
	2009	16.9	196	19.4	3593	-2.4
	2010	17.4	189	19.6	3444	-2.3
	1900 - 2000	15.8	188	18.7	3161	-3.4
	2005 - 2010	17.3	189	19.2	3470	-3

Elements of the pluviometric regime

Rainfall is the main source of water supply for plants. They affect vegetation both by direct action on plants and indirectly by the action exerted on the ground.

The rainfall during the studied period was swing, with dry years (2005 in Satu Mare) or excessive rainy (2010), which helps us to understand better the various causes of decline’s stands, largely due to water stress.

The rainfall in the period 2005 - 2010 at the wether station from Cluj-Napoca and Satu Mare.

To characterize the precipitation regime I have used the following indexes:

Rainfall amount bioactive period t > 10 °C, where thermal conditions are favorable vegetation.

Rainfall amount of moisture accumulation in the months on the biologically active s horizon of soil Σ PXI-III (when the deciduous forest is leafless and the canopy’s retention is minimal, and potential and actual evapotranspiration are zero or nearly zero). For hills and plains regions this period is considerate the recharge period for soil.

Rainfall amount during the period of maximum evapotranspiration Σ PVII-VIII, or the summer months of rainfall potential evapotranspiration, the retention value which depends on resort's capacity from the area of medium hills, low and the plain which influence the presence or productivity of forest species.

The amount of precipitation surpluses and deficits (ΣΔP ±) monthly and annual. The same amount of precipitation may surplus or deficit in the balance depending on potential evapotranspiration and other elements of the resort or local topoclimatic. This indicator shows much richer in water stress caused by excess moisture deficit during certain periods or other periods, things that only the intrinsic values of rainfall and ETP's annual media fail to overturn them.

Table 4. Pluviometric regime in the period 2005 – 2010 in Cluj-Napoca and Satu Mare

Month		Quantity of precipitations (mm)/year														
		2005	2006	2007	2008	2009	2010	1990-2000		2005	2006	2007	2008	2009	2010	1990-2000
ian	Cluj-Napoca	37.4	6.22	31.2	19.8	15.9	44.9	26.3	Satu Mare	43.4	16.2	69.2	37.4	33.6	76.2	39.8
feb		30.2	23.59	42.2	23.7	40.6	38.6	26.4		40.8	52.8	81.4	14.6	32.4	36.4	35.9
mart		29.7	78.73	36.2	36.5	71.9	24.9	25.4		14.4	114.8	24.0	58.0	64.2	29.6	35.0
apr		126.2	90.79	14.2	52.3	9.65	51.6	46.4		80.0	57.2	9.6	88.0	26.0	65.6	44.8
mai		52.8	76.80	130.6	70.9	33.7	138.4	74.4		95.0	140.0	95.2	94.0	47.6	146.8	63.1
iun		97.3	145.01	46.8	101.8	129.8	166.1	90.0		45.0	153.2	42.4	121.0	118.5	114.4	81.4
iul		126.7	38.60	92.3	164.1	54.6	97.0	79.0		69.8	14.8	103.2	143.8	27.8	197.2	69.4
aug		142.2	173.8	160.0	33.8	46.0	58.7	72.7		10.9	145.2	68.4	45.0	65.6	47.8	62.2
sept		61.9	8.83	96.0	36.8	4.5	73.9	42.7		16.6	0.8	17.8	59.8	13.4	108.6	45.6
oct		19.5	24.6	103.4	51.35	91.2	27.7	37.5		19.4	13.2	73.6	92.2	108.2	17.2	46.0
nov		18.9	11.9	39.8	17.46	50.1	26.1	31.6		26.0	43.6	63.8	25.8	101.8	85.8	47.3
dec		45.2	19.6	13.3	66.5	43.6	59.7	30.6		87.0		26.2	62.0	69.8	105.6	53.3
Annual average		788	698	806	675	593	808	557		548	752	778	842	709	1031	606

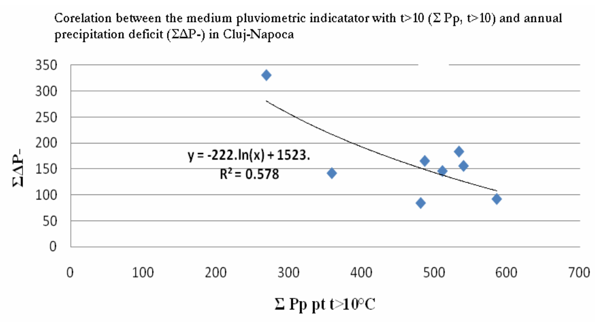
Table 5. Ecometric indices of hydrologic regime

