
Trace element Content of *Zingiber Officinale* and *Salvia Officinale* plants from Algeria Z.Lamari^{1*}, R.Larbi¹, H.Neggache²

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The medicinal plants studied in this work have been administrated many times in Algeria to cure some pains and diseases; diet has long been considered the source of trace elements.

Instrumental neutron Activation Analysis (INAA) has been performed to mineral determination. Total of eight elements have been quantified in *Zingiber Officinale* and *Salvia Officinale* plants commonly used in our country. Concentrations of Al, Mn, Na, K, Cl, Zn, Fe, and Eu have been determined by short and long irradiation times with a thermal flux in thermal column and in the core of NUR Algerian Reactor. The results obtained shown that Eu is present at trace level, Zn at minor and Al, Cl, K, Na, Fe and Mn at major levels. Quality control assessment has been determined by analyzing the IAEA-certified references materials. The present work will be developed into an approach between elemental content as therapeutic probability for the developing of pharmacological industries of drugs having coherence with folk use.

Keywords: Medicinal plants, Trace element, Biological effects, INAA

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Introduction

In recent time, the therapeutic use of medicinal plants has increased all over the world. The dose administrated to the local people is given by the herbalists based on the therapeutic experience of a lot of generations with thus an insufficiency in the clinical and scientific validation. The world Health Organization (WHO) recognized the role of the traditional medicine OMS (1996, 2008) although the low knowledge of the toxicity effects of these herbs (Sodipe, 1986). In this work we look for elemental composition in *Salvia Officinale* and *Ginger Officinale*, two medicinal plants commonly used in Algeria the table.1 report the botanical name of medicinal plants.

Experimental:

The herbs were grounded to powdered samples using an automatic mortar, after drying an infrared lamp at T°40 - 60°C during one (01)week, powdered samples were packed in polyethylene vials into triplicate with aluminum 1% gold (reactor Experiments, Inc) flux monitors for long irradiations.

The relative method is adopted, the elemental concentrations were corrected by flux factors at the different positions in the aluminum vial capsules figure.1 present graphically these correction factors. There was 9% difference in the flux factors between the upper and lower positions. soil-7(soil), SL1 (lake sediment) Environmental material, A11 (Milk powder), V10 (Hay Powder) and V8 (Rye flower), Biological Material and SD-M-2/TM (sediment marine lyophilized) marine material were Certified reference materials (CRMs) used for the calibration and quality control. The long and short irradiations were performed at NUR-Algerian Research Reactor. The reactor was operated at one (01) MW power with thermal and epithermal flux of $2.95E12 \pm 1.54E11 \text{ n / cm}^2/\text{ s}^{-1}$ and $5.94 E10 \pm 1.89E9 \text{ n / cm}^2/\text{ s}^{-1}$ in the thermal column pneumatic system and thermal flux of $3.89 E13 \pm 1.7E12 \text{ n / cm}^2/\text{ s}^{-1}$ in the Core. Sage and Ginger were irradiated together with AIEA- certified reference materials Soil-7 and A11. For the determination of the short lived isotopes ^{28}Al , ^{56}Mn , ^{38}Cl , ^{24}Na , ^{42}K ; the samples were irradiated with a thermal neutron flux for two minute

of irradiation time , after a delay time of 10 minutes at 08 hours, measurements time were performed for 2 minutes at three (03) hours.

For the determination of long lived isotopes ^{52}Eu , ^{65}Zn , and ^{59}Fe the both medicinal plant samples and standards were irradiated for four (04) hours in the core of reactor , with one (01) month delay-time and a three (03) days counting

time, the second round of the measurements were performed after a delay time of two (02) months. The figure.2 shows the typical gamma spectrum obtained for Salvia Officinalis and Zingiber Officinalis (long irradiation).

The gamma rays emitted were measured using BE 3830 (large Broad Energy – Ge detector) in conjunction with Genie 2000 version 3-2 program.

