RESEARCH PAPER:

Influence of organic manures on microbial population of *Amaranthus* and *Brassica* species grown with magnesite mine spoil

V. DAVAMANI AND P. DORAISAMY

Asian Journal of Environmental Science (December, 2009 to May, 2010) Vol. 4 No. 2 : 221-222

See end of the article for authors' affiliations

Correspondence to :
V. DAVAMANI
Department of Environmental Science, Tamil Nadu Agricultural University, COIMBATORE, (T.N.) INDIA

SUMMARY

The present study was concluded to evaluate the microbial dynamics of magnesite mine spoil. A pot culture experiment was laid out in the Department of Environmental Science, Tamil Nadu Agricultural University, Coimbatore. Results revealed that The bacterial, fungal and actinomycetes population were the highest in *Amaranthus* sp. grown in magnesite mine spoil with FYM, vermicompost and 100% NPK (21.2 x 10^6, 12.4 x 10^3 and 6.5 x 10^2 CFU g^{-1}, respectively). The increased and decreased microbial population was probably due to the availability of nutrient status in the spoil by the addition of organic amendments.

Key words : Organic manure, *Amaranthus* sp., *Brassica* sp., Magnesite mine spoil.

The success of phytoremediation depends upon the selection of plant species and soil amendments that maximize the removal of heavymetals from the top layer of contaminated soil. At the same time, amendment of contaminated soils with lime, phosphate and organic acids generally reduce the bioavailability of heavy metals (Khan *et al*., 2000). Purkayasitha and Menon (1999) reported that incorporation of organic residues in low organic soil influence the various soil biological activities leading to enhancement of plant growth. The addition of peat and manure increase Cu, Zn and Ni accumulation by wheat (Narwal and Singh, 1998) and also facilitate the plant growth in poor soils, providing a higher nutrient and water supply to the crops. Selvam and Lourduraj (1998) recorded that the organic matter influence soil productivity by influencing soil physical, chemical and biological properties.

MATERIALS AND METHODS

An experiment was laid out in the Department of Environmental Science, Tamil Nadu Agricultural University, Coimbatore to evaluate the rhizosphere microbial population of *Amaranthus* sp. and *Brassica* sp. grown with magnesite mine spoils. The treatment details are as follows.

T_1–Magnesite mine spoil + *Amaranthus* sp. + 100% NPK, T_2–Magnesite mine spoil + *Brassica* sp. + 100% NPK, T_3–Magnesite mine spoil + FYM + *Amaranthus* sp. + 100% NPK, T_4–Magnesite mine spoil + FYM + *Brassica* sp. + 100% NPK, T_5–Magnesite mine spoil + Vermicompost + *Amaranthus* sp. + 100% NPK, T_6–Magnesite mine spoil + Vermicompost + *Brassica* sp. + 100% NPK, T_7–Magnesite mine spoil + FYM + Vermicompost + *Amaranthus* sp. + 100% NPK, T_8–Magnesite mine spoil + FYM + Vermicompost + *Brassica* sp. + 100% NPK

Replication : 3; Design : Factorial Completely Randomized Block Design (FCRD)

Soil samples were collected from the pot culture experiments at different stages of crop growth *viz.*, post germination (five and four days for *Amaranthus* and *Brassica* species, respectively), 45^{th} day and post harvest stage and used for analyzing microbial population. Soil microbial population of different treatments were enumerated by the following standard plate count method using appropriate media for bacteria, fungi and actinomycetes as given below :

Sr. No.	Organisms	Medium	References
1.	Bacteria	Nutrient glucose agar	Allen (1953)
2.	Fungi	Potato dextrose agar	Riker and Riker (1936)
3.	Actinomycetes	Ken Knight's agar	Rangaswami (1966)

Accepted :
November, 2009

Table 1 : Effect of FYM and vermicompost on bacteria, fungi and actinomycetes population of magnesite mine spoil

