IMPACTS OF COMPOSTS APPLICATION ON PROPERTIES OF A DRY SOIL-A LAB SCALE STUDY

Geeta Unmar, Prof Romeela Mohee & Luxmee Bodhoo

INTRODUCTION

- Capacity of land to support life depends on the quality of soil- Need to develop ISFM
- However, this cannot be achieved by the application of chemical fertilizers- due to their unprecedented high cost and negative impacts on both the environment and human health.
- Thus, there is a paradigm shift in worldwide agriculture from high-input and extensive agriculture to sustainable and eco-friendly one.
- Synthetic chemical fertilizers increase the fertility of the soil in terms of nutrient levels but organic matter such as compost, not only increases the fertility of soil in terms of nutrient levels, but also improves the physical and chemical properties of the soil.

INTRODUCTION

- The composition of the MSW is highly organic around 80% (Mohee, 2002)
- The price of one tonne of locally produced compost will cost 75% less than one ton of fertilizer (Anon, 2009).

OBJECTIVES OF THE STUDY

- To characterize dry soil and three different types of compost (shredded paper compost, market waste compost, and hotel waste compost) in terms of moisture content, organic carbon content, pH, bulk density, Germination index and water holding capacity.

- To study the impact of different application rates of compost on soil

- To test whether soil amended with compost has the ability to control erosion runoffs and nutrient loss such as nitrate and phosphate.

- To determine the effect of different compost application rates on plant growth

METHODOLOGY

- Three types of compost utilized in this study were, namely:

Shredded paper compost-produced from windrow composting of grass and shredded paper –age: 5 months.

Hotel waste compost- substrates of comprised mainly of dry leaves, branches and grass- age: 4 months.

Market waste compost- was produced for the purpose of this study. Market waste was the major substrate. Age- 4 months.

- The dry soil used in this study was obtained from the University of Mauritius farm. The soil was not subjected to any application of fertilizer or pesticide and was only used for growing crops.

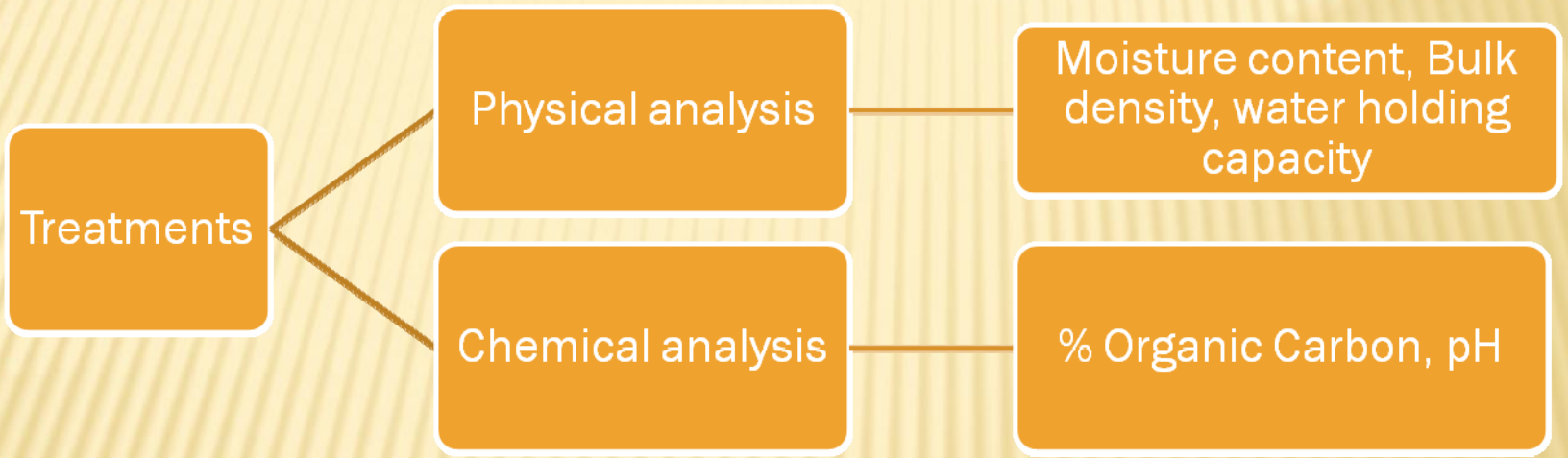
Characteristics of finished composts and dry soil

