JOURNAL OF SCIENCE AND ARTS

ANTIOXIDANT ACTIVITY OF BASIL EXTRACT

MANOLE ELENA[1]
[1]*The School Group „Constantin Brâncoveanu" Târgovişte, Unirii Avenue, No.20*

Abstract: *In order to delay or to avoid the process of polymer degradation, stabilizing agents are incorporated in the polymer mass. The phenolic or aminic stabilizing agents that are used industrially can dissolve or diffuse in food, altering their composition and their properties, that's the reason why it is so important to use some natural compounds with antioxidant properties. In basil we can find synthesized natural compounds with proven antioxidant properties that can be used for stabilizing the polymers, avoiding food contamination with unwanted products. These extracts contain natural compounds that are highly efficient in capturing free radicals.*

1. Introduction

In the plastic material used in packing food, there are some addition agents (antioxidants, plasticizers, colorants, etc.) that can dissolve and diffuse in that food, altering its composition and its conservation deadline [1-2].

Using natural antioxidants for stabilizing some polymers used in packing food represents a modern, needed and actual preoccupation in order to obtain ecological food packing (EU recommendation) [3].

Basils (*Ocimum* spp., Lamiaceae) contain a wide range of essential oils rich in phenolic compounds and a wide array of other natural products including polyphenols such as flavonoids and anthocyanins, compounds that are highly efficient in capturing free radicals [4].

2. Experimental

2.1. Vegetal material and extraction process

The basil extract has been realized by maceration in ethanol (1 part –plant / 10 parts –solvent) for 5 days at room temperature – cold extraction. After being filtered, the solution has been dry evaporated using a vacuum-air pump. The oxidation substrate was paraffin. This was added with 0.25% w/w. The components were stirred by mixing them with ethylene trichloride.

2.2 Investigation techniques and instruments

- Chemiluminescence (CL instrument OL – 94);
- Infrared spectroscopy (FT-IR instrument JASCO 4000); range: 4000-400 cm^{-1}
- Spectroscopy in UV – VIS (JASCO V570);

3. Results and discussions

3.1. Chemiluminescence

Measuring Chemiluminescence

After evaporation, the sample has been used for measuring isothermal chemiluminescence in air (163^{o} C). Figure 1 presents the CL curves of the mentioned samples from which we obtained the data in Table 1.

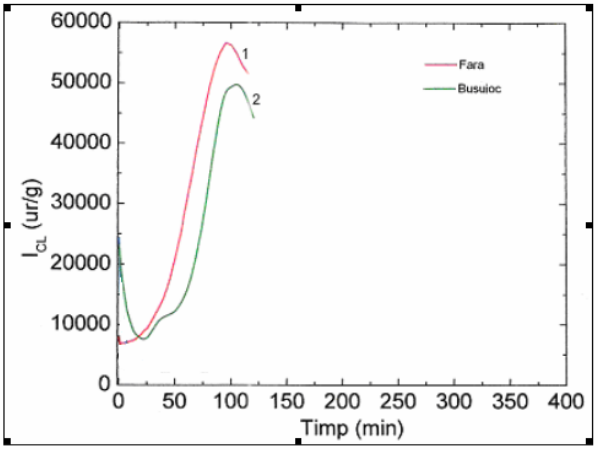


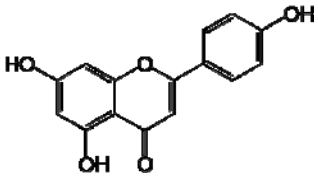
Figure 1. The CL curves (163° C, air) of the paraffin added (with 0,25% w/w) with basil extract.

Table 1 presents the kinetic parameters of the chemiluminescence from the paraffin sample stabilized with basil extract.

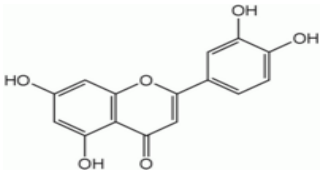
Table 1. The kinetic parameters for the oxidation (163° C, air) of the paraffin added (with 0,25 % w/w) with basil extract. CL data.

