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Germination and Growth Response of *Phaseolus Vulgaris* L. to Decomposed Newspaper.

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A B S T R A C T

The effect of decomposed newspaper on the growth performance of Phaseolus Vulgaris L. was studied at the University of Port Harcourt Botanical Garden. Experimental treatments were obtained by mixing thoroughly 2kg of sandy loam soils with 0.5kg, 1.0kg, 1.5kg, 2.0kg and 2.5kg of macerated newspaper. 0kg (Untreated soil) was used as control. Each level of treatment were replicated three times and maintained for eight (8) weeks. Growth Parameters showed that there were reductions in the plant height, leaf number, root length, fresh weight, dry weight, and moisture content of soils treated with decomposed newspaper comparable with the control. There were significant differences at P=0.05 between and within treatments. This study shows that decomposed newspaper inhibit the growth of Phaseolus vulgaris L.

Keywords: Growth, *Phaseolus Vulgaris L,* decomposed newspaper, treatment

INTRODUCTION

Agricultural soils are often subject to excessive erosion, nutrient run-off, and loss of organic matter and, consequently, a decline in fertility. One method of reversing the degradation and improving the quality of soils involves the addition of several kinds of wastes such as solid organic waste, sewage sludge, agricultural and industrial wastes, and animal manure (Crecchio *et al.,* 2001). In recent years, application of organic wastes to agricultural lands has received considerable attention owing to the cost and environmental problems associated with their disposal (Ahmad *et al.,* 2006). Composting is the biological decomposition and stabilization of organic substrates that involves aerobic respiration (Palmisano and Barlaz, 1996) and produces a final product that is stable, and free of pathogens and plant seeds that can be beneficially applied to land (Haug, 1993). During the process of aerobic composting, it generates carbon dioxide, water, and heat. On the other hand, anaerobic digestion is the biological decomposition of organic substrates in the absence of oxygen. During the process of anaerobic digestion, it generates methane, carbon dioxide, and numerous low-molecular weight intermediates such as organic acids and alcohols (Haug, 1993) and humus (Chynoweth and Pullammanappallil, 1996). This implies that significantly less energy is required per mass of organic decomposed during anaerobic digestion compared to aerobic composting. Compost has favorable effects on physical and chemical properties of soil, like pH, and the capacity to absorb nutrients from soil, increasing the availability of macro and micronutrients that stimulates microorganisms development (Biala, 2000).Compost obtained from the organic fraction of municipal solid waste, from sewage sludge and from other selected waste biomasses can be effective fertilizer for agriculture (Zhang *et al*., 2006). Compost amendment is also used to stimulate the soil microflora, particularly in degraded and arid environments (Ouedraogo *et al* 2001;Ros *et al* 2003), and to suppress pathogens through antagonistic effects. Adverse effects of compost amendment can also occur, such as altering the microbial biomass and diversity due to the presence of organic and inorganic contaminants (Gomez, 1998; Zheljazkov and Warman, 2003). However, the response of the microbial community is generally transient, and varies greatly with the nature of the organic amendments (Pascual *et al* 1998; Garcia-Gil *et al* 2000) and the level of compost application (Albiach *et al*., 2000; Garcia-Gil *et al*., 2000). Recognized bulking agents used for composting include sawdust (Sundberg and Jönsson2005; Kalamdhad *et al*. 2008), rice hulls and chips of tree cuttings (Chikae *et al*. 2006), horticultural waste compost (Stabnikova *et al*.,2005) and mulch hay and wood shavings (Cekmecelioglu *et al*. 2005).Newspaper contains 9% of moisture content (MC) (Wayman *et al*.,1992) and 94% of volatile solids with lignin content of the volatile solids ranging from 16% to 22% (Sun and Cheng 2002).Among the three important constituents of plant cell wall material, the cellulose, lignin and hemicellulose, lignin is particularly difficult to biodegrade and reduces the bioavailability of the other cell wall constituents (Naik *et al*.,2012).The domination of different indigenous microorganism population at various stages of composting plays a distinct role in degrading lignin (Raut *et al.*,2008; Belyaeva and Haynes 2009; Huang *et al.*,2010).

Shredded Newspaper were chosen as they are easily available bulking agents, can act as moisture adjuster due to their low moisture content and have high cellulose content, which can be a good source of carbon.

The study attempts to investigate the germination and growth response of *Phaseolus vulgaris* to decomposed newspaper.

MATERIALS AND METHODS

The experiment was carried out at the University of Port Harcourt Green House. Sandy loam soil were sourced from a site at the University of Port Harcourt were used for the study. The seeds of *Phaseolus vulgaris* were obtained from the Agricultural Development Programme (ADP) Rumuodumaya in Rivers State.

The obtained seeds were pretreated by picking out infected seeds. The viable ones were used for the research.