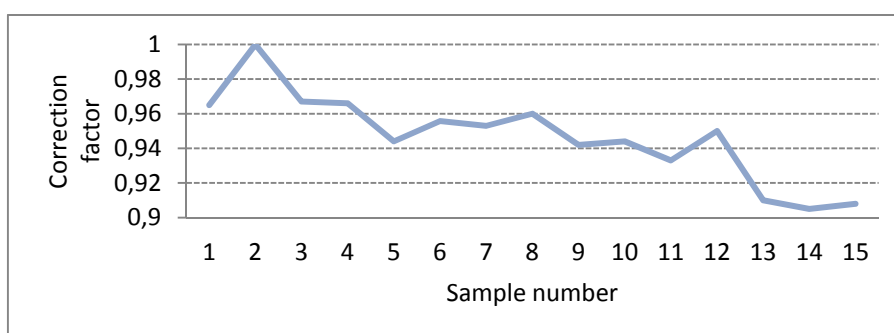


Fig.1 variation of flux correction for long thermal irradiation

Table.1 Botanical name for two medicinal plants.

Commun name	Botanical name	family	part used
Sage	Salvia Officinalis	Lamiacees	Leaves
Ginger	Zingiber Officinalis	Zingiberaceae	Root

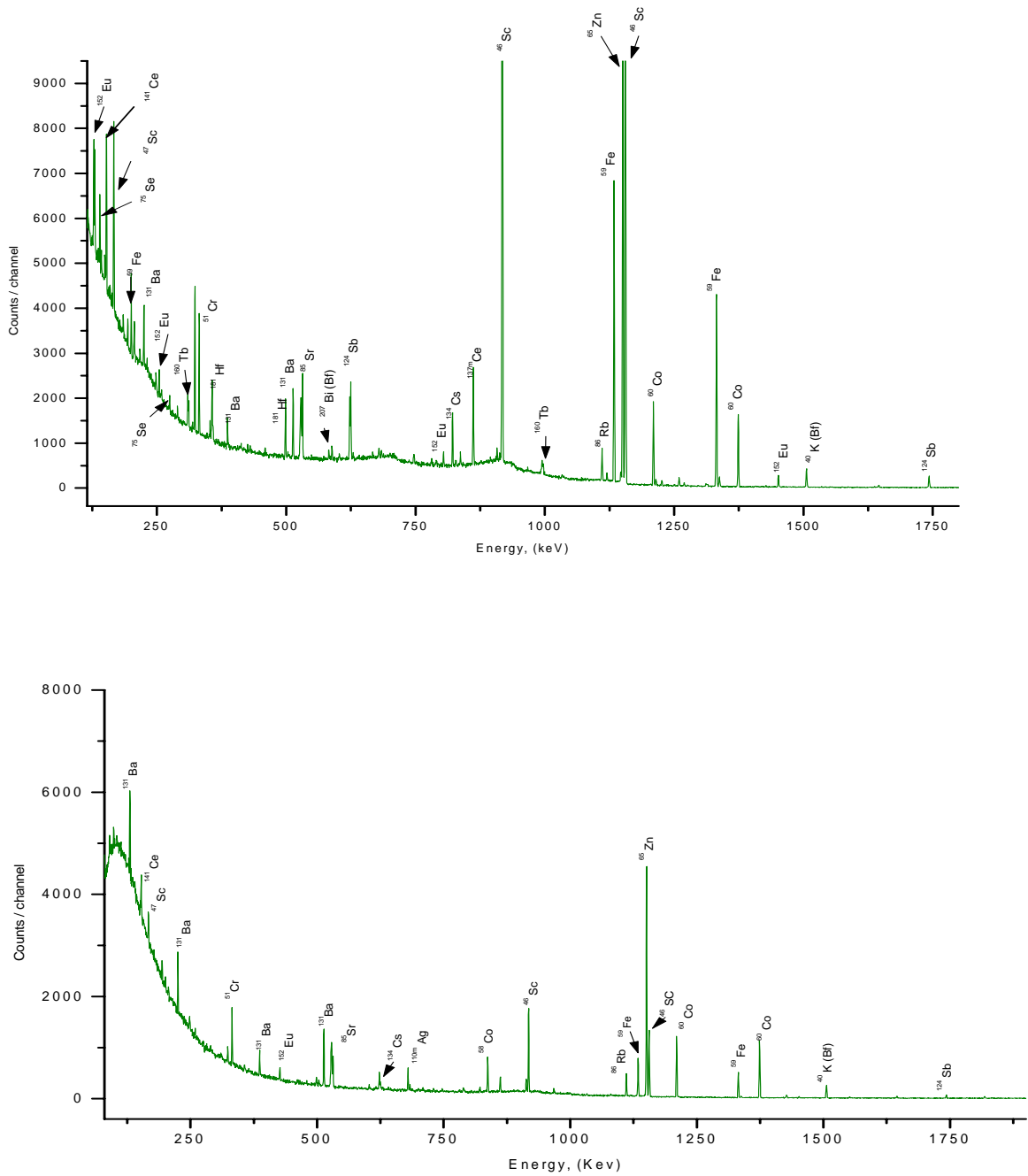


Fig. 2 Typical long-lived Spectrum obtained for four (04) hours of irradiation time and after a delayed time of one (01) month respectively of Salvia Officinalis and Zingiber Officinalis

Results and Discussion:

Table.2 lists the elemental concentrations obtained for the medicinal plants samples with 2 σ average deviation. For the elements studied the Zn is found at the

minor level , Eu is found at trace level and the Al, Cl, Mn, K, Na and Fe are found to be present at the major level.

