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EFFECT OF PERIODS OF COMPOSTING OF MEDIA ON THE WEED INCIDENCE AND THE GROWTH AND YIELD OF TOMATO (SOLANUM LYCOPERSICUM L)

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ABSTRACT

A field experiment was conducted during the rainy season of 2018 at the Teaching and Research Farm of the Department of Crop Science, University of Nigeria, Nsukka located in the derived savanna agro-ecology of Southeastern Nigeria. The experiment was carried out to evaluate the effect of seven (7) growth media and duration of composting on weed incidence and on the growth and yield of Tomato. The seven (7) media were composted for two different durations which gave a total of fourteen (14) treatments. The duration of composting was 4 and 8 weeks respectively. The seven-growth media used and their ratio were; T1= Rice husk dust + Poultry manure + River sand (3:2:1), T2= Top soil + Poultry manure + River sand (3:2:1) as control, T3= Top soil + Poultry manure + River sand (2:3:1), T4= Top soil + Poultry manure + River sand (1:2:3), T5= Sawdust + Poultry manure + River sand (3:2:1), T6= Rice husk dust + Poultry manure + River sand (2:3:1) and T7= Sawdust + Poultry manure + River sand (1:2:3). One variety of Tomato (TIMA) was evaluated using the seven (7) growth media composted at two different periods (4 and 8 weeks respectively). They were laid out in complete randomized design (CRD) with seven replications. The objectives were to ascertain the optimum composted media for growth and yield of tomato and to check the incidence of weeds in the composted media. The study revealed that the media composted for 8 weeks had early seedling emergence, higher fruit weight and fewer weed weight and population when compared with the other media composted for 4 weeks. T2 growth medium recorded significantly higher values for plant height (46.30 cm), number of branches (1.50), number of leaves (17.14) and stem girth (1.44 cm). It could be concluded from the study that T2 and T4 growth media provided positive results for vegetative and reproductive growth of tomato and therefore should be recommended for efficient production of tomatoes in containers.

KEYWORDS

growth media, compost, duration, weed population, weed biomass.

Introduction

Tomato (*Solanum lycopersicum* L.) belongs to the family *Solanacea* and it is one of the most important vegetable crops grown all over the world (Isack and Lyimo, 2015). Tomato is a popular and nutritive vegetable crop which ranked next to potato in world's vegetable production. It is an important cash generating crop for small scale farmers and also provides employment in production and processing industries (Jiregna *et al.*, 2012). Tomatoes are vital source of minerals and antioxidants such as carotenoids, lycopene, vitamins C and E, and phenolic compounds which helps to prevent some cancers and cardiovascular disorders. (Adalid *et al*., 2004). Sun-dried tomatoes, tomato sauce, tomato juice, tomato soup, tomato ketchup, and fresh tomato salad are just a few ways that tomatoes are consumed. (Frusciante *et al.*, 2007).

Growth media are considered among one of the most important factors affecting the production of tomatoes (Ahmad *et al.*, 2012). Natural soil along with peat are the most common growing substrates used for the container production of annual and perennial plants since many years (Hernandez-Apaolaza *et al.*, 2005). The use of growing media in greenhouses and other controlled environments in a variety of climatic settings have recently offered viable ways to boost food yield and productivity, particularly in developing nations. (Heydari *et al.*, 2006). Given the problems of growing crops in soil (e.g., salinity, poor soil structure and unpredictable interactions) and restricted water resources, the use of soilless culture with mixed substrate or hydroponic cultivation has expanded in recent years (Rougnom *et al*., 2009). Soilless cultures are widely used in the greenhouse, particularly during periods when production is not possible in the field; to improve the growing conditions and avoid unfavourable weather conditions and soil nutrient imbalance (Abad *et al*., 2002). Agricultural waste such as rice hulls, coir, sawdust and compost as growing media has been proved as an important substitute of simple soil for crop production in containers (Tariq et al., 2012).

