International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
www.chemijournal.com
IJCS 2020; 8(6): 470-471

Received: 03-09-2020
Accepted: 07-10-2020

M Prameela
Senior Scientist, Mushroom cultivation scheme, Department of Plant Pathology, College of Agriculture, PJTSAU, Rajendranagar, Hyderabad- 30, Telangana, India

G Uma Devi
Senior Professor & Univ. Head, Department of Plant Pathology, College of Agriculture, PJTSAU, Rajendranagar, Hyderabad- 30, Telangana, India

Corresponding Author:
M Prameela
Senior Scientist, Mushroom cultivation scheme, Department of Plant Pathology, College of Agriculture, PJTSAU, Rajendranagar, Hyderabad- 30, Telangana, India

Role of spent mushroom substrate in enhancing the growth parameters of three leafy vegetables

M Prameela and G Uma Devi

DOI: https://doi.org/10.22271/chemi.2020.v8.i6g.10814

Abstract
The results revealed that the seeds of amaranthus and spinach germinated within 5-7 days of sowing while the germination of coriander was recorded after 10 days of sowing in SMS filled pots. Whereas the leafy vegetables amaranthus and spinach germinated within 10 days of sowing whereas coriander germinated within 15-20 days of sowing in control pots (only soil). The growth parameters like plant height, number of leaves and length of leaves, diameter of leaves recorded at 20th and 40th day after sowing showed that there is no significant effect of spent mushroom substrate on plant height in three leafy vegetables whereas there is a significant effect on growth parameters number of leaves, length of leaves and diameter of leaves at 20th day after sowing whereas after 40 days after sowing only in spinach there is a significant increase in leaf length and leaf diameter while in coriander there is a significant increase in plant height whereas there is no significant effect on other parameters. The serial dilution of SMS in three leafy vegetables Amaranthus, Spinach and Coriander pots along with the control recorded the presence of microflora *Cladosporium* sp, *Pseudomonas* sp, *Bacillus* sp. in palak, whereas in amaranthus *Trichoderma* sp. was predominant and in coriander *Aspergillus* sp. *Pseudomonas* sp. were recorded and in control pots *Cladosporium* sp, *Aspergillus* sp, *Pseudomonas* sp, *Bacillus* sp. were recorded. The spent mushroom substrate enhanced the soil pH, EC, organic carbon, available nitrogen and potassium in the soil which promoted the growth of plants.

Keywords: Spent mushroom substrate (SMS), leafy vegetables, oyster mushroom, growth parameters, serial dilution, microflora

Introduction
Mushroom cultivation is a commercial venture throughout the universe. The substrate left as a waste after mushroom cultivation is referred as spent mushroom waste (SMW), or spent mushroom substrate (SMS) or spent mushroom compost (SMC). SMW is actually not a waste, instead it is a composted organic medium that remains as a by product during mushroom cultivation. SMS contains protein rich component formed by modification of agricultural materials by the fungus after few cycles of cultivation which can be used as very good soil conditioners for the cultivation of fruits, vegetables flower and foliage crops (Robbins *et al*., 1986) [1]. Spent mushroom substrate is a good source of carbon, nitrogen and other elements. Nitrogen content varies from 0.4- 13.7% with a C: N ratio of 9 to 15: 1 which enhances the growth of plants (Chorover *et al*., 2000) [2]. Spent mushroom substrate is considered to be a good source of organic matter and rich in macro and micro elements for plants, which help to increase the soil biological activity (Debosz *et al*., 2002) [3]. It is also known that roots of most plant supports a wide range of fungal communities which colonize roots intra and intercellularly. Such fungi are known as arbuscular mycorrhizal fungi (AMF) (Crecchio *et al*., 2001) [4] besides ectomycorrhizal and ectotrophic associations between fungi and plants (Eom *et al*., 2000) [5] are also common. Another group of fungi which are commonly found in soil help in growth promotion upon root colonization are known as plant growth promoting fungi (PGPF) (Hyakumachi 1994) [6]. Keeping in view these aspects a trial was conducted for evaluating the effect of SMS of oyster mushrooms on the growth of three leafy vegetables in pot experiments at Mushroom cultivation scheme, Department of plant Pathology, College of Agriculture, Rajendranagr, Hyderabad, Telangana state.

Materials and methods

The spent mushroom substrates of oyster mushroom was fermented for 40 days by covering with polythene sheet; thereafter the fermented spent mushroom substrate was sundried and used in experimental pots in the ratio of 1:1 ratio (SMS and soil). The seeds of three leafy vegetables Amaranthus, Spinach and Coriander available in the market were collected and sowing was done in five pots @ 10 seeds per pot along with control in a completely randomized design. Data on Germination period and growth parameters like plant height, number of leaves and length of leaves, diameter of leaves were recorded at 20th and 40th day after sowing.