Element	Zingiber Officinalis	Salvia Officinalis
Al	0.289 \pm 0.173	2.05 \pm 1.22
Cl	1.80 \pm 0.34	0.59 \pm 0.11
Mn	LLD	0.716 \pm 0.026
K	19.00 \pm 1.48	23.00 \pm 1.63
Na	0.58 \pm 0.035	0.28 \pm 0.013
Fe	0.94 \pm 0.022	1.176 \pm 0.026
Zn*	16.39 \pm 0.14	55.61 \pm 0.38
Eu*	LLD	0.31 \pm 0.006

*Values given in ($\mu\text{g} / \text{g}$).

Table.2 Elemental Concentrations (mg /g) for Zingiber Officinalis and Salvia Officinalis.

The figure.3 shows a significant variation of elemental concentrations present in the Ginger and Salvia, these results are in

agreement with range values reported by references concerning medicinal plants¹⁻²⁻³⁻⁴.

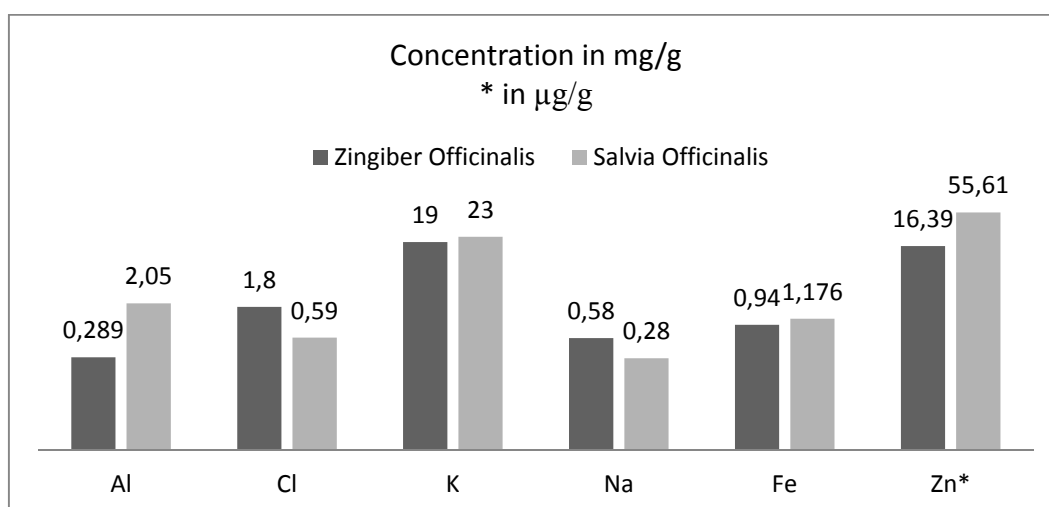


Fig.3 variation of elemental concentrations present in the Zingiber Officinalis and Salvia Officinalis

