RESEARCHES ON THE INFLUENCE OF PEDOCLIMATIC CONDITIONS FROM TECUCI AREA ON THE BIOMETRIC AND PHENOLOGICAL PARAMETERS OF *CYNARA SCOLYMUS*

Constanţa Nicodim

NaţionalCollege Calistrat Hogaş Tecuci
e-mail: constanta_nicodim@yahoo.com

Abstract

Taking into account the large number of people suffering from hepatobiliary disorders, we wished to analyze more thoroughly the plants with effect on these disorders. Thus, in this paper presents we present the biometric determination for the main morphological characteristics of plants and the results of biochemical determinations effectuated on artichoke, cultivated in the pedoclimatic conditions of the municipality Tecuci, county Galati, fro three consecutive years: 2006, 2007 and 2008. The biometric determinations were effectuated both in the field and in the lab, in the period of vegetative growth and in the blooming phase. The content in assimilating pigments was determined by spectrophotometry with computer rendering by measuring the absorbance, for wave lengths characteristic to pigments. We noticed that, during vegetation, the content in carotenoids increases. We also noticed that the ratio between chlorophylls increases due to the more rapid degradation of chlorophyll b as compared to chlorophyll a and decreases when the content in chlorophyll b increases.

Key words: pedoclimatic conditions, biometric and biochemical determinations, influence of pedoclimatic factors

INTRODUCTION

Phytotherapy represents the oldest method to cure diseases that people used along their multi-millenary history. We arrived at this method following our wish to live and survive the continuous attack of diseases.[2]

The disciples of the naturist medicine, namely of phytotherapy, were always numerous and this even in the glamorous period of the synthesis medicines. Nowadays too, more than ever, phytotherapy is preferred because it does not limit to teas and macerates but comprises a much larger range of pharmaceutical products, among which we mention the vegetal oils, syrups, etheric oils, ointments, creams, tinctures, extracts as well as the various essences. [4]

The therapeutic actions of the artichoke are numerous. Moreover, artichoke is used in the treatment of many *hepatobiliary and stomachic diseases*: chronic hepatitis, icterus, hepatic cirrhosis, regeneration of hepatic cells injured, allergies on a hepatic basis, hepatic insufficiency, gallstones, stimulation of the anti-toxic function of liver, gall calculosis, gall dyskinesia, gall fluidization and stimulation of the gall secretion, chronic cholecystitis, enteritis, cholangitis, vomiting, constipations, abdominal gripes and hemorrhoids. [5, 6, 10]

The study was made to use the pedoclimatic conditions in the culture of medicinal plants on large areas, so as to obtain large productions that might allow the treatment of many sick people.

MATERIAL AND METHOD

The evolution of the climate in the years under study was registered at Meteorological Station of Tecuci, and the pedological, hydrologic and of vegetation was taken over from the specialized literature. [1]

The biologic material used is represented by the artichoke plants cultivated in an experimental field from Tecuci town.

Artichoke is demanding in terms of light and temperature since it originates in the Mediterranean region. [11] In our country, it has optimal conditions in the areas from the south and south-west of Romania. It also behaves well in alluvial plains but it suffers because of the variation of humidity. It prefers the fertile permeable soils. [8, 9]

The biometric determinations were made both in the field and in the lab, in the period of vegetative growth and the blossom phase.

To **determine the assimilating pigments**, from the harvested plants we weighed samples of 0.5 g of fresh material that was crushed in the presence of ground glass for a better breaking up of tissues, gradually adding acetone having the role of a solvent for the assimilating pigments. The vegetal material crushed was then filtered until the vegetal remains stay white. The filtrate obtained is decanted in a calibrated flask of 50 ml and is brought up to the mark with acetone.

From the extract obtained we took several ml that were introduced in glass dish 5 mm thick. The content in assimilating pigments was determined by spectrophotometry with computer rendering by measuring absorbance for the following wave lengths:

- for chlorophyll a - at 431-432 nm in the blue specter and 662-663 nm in the red specter
- for chlorophyll b – at 453-454 nm in the blue specter and 616 – 617 nm in the red specter
- for carotenoid pigments at 425 – 426 nm, 447 – 448 nm respectively.

