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Research Article

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The effect of geographical region and phonological stage on the amount of essential oil extracted from *Inula viscosa* grown in Syria

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ABSTRACT

Inula viscosa was chosen to start a research due to the fact that this plant spreads widely in different geographical regions in Syria. The effect of environmental conditions on the amount of essential oil extracted from aerial parts of Inula was determined during three phonological phases (vegetative- flowering- post flowering). The plant was collected in the year 2013from three different geographical regions in Syria (Beit Diebeh, Der Mamma and Kafra). The results showed that the full flowering stage is ideal to harvest the plant in order to achieve greater therapeutic benefits. On the other hand, the amount of essential oil was very little during the vegetative stage in the three different regions. Climatic factors as moisture were very essential to biosynthesize larger amounts of essential oil, where the highest ratio reached 2.3 ml/ 100 g in (Beit Dieneh- Tartous).

Keywords: *Inula viscosa*, Essential Oil, Phonological Stage, Syria

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INTRODUCTION

Syria is considered one of the richest countries in biological diversity -especially botanical - due to geographical position, which allows the spread of 3210 plant species [1].The ratio of essential oil in plants varies depending on the genetic composition and environmental conditions [2].Thus, the ecological stress is considered the most important factor, which determines the production of essential oil due to the influence on the biological functions in plants[3].

Inulaviscosa is a plant belongs to the composite family and widely spreads in the countries of Mediterranean basin. Medicinal properties of *I.viscosa* were known for a long time ago, so many researchers have studied the chemical composition of this plant [4]. *Inula* extracts were found to possess antioxidant properties [5]. Hence, it is important to investigate the amount of essential oil extracted from *Inula* herb spread in Syria.

EXPERIMENTAL SECTION

1- Plant material:

The fresh samples of *I.viscosa* aerial parts were collected at three different phonological stages, June -2013 (vegetative stage), September -2013 (Full flowering stage) and December -2013 (post-flowering stage).

The plant was harvested from different areas located in Syria (Beit Diebeh, Der Mamma and Kafra), which are geographically anisotropic areas according to Emberger'spluviothermic quotient.

The values of the quotient were estimated at about (190-140-150) for the previous areas respectively using this formula:

Q2=2000*P/M2-m2

Where, P is the mean annual rainfall (mm), M is the mean of the maximal temperature for the hottest month (C°) and m is the mean of the minimum temperature values of the coldest month (C°).

2-Extraction of essential oil:
Samples of aerial parts were air-dried at room temperature for 10 days. After crushing, they were subjected to hydrodistillation using a Clevenger-type glass apparatus for three hours to obtain the essential oil [6].

Xylol was added to the distilled oils prepared previously until they were changed in color into light yellow and then the amounts of the oil were calculated based on the dry weight of the plant used for distillation, which was 100 g [7].

RESULTS AND DISCUSSION

Results have shown varying amounts of *Inula* essential oil according to different geographical regions and phonological stages. It should be pointed out that a little amount of the oil was obtained from samples in vegetative stage.

Essential oil amounts ranged between (1.7- 2.2) ml and (1.2- 1.9) ml for the flowering and post-flowering stages respectively – table 1.

Table 1- Amounts of essential oil extracted from *Inula* aerial parts according to different geographical regions and phonological stages

Area (2013)	Amounts of essential oil (ml)		
	Vegetative stage	Flowering stage	Post-flowering stage
Der Mamma	0,04	1,7	1,2
Kafra	0,06	1,9	1,7
BeitDiebeh	0,08	2,2	1,9

Table 1 shows different percentages of the essential oil due to anisotropic geographical regions and different Emberger'spluviothermic quotients. It could be said that the samples, which were collected from high rainfall areas (high-moisture areas), gave larger amounts of essential oil compared to lower rainfall areas (high sunshine duration). In other words, herbal samples, which were collected form Beit Diebeh site, gave larger amounts of essential oil where Emberger'spluviothermic quotient reached 190.

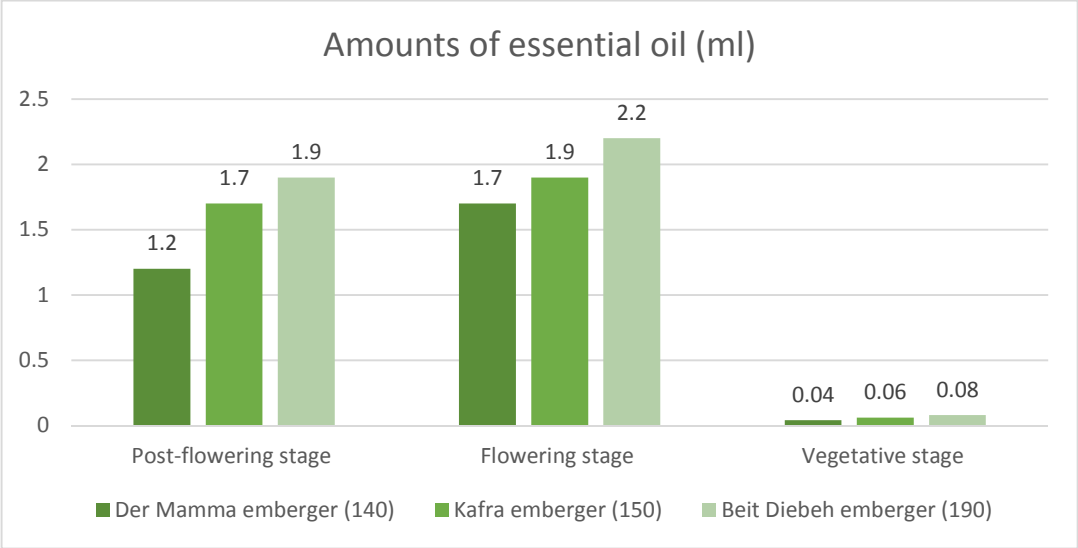

Figure1: Amounts of essential oil extracted from *Inula* aerial parts (ml) according to different geographical regions (different Emberger'spluviothermic quotient) and phonological stages

CONCLUSION

Our results showed that *Inula viscosa* contains the largest amount of essential oil at flowering stage. Also Emberger'spluviothermic quotients possess a direct effect on the amounts of essential oil produced by this plant. We recommended the need to work on more scientific researches include *Inula viscosa* due to its importance in medical field.

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