RESEARCH ARTICLE

•Arch Hyg Sci 2013;2(2):55-61
•Journal Homepage: http://jhygiene.muq.ac.ir

Effects of Compost, Vermicompost and Sulfur Compost on *Scindapsus aureus* Growth

Ali Reza Saffari[a], Hosein Alidadi[b*], Ali Asghar Najafpoor[b], Bayram Asadi[c]

[a] Recycle Organization of Mashhad Municipality, Mashhad, Iran.
[b] Health Sciences Research Center, School of Health, Mashhad University of Medical Sciences, Mashhad, Iran.
[c] Department of Environmental Health Engineering, Mashhad University of Medical Sciences, Mashhad, Iran.
[*]**Correspondence** should be addressed to Dr. Hosein Alidadi; **Email:** alidadih@mums.ac.ir

A-R-T-I-C-L-E I-N-F-O

Article Notes:
Received: April 11, 2013
Received in revised form: May 25, 2013
Accepted: June 1, 2013
Available Online: June 8, 2013

Keywords:
Compost
Garbage
Pothos
Scindapsus aureus
Sulphur Compost
Vermicompost

A-B-S-T-R-A-C-T

Background & Aims of the Study: This study was conducted to investigate effects of biofertilizers application and its interaction with organic manures on *Scindapsus aureus* performance.

Materials & Methods: The experiment was performed in a randomized block design with factorial arrangement of two above mentioned factors at greenhouse of Municipality fertilizer production factory. Three different fertilizers (vermicompost, granular compost fortified with sulphur and trash compost) were applied at four levels of 5, 10, 15, and 20 percent of soil. The comparisons among means were made using the least significant difference test calculated at p-values <0.05.

Results: Around leaves area index (LAI), performance of vermicompost (8.31) was better than other fertilizers. This increase can be related to more absorb nutrients, better nutrition and thus improve plant performance in the presence of vermicompost.

Conclusions: Thus use of fertilizers and especially vermicompost in the *Scindapsus aureus* growth with 10% of soil, will achieve increase in all indicators of plant growth. Thus, the processes of biological conversion such as composting in addition to economic value also have benefits for environmental protection.

Please cite this article as: Saffari AR, Alidadi H, Najafpoor AA, Asadi B. Effects of Compost, Vermicompost and Sulfur Compost on *Scindapsus aureus* Growth. Arch Hyg Sci 2013;2(2):55-61.

Background

Increasing population and industrial development lead to extended pollution in the environment (1). Today, the use of non-polluting sources and environment friendly resources, for providing plants culture, has attracted the attention of researchers.

Risk of environmental pollution, particularly soil and groundwater due to use of pollutant sources lead to more importance of alternative methods of soil cultivation (2,3). The application of bio-fertilizers is a suitable strategy to maintain soil fertility and increase production (4,5). Bio-fertilizers such as compost not only supports percentage of needed nutrients for plants, but also creates optimal physical and colloidal properties and a media for effectiveness of chemical fertilizers that it is very important (6-8). It is been reported that compost-treated soils had lower pH and increased levels of organic matter, primary nutrients, and soluble salts. In crop studies, it has been found that tomatoes grown in compost-amended soils yielded more (4).

Another method of producing organic fertilizer is compost changing to better and more

useful product that called granular sulfur compost, which is produced after adding additives such as sulfur and sugar beet molasses to compost garbage. The ability of fertilizer in increasing agricultural products has been proven.

A process related to composting which can improve the beneficial utilization of organic wastes is vermicompost. Vermicompost is the product of accelerated biological degradation of organic wastes by earthworms and microorganisms. Vermicompost is peat-like material with high porosity, aeration, drainage and water-holding capacity (9-11). It has been reported that vermicompost tends to have pH values near neutrality which may be due to the production of CO_2 and organic acids produced during microbial metabolism (9,11,12).

Many studies have been done on the use of organic fertilizers in agriculture (2,4,6,8,12), but there are not many on the use of organic fertilizers for *Scindapsus aureus* plant growth (Pothos). The *Scindapsus aureus* (Pothos) is considered among the very easiest of all house plants. The Pothos is easy to grow in house. It's a long-growing, leafy vine that can reach about 6 to 10 feet in containers. The Pothos is tolerant of low light conditions. Pothos can help purify indoor air.

Aims of the study: The aim of this study was to determine the potential of different rate for garbage compost, granular sulfur compost, vermicompost on the growth and yield of *Scindapsus aureus* (Pothos) under field conditions.

