THE VARIATION OF THE VOLATILE OIL CONTENT IN THE PLANTS ORGANS AT THE *ARNICA MONTANA* L. GENOTYPES

VARIAȚIA CONȚINUTULUI DE ULEI VOLATIL ÎN ORGANELE PLANTEI LA GENOTIPURILE DE *ARNICA MONTANA* L.

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Abstract. *Arnica montana L. is spread into Europe and Siberia. In our country, it's common in the whole Carpatian succesion, through hay fields, postures, glades, shrubs, beginning with the mountainous region, throughtout the subalpine region, but rarely in the alpine zone. In this paper, we present a variety analysis of the isolated volatile oil in some selected genotypes of this species. The calculation of the variety coefficient can ffer usefull information about the efficiency of some selection works in case you wish the improvement of some natures. Also, we present throught synthetic tables, the direct genetic parameters: the variation, the standard deviation, the average and the derived genetic parameters as the variety coefficient (Ardelean and Sestraş, 1996).*

Rezumat. *Arnica montana L. este răspândită în Europa şi Siberia. La noi în țară este comună în tot lanțul Carpaților, prin fânețe, păşuni, poieni, tufărişuri, din regiunea montană pînă în cea subalpină, mai rar în zona alpină.În lucrarea de față se prezintă o analiză a variabilității conținutului de ulei volatil izolat în câteva genotipuri selecționate din această specie. Calculul coeficientului de variabilitate poate oferi informatii utile privind eficiența unor lucrări de selecție în cazul în care se doreşte îmbunatațirea unor caractere. Deasemenea este prezentată în tabele sintetice parametri genetici direcți: varianța, abaterea standard, media şi parametri genetici derivați cum este coeficientul de variabilitate (Ardelean and Sestras, 1996).*

Regarding *Arnica montana* L., named populary arnica, it's a plant, natures monument, defended by the european laws. Inspide of all this, because of her curative properties, previously described, in this moment the biggest quantity used for therapeutic purpose in our country originates in the spontaneous flora, being picked up by unauthorized people, without any instruction for the conservation of the species. The cultivation of this plant is inexistent because there wasn't yet been studies a cultivation tehnology (Sand et al., 2007).

The flowers contain volatile oil (0,04 – 3,8%), arnidiol, arnisterine, faradiol, astragaline, izocvereitine, carnaubilic alchool, o paraffin, cafeic acid, carotenoizi (xantofil, xantofilepoxidul, zeaxantină). The roats contain volatile oil (0,5-1,5%) cafeic acid, fumaric acid, succinic acid, inulin, timol, timohidrochinonics compunds and metilesteri, 3-etilfenol, sugars etc. (Crăciun et al., 1976).

MATERIAL AND METHODS

The *Arnicae* flos flowers are harvest in june-july, at the beginning of the blissoming, through cuting or breaking the blossom (Pârvu, 1991). The tedding is made at shadow, throught thin layers. The artificial tedding at 40-50ºC.

For this analysis there were used dry blossom of the *Arnica montana* L.. species after the harvest. There was prepared a mixture of flowers, predominating the bulky .

At the end of the vegetation period, there were brought out analysis of this mixture about the content of volatile oil in the generative organs, the flowers.

The byological material used, was the one identified in the two locations, Valea Frumoasei (Alba district) and Masivul Cindrelu (Sibiu district), there were chosen three genotypes of each, for which there have been worked out quantitative analysis towards the extracted volatile oil. The genotypes have been noted this way: G_1, G_2 and G_3 the ones proceeded from Valea Frumoasei (Alba district) and G_4, G_5 and G_6 the ones proceeded from Masivul Cindre (Sibiu district).

After the harvesting, the flowers have been passed through a water flow and layed out to dry at the sun; then, they have been weighed on the ellectronical balance, minced, and then they have been liable to the outdrawing.

At the base of the volatile oil extraction method principle has been the watery vapours technical training helped by a laboratory autfit of type Neo-Clavenger (Ciulei et al., 1995).

There have been weigh 50g of vegetable arnica material that has been put in the distillation baloon, togheter with 700ml water. The balloon has been fit to a distilation gear. The oil purveyance tube, graded in divisions of 0,01ml, just like the inferior part of the separator have filled out with water through the deviation on top of the separator, which, after all closes with a stopper crossed by a drain. Carrying on, there has been left the water flow into the refrigerator and the balloon has been warmed out so that the water, during the boiling, was cracking, there has been stopped the water circulation out of the refrigerator and the vapours have been left to circulate a couple of minutes for washing the refrigerator of the adhesive oil spots. When the refrigerator has warmed out his whole lenght, the water has been left to circulate again, but this time has been turned out the heat source. After about 30 min., the oil coat has glide down into the graded tube, after turning on the emptying tap.

