

STUDIU PRIVIND INFLUENȚA STĂRII METABOLICE ȘI A ZONEI DE PROVENIENȚĂ ASUPRA PROPRIETĂȚILOR CHIMICE ALE CĂRNII LA SPECIA DE MELC TERESTRU HELIX POMATIA

STUDY REGARDING THE INFLUENCE OF ORIGIN AREA AND METABOLIC STATE ON THE CHEMICAL COMPOSITION OF THE MEAT FROM LANDSNAIL HELIX POMATIA

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SUMMARY

The present study aims to establish the differences between the chemical compositions of snail meat, depending on the origin area and the metabolic state. The biological material was represented of 60 snails from the same species (Helix pomatia var. Banatica), distributed in four samples (15 snails for each sample): sample I – Helix pomatia (origin area: Oravița; metabolic state: hibernating); sample II – Helix pomatia (origin area: Pădurea Verde, Timișoara; metabolic state: hibernating); sample III - Helix pomatia (origin area: Oravița; metabolic state: active); sample IV – Helix pomatia (origin area: Pădurea Verde, Timișoara; metabolic state: active) and from these snails we sampled the meat. The moisture level (%) was determined by meat desiccation, the raw protein (%) by Kjeldahl method, ash (%) by sample calcination and the raw fat (%) by Soxhlet method. The study revealed that the origin area and the metabolic estate had no major influence on the snail meat chemical composition (moisture, raw protein, ash and SASN level), only in the case of raw fat level.

REZUMAT

Scopul prezentului studiu este acela de a stabili diferențele care există în compoziția chimică a cărnii de melc, în funcție de zona de origine și starea metabolică. Materialul biologic a fost reprezentat de 40 de melci aparținând aceleași specii (Helix pomatia var. Banatica), distribuiți în patru loturi (10 melci pentru fiecare lot): lot I – Helix pomatia (zonă de proveniență: Oravița; stare metabolică: operculați); lot II – Helix pomatia (zonă de proveniență: Pădurea Verde, Timișoara; stare metabolică: operculați); lot III - Helix pomatia (zonă de proveniență: Oravița; stare metabolică: dezoperculați); lot IV – Helix pomatia (zonă de proveniență: Pădurea Verde, Timișoara; stare metabolică: dezoperculați) și de la acești melci a fost recoltată carnea. Umiditatea (%) a fost determinată deshidratarea cărnii, conținutul de proteină brută (%) prin metoda Kjeldahl, cenușa (%) prin calcinarea mostrei de carne, iar nivelul de grăsime brută prin metoda Soxhlet. Studiul a arătat că zona de proveniență și starea metabolică influențează compoziția cărnii mai ales în ceea ce privește conținutul de grăsime brută.

METHOD AND MATERIAL

The study took place in three consecutive steps:

Step 1 - Snail catchement and their systematization

In our research we used the meat from freshly killed snails (*Helix pomatia* var. *Banatica*). The systematization was based on the book of Alexandru V. Grossu, *Fauna R.P.R., Mollusca, vol.III, fascicula 1, Gastropoda Pulmonata*. We analyzed the way in which the origin area and the metabolic state influence the chemical composition of snail meat. Meat samples were numbered 1, 2, 3, 4, as you can see in table 1.

Table 1

Snail origin area and metabolic state

Sample number	Species	Origin area	Metabolic state
Sample 1	<i>Helix pomatia</i> var. <i>Banatica</i>	Oravița	hibernating
Sample 2	<i>Helix pomatia</i> var. <i>Banatica</i>	Pădurea Verde	hibernating
Sample 3	<i>Helix pomatia</i> var. <i>Banatica</i>	Oravița	active
Sample 4	<i>Helix pomatia</i> var. <i>Banatica</i>	Pădurea Verde	active

Step 2 – Choosing of anesthesia method

From a wide variety of anesthesia methods, in order to not affect the chemical structure of snail meat, we used the one mentioned by Rossmasler; the snails were introduced into a bowl full with water, covered with a cap, so as there would be no air inside the bowl. Although this method lasted for 24 h it had the advantage that the chemical composition of animal meat wasn't damaged.

Step 3 – The chemical analysis of snail meat

After the snails was killed, we cutt off the foot with a fine dissecting scissor and then minced it.