Materials & Methods

The plant growth trial was conducted in greenhouse at the Mashhad compost plant (Eastern Iran). The plant used in the study was *Scindapsus aureus* (Pothos). In this trial, effect of three bio-fertilizers (garbage compost, vermicompost and sulfur compost) was compared to germination and growth of *Scindapsus aureus* (Pothos).

The Experiment was carried out based on randomized complete block design with three replications. Factors of project included 3 kinds of fertilizer: garbage compost, vermicompost and granular sulfur compost, respectively (A_1, A_2, A_3), and different amounts of fertilizer in four levels of 5%, 10%, 15% and 20%, respectively (B_1, B_2, B_3, B_4).

The several cuttings from mother plant were used for testing. For rooting, prepared cuttings were kept in sand and under controlled temperature and humidity for 3 months. Uniformity of root length and diameter of cuttings for planting cuttings were observed. The chemical property of soil used in the experiment was showed in table 1.

Table 1) Chemical properties of soil used in the study

Parameters	EC (ds/m)	pH	TNV(%)	Organic Carbon(%)	Absorbable Phosphorus (ppm)	Absorbable Potassium (ppm)	Total Nitrgen(%)
Mean	1.73	7.90	17.13	0.25	2.47	247.33	0.053
Std	0.40	0.22	1.54	0.24	1.09	133.03	0.028

All greenhouse conditions, including temperature, humidity and light were similar for treatments. The experiments lasted for three months. During the study, the number of newly grown leaves and dried leaves were counted and recorded on special forms. Leaves area indicator was measured as well. Leaves area index (LAI) is defined as the one sided green leaf area per unit ground area in leaves (13).

Data analysis: Data were recorded on the special forms. The comparisons among means were made using the least significant difference test calculated at p-values <0.05.

Results

In this study three fertilizers (garbage compost, vermicompost and sulfur granular

compost) were applied to growth for *Scindapsus aureus* (Pothos). Some of the chemical constituents of three fertilizers are shown in table 2. Results of measured indicators, effect of fertilizer type, amount of fertilizers and their interaction was significant at 1% (α=1%) are shown in table 3. The effect of three bio-fertilizers on the number of newly grown and dried leaves of *Scindapsus aureus* is showed in figures 1 and 2. The effect of three bio-fertilizers on the LAI of *Scindapsus aureus* is shown in figure 3. The effect of fertilizer interaction type and amount on number of newly grown, dried leaves and leaves area index are shown in figures 4 to 6.

Table 2) Physicochemical characteristics of various fertilizers used in study

Test \ Fertilizer	Garbage Compost	Vermicompost	Granular Sulfur Compost
Humidity(%)	27	29.9	32.6
Organic matter(%)	51.8	48.9	50.7
Ash(%)	35.1	50.5	46.1
TNV(%)	13	15.2	11.2
Organic Carbon(%)	17.4	18.8	16.8
Saturation(%)	128	113.2	96
Total Nitrogen(%)	1.5	1.75	1.5
pH	7.4	8.1	7.5
Electrical Conductivity (ds/m)	3.9	2.8	5.2

Table 3) Results of Analysis of measured indicators

Changes Resource	Degrees of freedom	Number of newly grown leaves	Number of dried leaves	Leaves Area Indicator
Trial	2	14.778 (NS)	3.25 (NS)	0.101
Type of fertilizer (A)	2	974.778**	117.0**	53.247**
Amounts of fertilizer (B)	3	32.917**	8.37*	0.099
(A)×(B)	6	203.889**	40.593**	6.135**
Error	22	5.354	2.583	0.215

*: significant difference at 5%; **: highly significant difference at 1%; **NS**: Nonsignificant