Treatments	Microbial populations											
	Bacterial population (x 10^6 CFU g^{-1})				Fungal population (x 10^3 CFU g^{-1})				Actinomycetes population (x 10^2 CFU g^{-1})			
	Post germination	45th Day	Post harvest	Mean	Post germination	45th Day	Post harvest	Mean	Post germination	45th Day	Post harvest	Mean
T_1	7.0	9.1	8.1	8.1	5.3	8.8	6.3	6.8	2.7	4.3	3.6	3.5
T_2	6.7	8.4	7.6	7.6	5.3	8.2	6.7	6.7	2.0	4.6	3.0	3.2
T_3	9.6	10.8	9.9	10.1	6.8	10.1	9.1	8.7	3.3	5.3	5.1	4.6
T_4	9.4	9.9	8.7	9.3	6.4	10.6	7.6	8.2	2.9	4.4	4.0	3.8
T_5	10.3	11.9	10.7	11.0	7.1	10.9	9.7	9.2	3.9	5.1	4.7	4.6
T_6	9.7	11.0	10.0	10.2	6.8	11.2	10.4	9.5	3.5	5.0	4.2	4.2
T_7	18.5	24.6	20.6	21.2	9.3	14.8	13.0	12.4	4.9	7.9	6.6	6.5
T_8	16.3	20.7	17.8	18.3	9.0	13.9	11.7	11.5	4.4	7.5	5.8	5.9
Mean	10.9	13.3	11.7	12.0	7.0	11.1	9.3	9.1	3.5	5.5	4.6	4.5
	S.E.±		CD (P=0.05)		S.E.±		CD (P=0.05)		S.E.±		CD (P=0.05)	
T	0.3925		0.7892		0.1846		0.3713		0.2817		0.5665	
D	0.2404		0.4833		0.1131		0.2274		0.1725		0.3469	
T x D	0.6798		1.3669		0.3198		0.6431		0.4880		0.9812	

RESULTS AND DISCUSSION

The microbial populations were significantly influenced by the different treatments (Table 1). The bacteria, fungi and actinomycetes populations were recorded higher in *Amaranthus* sp. grown in magnesite mine spoil with FYM, vermicompost and 100% NPK and the lowest microbial population was recorded in *Brassica* sp. grown in magnosite mine spoil with 100% NPK. The increased microbial population may probably be due to the addition of organic manures. This is in accordance with the findings of Sri Ramachandrasekharan *et al.* (1995) who reported that the combined use of 100 per cent NPK and FYM @ 10 t ha^{-1} increased the population of bacteria (43.5 per cent) and *Azotobacter* (31 per cent) over control. Gaur (1982) observed that population of bacteria was more influenced than fungi and actinomycetes due to the addition of organics. On 45th day increased bacteria, fungi and actinomycetes population was recorded and after that it decreased and attained low value at post harvest stage. Decrease in microbial population in post harvest stage might be due to decreased nutrient availability as a result of plant uptake and leaching losses of nutrients.

Authors' affiliations

P. DORAISAMY, Department of Environmental Science, Tamil Nadu Agricultural University, COIMBATORE, (T.N.) INDIA

REFERENCES

Allen, O.N. (1953). *Experiments in soil bacteriology*. Burgess Publ. Co. Minneapolis, USA, pp. 69-70.

Gaur, A.C. (1982). A manual of rural composting. FAO/UNDP Regional Project RAS/75/004. Field Document No. 15, FAO, Rome, Italy, 102 pp.

Khan, A.G., Kuek, C., Chaudhry, T.M., Khoo C.S. and Hayes, W.J. (2000). Role of plants, mycorrhizae and phytochelators in heavy metal contaminated land remediation. *Chemos.,* **21**: 197-207.

Narwal, R.P. and Singh, B.R. (1998). Effect of organic materials on partitioning extractability and plant uptake of metal in an alum shale soil. *Water Air and Soil Pollut.,* **103**: 405-421.

Purkayasitha, P.P. and Menon, U. (1999). Organic residues in low organic soils. *J. Indian Soc. Soil Sci.,* **4**: 625.

Rangaswami, G. (1966). Agricultural microbiology. Asia Publishing House, London. pp. 413.

Riker, A.J. and Riker, R.S. (1936). *Introduction to research on plant disease*, John. S. Swift Co., St. Louis, Chicago, 117 pp.

Selvam, S.P. and Lourduraj, A.C. (1998). Organic manure application in field crops–A review. *Agric. Rev.,* 19(3): 202-204.

Sri Ramachandrasekharan, M.V., Muthusamy, P. and Ravichandran, M. (1995). Long term effects of fertilizers on microflora and soil properties in irrigated inceptisol. *Ann. Agric. Res.,* **16**: 195-200.