The results of the herbs rich in certain elements explain the observed therapeutic aspect individually or in the association with other plants. The iron concentrations 1.176 ± 0.026 mg/g and 0.94 ± 0.022 mg/g are observed respectively in Zingiber Officinalis and Salvia Officinalis these values are in accordance with regard to the other medicinal plants containing more than $100 \mu\text{g/g}$. Element like iron have immunomodulatory functions⁵⁻⁶. The Salvia Officinalis have the highest concentration of manganese $716.4 \pm 26.29 \mu\text{g/g}$ an antioxidant element⁷, it is required for the metabolism of vitamin B1, C, and E and it intervenes in another functions, regulation of the

immunizing system and the enzymatic activation⁷. The concentration of potassium observed in the present study was high in the two plants 19 ± 1.48 mg/g in root of Zingiber Officinalis and 23 ± 1.63 mg/g in the leaves of Salvia Officinalis this element constitute an essential part of important enzymes⁸, it is a diuretic, and it has a role in the regulation of the heart rhythm. We determined a high concentration of sodium in the plants 0.58 ± 0.035 mg/g in Zingiber Officinalis and 0.28 ± 0.013 mg/g in Salvia Officinalis. These concentrations of sodium and potassium can help in the maintains of the blood pH and the fluids osmotic pressure in the human body at normal levels.

The chlorine is an essential element, it is necessary for the renal function, the digestive and neurophysiologic system (Toto et al, 1984 ; Sackmann and Neher, 1984). It was reported by Reddy and Reddy (1997) and Singh and Garg (1997) the content of Zinc in the papaya (carica papaya) leaves is high (7.69 mg/g) compared with our results $16.39 \pm 0.14 \mu\text{g/g}$ and $55.61 \pm$

$0.38 \mu\text{g/g}$ respectively in Zingiber Officinalis and in Salvia Officinalis. Zinc is important for fertility and good mental⁹. Eu are present at trace level. The results of the AIEA reference materials (V-10, SL-1, V-8 and SD-M-2/TM) and their certified values are shown in table 3. These results show good agreement between the two values for almost element.

Element	IAEA-V10		IAEA-V8		IAEA-SL-1		IAEA-SD-M-2/TM	
	Measured	Reported	Measured	Reported	Measured	Reported	Measured	Reported
Al *	83 ± 4.9	47 ± 28.5						
Cl *			516 ± 99.63	570 ± 108				
Mn					3.25 ± 0.12	3.46 ± 0.16		
Na					1.79 ± 0.10	1.72 ± 0.135		
K	23.99 ± 1.7	21 ± 2.0						
Zn*	30 ± 1.7	24 ± 3.0						
Fe							27.40 ± 0.59	27.1 ± 1.75
Eu*							0.77 ± 0.16	0.85 ± 0.11

* Values given in $\mu\text{g/g}$.

Table.3 Quality Control assessment results (mg/g) for the AIEA - certified reference material samples.

Conclusion:

The INAA methodology adopted for this work characterized eight elements in Zingiber Officinale and Salvia Officinale these results may be helpful in folklore applications and in the future medicinal research. Some extract of medicinal plants contain besides the natural ingredients, the pollutants and this is due to the severe impact of the increasing industrialization and the environmental pollution which we

observed on the soil, the water and all the types of vegetations. The sage contains a lethal substance¹¹. Because all this potential toxicity the herbs should be administered with precaution. Actually the more extensive research has become the focus in the elementary composition¹² due to the diversity and potential that medicinal plants have.

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