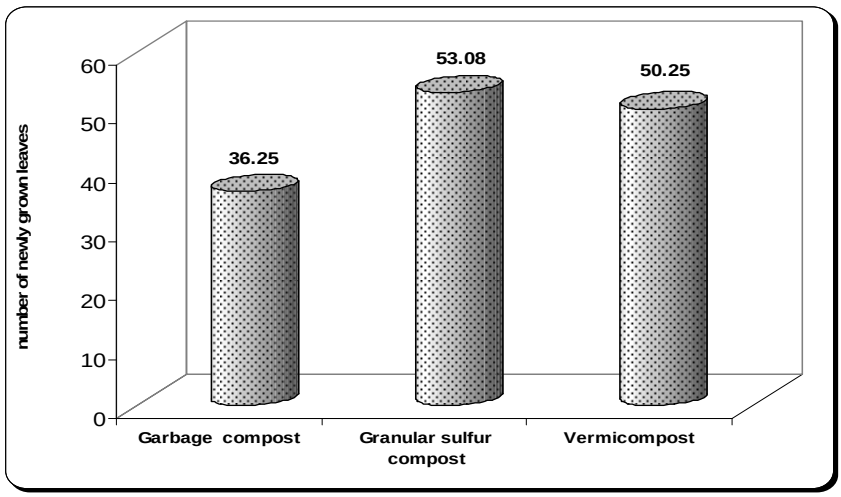

Figure 1) Effect of organic fertilizers on the number of newly grown leaves

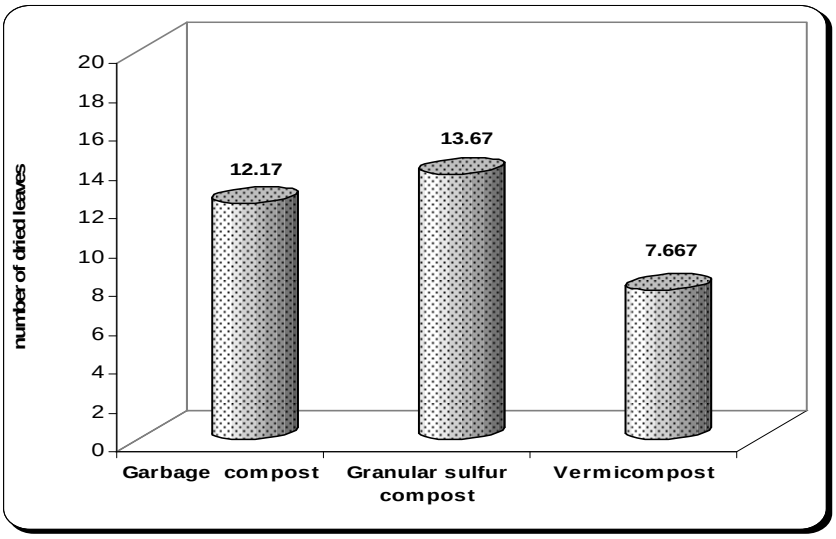

Figure 2) Effect of organic fertilizers on the number of dried leaves

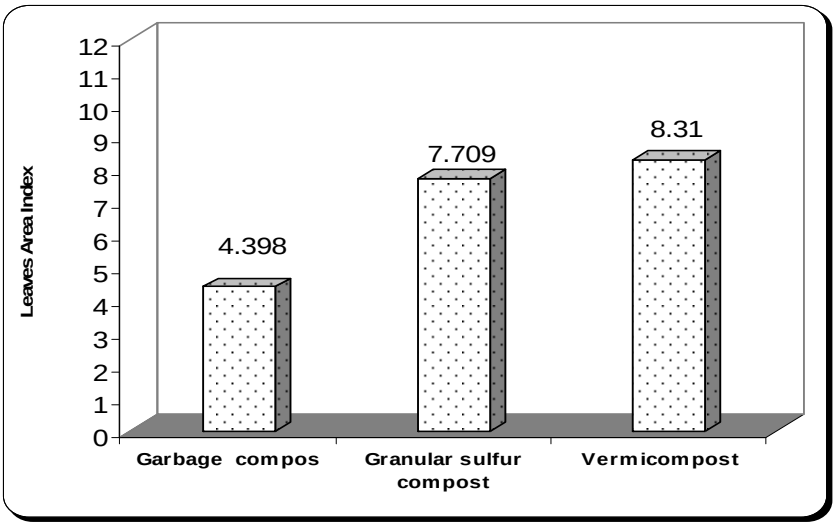

Fig 3: Effect of organic fertilizers on the Leaves Area Index

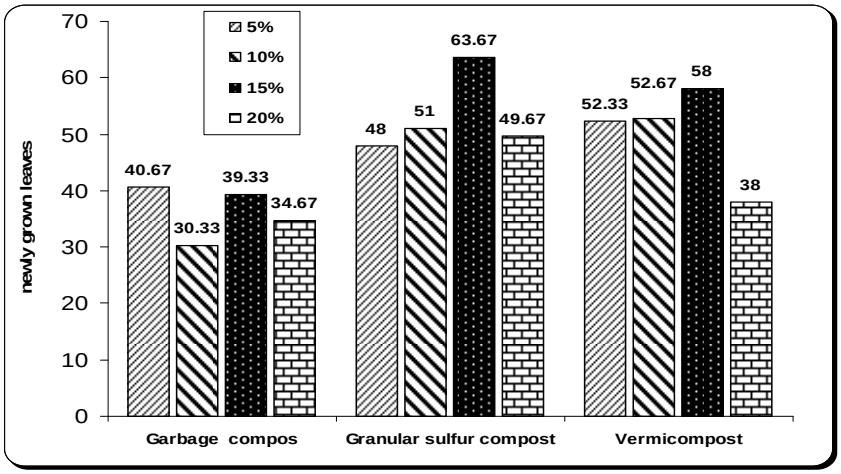

Figure 4) Interaction type and amount of fertilizer on the newly grown of leaves *Scindapsus aureus*