The results were expressed in mg %. [3]

RESULTS AND DISCUSSIONS

From the climatic viewpoint, year 2006, may be characterized as a normal year, with average temperatures quite close to the previous years. They did not register during summer values higher than 35^0C or minimum values in winter less than -20^0C.

The monthly average temperatures of the summer months ranged between 16^0C in May and over 22^0C in July. We may say it was a quite cold summer, and they did not register hot days.

Abundant precipitations were registered in August (103 mm) and the driest month was November (0.9 mm). The air humidity was lower in April and May, the maximum value being registered in December.

The period of sun shining was maximal in July (308 ore). In this month plants benefited from abundant light and warmth.

Year 2007 was a very dry year. With only 63.3 mm the annual average, the plants could not enjoy sufficient precipitations. In September they registered the highest values for this parameter (151 mm), and in July when plants need much water, the values were minimal, of only 13.9 mm.

The annual temperature was higher than in the previous year, with a positive extreme of almost 40^0C in July. We may say that in summer they registered scorching temperatures.

July registered the most hours of sun shining, more than 387, whereas in December the sun shone for only 41 hours.

From the viewpoint of climatic conditions, we may say that the summer of 2008 is characterized by dryness, modest precipitations and pretty low average temperatures.

Thus, in 2008, there were not enough precipitations, but fortunately they were well distributed in the months with high demands of plants for humidity. July was an exception when the quantity of precipitation was insufficient.

The average air temperature was moderate, with a maximum of 22.4^0C in July and a minimum of -1.9^0C in January. The extreme positive temperature was registered in August.

Air humidity was pretty low, especially in August, with only 56%. The other summer months did not register high levels of humidity either.

The area soil is the carbonic or brownish clack earth which is favorable to the culture of medicinal plants. The dominant wind is the north wind representing 29% from the annual frequency of winds. The south wind, with a frequency of 16%, blows more during

summertime, being quite dry. The climate is temperate continental.

In these conditions, the biometric observations from artichoke showed the following:

Table 1
Phenological observations

Observations	2006	2007	2008
Sowing	16 April	14 April	19 April
Springing	7 May	6 May	12 May
Temperature	11.9^{0}C	14.7°C	14.4°C
Air humidity	69%	64%	70%
Number of days between sowing and springing	21	20	23

Culture setting up was made by sowing on April 16th 2006, on April 14th in 2007, and on April 19th in 2008, when the air temperature was 9.3 ^{0}C, but the next days the temperature increased to 13^{0}C (in 2006), 11.6 ^{0}C (in 2007) and 14.3 ^{0}C (in 2008). The average air humidity was 77% in 2006, 55% in 2007, 66% in 2008. the precipitations fallen in the interval 1.04-20.04, was 35.9 mm in 2006, 13.4 mm in 2007 and 40.7 mm in 2008. (tab. 1)

The beginning of springing is when plantlets appear with cotyledonal leaves, usually 17- 20 days after sowing. The springing is influenced first of all by the soil temperature and then by humidity necessary to the seed germination. (tab. 1)

Springing was noticed in our case on May 7th in 2006, when the average air temperature registered 11.9°C, on May 6th in 2007 when the average air temperature registered 14.7°C, and in 2008, on May 12th when the average air temperature registered 14.4°C. (tab. 1)

After 9 days from springing there appear the first leaves that are false. The plant height was at that time of 7 cm. After 20 days from springing, there appear the first real leaves (2 cm). After 30 days, the first leaves reach 7 cm, and the following ones reach 2.5 cm. (tab. 3)

After 39 days the plants have 5 leaves (2 cotyledonal, 3 new leaves, 2 of 6 cm, and a third of 5 cm). (tab. 2)

After their appearance, leaves develop like a rich rosette growing to the characteristic dimensions and harvest may start. The period of vegetation until the first harvest is 90 days.

The forming of stems is characterized by the increasing of length of internodes of the central axis and starts after the formation of 6-7 stem leaves.

