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International journal of Advanced Biological and Biomedical Research

Volume 2, Issue 6, 2014: 2104-2108

Effect of foliar spray of urea and soil application of vermicompost on essential oil and chlorophyll content of green Mint (*Mentha spicata* L.)

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ABSTRACT

Essential oils from aerial parts of Mentha spicata, was obtained by steam destillation using a Clevenger-type system. These oils were screened for antibacterial and anti-Candida albicans activity using bioautographic method. A fiel experiments was laid out in agricultural research farm, city Namin, Ardabil province, Iran in 2013. Experiment was conducted in a randomized complete block with seven treatments and three replication. Foliar spray treatments urea solution at a rate of 1, 2 and 3% (in two stages, the first stage a month after transplanting when they had reached 10 cm in height to 20 days after the first stage and second stage), soil application of vermicompost fertilizer at a rate of 5, 10 and 15 tons per hectare and control. Chlorophyll in two phases, one week after the first treatment and harvest samples were measured by chlorophyll meter SPAD manually. Essential oil extracted from the leaves and twigs using 50 g samples of each treated flower with water distillation by Clevenger apparatus was performed. Results showed that the effect of experimental treatments on essential oil and chlorophyll were significant at the one percent level of probability. maximum chlorophyll index foliar urea treatment 3 percent and the lowest was observed in the control. Most essential oils (114.3cc per square meter) in 2% foliar urea treatment and the lowest (36.9cc per square meter) was obtained in control treatment. An increase of over 300% in performance is seen to be essential.

Key words: Chlorophyll, Essential oil and Mint

INTRODUCTION

Higher and aromatics plants have traditionally been used in folk medicine as well as to extend the shelf life of foods, showing inhibition against bacteria, fungi and yeasts. Most of their properties are due to essential oils produced by their secondary metabolism. Essential oils and extracts from several plant species are able to control microorganisms related to skin, dental caries and food spoilage, including

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Gram-negative and Gram-positive bacteria (Galli et al, 1985; Cecanho et al, 1999 and Adam et al, 1998). Aromatic plants and spices have great importance for food, cosmetics and pharmaceutical industries. Their use have taken place since ancient times, and despite many of them were substituted by synthetic ones, the demand for natural products is increasing (Guillén, et al, 1996). Mint have been used as spices and teas after drying, while the essential oil is utilized in cosmetics and pharmaceuticals. The essential oils contents in different species is influenced by genetic material, culture conditions and environment (Charles et al, 1990). In the present study, we focused on effect of foliar spray of urea and soil application of vermicompost on essential oil and chlorophyll content of green Mint.

MATERIALS AND METHODS

A filed experiments was laid out in agricultural research farm, city Namin, Ardabil province, Iran in 2013. Experiment was conducted in a randomized complete block with seven treatments and three replication. Foliar spray treatments urea solution at a rate of 1, 2 and 3% (in two stages, the first stage a month after transplanting when they had reached 10 cm in height to 20 days after the first stage and second stage), soil application of vermicompost fertilizer at a rate of 5, 10 and 15 tonnes per hectare and control. The rhizome bud cant row with 33cm between rows and 33 cm, with a density of 10 plants per square meter were planted. Chlorophyll in two phases, one week after the first treatment and harvest samples were measured by chlorophyll meter SPAD manually. For measuring chlorophyll measurements in two phases, one week after the first and second SA of four leaves on each 5 stem from each plot were randomly selected and handheld devices, manually chlorophyll meter CCM200 model was measured and the average of these four chlorophyll readings as treatment were considered. Essential oil extracted from the leaves and twigs using 50 g samples of each treated flower with water distillation by Clevenger apparatus was performed. The essential oil extracted by steam distillation method (water distillation) and by Clevenger apparatus (Clevenger) was performed .then the mixture was poured into a liter of powder and water balloons Clevenger was placed on the machine , and after reaching the boiling point was boiled for 2 h . With water vapor as the refrigerant oil distillation unit and were compiled. Oil and water into the water pipes were scaled back and then again inside the balloon distillation and condensation cycle oil into the micro tube Clevenger apparatus to produce (glass millilier small 1) poured. The statistical analyses to determine the individual and interactive effects of time cultivation and weeds control methods were conducted using JMP 5.0.1.2 (SAS Institute Inc., 2002). Statistical significance was declared at $P \leq 0.05$ and $P \leq 0.01$. Treatment effects from the two runs of experiments followed a similar trend, and thus the data from the two independent runs were combined in the analysis.