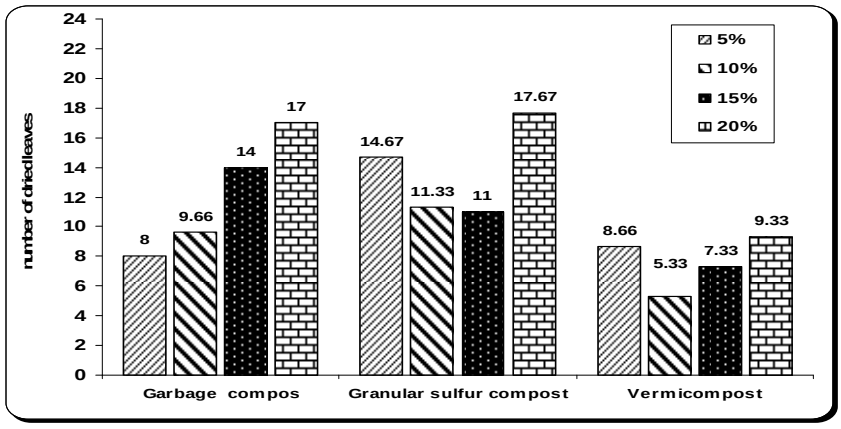

Figure 5) Interaction type and amount of fertilizer on the dried of leaves *Scindapsus aureus*

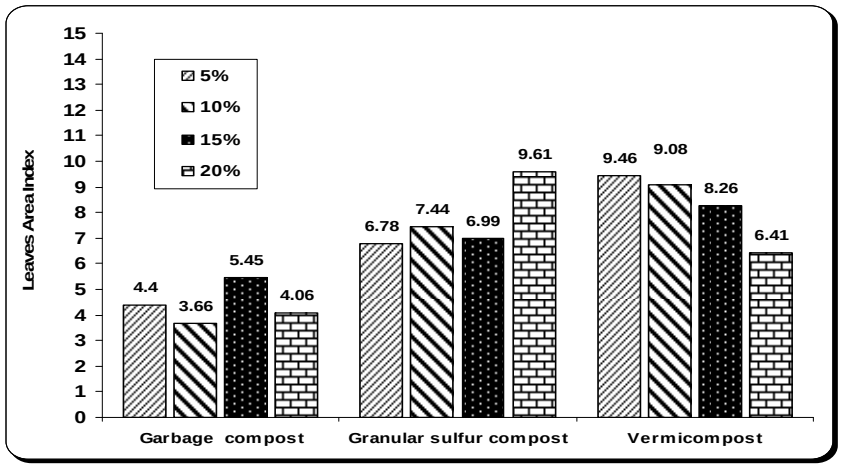

Figure 6) Interaction type and amount of fertilizer on the leaves area index

Discussion

According to figure 1, granular sulfur compost (53.08) is more effective on increase in the number of newly grown leaves of *Scindapsus aureus* than vermicompost (50.25) and garbage compost (36.25), due to improve in the nutrient and structure quality of soil ($p<0.05$), which is in consistency with the observations by Abdel Hady (14) and Sameei (15).

The effects of type of interaction and amount of fertilizer on the newly grown leaves showed that vermicompost and granular sulfur compost with a value of 15% had a better performance than the other compost (figure 4). There was an increase in the number of leaves and plant growth related to nutrition. Thus, it increased the growth of various parts of plants such as the leaves.

Several factors are involved in appearing of drying leaves, but one of the main factors is electrical conductivity. Because the electrical conductivity of granular sulfur compost (5.2 ds/m) and garbage compost (3.9 ds/m) is more than vermicompost (2.8 ds/m), thus increased number of dried leaves in the presence of two fertilizers was observed (figure 2). The results showed that maximum dried leaves was relate to granular sulfur compost and garbage compost, each with amounts of 20% and a minimum of them was related to the vermicompost with an amount of 10% ($p<0.05$). Vermicompost consists of elements and nutritional matters are needed for plant that can be gradually released and plants are used.

