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# The effect of elevation on essence of medicinal plant, *Descurainia Sophia (L.)* in natural growth places of Kerman's province

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## ABSTRACT

flixweed due to cure properties and suitability with body, has been considered as medicinal plant for continuous years and the traditional physicians in Iran recognize. This plant with the nature of fresh and hot nature which is applied for properties as stomach strengthen, appetizing and curing measles and scarlet fever. In this research the effect of the height from sea level on the amount of essence giving flixweed have been studied in eight regions of Kerman by different heights of 700 up to 2040 meter from sea level. The samples of flixweed were collected from different regions, Essence getting was done by grinded samples and after weighing the amount of 100 gram with Clevenger Apparatus & distillation method by water in 4 and half hours, To feel sure of correctness of the proceed for each sample, three repetitions were occurred. The results showed that by considering different factors which affect the amount of essence giving, statistical surveys by SAS software in the level of 0/01% in full casual design with 3 repetitions and by Duncan test proved that between percentage of essence amount and the difference of elevation, there is a negative & significant relationship. Among different regions, most amount of essence was related with Jiroft region with the elevation of 700m, having the percentage 0.0059 ml of essence 's amount & in the region of Bardsir with the height of 2040m from sea level, the least amount of essence 0.0048ml was considered.

**Key words:** Kerman, Essence, *Descurainia Sophia*, Flixweed, Height from sea level

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## 1. INTRODUCTION

**F**lixweed has been applied as a useful medicinal plant in Iran, India and China. This plant is at the class of Brassicaceae or Cruciferae with the scientific name of *Descurainia Sophia (L.) web* and it has been recognized with the similar name of *Sisymbrium Sophia L (1)*. Each bush of flixweed can produce 15000 seeds (2). Flixweed is native to southern Europe, Asia, South Africa, South America and New Zealand (3). In Iran in the regions of west (Hamedan & Kermanshah), north (Amol), central regions (Tehran, Karaj, Yazd), in south (Kerman, Fars) it grows, in non-cultivable regions and relatively humid this plant grows (4, 5). All the parts of this plant (leave, flower and seed) have medicinal property. The seed of this plant to be used for repulsion of maw worm and removal of kidney stone (6). In natural & cultivable ecosystems there

are many factors such as light, humidity, the elevation, the date of cultivation, and physical & chemical properties of the soil are the basic and identifier of the quality and the quantity of the plants (7). Essences are fragrant compositions which are found in different limbs of the plants and due to evaporation and in the vicinity of the air, they are called volatile oils or essence oils, these oils are chemical volatile combinations that include Terpenes, Sesquiterpenes, derivatives of their oxygenated and other combinations, essences are responsible for fragrant or taste in the plants (7, 8). Studies indicate that consumption of flixweed in women during pregnancy leads to more successful deliveries and less instances of elongated insemination, delivery and pregnancy (9). Iran with the different regions and growth places is including of 75000 up to 80000 species of the plants and has established

various ecotypes of different species of plants (10), therefore to identify the effective factors on the quality & quantity of the medicinal plants have been considered. Researchers had tried to find different methods to produce more effective substance in a research and study in 2007 which has been done by Mazaheri and his colleagues, the effect of height on the essence oil and wild Origan medicinal combinations were surveyed, the results showed that the increasing of height from 1800m up to 2800m causes decreasing the amount of the essence in Origan but amount of effective substance has been added, statistical analysis proved that the percentage between the essence and difference of elevation is a negative & significant relationship (11). In a research which has been done by Chris and his colleagues in 2002, the results showed that Essential oil yield didn't show any significant changes related to treatment variables and was between 0.2–0.5% (v/w). Planting density influenced oil composition, mainly by affecting its methyl cinnamate (the methyl ester of cinnamic acid with Molecular formula:  $C_{10}H_{10}O_2$ ) and linalool (3,7-dimethyl-1,6-octadien-3-ol or terpene alcohol with Molecular Formula:  $C_{10}H_{18}O$ ) content. Nitrogen and phosphorus supply didn't have a marked effect on oil composition (12). In the search of Jalali and his collaborators on the mass of oak in Golandroud, he realized that the height from sea level has more effects on the quality of the plant so by increasing the height from sea level, the quality of the Oak to be decreased (13). Another factor which has more effects on the amount of the essence and it's combinations, is the date of the cultivation and the compression of bush at the level. In a study in 2009 that has been carried out by Morteza and his colleagues, the date of the cultivation and the bush compression were examined on Valerian, they concluded