Parameters	Dry soil	Shredded paper compost	Hotel waste compost	Market waste compost
Moisture content %	35.4%	46.5%	33.91%	49%
Organic Carbon (g)	1.45	3.20	4.30	3.59
pH	4.7	7.4	6.9	6.6
Electrical conductivity(µs)	42.8	$3.5*10^{-3}$	1666	1330
Bulk density(kg/m^3)	-	383	521	547
N %	0.039	0.704	1.001	0.616
P (ppm)	43.6	452.4	17.7	61.4
K(ppm)	336.6	27046.6	3526.5	23461.1
Germination Index	0.7	0.042	0.6	0.58
Water holding capacity	x 0.95	x 3.45	x 1.51	x1.90

METHODOLOGY

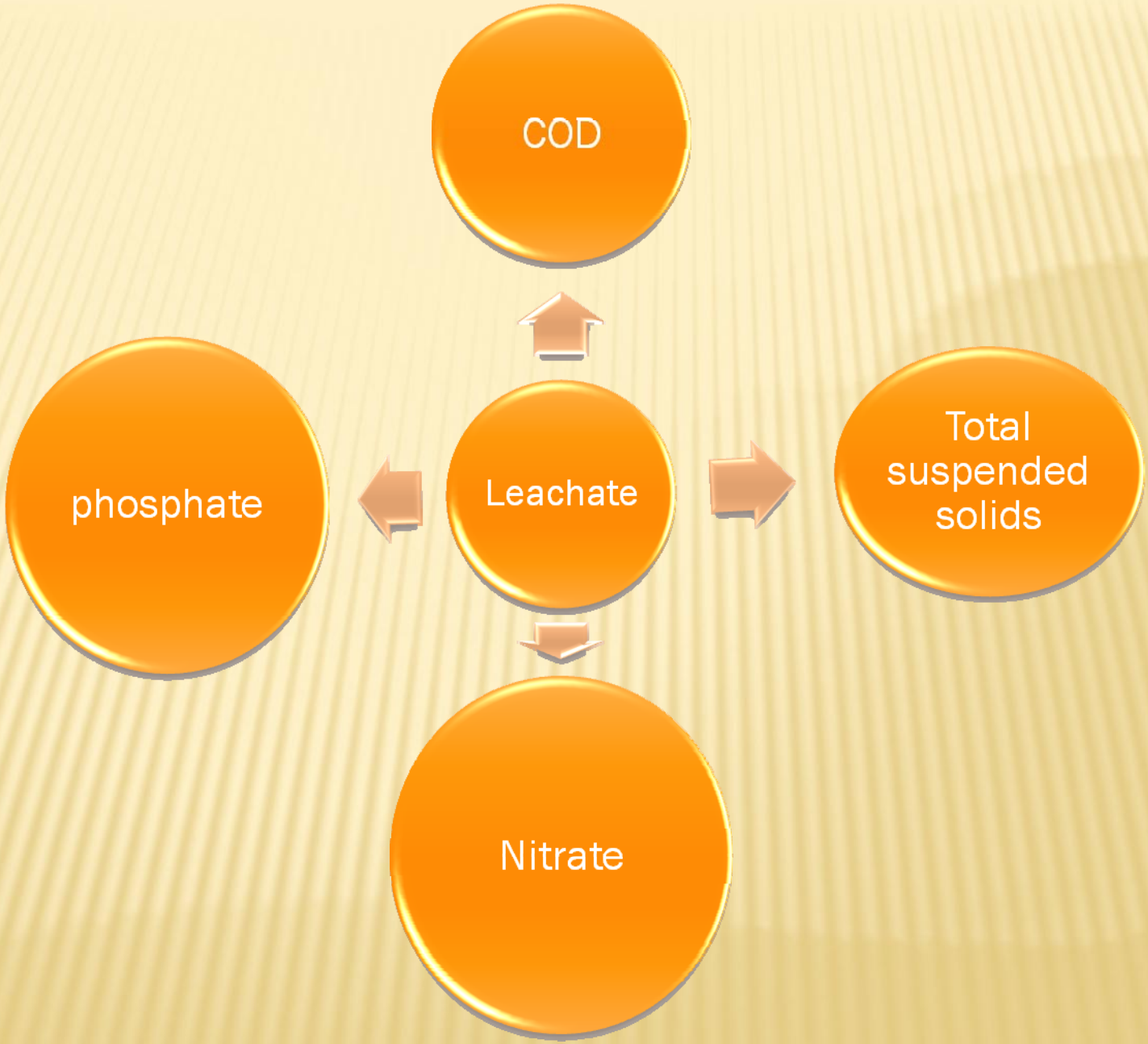
- The treatments studied were based on two ratios of soil:compost mixtures, that is, 50% soil/50% compost and 75% soil/25% compost. These volumetric ratios are commonly used by farmers.

