

MICROCLIMATE INVESTIGATIONS IN AND NEAR THE FOREST OF ÁSOTTHALOM

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Mikroklíma vizsgálatok az Ásotthalom környéki erdőben és közelében

1994. szeptember 5–10. között óránkénti mérések történtek az Ásotthalom környékén fekvő erdőben és ennek közelében, három különböző mérőpontban: 1. nyílt terepen, 2. tűlevelű és 3. lombhullató erdőben. Jelen dolgozatban a léghőmérséklet, relatív nedvesség és talajközeli szélsébség adatait hasonlítottuk össze a három különböző helyen végzett mérések alapján. Az adatokban jól tükröződik az erdő mérséklő hatása, továbbá a szélsébség növekedésekor az esti, illetve éjszakai időszakban bekövetkező hirtelen változás a relatív nedvességben és a léghőmérsékletben.

A series of hourly observations were made in and near the forest of Ásotthalom between 5–10-th September 1994 at three different sites, namely: 1. open space, 2. pine forest and 3. deciduous forest. In present paper the air temperature, the relative humidity and near surface wind speed observations were compared taken into account differences among the data obtained from three different sites. The moderating effect of forest was clearly mirrored in data as well as rapid changes in relative humidity and air temperature as consequence of increasing wind speed during twilight or night hours.

Key-words: microclimate, pine and deciduous forest, rapid changes in relative humidity and air temperature

INTRODUCTION

A field expedition was carried out by students of József Attila University of Szeged in period of 5–10-th September 1994, in and near the forest of Ásotthalom. Hourly measurements were made in 120 hour period including air temperature, relative humidity, wind speed (in km/h) and soil temperatures at 2, 5, 10 and 20 cm depths. The purpose of this paper is to point out microclimatic characteristics of different sites, namely: 1. open space, about 100 m distance from the forest, 2. pine forest, without clearing in its closest vicinity, 3. deciduous forest about 10 m distance from a small clearing. The soil temperature measurements are excluded from present investigation. The woodlands of Ásotthalom is about 30 km west of Szeged. It was planted first in early 20-th century and its present extension might estimated several square km. The forest consists of numerous types of trees, like locusts, birches, oaks, pines etc. The forest area is interrupted by clearings of very different sizes, thus it is an ideal field for investigation microclimatic characteristics.

The weather during the expedition was mostly calm, cloudless and sunny with few cumulus or cirrus, except the last day, when it turned cloudy or overcast with rain. Thus this weather was rather favourable for observation of microclimatic differences forming in undisturbed radiation. The measurements were continuous day and night at each of the mentioned three spots. The expedition was organized and supervised by Department of Climatology of the University.

COMPARISON OF MICROCLIMATIC CHARACTERISTICS

As it has been expected, the extreme values of wind speed, daily variations in air temperature as well as in relative humidity were observed at spot located in open space area. The temperature variations based on hourly measurements are presented in *Fig. 1*. Apperent extreme daily maxima and minima occured in open space area mainly 6-th, 7-th and 8-th September due to undisturbed radiation conditions. In 9-th September in late afternoon increasing cloudiness indicated the weather front having passed over the area and accompanied by rain of medium intensity in night and early hours of 10-th September. Hence the differences in meteorological elements among the open space and forest became insignificant.

Noticeable changes occured in afternoon of 6-th and at midnight of 8–9-th September in air temperature as well as in relative humidity. Namely the wind speed forced up to 7.6 km/h in open space area, 2.3 km/h and 3 km/h in forest observation

Microclimate of *Ásotthalom* woodland

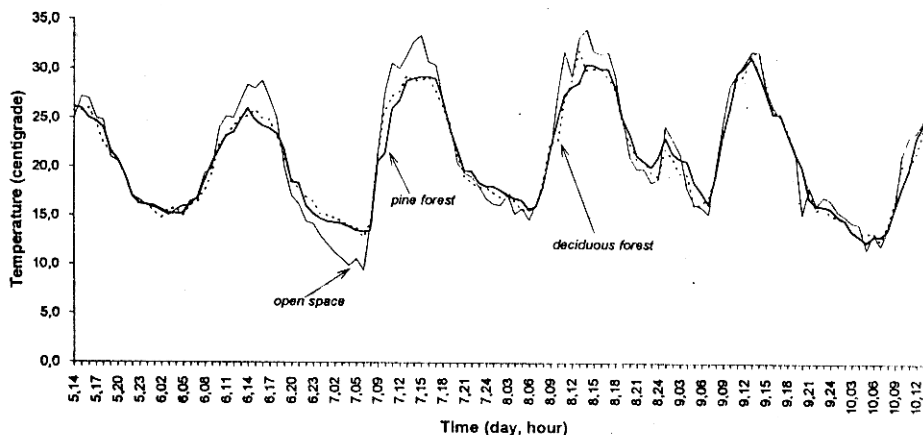


Fig. 1 Hourly air temperature observations in *Ásotthalom* woodland, about 30 km west of Szeged from 5 to 10 September, at three different sites

spots, respectively at 3 p.m. in 6–th September. At the same time the temperature increased and relative humidity decreased. Much more significant and similar phenomenon occurred at midnight of 8–9-th September: the wind forced rapidly from 0 to 2.5 km/h in open space area, meanwhile the relative humidity dropped from 94 to 34 per cent in open space spot, and from 84 or 82 to 57 or 56 per cent in the forest. At the same time the air temperature increased suddenly from 18.4 to 24.2 C degrees in open space and from 19 or 20 to 21.8 or 23.0 degrees in the forest into contrast with normal daily variation of these elements (see Fig. 2 and 3).