Extract	t_i (min)	$t_{1/2}$ (min)	V_{ox}^{max} (u.r./g min)	I_{max} (u.r./g)	t_{max} (min)
None	22	56	958	56634	95
Ocimum Basilicum (Basil)	39	79	465	27525	130

As can be observed, we obtain a considerable increase in the time parameters (t_i, $t_{1/2}$, and t_{max}) by adding to the paraffin the mentioned extract, and also lower values for the oxidizing rate.
The remarkable conduct of this extract's antioxidant activity can be explained by the existence of some natural polyphenols that are highly efficient in capturing free radicals.
In basil extracts composition we can often meet the apigenin and luteolin flavons, with the following structures [5]:

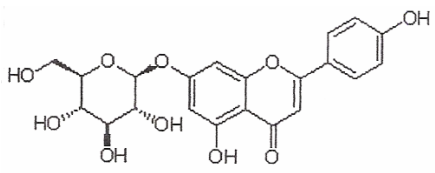


Apigenin

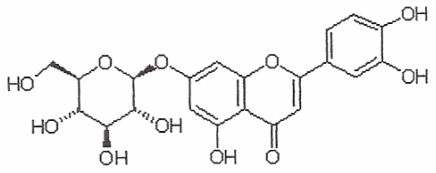


Luteolin

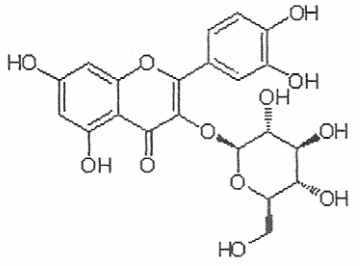
A lot of these flavonoids can be found also in the form of glucoside, such as: apigenin-7-o-glucoside, luteolin-7-o-glucoside, quercitin-3-o- glucoside [6].



Apigenin-7-O-glucoside



Luteolin-7-O-glucoside



Quercitin-7-O-glucoside

The study of dependence between the temperature's growth and the decrease in the period of induction of some paraffin samples, with or without basil extract.
Figures 2. and 3. presents the CL curves of paraffin nonadded and added at 178°C; 163°C; 156°C 178, with (0,25%) basil extract .

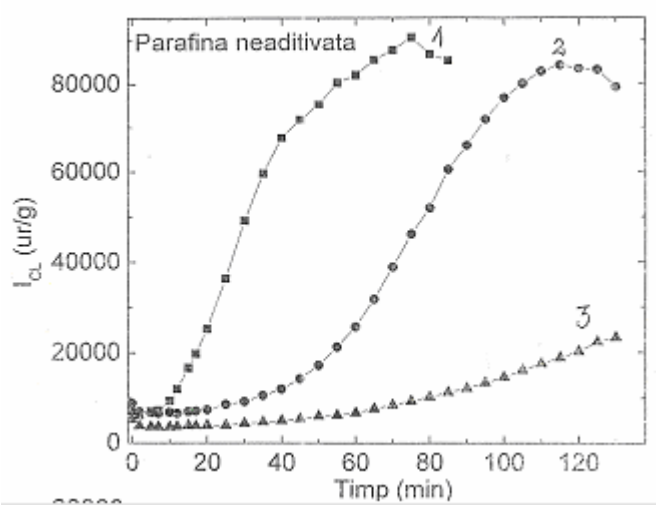


Figure 2. CL curves of some nonadded paraffin samples (1) 178°C; (2) 163°C; (3) 156°C