To determine the water content the snail meat was desiccated by stove drying till it has reached a constant weight. This method is considered as the most accurate method for the animal products. The loss of weight (%) represents the water content of our sample. The sample moisture was evaluated by formula:

$$\text{H}_2\text{O}\% = \frac{m - m_1}{m_2} \times 100$$

m = tare of weighing bottle + weight of sample before desiccation

m_1 = tare of weighing bottle+ weight of sample after desiccation

m_2 = (tare of weighing bottle + weight of sample before desiccation) - tare of weighing bottle

The result is considered tolerable if between the two parallel samples the value of calculated humidity (%) is not larger than 0.5%. When these values are outbalanced, the analysis must be repeated.

The content of dry matter was determined as a difference:

$$\text{Dry matter\%} = 100\% - \text{H}_2\text{O\%}$$

The protein analysis is based on the principle of product nitrogen content quantification. We evaluated the total amount of protein by Kjeldahl method, which involves the catalytic mineralization of sample, followed by a releasing of ammonium cations and the formation of monoammonium sulphate. The released ammonium is distilled, titrated and expressed in nitrogen equivalent, which is multiplied by a conversion factor and evaluated in protein equivalent. The sample nitrogen amount was established by formula:

$$\text{The total amount of nitrogen (\%)} = \frac{0.0014 (V - V_1)}{m} \times 6.25 \times 100$$

0.0014 = the amount of nitrogen (g), which correspond to 1 ml of 0.1N sulphuric acid
 V = the volume of 0.1N sulphuric acid introduced in the collecting vessel (ml)

V_1 = the volume of 0.1N caustic soda used in titration (ml)

m = the weight of sample used for distillation (g)

6.25 = meat protein conversion factor

The quantitative analysis of raw fat implies the release of the fat from the protean envelope. In order to achieve this we used the Soxhlet method. Organic solvents were used in order to extract the fat, which after the sample was weighting and estimated by percentage. For ensuring the complete extraction, before the analysis the sample was moderate heated in order to desiccate and destroy the protean membrane, which in the fat is enveloped. The results were estimated by using the formula:

$$\text{Raw fat (\%)} = \frac{m}{m_1} \times 100$$

where m = the amount of raw fat, calculated as the weight of boiling flask after drying + its tare

m_1 = the sample weight

The total amount of mineral substances was determined from the carbonized residue obtained after sample burning at $525 \pm 25^\circ\text{C}$, till the sample weight was constant. We evaluated the results by formula:

$$\text{Ash\%} = \frac{m_1}{m} \times 100$$

where m_1 = the amount of ash (g), estimated as the difference between the weight of melting pot with and without ash

m = the sample amount, evaluated as the difference between the weight of melting pot before burning and its tare weigh

RESULTS AND DISCUSSIONS

The results are presented in table 2.

From table 2 we observed that on the one hand the snails from the Oravița area had a higher moisture level than the snails from Pădurea Verde area, on the other hand their raw protein level was lower than that of the second snail population, regardless of metabolic state. This fact can be explained on the base of alimentary diet or on the effect of soil chemical composition. For a better understanding further studies will be needed.

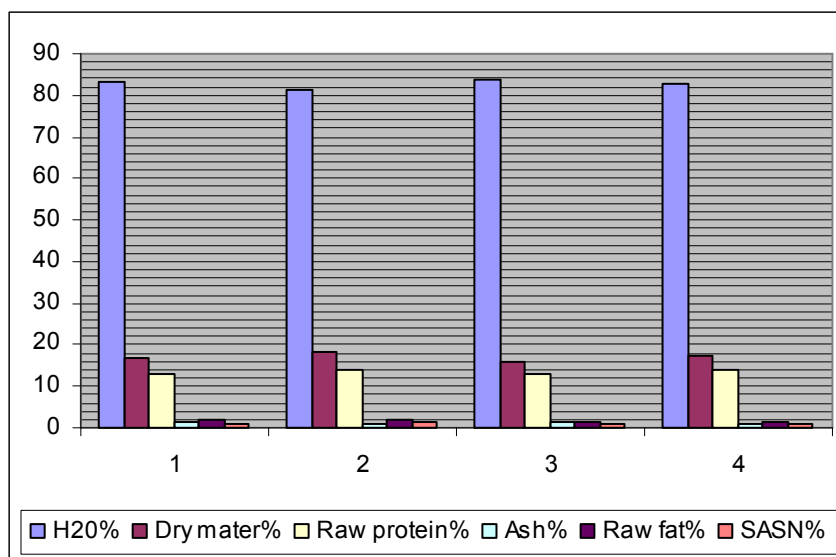
Table 2.