Results

The results revealed that the seeds of amaranthus and spinach germinated within 5- 7 days of sowing while the germination of coriander was recorded after 10 days of sowing in SMS filled pots. Whereas the leafy vegetables amaranthus and spinach germinated within 10 days of sowing whereas coriander germinated within 15-20 days of sowing in control pots (only soil). The students paired t-test analysis of the data on growth parameters like plant height, number of leaves and length of leaves, diameter of leaves recorded at 20th and 40th day after sowing showed that there is no significant effect of spent mushroom substrate on plant height in three leafy vegetables whereas there is a significant effect on growth parameters number of leaves, length of leaves and diameter of leaves at 20th day after sowing whereas after 40 days after sowing only in spinach there is a significant increase in leaf length and leaf diameter while in coriander there is a significant increase in plant height whereas there is no significant effect on other parameters.

The SMS in three leafy vegetables Amaranthus, Spinach and Coriander pots along with the control was analysed for the presence of microflora by serial dilution technique. It was recorded that in palak *Cladosporium* sp, *Pseudomonas* sp, *Bacillus* sp. were recorded whereas in amaranthus *Trichoderma* sp. was predominant and in coriander *Aspergillus* sp. *Pseudomonas* sp. were recorded and in control pots *Cladosporium* sp, *Aspergillus* sp, *Pseudomonas* sp, *Bacillus* sp. were recorded.

Table 1: Evaluation of Spent Mushroom Substrate (SMS) as organic manure for growth improvement of leafy vegetables in Telangana.

Leafy vegetable	Treatment	Growth Parameters							
		Plant height (cm)		No. of leaves (cm)		leaf length (cm)		leaf diameter (cm)	
		20DAS	40DAS	20DAS	40DAS	20DAS	40DAS	20DAS	40DAS
Amaranthus	Control	14.09* ± 0.56	29.77± 2.60	8.067± 0.69	13.63 ± 0.69	4.80 ± 0.23	7.85 ± 0.27	4.44 ± 0.35	3.97 ± 0.27
	Treated	22.70 ± 0.22	34.16±3.12	8.89± 0.49	13.43 ± 0.51	6.41 ± 0.63	8.35± 0.53	6.67 ± 0.26	4.12 ± 017
Spinach	Control	14.02 ± 1.19	18.53±1.60	5.6 0 ± 0.22	8.47 ± 0.60	5.54 ± 0.45	7.42 ± 0.6	3.14 ± 0.36	5.17 ± 0.20
	Treated	16.93 ± 0.90	18.60± 0.91	6.28 ± 0.20	9.34 ± 0.40	8.27 ± 0.50	9.33 ± 0.4	4.73 ± 0.34	6.46 ± 0.41
Coriander	Control	11.35 ± 0.38	18.31± 0.52	4.97 ± 0.26	11.40 ± 0.10	1.72 ± 0.06	2.59 ± 0.1	1.66 ± 0.09	2.23 ± 0.13
	Treated	12.38 ± 0.85	29.23± 1.6	6.87± 0.29	14.63 ± 1.01	2.49 ± 0.14	2.83 ± 0.1	2.29 ± 0.06	2.28 ± 0.11

*Values are average of 10 replicatoins. ± Standard error

Table 2: Effect of spent mushroom substrate (SMS) on soil properties

S. No	Particulars	Soil With Spent Mushroom Substrate	Soil
1	pH	7.850	7.600
2	EC	0.086	0.065
3	Organic Carbon	0.890	0.618
4	Available Nitrogen	176.40	170.10
5	Available Phosphorous	74.25	83.25
6	Available Potassium	488.875	344.25

The spent mushroom substrate enhanced the soil pH, EC, organic carbon, available nitrogen and potassium in the soil which enhanced the growth of plants.

Conclusion

The spent mushroom substrate of oyster mushroom can be re utilized as good soil amendment providing good essential minerals and compounds that are important for plant growth and development and has potential to increase the supply the essential components for the plants.

References

1. Robbins SH, Reghetti TL, Fallahi E, Dixon AR. Chaplin, M.H. Communications in Soil Science and Plant Analysis. 1986;17:457-471.
2. Chorover RH. Fox Hatcher, C.P. Romaine. (Final Research Project Report – Mushroom Industry Farmer-based Applied Research Program (MIFBAR) (The Pennsylvania State University), 2000, 87.
3. Debosz K, Petersen SO, Kure LK, Ambus P. Evaluating effects of sewage sludge and household compost on soil physical, chemical and microbiological properties. Applied Soil Ecology 2002;19:237-248,
4. Crecchio C, Curci M, Mininni R, Ricciuti P, Ruggiero P. Short term effects of municipal solid waste compost amendments on soil carbon and nitrogen content, some enzyme activities and genetic diversity. Biology and Fertility of Soils 2001;34:311-318.
5. Eom AH, Hartnett DC, Wilson GWT. Oceologia 2000;122:435- 444.
6. Hyakumachi M. Plant-growth-promoting fungi from turfgrass rhizosphere with potential for disease suppression. Soil Microorganisms 1994;44:53-68.