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Effect of Low Doses Gamma Irradiation on the Extraction Yield and Active Compounds of *Rosmarinus Officinalis* L. Essential Oils

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ABSTRACT

Rosemary was irradiated with gamma irradiation at different doses (5 to 50kGy). The evaluation of irradiation depended on the chemical studies and Yield of extracted essential oils. Results showed significant difference for the essential oils yield at different doses. Compounds were identified for extracted essential oils from each of non – irradiated and irradiated rosemary leaves samples, the main components of essential oil extracted from either non-irradiated or irradiated rosemary were 1,8cineole, camphor, endo-borneol and D-limonene. However, a significant difference was observed when exceeding a dose of 30KGy.

Keywords: *Rosmarinus officinalis* L., Extraction yield, Essential Oil Composition, Gamma Irradiation.

1. Introduction

Rosemary leaves is an evergreen shroud of *Rosmarinus officinalis* *Lamiaceae*, native to Mediterranean countries [1]. This plant is good and common example for aromatic plants which widely used in all over the world [2]. Volatile oils are produced from the primary secretions as secondary metabolites by aromatic plants, which are responsible for their smell, complex compounds obtained by each of distillation methods, localized in Mediterranean and tropical countries [2]. Irradiation is known as an effective method for sterilization and pasteurization, Gamma irradiation process with specific doses under control is an effective technique to preserve spices comparing with microwave treatment, where it does not cause flavor compounds losing [3]. Gamma rays are known for their influences on plant growth and development by inducing changes in cells and tissues. This study aims to determine the influence of gamma-irradiation process on the yield and extracted essential oils content from either non irradiated and irradiated rosemary leaves.

2. Experimental

2.1 Plant materials

Rosemary was purchased from USTHB at the flowering stage. The leaves were dried before treatment and kept in glass jars in room temperature.

2.2 Irradiation treatment

Gamma irradiation was carried out at the Algiers nuclear research center (CRNA). 50g samples of the rosemary leaves were packed in sterilized polyethylene bags and tightly sealed. The packed samples were treated at different gamma rays doses (5, 10, 15, 20, 30, 40 and 50 KGy) using cobalt 60 as the irradiation source.

2.3 Extraction of essential oils

Essential oils (EO) were extracted from dried rosemary leaves, which irradiated or non- irradiated by



hydrodistillation using Clevenger-type apparatus. The obtained essential oils were dried over anhydrous sodium sulfate and stored in dark bottles in refrigerator at 5 ± 20 C until used.

2.4 GC-MS Analysis

To identify the components of essential oils of dried rosemary leaves, GC-MS analyses were done for those irradiated or non- irradiated.

3. Results and Discussion

3.1 Effect of γ -irradiation process on the extracted essential oils content (%)

The experimental results show that the extraction yield is affected by the variation of the doses used during the pretreatments. The yield of essential oil increases with the increase in the dose and then decreases, the higher yield was obtained at a dose of 20KGy, i.e. 1.68%.

Table 1. *Effect of gamma irradiation on the Extraction yield*

Dose (KGy)	Yield (%)
5	1.42
10	1.53
15	1.57
20	1.68
30	1.51
40	1.30
50	1.20

3.2 Identification of extracted essential oil components

The results showed that 1,8cineole, camphor, endo-borneol and D-limonene were found to be as the main compounds of the essential oil of non-irradiated rosemary leaves. The essential oils of different irradiated rosemary samples showed the same chemical compounds. . However, the gamma-irradiated rosemary by 30kGy caused a decreasing in content of some essential oils components.

Table 2. *Percentages of the identified components for extracted EO of irradiated and non-irradiated dry rosemary leaves*

Compounds	Non irradiated leaves	Irradiated leaves at 30 KGy
1,8-Cineole	17.20	16.60
Camphor	16.44	15.90
Endo-Borneol	9.11	8.15
D-Limonene	8.60	7.44

4. Conclusions

Using gamma rays led to differences in the percentages in the volatile oil compounds of *Rosmarinus Officinalis* L. Also we found differences in the extraction yield.

References

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