The newspapers were sourced from a newspaper publishing house in Port Harcourt.

The soil were transferred into trays and air-dried for five (5 days). The air-dried soils were passed through a soil sieve (mesh) to remove big soil boulders and plant materials which were collected together with the soil.

Two Kilogram (2kg) of sandy loam soil was weighed using a triangular weighing balance. The treatment were obtained by mixing 2kg of sandy loam soil with0.5kg, 1.0kg, 1.5kg, 2.0kg and 2.5kg of macerated newspaper while 2kg of soil (containing no newspaper) served as control.

The seeds were sterilized with approximately 0.01%mercuric chloride solution for 30seconds, thoroughly washed several times with distilled water and air dried (Eseneowo and Umoh, 1996). During treatment floating seeds or those that had bubbles were discarded, while the remaining good ones were used for the research. Three seeds of *Phaseolus vulgaris* were sown directly in each polythene bag containing the various levels of shredded newspaper mixed with 2kg sandy loam soil. Each level of treatment was replicated three times using completely randomized design (CRD). The experimental works were maintained under light condition, the plant watered as need arises and allowed to grow for two months in order to determine the growth performance. The Physico-Chemical Characteristics of Experimental Soil were determined according to standard method of A.O.A.C. 1990.

The following growth and biochemical parameters were analyzed: plant height (cm), leaf number, root length (cm), fresh weight (g), dry weight (g), moisture content (%), pH, available phosphorus, Total Nitrogen and heavy metals.

The shoot length (plant height) was measured with a metre tape in centimetres from the soil surface to the plant apex. The plant were uprooted from each bucket and weighed immediately on a weighing balance, model PN 163 to avoid moisture loss. This was done to obtain the fresh weights. To get the dry weights, the plants were taken to the laboratory, oven-dried at 80ºC for 24 hours to get rid of all moisture and ensure a constant weight. It was then weighed on a PN 163 model weighing balance. The leaves of the test crop were rinsed with distilled water and dried. The dried plant materials of each sample were macerated into powdered form using pestle and mortar. The powdered form was sieved through a 0.2mm wire mesh to obtain fine powdered form. Each sample of the powdered materials was kept in small bottles for analysis. The contents of the mineral elements (N, Mg, P, K, Zn, Na, Ca, Fe, Mn,) were determined using an atomic absorption spectrophotometer.

All data collected were subjected to statistical analysis such as Analysis of variance (ANOVA) and standard error means. New Duncan Multiple range test (NDMRT) was employed to separate means at 5% level of significance.

RESULTS AND DISCUSSION

The soil pH, particles size, and elemental components are presented in table 1.

S/N	Parameters	Value
1	pH	6.4
2	Conductivity (µS/cm)	30
3	Clay (%)	8.8
4	Silt (%)	4.16
5	Sand (%)	87.04
6	Nitrogen (Mg/kg)	0.101
7	Phosphorus (Mg/kg)	0.38
8	Manganese (Mg/kg)	87.31
9	Zinc (Mg/kg)	6.02
10	Magnesium (Mg/kg)	100.7
11	Iron (Mg/kg)	4177.6
12	Calcium (Mg/kg)	110.49
13	Sodium (Mg/kg)	67.79
14	Potassium (Mg/kg)	42.74

The plant height of *Phaseolus Vulgaris* was significantly (P=0.05) decreased with increase in the concentration of decomposed newspaper. These values were significantly lower than that of the control treatment at 8 weeks after planting (Fig.1). The highest leaf number (24.33) was recorded at the control treatment while the least values (10.00) were recorded at 2.5kg concentration of the decomposed newspaper.The control had the highest root length throughout the duration of the experiment as shown in Fig 1.

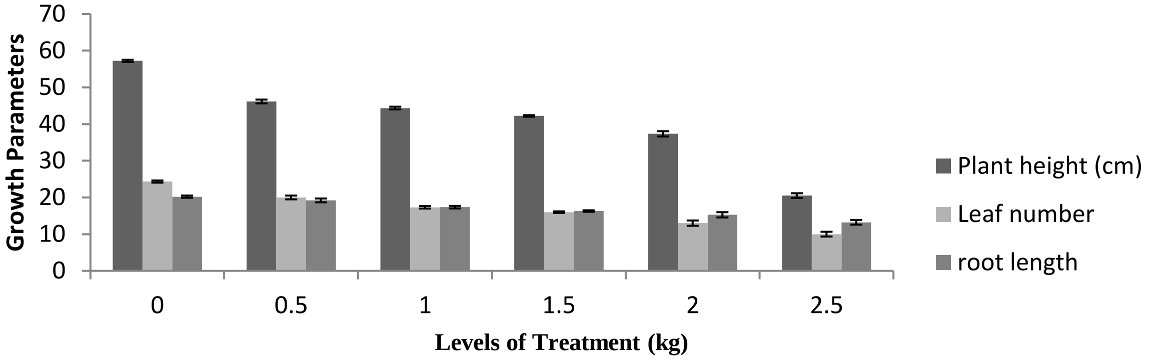

Fig.1: Mean Plant Height (cm), Leaf number and root length (cm) of *Phaseolus vulgaris* at 8 weeks after planting