Meteo station	Year	Σ Pp t>10°C	Σ Pp XI-III	Σ Pp VII-VIII	ΣΔP+	ΣΔP-	I c h anual	I Gams	I p Lang t> 10°C	I p Lang vernal	I p Lang estival
	2005	481.06	197.90	268.99	250.30	84.35	2.97	1.92	3.89	4.57	4.37
Cluj-Napoca	2006	533.81	172.51	183.61	260.46	183.28	1.42	1.70	6.43	7.38	0.55
	2007	540.01	155.40	252.35	295.52	155.69	1.90	2.09	5.93	4.87	6.13
	2008	511.04	185.58	198.86	176.37	145.94	1.21	1.64	4.75	5.07	5.02
	2009	268.75	212.45	104.59	264.98	330.20	0.80	1.44	2.97	4.84	2.47
	2010	585.76	202.25	155.92	263.61	92.11	2.86	1.97	6.00	9.09	3.87
	1900-2000	358.80	140.30	151.70	114.04	141.74	0.80	1.35	4.30	5.17	4.05
	2005-2010	486.70	187.68	194.05	251.87	165.26	1.52	1.79	5.00	5.97	3.74
Satu Mare	2005	336.70	217.80	80.70	217.76	316.84	0.69	4.45	2.98	4.07	2.22
	2006	524.40	296.80	70.70	342.01	233.08	1.47	6.11	4.6	8.47	3.82
	2007	336.60	253.80	171.60	255.36	288.69	0.88	6.32	3.1	3.47	3.87
	2008	643.80	200.00	188.80	249.89	84.03	2.97	6.83	5.7	5.97	4.66
	2009	407.10	218.00	93.40	336.36	312.55	1.08	5.75	3.44	4.79	2.18
	2010	680.40	313.80	245.00	301.46	76.97	3.92	7.50	6.53	7.32	5.71
	1900-2000	412.50	211.30	131.60	184.47	209.75	0.88	4.92	3.73	4.54	3.51
	2005-2010	488.17	250.03	141.70	283.81	218.69	1.30	6.16	4.39	5.72	3.67

After analyzing these climatic indices of hydrologic regime that only appear when the amount quantify of some rainfalls in a period is not sufficient.

The preparation of water balance and characterization of forest sites in terms of moisture regime, this quantity will be related to evapo-transpiration, because according to the same amount of precipitation may be in balance, deficit or surpluses, the values ΔP ± providing the most eloquent image.

Also there was a strong correlation between rainfall during the vegetation period of wild forest and rainfall unmatched.



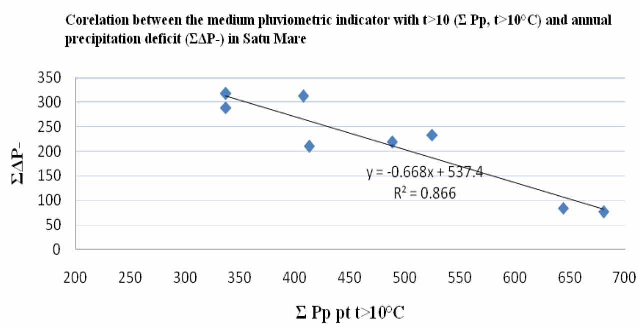


Figure 2. Correlations between rainfall index of months with temperatures above the geothermal and the rainfall deficit

4. Conclusions

The physical factors of the environment, in certain circumstances, may have different harmful actions to plants. These climatic or edaphic factors can be dangerous in whole or in part when they exceed certain limits in excess or less. The most frequent climatic factors which become harmful in forest life are: drought, frost, winds, heavy snow, sun stroke. Most often after loosening a plant or plant communities by physical factors such as climate, the parasite is quickly installed. To determine the exact cause of the disease, the diseased plants should be studied in their place of growth, taking into account the variation of weather factors before and after illness.

The thermal regime in the period 2005-2010 is characterized by average annual temperature slightly higher than the annual average, making exception in 2007, when in Somes Plain from Satu Mare area the average annual temperature was 11.25 ° C, compared with an annual average of 9.5 ° C. The emergence and development of drying phenomena in some stands, especially those with oak base from north-west of the country, can be easily evidenced by ecometric hydric indices, the most faithful through surpluses and deficits of precipitation (ΣΔP ±) monthly and annual compensation and retention index which shows the two sides of the sheet rain that only quantitative analysis of monthly and annual precipitation cannot tint and that is: in these stands we have periods of several months per year, especially in spring with stagnant water that contributes to worsening soil conditions and death by asphyxiation and root rot of trees and in summer is recorded a pronounced moisture deficit (especially in the years 2005, 2007 and 2009)

Given the importance of knowledge of climatic factors, especially for young stands and for crops Pepin is giving a special attention for short-term to weather forecasts and even the environment, enabling the optimal measures to counteract the negative effects of attacks and use of various pathogens climatic indices to allow a more precise delimitation and a nuance of the local climates of the district which may prove useful in the application of differentiated forest-technical measures to increase productive capacity and ecoprotective stands.

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