Treatments	%soil /%Compost	Denotations
Dry soil (control)	100% soil	S
Soil + Urea (used for comparison)	Based on 46% N	SU
Soil + shredded paper compost	50/50	SP1
	75/25	SP2
Soil + Market waste compost	50/50	MW1
	75/25	MW2
Soil + Hotel waste compost	50/50	HW1
	75/25	HW2

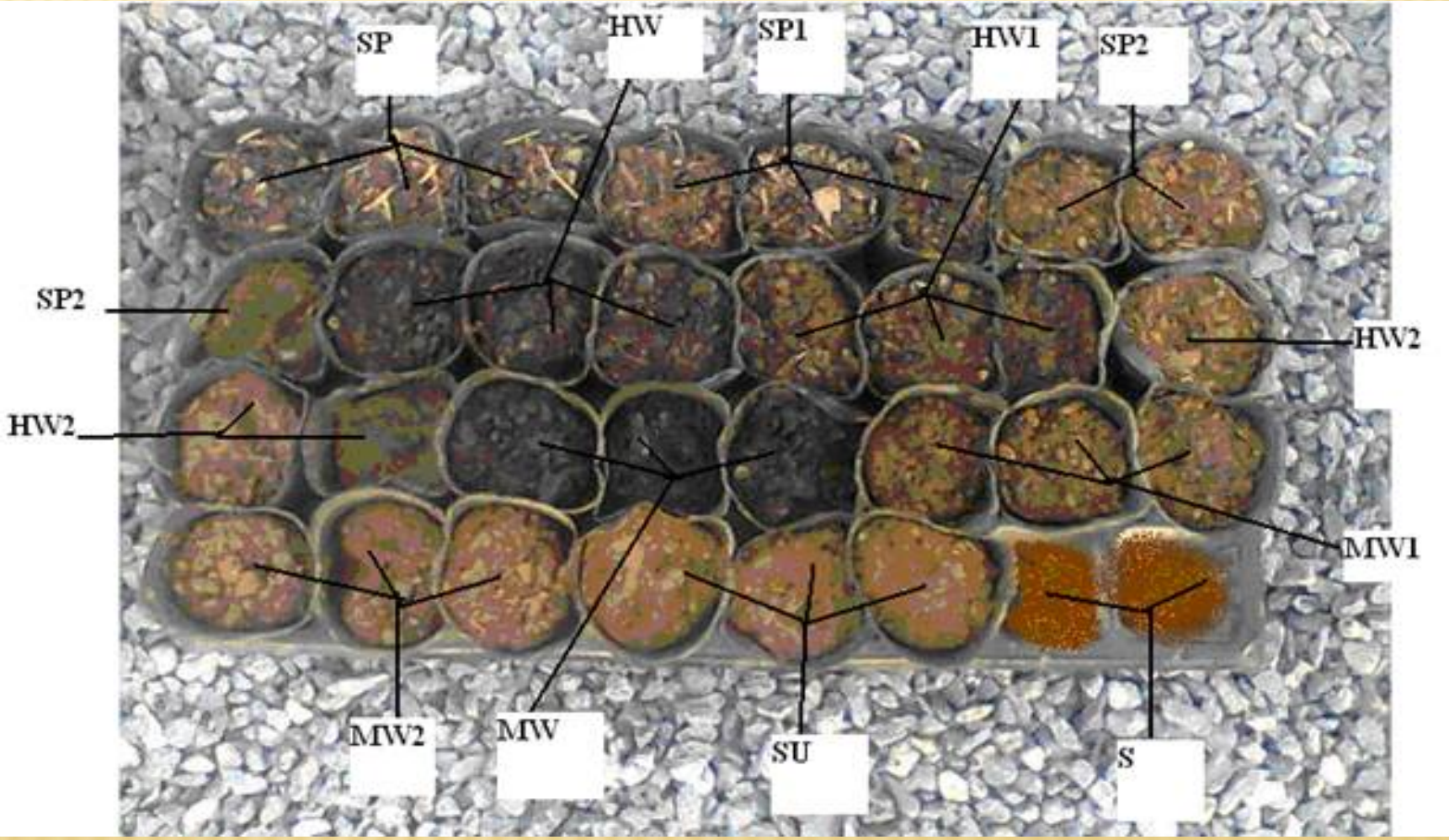

Treatments
Physical analysis
Chemical analysis
Moisture content, Bulk density, water holding capacity