that if the compression of the bushes to be slight and there are enough distances among the bushes, the amount of the essence would be more (14). Medicinal plants of the economical which are bargain that amount of secondary metabolites are desirable to be reached in these plants. Therefore by selecting suitable and effective environmental factors on effective substance plants can be carried out in the field of culture and development of medicinal plants. So in this research the effects of the height from sea level on the amount of essence giving *Descurainia Sophia* have been studied in eight regions of Kerman by different heights of 700 up to 2040 meter from sea level.

## 2. MATERIALS AND METHODS

This research was done by Clevenger Apparatus and by the method of distillation for extracting of essence and next, The essence was solved by Dichloromethane and by considering the amount of the solvent, they were put under chemical hood (Besat Co., Iran) till to separated from essence. Finally, the study was performed using SAS software, with three replications in a completely randomized design. For this purpose, the natural habitats of this species in Kerman province were identified with the aid of herbarium officials and Eight regions with different elevation were selected. The samples of flixweed from 8 regions of Kerman (Figure 1) in the spring with the help of local people were collected, plant samples include root, stem and leave of flixweed, after cleaning in free air and under dried shade and were kept in the pocket till the extraction the essence.

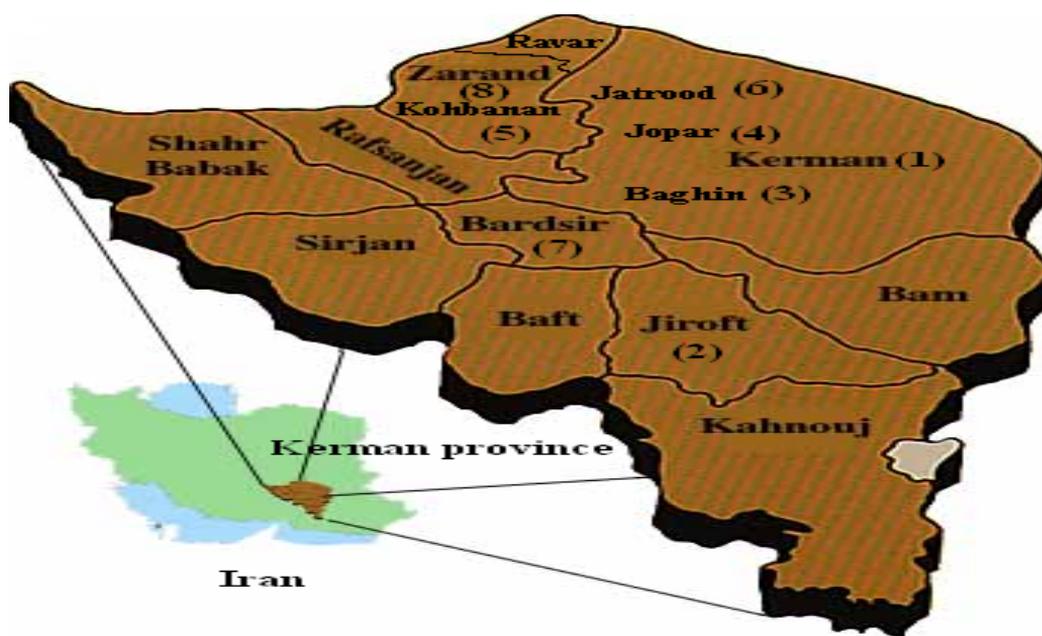


Figure 1. The geographical regions of the collected flixweed masses across Kerman province

