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Research Article

Evaluation of Some Morphological Characteristics of Different Basil Masses (*Ocimum basilicum* L.)

Hamed Aflatooni[1]*, Mohsen Ebrahimi[2], Hossein Ramshini[3] and Gholam Akbari[4]

Department of Agronomy and Plant Breeding, Abourihan College, University of Tehran, Iran

ABSTRACT

In order to Study of some physiological characteristics of the basil plant was carried out and during which the 4 masses (Abu-Rayḥan, Heidari, Jaefari, Rey city) Cultured and evaluated. Plant specimens were obtained during 2 harvesting. Before entering the plant to flowering stage, the chlorophyll content was analyzed with spad. During this research, 10 plants per block were randomly selected and their chlorophyll content was investigated. In total, out of 160 measured plants, 2 points A and B are slightly different from each other, but point C has a very great difference compared to point A. It can be said that the point C has higher chlorophyll content than the point B and B has higher chlorophyll than point A. In the stage, then after harvest and transfer to the laboratory, their fresh weight was measured. The plant samples were placed in a laboratory and dried in air dry at ambient temperature. In the first impression, after a week and in the second harvest after sixteen days, the specimens were dried and then weighed, Then weighed the samples with the aid of the Clevenger apparatus and prepared the essential oils within 3 hours, According to the obtained data, in the first impression, the lowest weight of the essential oil was obtained from Rey city mass with 0.12 g weight and the highest weight of the essential oil was obtained from the Abu-Rayḥan mass with weight 0.21 g. In the second harvest, the minimum weight of the essential oil was related to jaefari mass with weight of 0.07 g and the highest weight of essential oil obtained from Heidari mass and weighing 0.13 g. Finally, the data were computed and analyzed using SAS and Excel softwares..

Keywords: Essential oil; Physiology; Basil; Chlorophyll; Spad

INTRODUCTION

Basil is an important herb of the Lamiaceae family. Basil is an herbaceous, herbaceous plant with a height between 40 and 60 cm, which has a great variety in morphology and secondary compounds, and especially essential oils [1].

The origin of this plant is from the countries of Afghanistan, Iran [2], Iran Plateau, India [3], Pakistan, Thailand, Northwest and Northeast Africa, Central Asia [4], South Asia and Central Africa reported that the major part of Basil's essential oil is phenylpropanoids [5].

The properties of this plant can reduce cardiovascular diseases, prevent cancer, and preserve the health of the skin. Basil, like other herbs of the Laminae family, is the source of ring compounds and essential oils, it has anti-parasitic, anti-bacterial, anti-fungal and anti-oxidant properties [6] and used in the cosmetics industry [7]. Basil essential oil is used as a spice in confectionery, salad, ice cream and perfumes, and is used in the preparation of non-alcoholic beverages and toothpaste. To obtain the essential oil of high quality and quantity, the vegetative body of the basil plant should be harvested before the flowering stage. Basil's essential oil is a yellowish or greenish-colored liquid. Not dissolved in water but dissolves in 2 times the volume of alcohol at 80°C. With ether and chloroform there is no solubility. Basil essential oil should be stored in closed containers, in a cool place and away from light.

MATERIALS AND METHODS

This research was conducted in july 2018 at the Research Farm of Abu-Rayḥan College, Tehran University, in Pakdasht (southeast of Tehran). The latitude was 18° 28' N, longitude 81° 24' East and 1180 m above sea level.

In this research, 4 basil masses (named after Abu-Rayḥan, Heidari Alouak, Jafari Alouak, Rey-city) were used. The 4 populations were cultured randomly and in 4 replicate (Figures 1 and 2). After cultivation, when they reached the appropriate height (about 40 cm), their chlorophyll content was evaluated before the flowering stage. To do this, use the SPAD (Minolta model). 10 plants per block were randomly selected.

Correspondence to: Hamed Aflatooni, Researcher Department of Agronomy and Plant Breeding, Abourihan College, University of Tehran, Iran. Telephone: +989111867211,+989336310415; E-mail: hamed.aflatooni@ut.ac.ir

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Finally, the chlorophyll content of the 3 leaves of the leaf, the first (A) point, the middle (B) point and the end (C) point for 160 leaves of basil, were measured randomly under sunny conditions. After recording the data, analysis of variance in a randomized complete block design (RCBD) with 3 leaf points as 3 treatments was performed and was considered as random blocks.

Figure 1: First cultivation on the farm.

Figure 2: Before entering the reproductive stage.