The outdrawing took about 4-5 hours for each sample. After the training, the obtained volatile oil has been measured in millilitres and ascribed to 100g of vegetable tissue. Upon the obtained oil there has been added about 1 ml benzene. The oil togheter with the benzene have been caught carrefully into glassbottle there has been a spatulatop of sodium sulphate anhydrous, used to remove the possible water stamps. With the help of a Pasteur dropper ther has been drown out the volatile oil out of the glassbottle, the benzene has evaporate and the oil has been closed into a vial so that it could be keeped in best conditions until the analysis, without changing properties.

RESULTS AND DISCUSSIONS

The volatile oil drawn out of the blossom samples has got an orange colour, of middle solid consistent and flavoured smell. This one has been related to millilitres oil for 100g vegetable product.

The performed analysis for the content of the flowers species *Arnica montana* L. have noticed a volatile oil content between 1,7-3,5 at 100g of dry tissue.

Table 1

The rezults about the content amount of volatile oil drawn out of the *Arnica montana* L. genotype flowers under investigation

Nr. crt.	Genotype	Content of volatile oïl (ml / 100g vegetable tissue)
		Subterranean organs
1.	G_I	2,8
2.	G_2	3,2
3.	G_3	2,6
4.	G_4	3,5
5.	G_5	3,1
6.	G_6	1,7

At the genotypes of Valea Frumoasei (Alba district) the content is between 2,6 and 3,2 ml oil for 100g vegetables product while that of Masivul Cindrelul (Sibiu district) is between 1,7 and 3,5 ml oil for 100g vegetables product. Out of the pasted results on the first table can be noticed that the chosen genotypes of Masivul Cindrelul (Sibiu district) presents a more pronounced variability. The extreme value has been obtained ot the $G\text{-}_4$ genotype.

Table 2

The direct genetically parameters (the variation, the standard swerwe) and derived genetically parameters (variety coefficient) calculated for the morphological characters

The Character	The variation s^2	The standard swerve s	The average $\overline{x}$	Variety coefficient s%
The volatile oil content	0,39	0,63	2,81	22,39

Out of the synthetiyed information analysis in the second table, we can observ that the values of the direct genetical parameters are: the variation = 0,39, the standard swervw = 0,63 and he average = 2,81.

In case of the derived genetical parameters there has been calculated the variety coefficient which is equal to 22,36.

CONCLUSIONS

The results of the chemical analysis for the measure of the volatile oil content, have put forward the value of the analysis material and the fact that the moment of the flower harvest was most favourable.

It's distinguished for the volatile oil content the genotype G_4 with 3,5ml/100g plant, content which is determined in the flower. Out of the analysed characters, the volatile oil content of the root has got a high coefficient valve of variety, which proves that there can be succesfully accomplished selection works of this nature.

REFERENCES

1. **Ardelean M., R. Sestraş**, **1996** - *Ameliorarea plantelor şi tehnică experimentală, partea a II-a, Tehnică experimentală, îndrumător de lucrări practice*. Tipo Agronomia, Cluj-Napoca.
2. **Ciulei I., Viorica Istudor, Madelena Palade, Elena Niculete, Cerasela Elena Gârd**, **1995 -** *Alnaliza farmacognostică şi fitochimică a produselor vegetale.* Vol I şi II, Editura Tehnoplast Company S.R.L., Bucureşti.
3. **Crăciun F., O. Bojor, M. Alexan**, **1976** - *Farmacia naturii*. Editura Ceres, Bucureşti.
4. **Pârvu C.**, **1991** - *Universul Plantelor – Mică Enciclopedie*. Editura Enciclopedică, Bucureşti.
5. **Pop M.R., Camelia Sand, Dana Bobiț, C.H. Barbu**, **2006** - *Improving the amount and quality of the active principles from A*ngelica archangelica L.*using genetic fingerprints*. Journal of Central European Agriculture, Volume 7, Number 3, Proceedings from the First International Conference on Agriculture and Rural Development Topusko, ISSN 1332-9049, November 23-2., Croatia
6. **Sand Camelia, Dana Bobit, C.H. Barbu, M.R. Pop**, **2007** - *Studies concerning the in vitro multiplication of Arnica montana L. species*. Romanian Biological Sciences, Vol V, No. 1-2, ISSN 1584-0158, Piatra Neamț, Romania.