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Bibliography. Figures. Tables.

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CONTRIBUTION TO THE DOMESTICATION OF *MICROMERIA BARBATA*(HARESH EL BLAT)

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Abstract

Micromeria barbata Boiss., is one of several species of "*Lamiaceae*" family, known for its aromatic and medicinal characteristics. A field survey was carried out during the spring and summer of 2005 to study the distribution and abundance of this plant among the flora of Lebanon. This work aimed at studying the effect of chemical fertilizers and controlled environmental and agricultural conditions on yield and oil quantity of *Micromeria barbata*. To achieve this objective, two experiments were conducted. The first one was aiming at controlling the behavior of *Micromeria barbata* to different fertilizers, the second one was about the response of this plant to different environmental factors. The results indicate an increase in height if N is used, and an increase in biomass in the case of K., Phosphore gave no significant response. The response to different climatic conditions showed that planting in a sunny green house, and using a high moisture regime and a white calcareous soil, gives best results in yield.

Key words: *Lamiaceae*, *Micromeria barbata*, medicinal plants.

Résumé

Micromeria barbat Boiss., est l'une des différentes espèces de la famille Lamiaceae, connue par ses propriétés aromatiques et médicinales. Une enquête sur le terrain a été faite durant le printemps et l'été 2005 pour étudier la distribution et l'abondance de cette plante dans la flore libanaise. L'objectif de cette étude est de déterminer l'effet de la fertilisation chimique, des conditions contrôlées environnementales et agronomiques sur la production en biomasse

et la quantité des huiles essentielles de la micromérie. Pour achever cet objectif, deux expériences ont été réalisées. La première expérience s'agissait de la réponse de *Micromeria barbata* contre différents fertilisants, la deuxième indiquait sa réponse contre différents facteurs environnementaux. La réponse aux différents fertilisants se résume par une croissance en hauteur suite à l'utilisation du nitrogène et en masse potassium. Le phosphore n'affecte pas la production. La réponse aux différents facteurs environnementaux a montré que planter dans une serre ensoleillée, en irriguant fréquemment et en utilisant un sol blanc calcaireux donnent les meilleurs résultats en production.

Mots clés: Lamiaceae, Micromeria barbata, plantes medicinales.

INTRODUCTION

The genus *Micromeria* belonging to the family of *Lamiaceae* includes many species that exist in Lebanon. One of these species is *Micromeria fruticosa* known as Zopha or Zuta Levana (little mint, tea hyssop) widly distributed in this country. Its remarkable richness is highly due to the geographical position, the variations of relief and the bioclimatic characteristics predominant in Lebanon (UNEP, 1996). For many years, researchers have studied this plant (Dudai, 1993). At the beginning of the century, the industrials of the aromatic sector depend their production on wild cultivation. Actually, many species are threatened by extinction. For protecting the wild flora, many countries have restricted this type of cultivation. But, the future of the market of medicinal plants depends on the progress of research. The domestication and the agricultural techniques are the unique solution of regular supply in this plant (Modawar, 2003). *Micromeria barbata* is a unique plant in the Lebanese flora and is endemic only in very few habitats in Lebanon (Post, 1993). Being a scarce plant and having a very high potential use in pharmaceutical and cosmetic products requires a very close look on its performance under agronomic conditions. This research aims at trying the possibility of domesticating *Micromeria barbata* in ordre to reduce pressure on natural resources, and increase its production. This helps Lebanese farmers in finding new resources and new markets. The domestication was developed through analyzing different fertilizers and various climatic conditions as well as different doses of irrigation and different types of soils on the development and quantity of oil that can be extracted from the plant.

MATERIALS AND METHODS

A survey was made on selected regions: "Kana" (South Lebanon), "Ghazir", "Artaba" (Mount Leba-

non), "Kafarnabrakh", "Ehden", "Abdin", "Kafarhazir" and "Kousba" (North Lebanon), that are native locations of *micromeria barbata*, was not found in many places referred to in old literature. It is important to note that this plant was found in Kana near to the grotto and in Sir el Duniya in the middle of the cedars forest.

Samples of of *M. barbata* plants and seeds were collected from the mentioned areas. Dried flowers were collected from Kana, the seeds were separated from the dried flowers and put on trays filled with a mixture of peatmoss and sand in April 2005 and put outside under rainy climate, until the germination (2 months). Seeds were small, light brown and very light. Cuttings were made from the transplanted plants as follows: 7cm of each stem was taken and then planted in small pots. Aftrewards, they were transplanted in bigger pots where they successfully lived. *Micromeria barbata* plants were isolated from a wild population in Kana and transferred to IRAL field, at Fanar station.

They were moved entirely (with roots) and planted in IRAL field in 2004. They were grown in local sandy soil, and were exposed to weed control and sub-irrigation. Data on yield, plant growth and quantity of oil were collected. To find the best agricultural practices and climatic conditions for the growth of *Micromeria barbata* and trying to find the way for domesticating it in Lebanon, two experiments with different parameters were done. The first experiment utilized N, P, K, and NPK at the rate of 100kg/ha in 1kg pots filled with half. half sand and peat. The second experiment consisted of using three types of soils, white, red, and pot mix whose texture was tested (sedimentation method), and pots were placed in three places (shade, full sun, green house). Low and high irrigation regimes were practiced. Two repetitions were done to eliminate foreign factors that can affect plants development and oil quantity. Extraction of essential oils were done using hydro-distillation.

RESULTS AND DISCUSSION

Soil physical analysis showed that the red soil was a clay sandy loamy soil, the mixt soil was a sandy soil (plus peatmoss) and the white soil was a loamy soil. The obtained results showed that micromeria gives a higher production characterizes *M. barbata* if it is planted in a sunny greenhouse (Figure 1) and in a white calcareous soil or a mixture of sand and peatmoss (Figure 2).