At the first glances the wind speeds seemed very low even in cases of their strengthening. The reason was that the cup anemometers were fixed close to the ground, about at 1.2 m height. Hence the roughness of the ground (small dunes, sand hills) has had especially braking effect on the air motions. Evidently the wind speed must have increased rapidly in higher air-layers, and has grown by several times stronger at 15–20 m, i.e. on the top of woodlands.

The temperature maxima measured by maximum thermometers were as follow:

Microclimate of Ásotthalom woodland

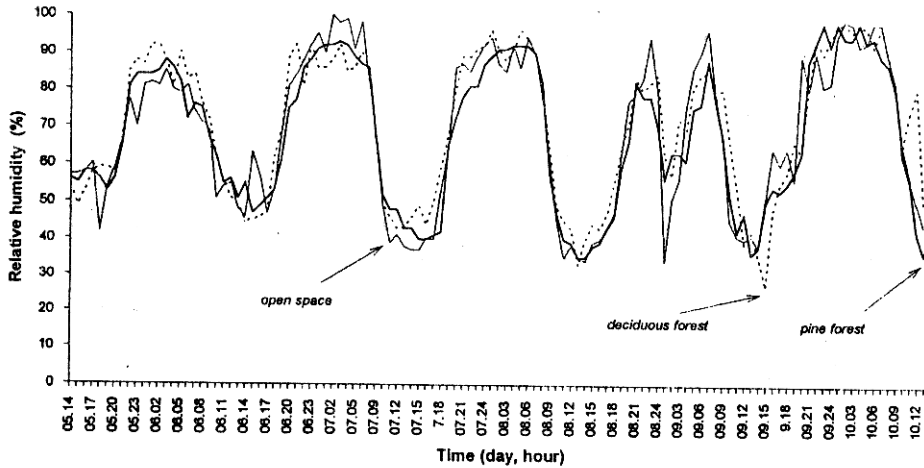


Fig. 2 Hourly relative humidity observations; the time and locations are the same as in Fig. 1

	5.	6.	7.	8.	9.	10.	September, 1994
open space	29.5	31.0	35.0	34.5	34.5	26.5	C degrees
pine forest	27.6	28.0	32.2	30.2	30.2	23.9	"
deciduous forest	27.6	28.0	32.6	30.5	30.9	24.3	"

The maxima were higher by 2–4 C degrees in open space, than in the forest, and up to 0.7 C degrees higher in deciduous forest, than in pine forest. The latter slight surplus might be explained by small clearing close to the spot in deciduous forest.

The daily variations in relative humidity were normal with maxima at nights, and minima in the afternoons except the midnight of 8–9-th September, when it dropped rapidly due to awakening wind, which swept up the inversion in lower layers. The differences between open space forest in relative humidities are not quite consequent. Nevertheless in some cases (e.g. in 6–7, 8–9 September) the greatest daily variations occurred in open space, in other cases (e.g. at night 5–6, 7–8, in the

afternoon of 9-th September) extreme values were observed in deciduous forest (see Fig. 2).

The awakening winds were always strongest in the open space spot and reached its maximum (about 10 km/h) at 9 o'clock p.m. in 9-th September, when a weather front passed through the area. The difference of wind speed between open space and forest is completely convincing. It was pointed out that the maxima of wind-speed usually occurred around noon between 10 a.m. and 3 p.m., except the case of passing through front in 9-th September (Fig. 3). So it was proved that in undisturbed background situation the wind speed exhibits a clear daily variation with moderate strengthening around noon and almost completely calm weather at night.

Microclimate of Ásotthalom woodland

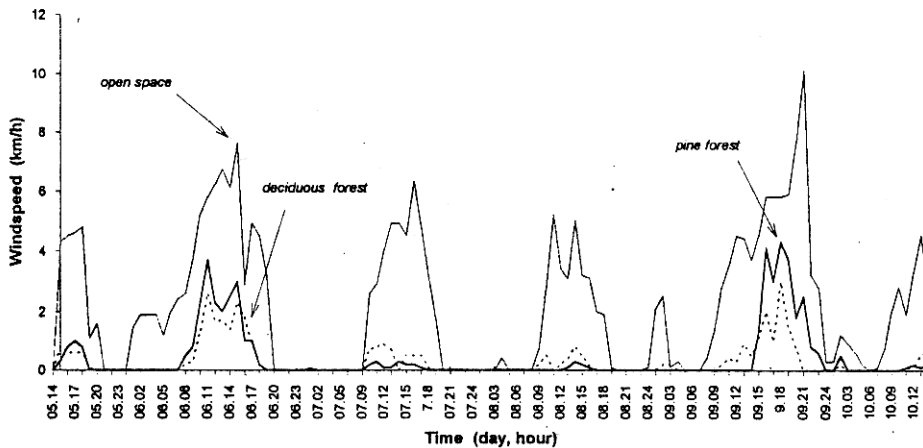


Fig. 3 Hourly windspeed observations about 1.2 m above the ground: the time and location are the same as in Fig. 1

It is noteworthy to mention that the observations took place nearly one km far from the nearest village, Ásotthalom, and surrounded by woodlands. So the influence of the village was absolutely out of question. This expedition has been the first one in this area and its repeat is expected in coming years. Similar investigations of microclimate had been completed in 1950-s and 1960-s by professor R. Wagner, previous head of Department of Climatology at József Attila University of Szeged, but in quite different areas, like Mountain Bükk in northern part Hungary and partly in Great Hungarian Plain (Wagner, 1959, 1963, 1969, 1970; Kiss, 1959; Oberska-Starkel, 1970; Boros and Suhai, 1970). It is hoped that the continuation of such investigations

will yield more and more new knowledge on the microclimate making enable the analysis of different heat and air moisture balance under different microclimatic conditions.

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