

INVESTIGATION OF CYNODONTI-POETUM ANGUSTIFOLIAE COMMUNITIES IN CONTROLLED ENVIRONMENT

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Introduction

The use of phytotrone methody for analysing the effect of environmental factors has been accepted more and more since the 1950s and, in our days, it is an indispensable method in the phytoecological researches, as well. The experimental objects are chosen, almost without any exception, from among the cultivated plants. We don't know any investigation the aim of which would have been to analyse the connections between the natural stands and the environmental factors by using the phytotronic methody. The phytotrone used in our Botanical Gardens since 1971 has rendered us possible, owing to its size, to attempt dealing with the latter problem.

Materials and Methods

We have chosen for the object of our investigations the stand *Cynodonti-Poëtum angustifoliae* developed secondarily in the Botanical Gardens of the Attila József University, after having investigated it under field conditions already in 1970, from April until September. We have carried out parallel two investigations, in field and conditioned circumstances: the first one from 26 April till 2 June 1972, the second one from 2 June till 12 July 1972, in four repetitions each. The size of the „sods of grass” was 30 by 25 cm and the thickness of soil-layer 15 cm. These were placed in plastic boxes. At setting the experiments the stand was cut back till the soil surface both under field conditions and in conditioned circumstances. For the investigation, the phyto-mass above the surface was collected in a way of „harvesting” and divided into species. The dry weight was determined by dividing it into *Poa angustifolia* and „other” fractions as the dominance value of the „other” species was low. The average species combination is:

| | |
|-----------------------------|---------|
| <i>Poa angustifolia</i> | 85 p.c. |
| <i>Agropyron repens</i> | 4 p.c. |
| <i>Cynodon dactylon</i> | 3 p.c. |
| <i>Convolvulus arvensis</i> | 2 p.c. |
| <i>Vicia angustifolia</i> | 2 p.c. |
| <i>Setaria viridis</i> | 2 p.c. |
| <i>Stellaria media</i> | 1 p.c. |
| <i>Trifolium repens</i> | 1 p.c. |
| <i>Medicago lupulina</i> | 1 p.c. |

In conditioned circumstances, the watering of the sods of grass according to weight was not possible because of technical problems therefore the sods of grass were sprayed according to the experience, with 50 ml/sq. dm distilled water daily. That did not enable us to provide for the same water content both in field and in conditioned circumstances. At the end of the experiment, the soil-water content was about 25 weight per cent in the phytotrone and 15 weight per cent under field conditions.

The material was elaborated on two occasions in both experiments. In this paper, the data of the first experiment are taken for basis.

At the investigations in conditioned circumstances, the temperature has changed, in a daily rhythm, between 20—25 °C and the vapour content between 50—70 p.c. The value of lighting energy was $0.9 \cdot 10^5$ erg/sq. cm/sec.

Results

In the course of the preparatory experiments, begun in the November of 1971, we were dealing first with the problem whether an investigation of the parts of natural stand in conditioned circumstances could be solved at all or not. Our investigations led to the result that the growth and development of plants in the „sods of grass” taken from the stand mentioned above and placed in plastic boxes, in spite of the comparatively thin soil-layer, had been satisfactory for five to six weeks, therefore, the investigation in the phytotrone could be performed.

Following that, we have dealt with the problem how to characterize the structure of stand the most satisfactorily, emphasising the closed character and species combination of the stand. At grasses, that could hardly be solved by means of the number of shoots. The dry weight, however, divided into species and referred to the territorial unit, is a characteristic datum that can be evaluated with statistical methods, too. Taking that for basis, four to five sq.dm were given as a minimum area for our stand investigated, being not more than half of the „stand” placed in our growing boxes.

In conditioned circumstances the period of rest and the rhythm of development of the stand-forming species, as well, can be determined well. On the other hand, we could not deal with the phenological rhythm because of the short time of investigations, lasting only for five to six weeks. During that time only a few species, e.g., *Poa angustifolia*, *Lotus corniculatus* get to flowering.

It is difficult, even in the phytotrone, to refer the energy exploitation to a leaf surface, mainly because of the problems of determining the leaf surface of grasses. Therefore, even if we consider as the best to refer the utilization of energy to the leaf surface, nevertheless we have accepted the growing area for a basis of reference.

