EFFECT OF VERMICOMPOST (COW MANURE) AND MYCORRHIZAL 
ON SOME PHYSIOLOGICAL CHARACTERISTICS OF TURNIP 
(\textit{BRASSICA RAPA} L.) IN HYDROPONIC CULTURE

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ABSTRACT

Excessive use of fertilizers to increase the product and disturb the ecological balance and biological environment and also has caused many environmental hazards. The excretion of large amounts of animal waste as a serious environmental problem and it is costly. In a recent research, using earthworms to convert organic waste has been considered. Compost derived from the activity of earthworms on organic waste, which is called vermicompost, which are very valuable and important nutrients for plants. Using vermicompost reduces the negative effects of chemical manure and increase soil fertility. In addition, a mycorrhizal fungus is stimulating plant growth and affect on some indicators plant growth. In this study, the effect of vermicompost on three levels (zero, 20% and 50%) and fungi at two levels (without fungi and with fungi) on turnip plants was investigated. The results showed that the fungal inoculation, germination, growth parameters (total chlorophyll content, fruit diameter, leaf number, leaf area, shoot fresh weight and dry weight) was significantly altered, especially in symbiotic fungi with these root of plants in 20% vermicompost.

1. INTRODUCTION

Excessive use of fertilizers will cause environmental pollution and will destroy the balance of the ecosystem that is one of the major problems (Mishra, 2004). Thus, biological fertilizers can be considered a suitable solution for overcoming this problem, further by adding beneficial organisms to improve soil fertility and increasing fertilizer planting beds in hydroponic greenhouses and also increase the qualitative and quantitative products. In fact, using organic fertilizers like vermicompost and mycorrhizal fungi can be used in a sustainable agricultural system (Saleh Rastin, 2001). Earthworms digested the organic waste and convert to vermicompost with high porosity, water absorption and retention water that improved growth plant and increased of crop yield (Arancon, 2004). Edward and Bätz (1992) found that earthworms were increased significantly plant growth in culture media.
Fungi symbiosis with the roots will cause increasing nutrient absorption, micronutrient uptake, increase of water absorption, reduction of environmental stresses and enhance resistance to pathogens and increase yield and plant growth (Sharma, 2002a). The purpose of this study was determining the appropriate level of vermicompost and mycorrhizal arbuscular on plant growth for increased yield of turnip.

2. Materials and Methods

This research was performed in soilless culture Research Center greenhouse in Isfahan University of Technology as completely randomized design with six treatments and three replicates. Bed planting was mixture of perlite and cocopite with 3 to 1 ratio. Vermicompost treatments in three levels (zero, 20% and 50%) and fungi treatments at two levels (without fungi and inoculated with the fungi) respectively. For prepared vermicompost from Rotted cow manure with the suitable EC level, was used of *eisenia foetida* and rotted cow manure as planting bed and after a few months, cow manure convert to black granules in the bed of cow manure that is as a sign of prepared vermicompost and will enter the preparation cycle.

Turnip seeds preparation from Isfahan research center, the seeds was anti-infective and planted in trays of sand, then were transferred to pots in stage of two or three leaf and were watered daily by Johnson's nutrient solution. For fungal Inoculums was placed in the pot for transplanting to the amount of 20 g of inoculums was added to the pot by the mycorrhizal arbuscular. After 60 days, the amount of total chlorophyll were measured by the MINOLTA SPAD-502 chlorophyll meter, then remove the plant from the crown and shoot and were measured leaf area and leaf number, fresh weight and dry weight by a digital scale, fruit diameter by a digital caliper, also were measured root fungal contamination by appropriate staining (Rajapakes, 1992) using light microscopy model TRCO (TR-1004UT) were photographed.

3. Results and Discussion

Results of mean comparisons showed that the highest percentage of germination was in the vermicompost treatment. Investigated using light microscopy revealed mycorrhizal arbuscular able to root symbiotic and the coexistence increased in 20% vermicompost treatment (Fig. 1), the total chlorophyll content was higher than control and the highest increase was in 20% vermicompost and fungi treatment, also leaf area increased with increasing percentage of Vermicompost. The highest rate of increase in leaf area and number of leaf has been in fungi and 20% vermicompost treatment. Shoot fresh weight and shoot dry weight measurements showed that this value increased with increasing vermicompost and the highest increase was in 20% vermicompost and fungi treatment (Figure 1-6). Sutar (2009) showed Increasing growth of some plants in
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Figure 1 - The influence mycorrhizal arbuscular in the bed 20% vermicompost treatment

Diagram 1 - Fruit diameter

Diagram 2 - The amount of chlorophyll (SPAD)

Diagram 3 – Area leaf

Diagram 4 - Number of leaves

Diagram 5 – Shoot dry weight

Diagram 6 - Shoot fresh weight
The vermicompost treatments was for the activity of earthworm and hormones is secreted.

Excreta of earthworm were rich of Micro-organism in especially bacteria and contain large quantities of plant hormones (auxin, gibberellin and cytokinin) that is in low concentrations significantly affect plant growth and development (Atiyeh and et al, 2001).

On the other hand, the results shown that 20% vermicompost treatment and fungi has a better performance on plant root symbiosis with the fungus. Generally, the nutritional and environmental conditions: including nutrients, light, moisture, pests and disease increase Chlorophyll content in the leaves and thus the plant can produce more energy (Demir, 2004). This fungal network increasing the speed uptake nutrition and water uptake in plant and improve plant growth and yield (Marschner, 1994).

REFERENCES