Leaves registered lengths and widths in 2008, given that they enjoyed better climatic conditions as compared to the previous years. Thus, adding to these parameters the leaf weight and the number of leaves on a plant, we obtain high productions of vegetative mass per hectare in 2008 as compared to 2006 or 2007. (tab. 4)

It blooms in July and August and the red-violaceous flowers are arranged on top of every branch in big globular capitula covered with thick fleshy scales at the basis.

The harvest of leaves was made 4 times a year in 2006 and 2007, and 5 times in 2008. The first harvest was made in the interval June 15th -20th, the second between July 15th - 20th, the third between August 15th -20th, and the fourth on September 30th. In 2008 the fifth harvest was made about November 20th.

The harvest was made manually by scythe and using protection gloves. After harvest, the leaves were quickly put into baskets so as to be dried or processed in fresh state. The young leaves in the middle of the shrub were left in vegetation.

The fresh leaf production varied between 200-250 q/ha, and after drying 30-40q/ha.

By drying in a natural manner we obtained raw materials qualitatively adequate, though it is difficult because they

contain much water, the quantity of leaves is big and the period of drying lasts fro 20 days.

After drying, from 6-8 kg of fresh leaves we obtained about 1 kg of dried leaves.

Table 2
Weight of fresh vegetal mass

No. crt	Date	Kg/ha	% of average	Difference from average	Signification
1	May 15th	10,400	109.2	+880	+
2	July 15th	17,200	180.6	+7680	++
3	September 15th	20,000	210.0	+10480	+++
Average/month		9,520	100		

From the weighing effectuated, it resulted a production of 10,400 kg/ha in May, 17,200 kg/ha in July and 20,000 kg/ha in September.

It results a massive increase of the vegetal mass in July, August and September, in the last month registering a double production as compared to May. (Table 2)

Fig. 1. - Plantlets 20 days after springing

Table 3
Phenophases followed for 30 days

Period	Date	Phenophases observed
3 days after springing	10.05.06	plantlets with two cotyledons measure 6 cm: small stem + cotyledons 4.5 cm, ridicule 1.3 cm.
9 days after springing	16.05.06	plantlets of 13 cm: stem + cotyledonal leaves 7 cm, and root of 6 cm.
15 days after springing	22.05.06	plantlets of 19.5 cm, 11 cm – stem + cotyledonal leaves, and root of 8 cm.
20 days after springing	27.05.06	plantlets of 22.5 cm :13 cm stem + cotyledonal leaves, root of 9 cm; the next leaves measured 2 cm.
30 days after springing	06.06.06	cotyledonal leaves, the second series of leaves (the first real ones) already had 7 cm, different from the first ones, the second series of real leaves had 2.5 cm

Table 4
Biometric observations

	2006	2007	2008
Leaf average length (cm)	66.4	65.8	69.2
Leaf average width (cm)	41.3	38.4	46.1
Average weight of a leaf (g)	74.6	71.4	77.3
Average number of leaves on a plant	13	11	15