In Table 1, the meteorological data are summarized in monthly mean value, as compared with the average of many years. In April and May the temperature and precipitation corresponded well to the average of many years while the duration of sunny weather and of radiating energy was less, mainly in May. The want of energy is, anyway, only 10 per cent or so.

In Figs. 1 and 2, the climatic data are given in pentads. It can be established that the values of temperature and radiating energy are rising rather uniformly corresponding to the season. The distribution of precipitation is showing fortnightly periods, the number of sunny hours is changing enough.

It can be established that, apart from the dominant *Poa angustifolia*, the ratio of participation of the other species was in the experiments in averagely conditioned circumstances not more than ten per cent, and under field conditions 25 per cent. Our recording plots were larger than the minimum area of the stand. The conclusion may, therefore, be drawn that the other species responded

Table 1. Meteorological data

| Month | Mean temperature | | | Precipitation | | | Sunny hours | | | Radiating energy* | | |
|-------|------------------|----------|-------|---------------|----------|-------|-------------|----------|-------|-------------------|----------|--------|
| | 1972 | 50 years | Diff. | 1972 | 50 years | Diff. | 1972 | 50 years | Diff. | 1972 | 50 years | Diff. |
| April | 12.3 | 11.4 | + 0,9 | 56 | 49 | + 7 | 159 | 187 | - 28 | 11.190 | 11.036 | + 154 |
| May | 16.3 | 16,8 | - 0,5 | 53 | 61 | - 8 | 179 | 258 | - 79 | 13.844 | 14.592 | - 748 |
| June | 20,5 | 20,0 | + 0,5 | 35 | 68 | - 33 | 282 | 271 | + 11 | 16.702 | 14.945 | + 1757 |
| July | 21,7 | 22,3 | - 0,6 | 82 | 51 | + 32 | 217 | 309 | - 92 | 14.753 | 15.168 | - 415 |

* cal/sq.cm (1958—1962)

Table 2. Change in dry weight (g/sq.dm) in conditioned circumstances and under field conditions (2 June 1972).

| Repetition | Phytotrone | | | | | Field conditions | | | | |
|------------|------------|------|------------|------|-------|------------------|------|------------|------|-------|
| | Poa | | Other | | Total | Poa | | Other | | Total |
| | Dry weight | p.c. | Dry weight | p.c. | | Dry weight | p.c. | Dry weight | p.c. | |
| 1 | 1,47 | 88 | 0,20 | 12 | 1,67 | 1,36 | 76 | 0,44 | 24 | 1,80 |
| 2 | 1,67 | 93 | 0,13 | 7 | 1,80 | 1,71 | 81 | 0,40 | 19 | 2,11 |
| 3 | 1,40 | 84 | 0,26 | 16 | 1,66 | 0,69 | 50 | 0,69 | 50 | 1,38 |
| 4 | 1,54 | 94 | 0,10 | 6 | 1,64 | 1,27 | 88 | 0,17 | 12 | 1,44 |
| Average | 1,52 | 90 | 0,17 | 10 | 1,69 | 1,25 | 75 | 0,42 | 25 | 1,67 |

to the conditions of the phytotrone in a more sensitive way than *Poa angustifolia*. The explanation for that is to be found first of all in the root-system. The root-system of other species penetrates mostly deeper than the fibrous root-system of *Poa angustifolia*, and for these the 15 cm thick soil layer does not suffice.

In spite of all these, under field conditions and in conditioned circumstances, the dry-matter production falling to the territorial unit is completely identical: 1.69, resp. 1.67. It is proved also by that that one can work in a real way with that stand in conditioned circumstances.

It follows from the above mentioned data that in conditioned circumstances the stand is more homogeneous than under field conditions. In conditioned circumstances, for instance, the ratio of the participation of *Poa angustifolia* in the dry weight changes between 84 to 94 per cent, under field

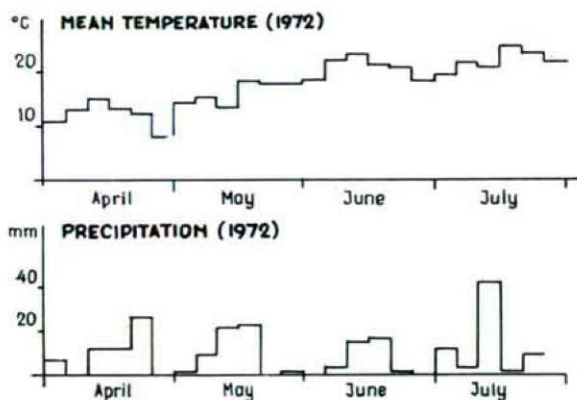


Fig. 1. Change in the mean temperature and the conditions of precipitation, in 1972.

conditions, however, it is between 50 to 88 per cent. The extreme values of the total dry weight referred to sq.dm, representing the character closed, are: in phytotrone 1.64 to 1.80, under field conditions 1.38 to 2.11 g.