Figure 3: Drying the organs.

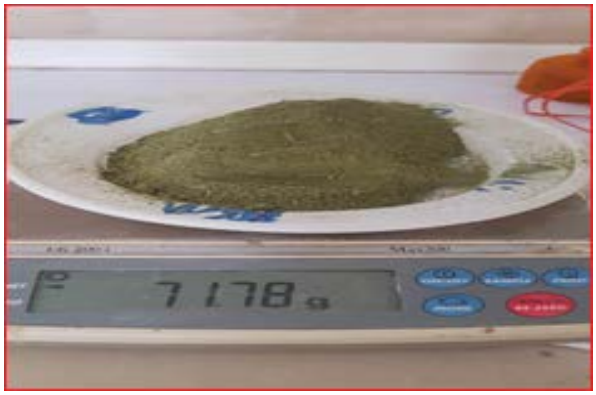

Figure 4: Powder obtained from dried plant organs.

Then, the mean comparison using LSD method was performed using SAS v.9.3 software [8]. And 160 different plants examined in the field, SPSS v.19 software was used to compute descriptive statistics such as mean, fashion, middle, minimum and maximum, range of variations, standard deviation and standard error for each leaf point. In the next step, they cut them from 4 to 6 cm above the

Figure 5: Essential oil preparation by Clevenger machine.

Figure 6: Essential oil collection.

Figure 7: Collection of essential oils in the tube.

surface of the soil and were taken randomly from the ground by a 40 cm square quadrate.

Samples are taken to the lab and after measuring their fresh weight and taking the relevant numbers, place them on clean and dry papers on the surface to dry completely for 1 week (Figure 3). (During this time the return of plant samples was done every 24 hours), after a week, they were crushed and powdered and then weighed (Dry weight). The next step, carried out with the aid of the Clevenger device, Powdered and weighed (Figure 4). Samples with a ratio of 1 to 10 (equivalent to 1 g of dry matter in 10 ml distilled water) are poured into the Clevenger apparatus and after adjusting the device and preparing (such as connecting the inlet and outlet hoses, Pouring the desired volume of distilled water, connecting

Figure 8: The second stage of harvesting the basil plant.

Figure 9: Total samples provided.

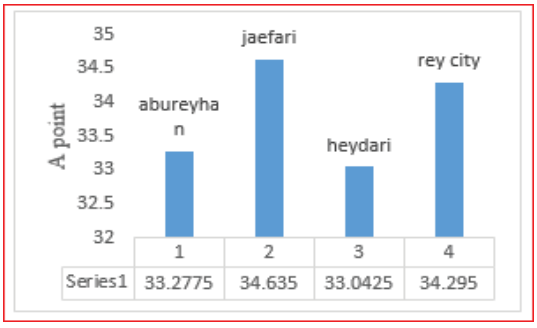

Figure 10: The mean chlorophyll content of each point for the masses, point (A).

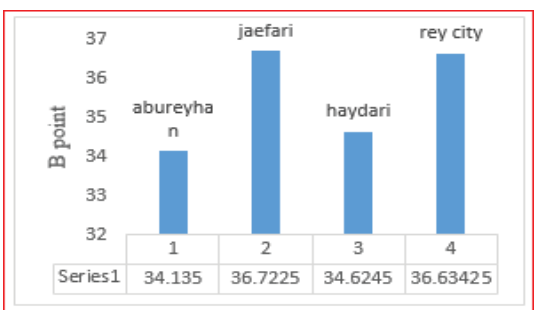

Figure 11: Curve checking the average chlorophyll content of each point for the masses, point (B).

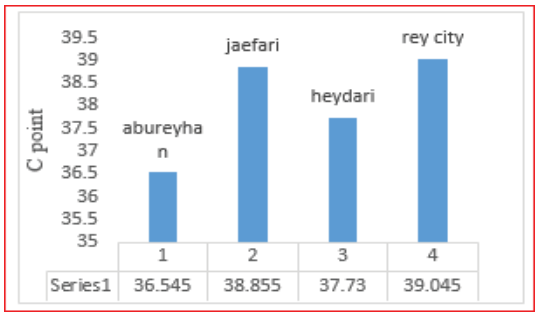

Figure 12: The mean chlorophyll content of each point for the masses, point (C).