Weeds constitute a major problem in tomato production. Weeds reduce yields by competing for space, light, water and nutrients, weakening crop stand and reduce harvest efficiency (Abbasi *et al*., 2013). Apart from their direct effect on yield reduction, common weed species such as *Amaranthus spinosus* (L) and *Solanum nigrum* (L) have been reported to serve as reservoir hosts for pests and diseases (Erinle, 1982, Alegbejo, 1987). Increased incidence of several viral disorders of tomatoes also reinforces the need for good weed control. Weed emergence is environment specific and the type of weed is determined by the environment a crop is cultivated on. The environment provided by a growth media supports little or no weed. Therefore, the objectives of this study were to determine the effect of seven growth media and duration of composting on the growth and yield of tomatoes and to ascertain the different weed biomass existing in the different media.

MATERIALS AND METHODS

Study location

The field experiment was conducted in the Department of Crop Science Teaching and Research Farm,Faculty of Agriculture, University of Nigeria, Nsukka ($06^0$52`N, $07^0$24`E), which is 447.26 m above sea level. The study area is humid tropic characterized by a bimodal rainfall pattern with peaks in June and September and a dry spell between mid-July and August. The site is characterized as tropical utisol of sandy loam texture. Temperature is uniformly high throughout the year, with mean minimum and maximum annual values of 21 and 31 ^{0}C, respectively.

Experimental set up

The study was executed between the months of January to July in 2018 planting season. The treatments were designed as a completely randomized design (CRD) with seven replications. The treatment comprised seven (7) growth media which were composted at two different durations which gave a total of fourteen (14) treatments combinations. The duration of composting was 4 and 8 weeks respectively. The seven growth media ratios were mixed, bagged and properly labeled. The first set of the media were mixed and allowed to decompose for 4 weeks before the second set was mixed and allowed to decompose for another 4 weeks. This gave rise to the 4- and 8-week composting periods. The compost mixtures were turned every week throughout the period of composting. The seven growth media were; T1 = Rice husk dust + Poultry manure + River sand (3:2:1), T2 = Top soil + Poultry manure + River sand (3:2:1) as control, T3 = Top soil + Poultry manure + River sand (2:3:1), T4 = Top soil + Poultry manure + River sand (1:2:3), T5 = Sawdust + Poultry manure + River sand (3:2:1), T6 = Rice husk dust + Poultry manure + River sand (2:3:1) and T7 = Sawdust + Poultry manure + River sand (1:2:3). At the end of the composting periods, the compost mixtures were put in polyethylene bags up to three quarter full and perforated to allow for aeration. The bags were randomly placed at 0.5 m by 0.5 m on a field cleared of grasses and weeds. Tomato seeds (*tima variety)* were sown at five seeds per bag and later thinned to one seedling per bag after two weeks of seedling emergence and that gave a total of 98 plant population. No additional manure was added to the treatments throughout the study. The weeds that grew around the polyethylene bags were cleared regularly with machete and hoe. Insect that attacked tomato crops such as grasshopper (*Zonocerus variegatus)* were controlled by hand picking. Fruit harvesting was done by hand picking when the fruits were ripe.

Data Collection and Analysis

Weed data

Weed identification: Weed encountered in the different media was identified to species level using a handbook of West Africa weeds (Akobundu and Agyakwa, 1998).

Weed biomass: Weeds growing in each bag in the different media were counted at two weekly intervals starting from 4 weeks after planting.

Weed density: The weeds identified were harvested from the base and categorized and then weighed on an electric balance (in grams) to get the fresh weight. Thereafter, was dried in an oven at 80 ^{0}C for 48 hours and the dry weight recorded.

Plant growth characteristics

Following observations on plant growth characteristics were evaluated during the course of the study.
Days to emergence: Number of days was counted from the date of sowing to emergence of first seedling on each media.

Days to 50% emergence: Number of days was counted from the date of sowing to the emergence of 50% of the seeds planted per bag.