Local 1 (shade) and 3 (green house) were the best in term of height development. The effect seems to be not significant on micromeria plant height development. The effect of the irrigation factor was highly signifi-

cant. Soil 1(white) and 3(red) were the best in term of fresh weight.

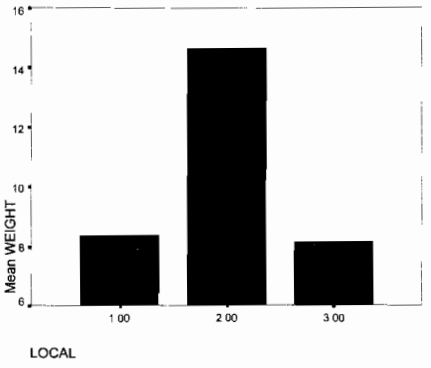

Figure 1. Weight (g) of Micromeria plants grown in three different environments

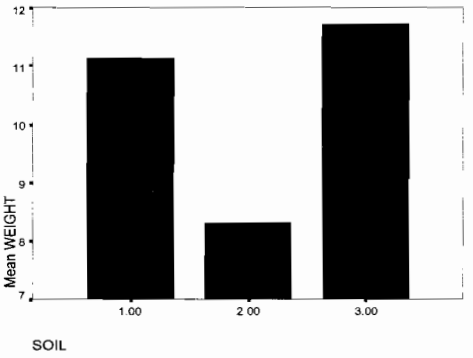

Figure 2. Weight (g) of Micromeria plants grown in three types of soils

This shows that micromeria plants prefer light loam sandy soils and can tolerate poor calcareous soils. The effect of the factor irrigation was not significant, which means that moisture does not affect micromeria plant weight. The effect of the factor (local) was highly significant. Local 1(shade) and 3(green house) were the best in term of number of branches. The soil factor effect on micromeria plant height the number of branches of micromeria plants was significant. The effect of the period of harvesting was significant. The effect of the factor (local) was significant. Local 3 was the best in term of number of flowers. The soil factor effect was highly significant on micromeria plant height. The effect of the period of harvesting was highly significant. The effect of the factor (local) was not significant. The soil factor effect seams to be not significant on oil quantity. The effect of this factor was not significant. The effect of the cut of harvesting was not significant. The response of *Micromeria barbata* to classical plants nutrients was measured in a pot experiment at field equivalent rate of 100 kg/ha for N, P, K and their combination.

The results showed that *Micromeria barbata* is a plant that responds positively to better nutrition. The effect of fertilizing factor on micromeria plant height was highly significant. Nitrogen was the best in term of plant height. Potassium was the best in term of plant weight. (Figure 3).

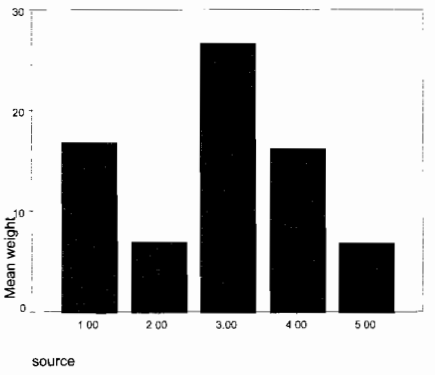

Figure 3. Weight of micromeria plant treated with four different fertilizers

The effect of fertilizing factor on micromeria plant branches number was not significant. The effect of fertilizing factor on micromeria plant flowers number was not significant. The effect of fertilizing factor on micromeria plant oil percentage was not significant.

CONCLUSION

A field survey was carried during the spring and summer of 2005 to study the distribution and abundance of the *Micromeria barbata* among the Lebanese flora. It was found only in two regions, around Kana in the South, and in Sir al Duniya in the North. Two experiments were conducted at Fanar station of IRAL. The first experiment focused on response of *M. barbata* to nutrition while the second experiment centered around the physiologic requirements of the plant as heat, light, and moisture. The first experiment showed that the use of fertilizers, significantly influenced micromeria plants, in term of weight and plant height. The study indicated that, Nitrogen is the best fertilizer for growing taller plants (increasing of 37.571 cm/plant during the growing period) and Potassium is the best for higher biomass (increasing 26.7 g/plant during the growing period) and is economically efficient for the farmers. No effect of fertilizers was observed on oil percentage of micromeria plants. But we can make a higher oil production by working on higher biomass production. The second experiment showed that the light, temperature and moisture regime have a direct effect on these plants development and by controlling them we can control the yield production of these plants. The study indicated that using a high moisture regime is efficient in term of plant height, but it did not really affect the plant biomass, so micromeria plants can be planted in areas that suffer from water deficiency. Cultivating micromeria plants in full sun is efficient in terms of biomass (plants increased of 14.64 g/plant) while cultivating in shade is efficient in term of plants height (plants increased of 40.098 cm/plant). Using a high temperature regime affects positively the height and fresh weight of micromeria plants. Planting in a white calcareous soil or a mixture of sand and peat-moss gives a higher biomass produc-

tion (plants increased respectively 11.12 and 11.71g/plant). None of the studied conditions showed an influence on oil percentage.

In short terms, *Micromeria barbata* is a wild plant that can be domesticated in Lebanon by mastering several agricultural practices and conditions:

- Propagation by cuttings and seeds is a simple process.
- Practicing a high moisture regime (irrigation daily if planted in pots), but it is advisable to plant in the field because pots inhibit the root system development which affect plant development.
- Cultivating in a sunny green house using a white calcareous soil.

Supplying with Potassium and Nitrate.

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