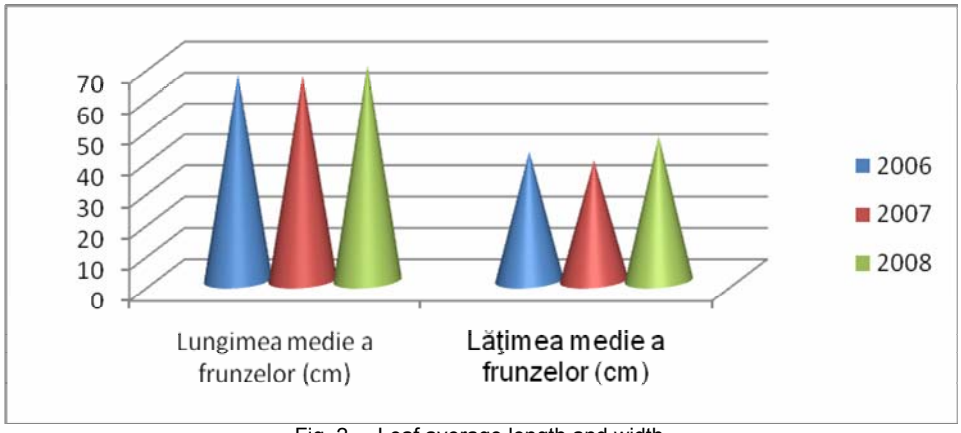

Fig. 2. – Leaf average length and width

The biochemical observations show that during vegetation there occurs a decrease of the content in chlorophyll "a" reaching in September to a difference of more than 4% as compared to the beginning of this period. In exchange, we notice an increase of the content in chlorophyll "b" so that at the end of vegetation the increase is about 4% higher than in May.

In general, even if chlorophyll "b" increases quantitatively, on the whole, the total quantity of chlorophyll decreases during vegetation.

The ratio between the two chlorophylls also decreases by almost 8%

The value of the ratio chlorophyll/carotenoids decreases too during vegetation, but to smaller extent.

As for the carotenoid content, the value of this parameter increases during vegetation, but very little reaching an increase of almost 3% in September compared to May. (Table 5)

Table 5
Content in assimilating pigments

No. crt	Pigment	mg%			mg% in May		
		May	July	Sept.	May	July	Sept.
1	chlorophyll "a"	15.40	15.12	14.74	100.0	98.2	95.7
2	chlorophyll" b"	4.82	4.32	5.02	100.0	102.1	104.1
3	chlorophyll pigments (a+b)	20.22	20.04	19.76	100.0	99.1	97.7
4	ratio chlorophyll a / chlorophyll b	3.20	3.07	2.94	100.0	95.9	91.8
5	ratio chlorophylls / carotenoids	4.18	4.09	3.97	100.0	97.8	94.9
6	carotenoids	4.84	4.90	4.98	100.0	101.2	102.9

CONCLUSIONS

1. Year 2008 is characterized as being the most favorable to the culture of medicinal plants, with high temperatures and precipitations divided uniformly in the vegetation period.
2. The total chlorophyll pigment content (a + b) decreases during vegetation.
3. The total carotenoid content increases during vegetation.
4. The ratio between chlorophylls increases due to the more rapid degradation of chlorophyll b as compared to chlorophyll a and decreases due to the increase of the content in chlorophyll b.
5. The ratio between chlorophylls and carotenoids decreases constantly during vegetation period.

REFERENCES

Books

[1] Blaga Gh., Filipov F., Rusu I., Udrescu S., Vasile D. - Pedologie, Edit. Academic Pres., Cluj-Napoca, 2005
[2] Bujor O., Popescu O, 2003 - *Fitoterapie tradiţională şi modernă*, Edit. Fiat Lux Bucureşti
[3] Ciulei I; Istudor Viorica; Palade Magdalena & colab 1995 - *Analiza farmacognostică şi fitochimică a produselor vegetale*, Edit. Tehnoplast, Bucureşti
[4] Istudor Viorica 2001 - *Farmacognozie, fitochimie, fitoterapie.* Edit. Medicală Bucureşti
[5] Milică Constantin 2002 – *Tratamente naturiste în bolile aparatului digestiv*. Edit. Ion Ionescu de la Brad Iaşi
[6] Milică C. 2007 - *Tratamente naturiste în serviciul sănătăţi.,* Edit. Trinitas Iaşi
[7] Muntean, L. S. şi colab. 2007 - *Tratat de plante medicinale cultivate şi spontane*, Edit. Risoprint Cluj-Napoca
[8] Pârvu C. 2000– *Enciclopedia plantelor – mica enciclopedie*, Edit. Tehnică, Bucureşti
[9] Răvăruţ M., E. Turenschi 1973- Botanica, Editura Didactică şi Pedagogică, Bucureşti.
[10] Robu T., Milica C -Izvoare de sanatate din flora medicinala.Editurile "Ovidius University Press", "Ex Ponto", Constanta 2005
[11] Vasilca-Mozoceni A. 2003 –*Ghidul plantelor medicinale*, Edit. Polirom Iaşi