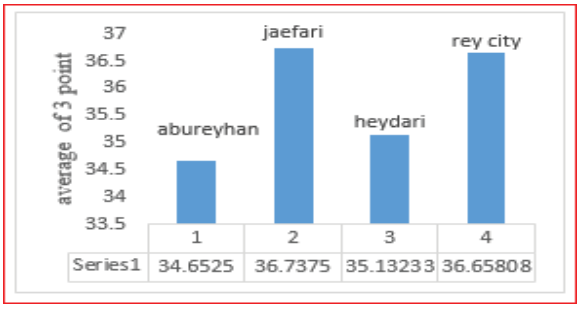

Figure 13: Curve of the mean chlorophyll content for the average of three points.

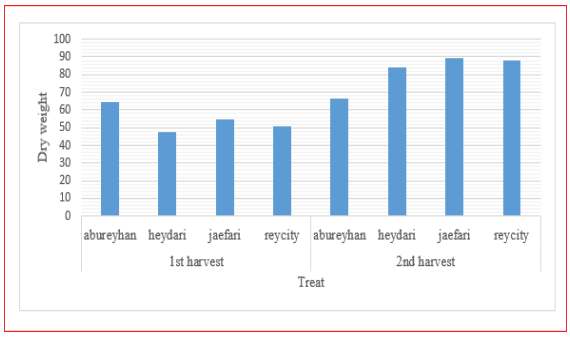

Figure 14: Curve of significant levels of numbers obtained from fresh weight.

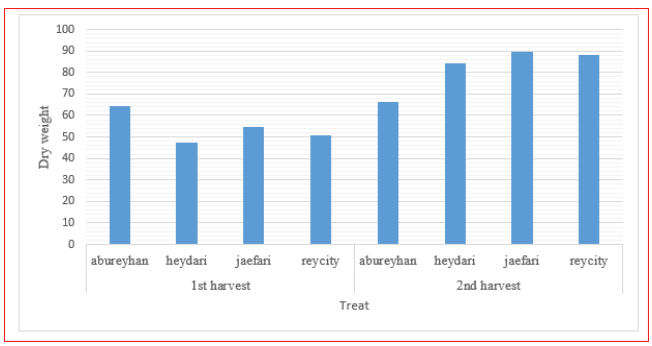

Figure 15: Curve of significant levels of numbers obtained from dry weight.

the plug to the socket, etc.) Turn on the device and collect a certain amount of essential oil within 3 hours (Figure 5).

This process was performed for every 16 samples. It should be noted that, according to the protocol, the essential oil was obtained within a time interval of 2 hours and then there was no significant change in the volume and weight of the essential oil (Figure 6). Finally, the essential oil was poured into the tube (Figure 7). After completing the work, notes the weight of the obtained oils in Excel, then the weight of the essential oil obtained from the dry matter must be subdivided to give the final weight of the essential oil. The

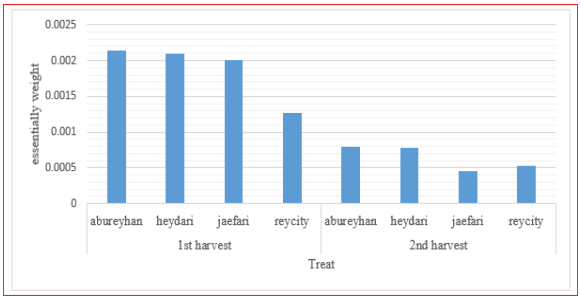

Figure 16: Curve of significant levels of numbers obtained from essential weight.

Table 1: Results of comparison of chlorophyll content of three points of Basil leaf.

Leaf area	Average
First leaf (A)	33.6375[a]
Middle of leaf (B)	35.52906[ab]
Leaf end (C)	38.04375 [c]

*The different letters indicate a significant difference with the LSD test at the chlorophyll content

Table 2: Analysis of variance of chlorophyll content in three points of leaf of four Basil masses (Comparison between treatments).

S.O.V	Df	Ss	Ms	f
Block	3	870.2	290.066	12.55**
Line	3	406.47	135.49	5.86*
Point	2	1543.458	771.726	33.39**
Line × point	6	67.057	11.176	0.48ns
Error	463	10701.901	23.114	
C.V.	13.40%	~	~	~~

*, **, ns: Significant at 5%, 1% levels of probability and no significant difference respectively.

Table 3: Descriptive statistics of chlorophyll content, first point (A), middle point (B), end point (C) of basil plant (Rey city, Abu Rayḥan, Jafari, Heidari masses).