Plant height: The height of plants was measured in centimeters, from base to the top leaf of the plant.

Number of leaves per plant: The total number of leaves per plant was counted for each media at two weekly intervals starting from four (4) weeks after planting.

Number of branches per plant: The total number of branches per plant was counted for each media at two weekly intervals starting from the fourth week after planting.

Stem girth: The girth of the stem of each plant was measured in centimeters (cm) with the help of vernier caliper.

Number of trusses: The total number of trusses per plant was counted in each media.

Number of flowers per plant: Flowers per plant were counted regularly during the blooming period of the crop in each media.

Fruit weight per plant: Fruit weight per plant was collected at regular interval of four days in each plant and weighed on an electric balance (in grams) and average was computed.

All the data collected were subjected to analysis of variance (ANOVA) following two-way procedure for CRD experiments using Genstat Release 12.1 Discovery Edition (2009). Weed data were first transformed with square root transformation method before the statistical analysis was carried out. Mean separation across the treatments were done using Fisher's Least Significant Difference at 5% probability level ($LSD_{0.05}$).

Table 1: Different treatment combinations of the growth media

Treatment	Combinations	Ratio by volume (v:v:v)
T1	Rice hull dust + Poultry manure + River sand	3:2:1
T2	Top soil + Poultry manure + River sand (Control)	3:2:1
T3	Top soil + Poultry manure + River sand	2:3:1
T4	Top soil + Poultry manure + River sand	1:2:3
T5	Sawdust + Poultry manure + River sand	3:2:1
T6	Rice hull dust + Poultry manure + River sand	2:3:1
T7	Rice hull dust + Poultry manure + River sand	1:2:3

RESULTS AND DISCUSSION

Weed floral composition

A total of fourteen (14) weed species belonging to eleven (11) families were identified during the study period (Table 2). The weed species comprised 9 broadleaf, 4 grasses and 1 sedge. Family *Poaceae* had 3 species, *Amarantheceae* had 2 species while other weed families like *Commelinaceae, Asteraceae, Mimosoideae, Euphorbiaceae, Leguminosae, Malvaceae, Loganiaceae, Urticaceae and Cyperaceae* had one species each. The weed species found in other growth media were *Calopogonium muconoides, Commelina erecta, Ageratum conyzoides, Mimosa pudica* while *Phyllantus amarus* and *Laportea aestuans* weed species *were* mostly found in the T2 (Top soil + Poultry manure + River sand (3:2:1)) growth medium. Among the growth media, T1 (Rice hull dust + Poultry manure + River sand (3:2:1)), growth medium recorded higher weed species diversity while the least was recorded in T4 (Top soil + Poultry manure + River sand (1:2:3)) medium. The most abundant broadleaf weeds encountered in the different growth media were *Mimosa pudica, Amaranthus spinosus, Phyllantus amarus* and *Celosia leptostachya.* Grasses weed species that were most abundant include *Panicum maximum, Digitaria horizontalis* and *Eleusine indica. Cyperus*

rotundus was the only sedges encountered though less frequent. These different weed types have been variously reported to be associated with tomato (Adigun *et al*., 1993).