% Organic Carbon, pH

METHODOLOGY- EROSION TEST

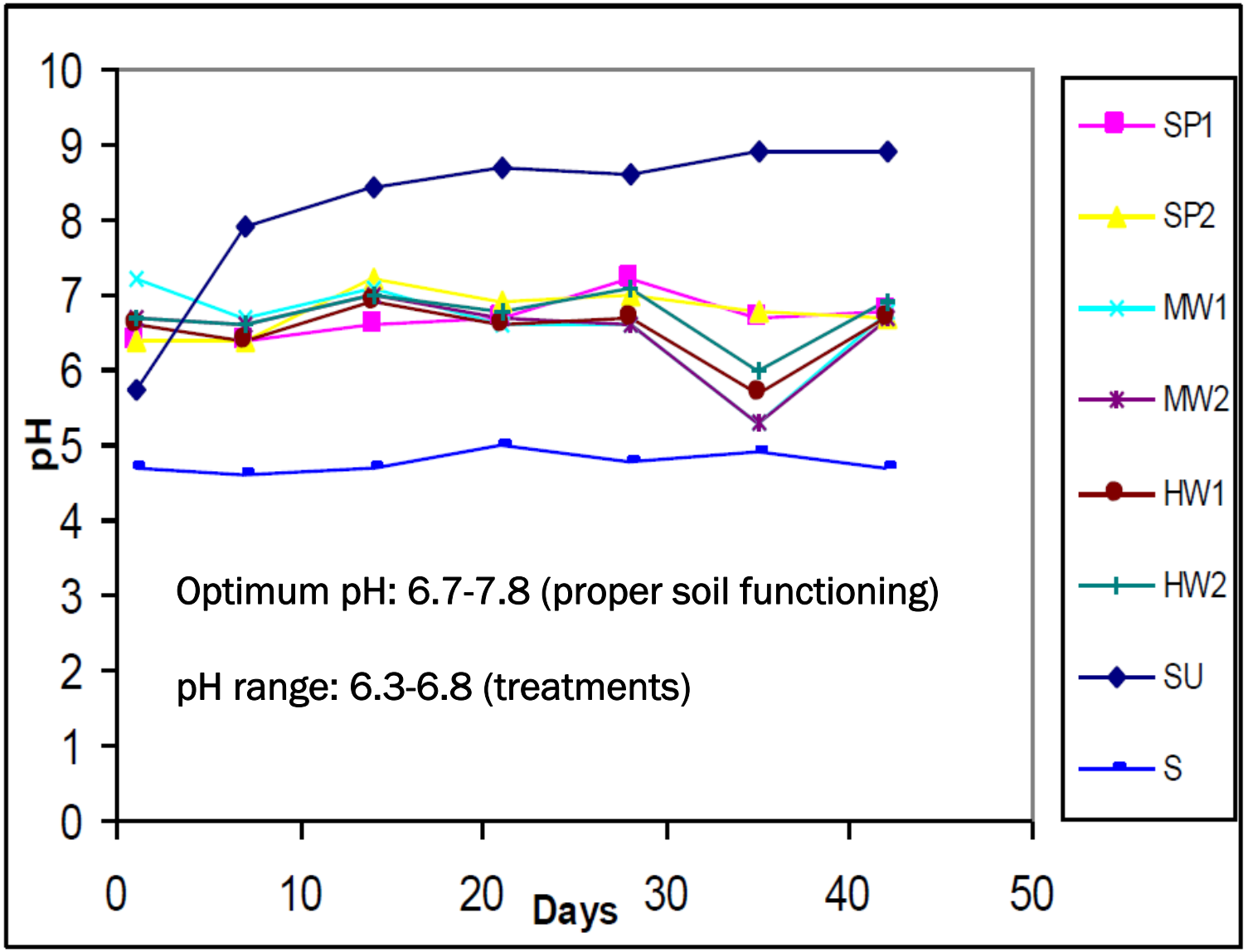
- To assess the impact of compost application on soil erosion, a 0.3m by 0.5 m plot frame was designed. Made with plywood and having a depth of 0.16m, the frame was perforated and inclined at an angle of 26°. Runoff samples were collected directly from the base of the frame.