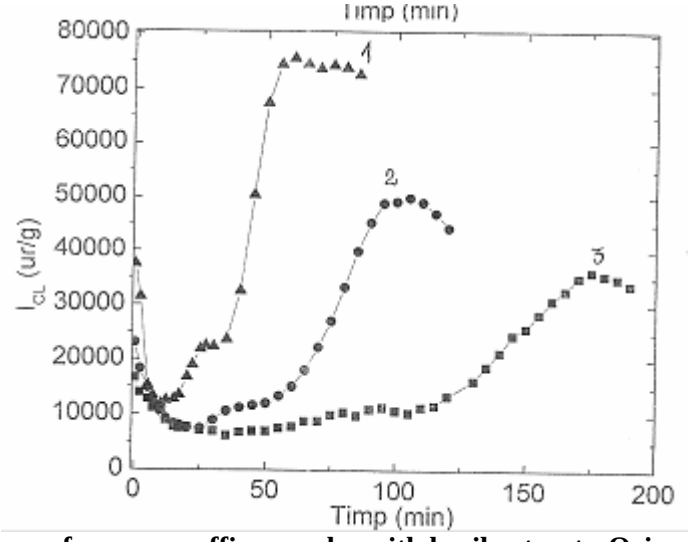


Figure 3. CL curves of some paraffin samples with basil extract - Ocimum Basilicum (1) 178°C; (2) 163°C; (3) 156°C

Figure 2 and 3 present the linear dependence ln t_{max} vs 1/T from which we obtained a thermo oxidation activation energy of 64,4 KJ/mol for the nonadded paraffin sample, respectively 75,3 KJ/mol for the sample with Ocimum Basilicum (basil) extract (0,25%).

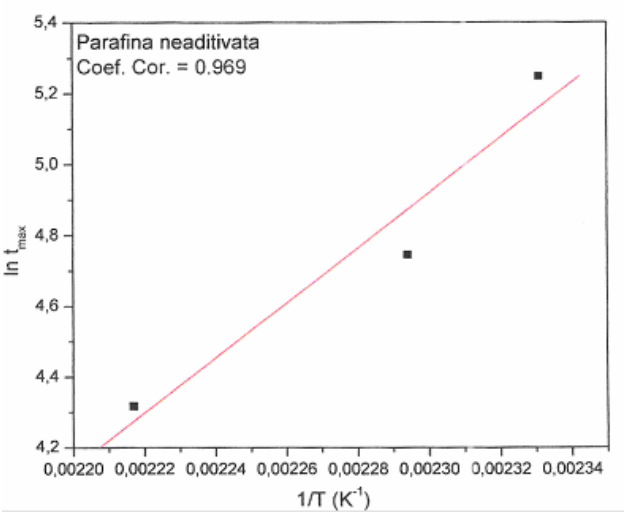


Figure 4. ln t_{max} vs 1/T dependence for nonadded paraffin. CL data.

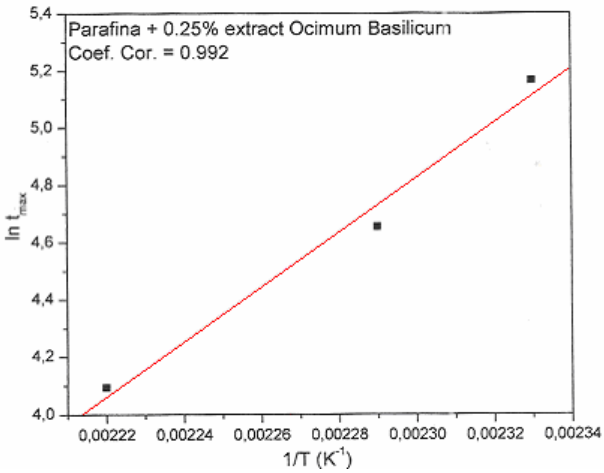


Figure 5. ln t_{max} vs 1/T dependence for the paraffin with basil extract (0,25%). CL data

3.2. IR absorption spectra

The analysis in the IR spectra (4000 – 400 cm^{-1}) of the obtained extract has been done in the solid state using ATR. Their spectra have been compared to that of some flavonoids and phenolic acids.