Table 2: Weed species observed in the growth media and their preponderance

Common name	Scientific name	Family	Lifecycle	Morphology	Weed Severity
Guineagrass	*Panicum maximum* Jacq.	*Poaceae*	Annual	Grass	**
Crabgrass	*Digitariahorizontalis*Willd.	*Poaceae*	Annual	Grass	*
Slender dayflower	*Commelinaerecta* Linn.	*Commelinaceae*	Annual	Grass	***
Goosegrass	*Eleucine indica* (L)Gaertn.	*Poaceae*	Annual	Grass	*
Goatweed	*Ageratum conyzoides* Linn.	*Asteraceae*	Annual	Broadleaf	***
Sensitive plant	*Mimosa pudica* Linn.	*Mimosoideae*	Annual	Broadleaf	***
Gulf leafflower	*Phyllantusamarus* Schum. &Thonn.	*Euphorbiaceae*	Annual	Broadleaf	**
Thorny pigweed	*Amaranthus spinosus* Linn.	*Amaranthaceae*	Annual	Broadleaf	*
Calopo	*Calopogoniummucunoides*Desv.	*Leguminosae*	Annual	Broadleaf	*
Broom weed	*Sida acuta*Burn.f.	*Malvaceae*	Annual	Broadleaf	*
Celosia	*Celosia leptostachya*Benth.	*Amaranthaceae*	Annual	Broadleaf	***
Pinkweed	*Spigeliaanthelmia* Linn.	*Loganiaceae*	Annual	Broadleaf	**
Tropical nettleweed	*Laporteaaestuans*(Linn.) Chew.	*Urticaceae*	Annual	Broadleaf	**
Purple nutsedge	*Cyperus rotundus* Linn.	*Cyperaceae*	Perennial	Sedge	***

*=Less severe, **=Severe, ***= Most severe

Days to Emergence and days to 50% emergence

The period of composting had no significant effect on the days to tomato seedling emergence (Table 3) but had significant effect on the days to 50% emergence. The media composted for four (4) weeks took longer number of days (10.12 days) to attain 50% emergence when compared with the media composted for eight (8) weeks. T6 (Rice hull dust + Poultry manure + River sand (2:3:1)) growth medium took longer number of days (9.93 days) to emerge and was statistically similar to the number of days recorded for T7 (Sawdust + Poultry manure + River sand (1:2:3)) growth media. T2 (Top soil + Poultry manure + River sand (3:2:1)) growth medium took shorter number of days (6.43 days) to emerge and was statistically similar to those obtained from T1 (Rice husk dust + Poultry manure + River sand (3:2:1)) (7.0 days) and T4 (Top soil + Poultry manure + River sand (1:2:3)) (7.21 days) respectively when compared with other growth media. T6 (Rice husk dust + Poultry manure + River sand (2:3:1)) growth medium recorded significantly ($p<0.05$) higher number of days to 50% emergence (12.0 days) which was significantly ($p<0.05$) higher than what was recorded in other growth media while the least number of days to 50% emergence was recorded in T2 (8.0 days). Nursery medium has been found to influence the quality of seedling emergence and growth, this research confirms the efficacy of rice hulls and top soil which have been successfully used as growing media (Syahida, 2012). Early seedling emergence obtained in T2 growth medium shows that the medium has favorable physical and chemical characteristics, which facilitated seedling emergence. This result agrees with Baiyeri and Mbah (2006) who stated that growth medium type and environmental elements such as oxygen, nutrients, and water availability, temperature and light have impact on how well seeds germinate. Seed germination, seedling emergence, growth and plant quality are influenced by the growth medium. The result of the present study shows that top soil supported seedling growth significantly. The findings are in line with the findings of Agbo *et al*., (2006).

Table 3: Effect of duration of composting and growth media on emergence data of tomato (*Solanum lycopersicum* L.)

Treatments	Days to emergence (days)	Days to 50% Emergence (days)
Composting duration		
4 weeks	8.10	10.12
8 weeks	7.94	9.47
F-LSD $_{(0.05)}$	Ns	0.58
Growing Media		
T1	7.00	8.57
T2	6.43	8.00
T3	7.29	9.07
T4	7.21	9.00
T5	8.57	10.50
T6	9.93	12.00
T7	9.71	11.43
F-LSD $_{(0.05)}$	0.84	1.08

T1= Rice husk dust + Poultry manure + River sand (3:2:1), T2= Top soil + Poultry manure + River sand (3:2:1) as control, T3= Top soil + Poultry manure + River sand (2:3:1), T4= Top soil + Poultry manure + River sand (1:2:3), T5= Sawdust + Poultry manure + River sand (3:2:1), T6= Rice husk dust + Poultry manure + River sand (2:3:1) and T7= Sawdust + Poultry manure + River sand (1:2:3), ns= not significant.