Essence getting was proceeded in this way that the samples were grinded after drying & after weighing in the amount of 100gr., essence giving was carried out by Clevenger Apparatus and by the method of distillation with water in four and half hours, to feel sure of the correctness of the job, repetitions for every sample were done three times (15). In this test all the parts of flixweed (stem, root and the flower) were used, 500 gr water was added in to the balloon and after installing the apparatus and the flow of cooling water, distillation was done. For specifying the amount of essence due to distillation after distilling the material with the water, distilled material was collected in a scaled pipe, the amount of essence from distilling was less and was assembled as jelly and nearly solid, at the point of collection the essence was stuck to the glass wall and was sticky and transparent, at first the water of the apparatus was emptied and then was transferred to the small plate of solvent, Dichloromethane which is poisonous and volatile. The essences were solved by the solvent and by considering the amount of the solvent, they were put under chemical hood for 30 minutes till to separated from essence. Due to less volume of gotten essence from flixweed, after getting the pure essence, for obtaining the amount, the weight of the full plate to be declined from empty weight of the plate and the amount of the essence to be obtained. In separating process, special syringes of essence getting with the slight volume of 25microlitter to be used. Samples in dark small plate were stored in the refrigerator at 4 ° C. The obtained data was entered into computer using software excel. By analyzing this data, descriptive statistics was presented graphically.

Finally, the study was performed using SAS software, with three replications in a completely randomized design and Also the comparison among the treat in the method of Duncan & LSD were carried out.

### 3. RESULTS AND DISCUSSION

In respect of this point that there are different factors in the amount of produced essence in different regions such as the length of day and night, the amount of irrigation or the humidity, the elevation, the date of harvest, climate and the way of drying the plant mass, compression of the level, each of these factors could effect on the quality and the quantity of the essence (16). While in this study flixweed has been collected from the regions that there is self growing of this plant and there is no man's interference in the growing of this herbal and by considering the date of harvesting while these samples are collected in the spring but due to geographical conditions of the regions and different climates, the amount of the essence in the masses have been different and on the basis of one pattern, decreasing or increasing like the height from the sea level have been calculated. The amount of essence of mentioned masses is variable between 0.0048 ml up to 0.0059 ml. The Table 1 illustrates existed essence of native masses of flixweed as Jiroft region that has the least elevation with 700m, has the most percent of the essence ;0.0059 ml and Bardsir region that has the most elevation; 2040m has the least percent of essence amount 0.0047 ml.

Table 1 . The amount of existed essences in the masses accompanied with the heights from sea level, m=metter, ml=millimeter

Row	Sample place	elevation	amount of essence	Row	Sample place	elevation	Amount of essence
1	Kerman	1755 m	0.0049 ml	5	Kohbanan	1945 m	0.0049 ml
2	Jiroft	700 m	0.0059 ml	6	Chatrood	1806 m	0.0050 ml
3	Baghin	1717 m	0.0055 ml	7	Bardsir	2040 m	0.0048 ml
4	Jopar	1893 m	0.0050 ml	8	Zarand	1650 m	<b>0.0052 ml</b>

In this research in completely randomized design with 3 repetitions took step for variance analysis, SAS software for comparison the average the cares, Duncan test and LSD were applied. The expressive difference at the level of % 0.01 shows the effect of the height on the amount of produced essence in 8 different regions of Kerman (Table 2).

Table 2. Testing 8 treats in a completely randomized design with three repetitions

Source	DF	Type III SS	Mean Square	Pr > F
treat	7	2.94E-6	4.2533333E-7	0.0001
r	2	1.6E-7	8E-8	<b>0.0001</b>

In respect of Duncan test and LSD, the results were similar; the effect of the height on the amount of the essence has been divided into 5 groups that Jopar together with Chatrood identified in one group and Kerman with Kohbanan located in another group and this shows similar

amount of the essence in the heights are close to each other and other regions were located in single member groups (Figure 2).

