

The Effect of Organic and Biological Fertilizers Application on Biomass Yield and Poly-phenols Contents of Dwarf Chicory Leaves (*Cichorium pumilum* Jacq.)

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Introduction

Dwarf chicory (*Cichorium pumilum* Jacq.) is an annual species from chicory genus in Asteraceae family grows in Western and Southern parts of Iran which is used as a traditional medicinal herb. To date there are a few studies on this species which have been carried out under field conditions. Dwarf Chicory can be used for cancer treatment. In many studies, the presence of phenolic and terpene lactones has been confirmed in chicory tissue. Each type of fertilizer (chemical, organic and biofertilizer) has its advantages and disadvantages but due to the problems caused by the use of chemical fertilizers, organic and biological fertilizers can be used as alternatives to chemical fertilizers to increase soil fertility and produce sustainable agriculture. The present study was conducted to evaluate the effects of organic and chemical fertilizers and biological fertilizers on quantitative and qualitative characteristics of dwarf chicory (*Cichorium pumilum* Jacq.) in different cuttings.

Materials and Methods

The experiment was carried out in a factorial layout based on randomized complete block design with four replications at the Agricultural Research Station of Ferdowsi University of Mashhad (59°28 E and 36°15 N) during 2011-2012 growing season. Plots were designed with 4 m long and 2.5 m width, 1 m apart each other. Between blocks, 1 m alley was kept. The experimental treatments were all combination of organic and chemical fertilizers (Urban compost 4 t. ha⁻¹, vermin-compost 4 t. ha⁻¹, urea fertilizer 130 kg. ha⁻¹ and control) and biological fertilizer (Biosulfur biofertilizer + pure sulfur 100 kg. ha⁻¹ and control). Seed sowing was performed by hand on the middle of the furrows. Seedlings were thinned at the four-six leaf stage. The irrigation was done after seed sowing two times per week until plant establishment and then with weekly irrigation until maturity stage. Weeds were removed by hand during growing seasons. Harvesting was performed before stem initiation at the first cut and flower initiation at the second cut and then biological yields were measured by harvesting 2.25 m² of the central part of each plot. Folin-Ciocalteu method of assay was used to measure leaf polyphenols. Comparison of means were performed by Duncan's multiple range test (DMRT) at 5% and 1% probability levels by using SAS and MSTAT-C statistical software.

Results and Discussion

The results showed that organic and chemical fertilizers and its interactions had significant effect on fresh and dry weight of biomass in the first and the second cuts and total accumulated biomass. The highest fresh weight of biomass at both cuts and total accumulated biomass were observed in chemical fertilizer + biosulfur biofertilizer treatment. It seems that readily and immediately available of nitrogen and sulfur elements in chemical fertilizer + biosulfur biofertilizer treatment increased the biomass yield of the plant. Compost treatment produced the highest dry weight of biomass in both cuts and total accumulated biomass. Results indicated that studied factors and their interactions had significant effect on poly-phenols contents of dwarf chicory leaves in both cuts. The highest and the lowest poly-phenols contents of dwarf chicory leaves in both cuts were observed in vermi-compost and chemical fertilizer+ biosulfur biofertilizer treatments, respectively. It seems that the slow growth and low shading of the leaves were the main reason to increase polyphenols and the absence of nitrogen deficiency and low soil pH cause reduced the concentration of polyphenols.

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Conclusion

According to the results obtained in this research, it can be concluded that the compost treatment had a positive effect on vegetative yield and poly-phenols contents of dwarf chicory leaves and its use can be an effective step towards achieving sustainable agriculture and replacing the use of chemical fertilizers. Our results revealed that total poly-phenols contents declined by increasing nitrogen and decreasing pH.

Keywords: Biosulfur biofertilizer, Compost, Medicinal Plant, Vermi-compost

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