Table 3 is containing the data of productivity referred to the whole time of the experiment, resp. to the first and second halves of the experiment.

The complete productivity of the stand falling to the whole time of the experiment is identical both in the phytotrone and under field conditions (4.5, resp. 4.6 g/sq.m/day). In the detail, however, these data are different, mainly in the second half of the time of investigation. The total productivity is, then too, the same: 5.6 g/sq.m/nap. But under field conditions, the ratio is shifted towards the other „fraction” that partly is meaning the dicotyledons. This admits, as well, of concluding the problem mentioned above in connection with the root-system that manifests itself first of all in the second half of the time of investigation.

The energy utilization of the stand is contained in Table 4, on the basis of the average of the fourth repetition. It can be established that in conditioned

Table 3. Change in productivity (/sq.dm/day) in conditioned circumstances and under field conditions.

| Matter | 26. IV—19. V. | | 19. V—2. VI. | | 26. IV—2. VI. | |
|------------------|---------------|-------|--------------|-------|---------------|-------|
| | Poa | Other | Poa | Other | Poa | Other |
| Phytotrone | 0,033 | 0,005 | 0,053 | 0,003 | 0,041 | 0,005 |
| Field conditions | 0,030 | 0,006 | 0,033 | 0,018 | 0,034 | 0,011 |

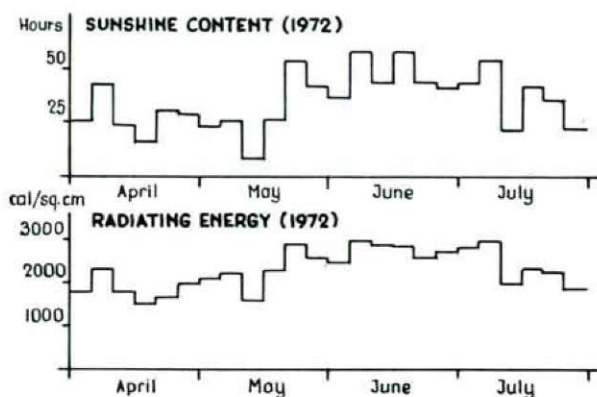


Fig. 2. Change in the values of sunshine content and radiating energy in 1972.

circumstances the utilization of genery is considerably higher — 2.9 per cent — than under field conditions — 0.7 per cent. The energy utilization is, at any rate, not uniform in the complete time of investigation: at the beginning it is lower, later on higher both in conditioned circumstances and under field conditions. In conditioned circumstances this increased utilization of energy may be attributed to the joint effect of light and temperature. There occur, namely, in conditioned circumstances neither in respect of the light nor in that of the temperature any extreme values like those under field conditions.

Table 4. Energy utilization reckoned for the growing area in conditioned circumstances and under field conditions (%).

| Matter | 26. IV— 19. V. | V. 19— 2. VI. | 26. IV— 2. VI. |
|---------------------|-------------------|------------------|-------------------|
| Phytotrone | 2,3 | 3,8 | 2,9 |
| Field conditions | 0,6 | 0,8 | 0,7 |

Summary

The authors are dealing with the methodological problems of investigating the natural stand of soft stalks (*Cynodonti-Poëtum angustifoliae*) in conditioned circumstances. The investigations were carried out in the phytotrone of the

Botanical Gardens of the Attila József University. The temperature changed in daily rhythm between 20—20 °C, the vapour content between 50—70 per cent; the energy of illumination was $0.9 \cdot 10^5$ erg/sq.cm/sec.

It can be established that the stand developed well with the methodology applied for five to six weeks, the dry weight referred to the territorial unit was the same under field conditions and in conditioned circumstances.

In conditioned circumstances there are possible more exact investigations than under field conditions. It is only not possible to deal with the phenological rhythm because of the comparatively short time of investigation. (Only a few species, e.g., *Poa angustifolia*, *Lotus corniculatus* get to flowering).

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