## Essence average

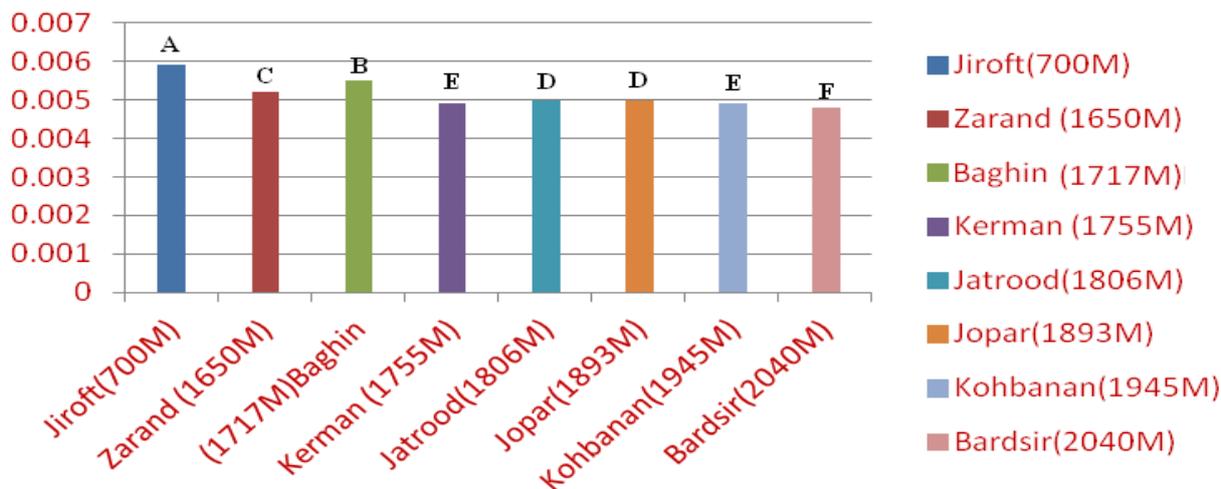


Figure 2. Grouping based on average Essence different treat according to Duncan & LSD test, 0.01%

Duncan and LSD tests proved that between the percentage of essence and the difference of height from seal level, there is a negative and expressive relation as by increasing the height from sea level, the amount of the essence in mentioned masses would be decreased. In Mazaheri's study and his colleagues, it was understood that increasing of the height from 1800m up to 2800m causes decreasing the amount of essence of Origan but the amount of the effective substance compositions have been gone up. Through a study by Mohammadian and his collaborators in 2014 about the effect of height from sea level on effective substance of origan in Lorestan's growth places, It was shown that by increasing the height from sea level, effective substance in the essence of origan has been gone up (17). In a survey by Hiva and his colleagues in 1986 on the amount of Cumin's essence in different regions of geographical widths, they realized that total amount of essence and the amount of Karvoon have not been different under influence of latitude (18) but by considering Mazaheri's research, Hosseini's research and other studies the height is an effective factor on the amount of essence in mentioned masses (11, 19). In future studies that there will be similar conditions in all regions, this matter should be discussed.

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### 4. CONCLUSION

The findings of this research show the samples of flixweed in province of Kerman has the pattern changes of elevation, from 700 up to 2040m. The amounts of essence by increasing the height are different. The amount of mentioned essence significantly decreases at the level of 0.01%. The native samples of Jiroft with the least height from sea level have most amount of essence and the native samples of Bardsir have the least essence with the most elevation. These results show the effect of environment on the amount of the essence. The obtained results from this research are accordance with Mazaheri & Hosseini's studies and the effect of the height from sea level on the amount of the essence is confirmed (11, 19). Other different factors on the amount of essence in herbal masses are bush's compression, light, moisture and physical and chemical properties of soil. For getting the best and the most effective essence, it is necessary to consider some cases like the property of herbal material, right dissolver and accuracy of essence extraction processes. In the method of essence extraction by Clevenger equipment, the little amount of essence was prepared from flixweed, by considering that newly techniques for extraction follows the increasing of quantity and quality of the extracted materials, preventing from contamination and decreasing the cost of preparing the sample, new techniques like Microwave could be applied for extraction of *Descurainia Sophia*.

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### AUTHORS CONTRIBUTION

This work was carried out in collaboration among all authors.

## CONFLICT OF INTEREST

The authors declared no potential conflicts of interests with respect to the authorship and/or publication of this Paper.

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