Thus, reduced number of dried leaves with application of vermicompost 10% is relevant.

The reduce yield components of plant in presence of high amounts of garbage compost is due to high concentration of salts and nutrients in it and high sensitivity of *Scindapsus aureus* to them which can cause toxicity in high amounts. Increase of dried leaves with the use 20% granular sulfur, compost indicates toxicity of fertilizer type in high amounts.

The results obtained indicate that around leaves area index (LAI), performance of vermicompost (8.31) is better than other fertilizers. This increase can be related to more absorbed nutrients, better nutrition and thus improved plant performance in the presence of vermicompost (figure 3). Also results showed that highest LAI was related to vermicompost with a ratio of 5 and 10 percent and granular sulfur compost with 10%, due to supply nutrients and improved soil physical conditions along with using of vermicompost that provided a more suitable environment for plant growth, and its increased LAI (figure 6), which is in consistency with the observations by Khayyat *et al.* (16).

Conclusions: The biological and organic fertilizers in comparison with other fertilizers have more nutritional and improving values. One of the fertilizers is vermicompost that has major advantages compared to other fertilizers. Thus use of fertilizers and especially vermicompost in the *Scindapsus aureus* growth with 10% of soil, will achieve increase in all indicators of plant growth. Thus, the processes of biological conversion such as composting in addition to economic value also have benefits for environmental protection.

Footnotes

Acknowledgments:

Authors would like to thank for the helps of staff of "Mashhad Compost Plant", and also Mr. Najafi for his contribution in this study.

Funding/Support:

None declared.

Conflict of Interest:

The authors declare no conflict of interest.

References

1. Vargas-Garcia MC, Suarez-Estrella FF, Lopez MJ, Moreno J. Influence of microbial inoculation and composting material on the evaluation of humic-like substances during composting of horticultural wastes. Process Biochem 2006;41:1438-43.

2. Levy JS, Taylor BR. Effect of pulp mill solids and tree composts on early growth of tomatoes. Bioresour Technol 2003;89(3):297-305.

3. Adriano DC, Bollag JM, Frankenberger WT. Biodegradation of contaminated soil, Agronomy Monograph. Madison: Science Society of America;1999. p.772-3.

4. Garcia-Gomez A, Bernal MP, Roig A. Growth of ornamental plants in two composts prepared from agro industrial wastes. Bioresour Technol 2002;83(2):81-7.

5. Lory JA, Russell MP. Evaluation of physical and chemical analysis of Soil. Social Science 2005;62(3):32-40.

6. Tejada M, Doboa MM, Benitez C. Study of composting of cotton residues. Bioresour Technol 2001;79(2):199-202.

7. Jilani S. Municipal solid waste composting and its assessment for reuse in plant production. Pak J Bot 2007;39(1):271–7.

8. Gautam SP, Bundela PS. Composting of municipal solid waste of Jabalpur city. Glob J Environ Res 2010;4(1):43–46.

9. Alidadi H. Combined Compost and Vermicomposting Process in the Treatment and Bioconversion of Sludge. Pak J Biol Sci. 2007;10(21):3944-7.

10. Dominguez J, Edwards CA, Subler S. A comparison of vermicomposting and composting. Biocycle 1997;38:57-9.

11. Nedgwa PM, Thompson SA. Effects of C to N ratio on vermicomposting of biosolids. J Biores.Technol 2001;75:7-12.

12. Atiyeh RM, Dominguez J. Changes in biochemical properties of cow manure during Processing by earthworms and the effect on seeding growth. Pedobiologia 2000;44(6):709-24.

13. Scurlock JMO, Asner GP, Gower ST. Worldwide historical estimates and bibliography of Leaf Area

Index., 1932-2000. USA Oak Ridge National Laboratory; 2001.

14. Abdel Hady M, Shanan N. Enhancement growth characters of photos plants grown in different improved pot media. Int J Acad Res 2010;2(2):89-97

15. Sameei L, Khalighi A, Kafi M. Peat moss substituting with some organic wastes in Pothos (Epipremnum auareum Cv. Golden Pothos) growing media. Iran J Hortic Sci Technol 2004;6(2):79-88.

16. Khayyat M, Nazari F, Salehi H. Effects of different pot mixtures on Pothos (Epipremnum aureum Lindl and Andre 'Golden Pothos') growth and development. Am Eurasian J Agric Environ Sci 2007;2(4): 341-8.