Treatment effect on morphological parameters

Composting duration had no significant effect on the growth parameters assessed except on the plant height at 4 weeks after planting (WAP) where the media composted for 4 weeks gave significantly ($p<0.05$) higher plant height (11.59 cm) when compared with the other composting duration (Table 4). At 6 WAP, all the plant growth parameters were statistically the same across the 4 and 8 week composting duration. At 8 WAP, the media composted for 8 weeks recorded significantly ($p<0.05$) higher value for number of branches (3.64) and stem girth (1.59 cm) respectively than the other composting duration. Among the growth media, T2 recorded significantly ($p<0.05$) higher plant height at 4 WAP (16.86 cm) which was comparable with those obtained from T4 (15.44 cm) and T3 (15.04 cm), while the least was obtained in T5 (5.31 cm) which was statistically similar to those obtained in T1 (6.08 cm), T6 (7.24 cm) and T7 (8.26 cm) respectively. The number of leaves followed the same trend as the result obtained in plant height. The highest stem girth was recorded in T3 (0.98 cm) which was statistically similar to those recorded in T4 (0.93 cm), T2 (0.87 cm) and T6 (0.82 cm) while the least was recorded in T1 (0.66 cm). At 6 WAP, T2 growth medium recorded significantly higher values for plant height (46.3 cm), number of branches (1.50), number of leaves (17.14) and stem girth (1.44 cm) while the least values for these parameters were consistently recorded by T1 growth medium.

At 8 weeks after planting, the same trend repeated itself on the morphological parameters recorded. Higher plant height recorded in this study in growth medium T2 could be attributed to adequate poultry manure which enhanced plant growth. Top soil mixture supported significantly taller seedlings, all through the experiment, the tallest seedling were those with top soil in combination with poultry manure and river sand. The result of the research agrees with the report of Hirpa (2021) that higher plant height of *Azadiracthta indica* was recorded in soil mixture ratio of 2:2:1 (Top soil:compost:sand) than any other growth media used in the experiment. The result of the study also

agrees with the work of Okunomo (2010) who obtained higher seedlings height in decomposed poultry droppings than in other treatments with *P. bicolor* plant. Also,Ngwu *et al*. (2016) reported highest plant height of *Jatropha curcas* in their mixture. Babiker *et al*. (2009) stated that application of manure enhances the organic carbon content of soil, induces water infiltration and increases their capacity to retain nutrients against leaching losses, thereby improve soil fertility as observed in the study. The results obtained from the study are in agreement with other studies on other crops which reported that availability of poultry manure enhances plant growth (Shamet *et al*., 1994 and Sudhara*et al*., 1995). Decomposed poultry manure may have released nutrients in addition to improving infiltration and water holding capacity (Mathowa *et al*., 2014). The short plants height observed in the rice hull combination with river sand and poultry manure could be attributed to poor aeration as a result of poor drainage. Okunlola (2016) reported that when rice husk was mixed with top soil or river sand, humus content of the growing medium increases and thus it supports vigorous growth of the plant but this is in contrast to the result of the study because the growth medium with mixture of rice husk was the medium that showed the least in response to seedling growth and emergence. It is also possible that the vigorous and fast growth of seedlings in top soil mixture was enhanced by the good water holding capacity and nutrients supplied by the media. Law-Ogbomo and Remison (2008) reported that uptakes and utilization of applied fertilizers significantly enhanced number of plant leaves. More number of leaves in plants reflects good vigor and their suitability to environment and growth media. The enhancement in the number of leaves by organic matter application was a precursor to greater amount of assimilate and thus allowing more translocation to the berry (Law-Ogbomo and Remison, 2008). The authors opined that changes in number of plant leaves would affect the overall performance since plant leaves serves as the photosynthetic organ of the plant. Increase in number of leaves leads to better utilization of solar radiation. The increased number of leaves reported in top soil mixtures agrees with the report of Masarirambi *et al.* (2010) that organic manure enhanced the number of leaves in lettuce by providing sufficient amount of nutrients that accelerate the growth of leaves.