Index	A	B	C
Mean	33.6375	35.52906	38.04375
Std. Error of Mean	0.418149	0.353716	0.399532
Median	33.8125	35.52906	38.04375
Mode	39.6	34	42
Std. Deviation	5.28917	4.474151	5.053683
Variance	27.97531	20.01803	25.53971
Range	30.3	24.6	29.1
Minimum	18.9	24.7	25.8
Maximum	49.2	49.3	54.9
sum	5410	5684.65	6087

Table 4: Results obtained from measurement of fresh weight, dry weight and essential oils of treatments in different blocks.

Essential oil	Dry weight g × m^2	Fresh weight g × m^2	Mass	Harvest
0.21	192	2596	Abu Rayḥan	1
0.2	142	1694	Heidari	1
0.2	164	2007	Jaefari	1
0.12	151	2092	Rey city	1
0.11	198	2630	Abu Rayḥan	2
0.13	252	2875	Heidari	2
0.07	268	2963	Jaefari	2
0.09	264	2786	Rey city	2
0.11	52	725	~	LSD 0.05

second harvest took place when the plants reached a height of 30 to 40 centimeters (Figure 8). Because the stems and plant organs were thicker than before, their drying process lasted about 2 weeks, the next steps of the research were also carried out according to the order of the first cultivation. The numbers obtained from fresh weight and dry weight of the shoot organs and the weight of the essential oils were recorded and taken into Excel software. In the next steps, using Excel and SAS, analysis of variance and other calculations took place.

RESULT AND DISCUSSION

In carrying out this research, were focused on condition of the plant with respect to disease or tension present in the environment. The chlorophyll content of 10 green basil plants (Rey city, Abu-Rayḥan, Jaefari and Heidari masses) from 3 different origin was measured in 4 lines with 4 replications [9] (Figure 9). The important content of Basil plant is present in its secondary composition, but after flowering the amount of secondary compounds was decreased so, it is necessary to measure chlorophyll content before flowering [10]. The results were achieved by taking the measurement within one day during 10 am to 14 pm (in very sunny air) [11], at the end of the work, the numbers obtained from the measurements were recorded in Excel sheet and then calculations were done with the help of SAS software, and through the LSD method. Finally, the numbers obtained were compared and evaluated in terms of significant levels (Table 1).

The result of an average comparison of the ANOVA method was as follows: A Point is not significant at the level of 5% (Figure 10), B point is relatively significant at 5% level (Figure 11) C Point is quite significant at 5% (Figure 12) level and 2 points A and B have very little difference and can be ignored (Figures 13, Tables 2 and 3).

But the C point has a lower difference with B point and a greater difference with A point, or, in other words, a significant difference. Therefore, it is recommended that researchers make and use C point for the purpose of measuring or extracting chlorophyll for laboratory and other research.

The C point has higher chlorophyll content than the other two points; this can be very effective in measuring. According to the calculations, the Abu Rayḥan mass has highest fresh weight, dry weight and essential oil percentage (fresh weighed is 2596 g/m^2, dry weight is 192 g /m^2 respectively and 0.21% essential oil) during first harvest [12]. But in the second harvest, the highest fresh weight and dry weight were allocated to jaefari mass (fresh weight is 2963 and dry weight is 268 g /m^2 respectively) (Table 4) [13] and the

highest percentage of essential oil was allocated to Heydari mass (with 0.13% essential oil) [14] (Figures 14, 15 and 16).

In the significance level study, using LSD test at 5% level, it was found that the first impressions of Heidari and Aou Rayhan were significantly different and the other masses had a slight difference. There was no significant difference in dry weight and essential oil percentage [15]. However, in the second harvest, there was no significant difference in fresh weight, and there was a significant difference in dry weight between (Abu Rayhan and Heidari), (Abu Rayhan with Jaefari) and (Abu Rayhan with Rey city). There was no significant difference in percentage of essential oil [16-18].

CONCLUSION

In the current research the low weight and the low value of the mass in the second harvest in cold season and the temperature below 7°C is associated with cold stress. Because the first harvest had a long day and high temperature, but in the second harvest due to shorter daytime and low temperature, the plant was under stress, and the content of its essential oil got decreased and it entered into the flowering phase more quickly. From this we can conclude that the first harvest is suitable for the preparation of essential oils for pharmaceutical and industrial applications. But in second harvest due to increased plant volume (stems, leaves) is more suitable for use with spices and feeds. Therefore, it is recommended that in order to achieve the higher essential oil, it is necessary to provide conditions such as high temperature, a longer daytime, with suitable irrigation and sufficient fertilizer (such as n, p, k).

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