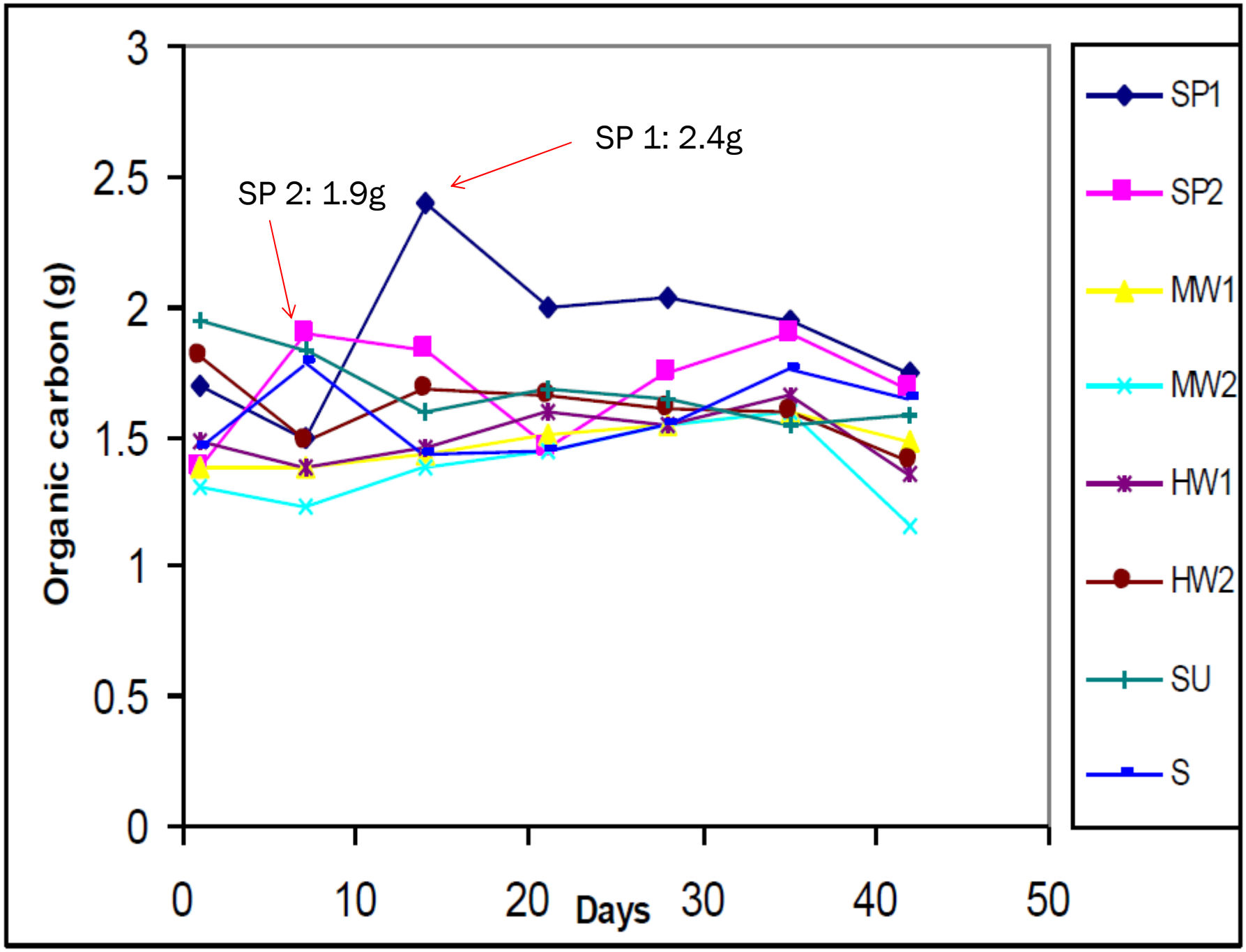

COD
phosphate
Leachate
Total suspended solids
Nitrate

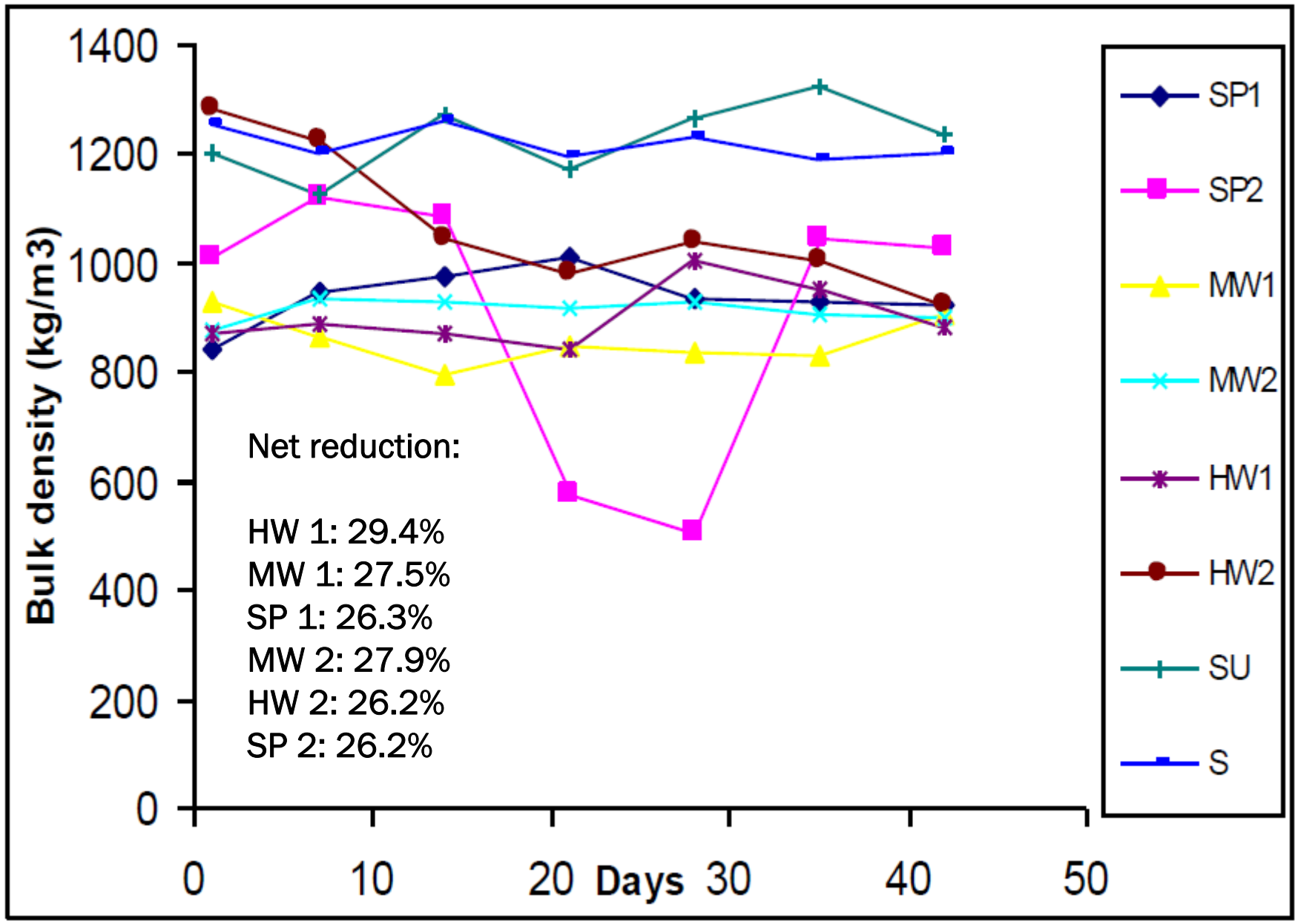
METHODOLOGY- GERMINATION TEST

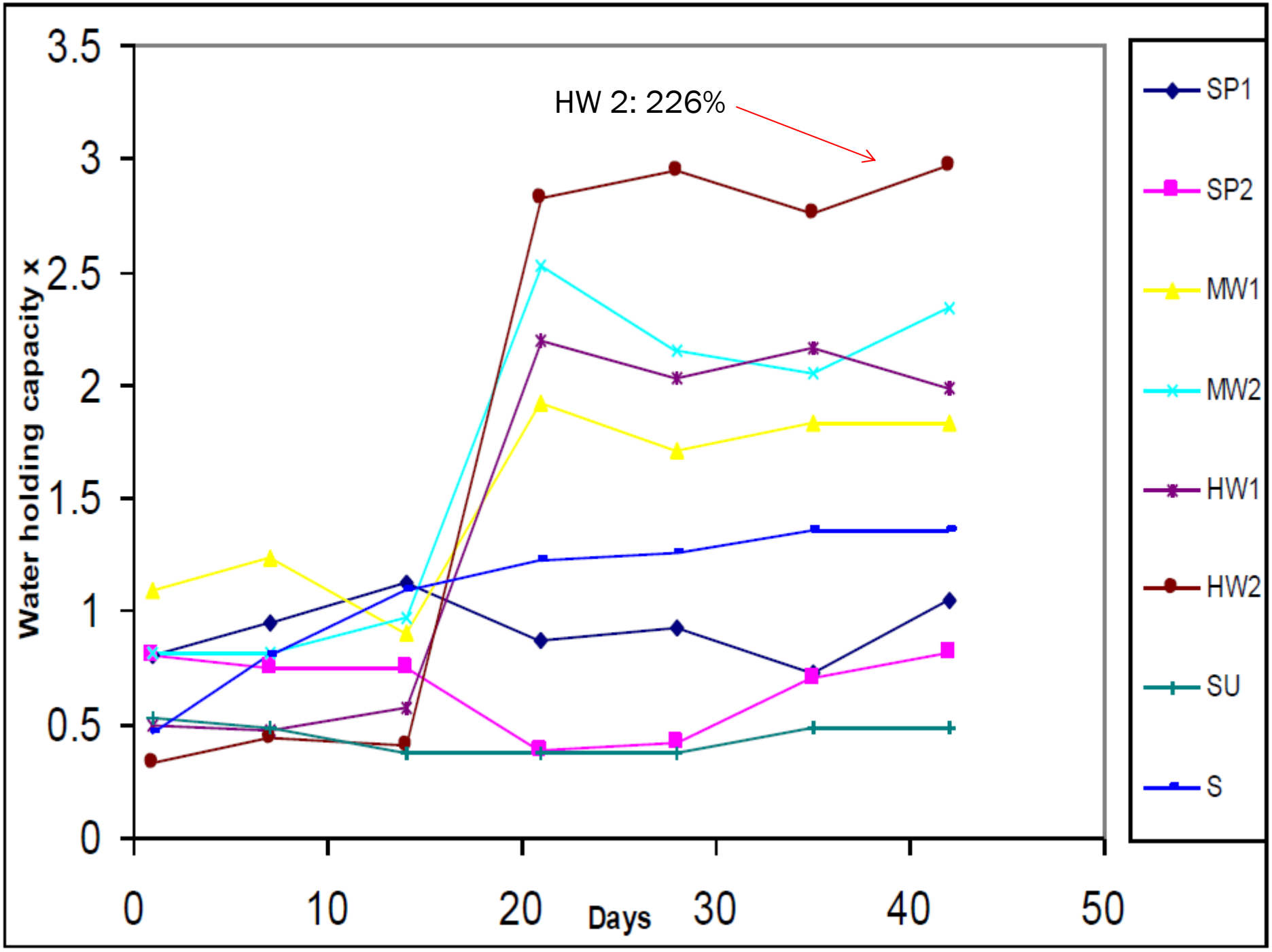


RESULTS AND DISCUSSION




SP 1: 2.4g
SP 2: 1.9g
Organic carbon (g)
Days
0
0.5
1
1.5
2
2.5
3
0
10
20
30
40
50
SP1
SP2
MW1
MW2
HW1
HW2
SU
S


Bulk density (kg/m3)
1400
1200
1000
800
600
400
200
0
0
10
20
Days
30
40
50
SP1
SP2
MW1
MW2
HW1
HW2
SU
S
Net reduction:
HW 1: 29.4%