The fresh weight of *Phaseolus Vulgaris* decreased with increase in the concentration of decomposed newspaper. Similarly the dry weight of the crop decreased with increase in the concentration of the decomposed newspaper (Fig.2). Statistical analysis showed significant treatment effect for fresh weight and dry weight at P=0.05.

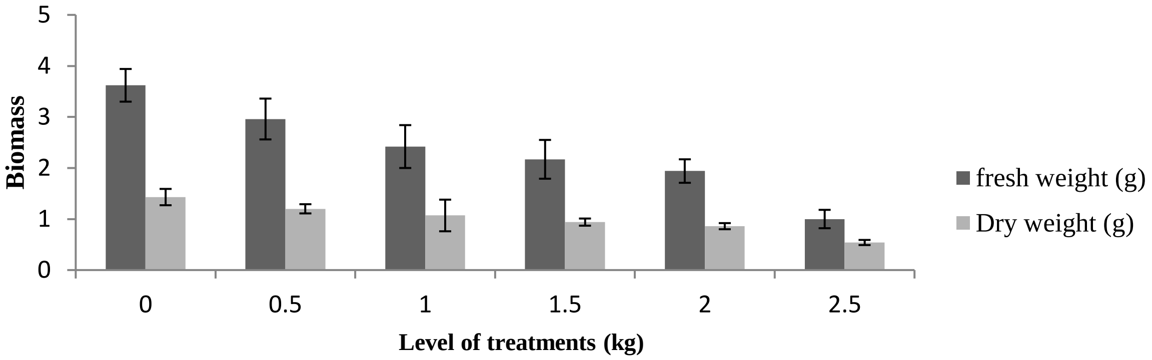

Fig 2 : Mean Fresh and Dry weights (g) of Phaseolus vulgaris at 8 weeks afer planting

The moisture content was not affected by the impact of decomposed newspaper Fig, 3. The moisture content also decreased with increase in the concentrations of decomposed newspaper, but there was no significant difference between moisture content between and within treatments (P=0.05).

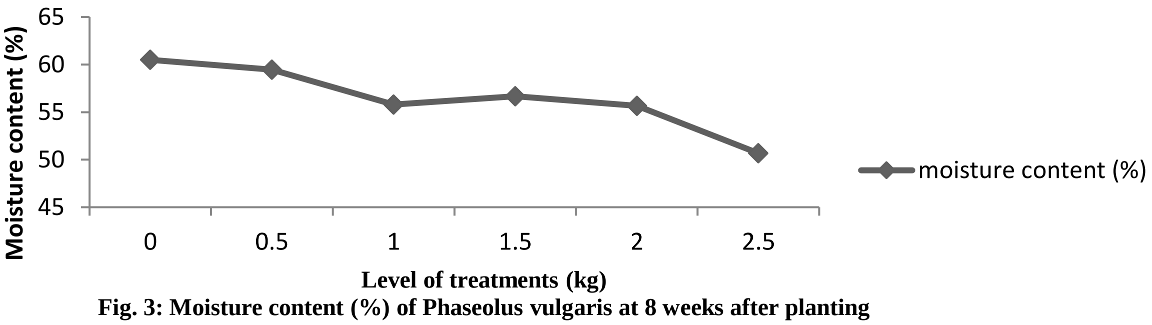

Fig. 3: Moisture content (%) of Phaseolus vulgaris at 8 weeks after planting

Results indicated that there was a general decrease in the Plant height, root length, number of leaves, moisture content, fresh weight and dry weight in the soils treated with decomposed newspaper except in the control. This agrees with the findings of (Dutta and Biossyna, 1997) that worked on the effect of paper mill effluent on germination of rice, cowpea seed and growth behaviour of its seedling and discovered that effluents particularly at higher concentration inhibit germination. The overall decrease in the fresh and dry weight of the crop in the soils treated with decomposed newspaper agrees with the work of Braidy and Weil (1996) who stated that pH interaction with soil nutrient plays a determining role in the availability of nutrient for crop growth and development.

CONCLUSION

This study showed that decomposed newspaper inhibited the growth of *Phaseolus Vulgaris.* The growth parameters such as plant height, root length, leaf number, fresh weight, dry weight and moisture content of the crop were negatively affected by the decomposed newspaper. Therefore, this study suggests that decomposed newspaper should be disposed off properly to avoid contamination of the environment.

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