The increased number of branches found in the T2 and T4 growth media than in other growth media could be attributed to the fact that poultry manure component of the growth media provided additional nutrients and thus boost the morphological growth of tomato plant. El-Tahany (2006) reported that adequate amount of nutrients in the soil improved growth of pepper plants. Also Hirpa (2021) reported higher plant height of *Azadirachta indica* in soil mixture of 2:2:1 (top soil:compost:sand) than the other growth media used in their experiment.

Table 4: Effect of period of composting and growth media on the growth parameters of tomato (*Solanum lycopersicum* L.)

	4				6				8			
Treatments	Weeks after planting											
Composting duration	Plant height (cm)	Number of branches	Number of leaves	Stem girth (cm)	Plant height (cm)	Number of branches	Number of leaves	Stem girth (cm)	Plant height (cm)	Number of branches	Number of leaves	Stem girth (cm)
4 weeks	9.76	0.00	6.22	0.84	44.20	0.45	13.37	1.29	54.10	3.04	24.33	1.44
8 weeks	11.59	0.00	5.78	0.87	40.90	0.53	11.59	1.24	49.90	3.64	23.35	1.59
F-LSD $_{(0.05)}$	1.71	ns	ns	ns	ns	ns	ns	ns	ns	0.58	ns	0.13
Growth Media												
T1	6.08	0.00	5.00	0.66	31.70	0.07	8.07	1.03	40.70	3.07	14.00	1.24
T2	16.86	0.00	7.21	0.87	46.30	1.50	15.79	1.27	60.00	6.79	33.21	1.74
T3	15.04	0.00	6.14	0.98	44.30	0.21	10.64	1.30	57.50	4.71	21.71	1.50
T4	15.44	1.00	6.79	0.93	43.90	0.57	17.14	1.44	49.80	5.57	31.71	1.59
T5	5.31	0.00	5.07	0.76	32.80	0.79	11.07	1.29	41.20	4.29	20.93	1.34
T6	7.24	0.00	5.21	0.82	36.40	0.20	11.93	1.43	48.70	3.50	15.57	1.62
T7	8.26	0.00	6.57	0.72	35.04	0.29	12.48	1.11	44.30	5.00	29.71	1.32
F-LSD $_{(0.05)}$	3.19	0.00	1.06	0.21	9.85	0.53	3.52	0.18	9.37	1.60	3.11	0.19

T1= Rice husk dust + Poultry manure + River sand (3:2:1), T2= Top soil + Poultry manure + River sand (3:2:1) as control, T3= Top soil + Poultry manure + River sand (2:3:1), T4= Top soil + Poultry manure + River sand (1:2:3), T5= Sawdust + Poultry manure + River sand (3:2:1), T6= Rice husk dust + Poultry manure + River sand (2:3:1) and T7= Sawdust + Poultry manure + River sand (1:2:3), ns= not significant.

Treatment effects on yield parameters

Composting duration had no significant effect on the yield parameters at 4-8 WAP (Table 5). The growth media varied significantly ($p<0.05$) at 6 and 8 WAP. At 6 WAP, T4 growth medium consistently recorded significantly higher number of trusses (5.83) and number of flowers (21.0) while the least for these parameters was consistently recorded by T1 growth medium. At 8 WAP, T4 growth medium recorded significantly higher fruit weight per plant (52.2 g) while T1 growth medium had the least (22.6 g) fruit weight. These results indicate that medium T4 performed best generally in terms of yield parameters measured. The present result supports the report by Baiyeri and Mbah (2006) that soil-based medium performed better than soilless based medium. This result of the study is akin with the report of Meena *et al*. (2017) that growing mixture of soil + vemicompost + vermiculite increased root length and root number in papaya. The combined mixture of top soil in T2 and T4 growth media showed significant effect on the yield parameters probably due to the synergistic combinations of these factors improving the physical conditions of the media nutritional factors (Sahni *et al*., 2008). The result may be due to better nutrient availability leading to higher production of photosynthetically functional leaves in these treatments which resulted in better yield parameters (Borah *et al*., 2008) as observed in the tomato crop.