RESULTS AND DISCUSSION

The results of the analysis of variance table showing the effect of treatments on chlorophyll index in both periods is significant at the one percent level (table 1). So that both the maximum chlorophyll index foliar urea treatment 3 percent and the lowest was observed in the control (table 2). Since nitrogen is one of the most important elements of the chlorophyll structure appears to be sprayed with urea and nitrogen uptake by the plant leaf chlorophyll content increased.

Table 1. Analysis of variance (mean squares) for effects foliar spray of urea and soil application of vermicompost on essential oil and chlorophyll content of Mint.

S.O.V	DF	Primary chlorophll	Secondary chlorophll	Essential oil
Block	2	0.27	46.62	66.92
Tteatment	6	27.42**	72.19**	2225**
Error	12	6.14	28.65	121.94
CV (%)		6.87	14.25	1.21

* and **: Significant at 5% and 1% probability levels, respectively

Table2. Mean comparisons for effects effects foliar spray of urea and soil application of vermicompost on essential oil and chlorophyll content f Mint.

Treatments	Primary chlorophll (SPAD)	Secondary chlorophll (SPAD)
control	33.17[a]	30.4[b]
5 ton vermicompost/ha	34.26[a]	34.9[ab]
10 ton vermicompost/ha	33.6[a]	35.7[ab]
15 ton vermicompost/ha	33.8[a]	35[ab]
1 percentage urea	37.8[a]	42[a]
2 percentage urea	38.5[a]	39.8[ab]
3 percentage urea	40.1[b]	44.7[a]

Means by the uncommon letter in each column are significantly different ($p<0.05$).

The results of Table Analysis of variance showed that the effect of experimental treatments on essential oil yield is significant at the one percent level of probability (Table 1). Most essential oils (114.3cc per square meter) in 2% foliar urea treatment and the lowest (36.9cc per square meter) was obtained in control treatment. An increase of over 300% in performance is seen to be essential (figure 1). Several studies have shown that proper levels of nitrogen significantly increased the essential oil of peppermint (Omidbaygi, 2011). Khanna et al, (2005) stated that the use of nitrogen fertilizers sprayed on the green parts of the plant compared to the direct use of the soil has led to the further production of essential oil of fennel. According to the diagram, the effect of treatments on essential oil yield can be substantially increased application of vermicompost has this trait. It seems that since vermicomposting compost nutrients more available to plants ¬ form of nitrate, phosphate, potassium and exchangeable Ca solution is therefore to increase performance is essential. Increase in oil yield has been reported by several researchers (Anwar et al, 2005; Atiyeh et al, 2001).

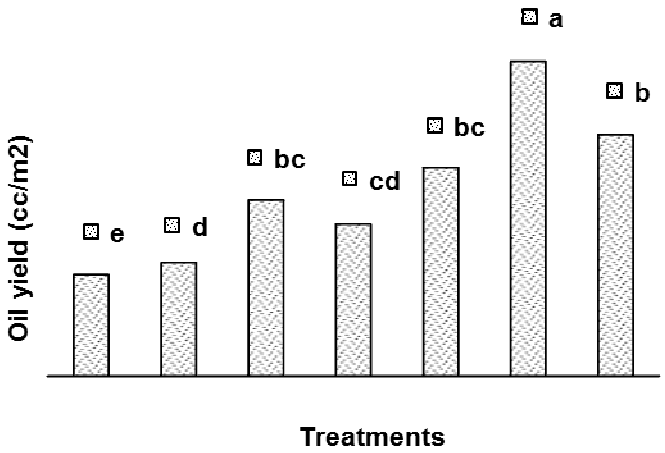

Figure 1. Oil yield changes as affected by experimental treatments.

From right to left: t1. Control **t2**. 5 ton vermicompost /ha **t3**.10 ton vermicompost **t4**.15 ton vermicompost /ha **t5**. 1 percentage urea **t6**.2 percentage urea **t7**. 3 percentage urea

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