MW 1: 27.5%
SP 1: 26.3%
MW 2: 27.9%
HW 2: 26.2%
SP 2: 26.2%


HW 2: 226%
Water holding capacity x
3.5
3
2.5
2
1.5
1
0.5
0
0
10
20
Days
30
40
50
SP1
SP2
MW1
MW2
HW1
HW2
SU
S

Results obtained after the analysis of the runoffs

Treatment	Volume of leachate (ml)	COD(mg/L)	TSS(mg/L)	Orthophosphate (mg/L)	Nitrate(mg/L)
SP1	980	306.5	2.395	6.08	50
SP2	1300	509	3.725	13.96	126
MW1	900	384	7.305	8.6	181.9
MW2	1250	399.5	9.035	44.4	201.8
HW1	800	298.5	6.56	45.41	63
HW2	1350	363	8.145	83.75	56
SU	1525	472	9.345	354	135
S	1420	413.5	9.248	91.25	69

RESULTS AND DISCUSSIONS- GERMINATION TEST

Treatments	Average No. of seeds germinated
SP	0
SP1	3
SP2	5
MW	4
MW1	4
MW2	4
HW	4
HW1	4
HW2	4
S	3
SU	0

Germination Test

CONCLUSION:

- Composts have the ability to reduce loss of solids (organic matter) and nutrients in runoffs. Thus, leachates from soils treated with composts have a lower ability to pollute water bodies, compared to soil amended with fertilizers.

- Soil amended with compost promotes growth of plants. This was deduced in the germination test, as compared to dry soil, market waste compost and hotel waste compost amendments produced more foliages.

- The incorporation of composts in the soil helps to decrease the bulk density of the soil considerably. For instance, HW1, MW2 and SP1 decreased the bulk density of bare soil by 29.4%, 27.9% and 26.3% respectively.

“If the soil is destroyed, then our liberty of action and choice are gone ...”

W.C. Lowdermilk