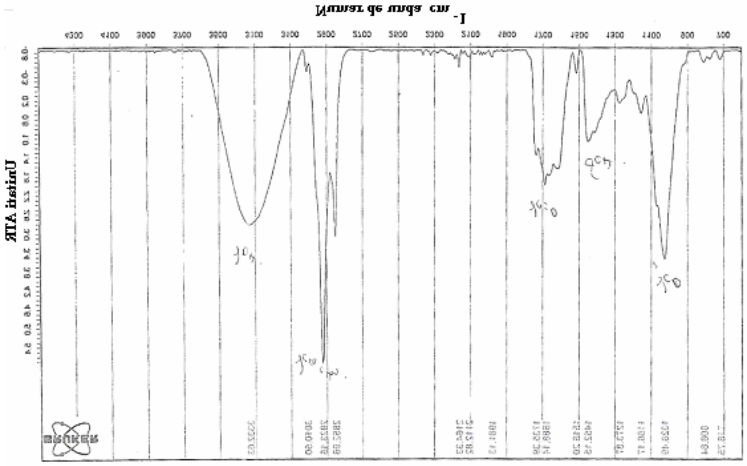


Figure 6. IR spectrum of Ocimum Basilicum (basil) – solid sample

The obtained bands indicate the flavonoids structure's presence.

3.3 UV-VIS absorption spectra

The absorption spectra in UV–VIS range from the investigated basil extract are presented in Figure 7.

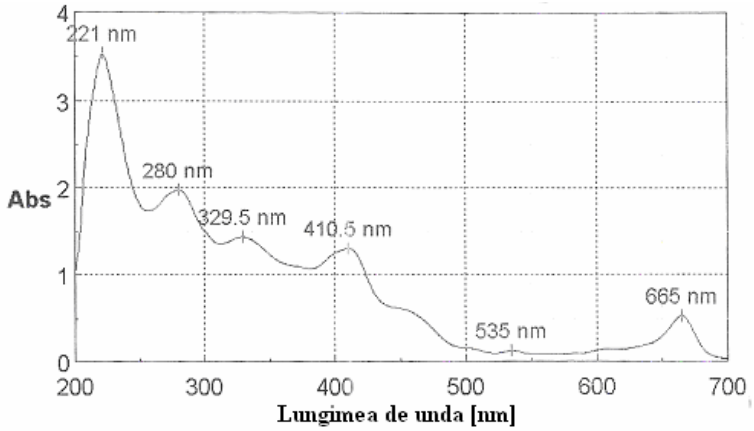


Figure 7 .The absorbtion spectra in UV – VIS of the alcohol basil extract (dil. 1:24)

These spectra have been compared to those of the flavonoids and some phenolic acids considered as standard, evidenced the aromatic structures and the chromopherous groups >C=O and the –OH groups.

4. Conclusions

- By CL measuring of paraffin with basil extract at different temperatures, its antioxidant characteristic has been underlined.
- The obtained results underline the significant part played by the polyphenolic vegetal structures in obtaining significant antioxidant effects upon polymeric substrates used in the food packing industry;
- The natural antioxidants introduced in the polymers which are being used in making the food packing films avoid contaminating food with the traditional phenolic antioxidant used in packing, antioxidants which migrate by diffusion at room temperature [7].

References

[1] Herdan J.M., Giurginca M., Meghea A.(1995). *Antioxidanti*, Editura Tehnica, Bucuresti 1995
[2] Horun S., Sebe O.(1983).*Degradarea si stabilizarea polimerilor*, Editura tehnica, Bucuresti 1983.
[3] Jipa S., Setnescu R., Setnescu T.(2004).*Ambalaje ecologice pentru produse alimentare* Editura Electra , Bucuresti,2004.
[4] Simon, J.E., J. Quinn, and R.G. Murray. 1990. Basil: A source of essential oils. p: 484–489. In: J. Janick and J.E. Simon (eds.), Advances in new crops. Timber Press, Portland, OR.
[5] Pokorny I.,Yanishlieva N.,Gordon M.(2001) *Antioxidants in foods –Practical applications*,Woodhead Publishing Limited,Cambridge, England, 2001
[6] F. Areias, P. Valentao, P.B. Andrade, F. Ferreres, R.M. Seabra, *J. Agric. Food Chem.* 48, 6081 (2000)
[7] FPN 2002- *Food Packaging Bulletin 11(7),* 2002