The chemical composition of snail meat depending to origin area and metabolic state

<i>Origin area</i>	<i>Oravița</i>	<i>Pădurea Verde</i>	<i>Oravița</i>	<i>Pădurea Verde</i>
Metabolic state	hibernating	hibernating	active	active
H₂O%	83.3325	81.535	83.89552	82.82478
Dry mater%	16.66702	18.465	16.10448	17.17522
Raw protein%	13.08694	13.95954	13.0064	14.02
Ash%	1.28967	1.14524	1.25487	1.046
Raw fat%	1.74731	1.8906	1.48731	1.27734
SASN%	0.8031	1.46962	0.0959	0.83

A graphic illustration of data is shown in figure 1.

Figure 1



But this kind of data interpretation allowed us to do only simple observations. For a complex data analysis we considered for each parameters (moisture%, raw protein %, raw fat%, ash%) a comparative coefficient (k) calculated as the percentage ratio existing between the parameter values for different sample. To simplify the results processing sample 1 was designated as S₁, sample 2 as S₂, sample 3 as S₃ and sample 4 as S₄. For example the comparative coefficient between sample 1 and sample 3 moisture (km_{1,3}) was evaluated as :

$$\text{Ash\%} = \frac{S_1 \text{moisture (\%)}}{S_3 \text{moisture (\%)}} \times 100 = \frac{83.3325}{83.89552} \times 100 = 99.40\%$$

This coefficient showed us that the moisture of the hibernating snail is by 0.60% higher than that of the active snail from Oravița. The same way, we calculated km_{1,2}, km_{3,4}, km_{2,4}, and the comparative coefficient for raw protein (kp), raw fat (kf) and ash coefficients (ka), as is undermentioned in table 3.

Table 3.

Percentage ratio existing between meat chemical parameters from different samples

	V _{S1} /V _{S3} X100	V _{S2} /V _{S4} X100	V _{S1} /V _{S2} X100	V _{S3} /V _{S4} X100
km %	99.40	98.42	102.20	101.29
kp%	100.61	99.57	93.34	92.21
ka%	102.20	109.25	88.80	83.35
kf%	117.29	148.54	91.80	114.48

where V_{S1} = the value of parameter for sample 1

V_{S2} = the value of parameter for sample 2

V_{S3} = the value of parameter for sample 3

V_{S4} = the value of parameter for sample 4

We observed that the values of kp, kf and ka indicate no major differences between the samples in the case of moisture, raw protein and ash content. But in the case of raw protein, kp reveals significant differences, depending on origin area and metabolic state. The raw fat content of hibernating snail from Oravița area is by 17.29% higher than that of active snail from the same area, when the same difference between the snails from Pădurea Verde area is of 48.54%, that is almost three times more than in the first case. These observations can be explained on the basis of the additive effect of two factors.

The first factor is the climate effect; the Oravița area has a temperate continental climate, with powerful mediteranean influences, characterized by mild winters and dry summers, when Pădurea Verde area has an excessive temperate continental climate, characterized by harder winters and greater variation of temperature amplitude. So for survive the snails from Pădurea Verde area need to accumulate more fat to live till the next spring.

The second factor is the level of environment anthropoization. The snails from Oravița area were sampled from a garden, a habitat where the man interference is much stronger than in the case of the snails from Pădurea Verde

area, which were sampled from the forest border. A habitat characterized by a higher level of man interference involves a cushy living, because the snails don't need so much to move in order to find food.

These conclusions are enforced by the value of $k_{p1,3}$ and $k_{p3,4}$.

CONCLUSIONS

1. The snails from the Oravița area have a higher moisture level than the snails from Pădurea Verde area, when their raw protein level is lower than that of the second snail population, regardless of metabolic state

2. The origin area and the metabolic state do not affect the snail meat moisture, raw protein and mineral substances content, but influence the raw fat level.

3. The snails hibernating raw fat level is higher than that of the active snails, regardless of origin area.

4. The raw fat level variation, depending on metabolic state is higher in the case of the snails originated from area with harsher winters and greater thermic amplitude.

5. The snails originated from a habitat strongly influenced by man interference presents a lower variation of raw fat level between hibernating and active state than those from habitat characterized by a smaller man interference.

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