Table 5: Effect of duration of composting and growth media on the yield parameters of Tomato (*Solanum lycopersicum* L.)

	Number of Trusses	Number of flowers	Number of Trusses	Number of flowers	Number of Trusses	Number of flowers	Fruit weight/plant (g)
	4		6		8		
Treatments	Weeks after planting						
Composting duration							
4 weeks	1.65	7.80	4.28	15.80	6.27	20.70	22.20
8 weeks	2.42	8.40	4.43	17.00	7.16	20.60	43.70
F-LSD $_{(0.05)}$	ns	ns	ns	ns	ns	ns	ns
Growth media							
T1	1.38	4.30	2.54	10.10	4.33	12.30	22.60
T2	2.40	10.00	4.50	17.50	7.53	19.80	30.60
T3	1.91	8.80	4.54	17.10	7.08	20.40	46.30
T4	2.45	9.20	5.83	21.00	7.92	30.10	52.20
T5	1.42	5.67	3.54	12.60	6.60	25.60	25.80
T6	1.56	8.20	4.80	15.67	5.34	19.20	20.50
T7	1.44	5.30	3.53	13.90	5.10	17.80	19.80
F-LSD $_{(0.05)}$	ns	ns	1.60	7.00	1.85	8.08	37.87

T1 = Rice husk dust + Poultry manure + River sand (3:2:1), T2 = Top soil + Poultry manure + River sand (3:2:1) as control, T3 = Top soil + Poultry manure + River sand (2:3:1), T4 = Top soil + Poultry manure + River sand (1:2:3), T5 = Sawdust + Poultry manure + River sand (3:2:1), T6 = Rice husk dust + Poultry manure + River sand (2:3:1) and T7 = Sawdust + Poultry manure + River sand (1:2:3), ns = not significant.

Treatment effects on weed data

Duration of composting did not significantly influence number of grasses and weed fresh weight at 4 WAP (Table 6). Composting duration of 8 weeks recorded significantly higher number of broadleaves (2.92/bag), number of sedges (1.30/bag) and weed dry weight (2.32 g). Significantly ($p<0.05$) higher number of broadleaves was recorded in T1 growth medium (4.01/bag) when compared to the other growth media while the least was recorded in T4 growth medium (1.44 /bag). T2 and T3 growth media recorded significantly higher number of grasses (1.18/bag) respectively while the least was recorded by T6 growth medium (0.77/bag). T1 growth medium recorded significantly ($p<0.05$) higher number of sedges (1.48/bag) which was statistically similar to those of T3 (1.47/bag), T2 (1.30/bag) and T7 (1.24/bag) while the least was recorded in T4 growth medium (0.77/bag). T1 growth medium consistently recorded significantly higher weed fresh weight (11.33 g) and weed dry weight (3.70 g) when compared to other growth media while the least was recorded consistently in T6 (2.53 and 0.67 g) respectively.

Table 6: Effect of duration of composting and growth media on weed data at 4 weeks after planting of tomato

Treatment					
Composting duration	Number of broadleaves/bag	Number of grasses/bag	Number of sedges/bag	Weed fresh weight (g)	Weed dry weight (g)
4 weeks	4.08(1.69)	0.84(1.04)	0.92(1.04)	5.31	1.36
8 weeks	12.04(2.92)	0.59(0.97)	1.67(1.30)	7.02	2.32
F-LSD$_{(0.05)}$	0.30	ns	0.18	ns	0.68
Growth Media					
T1	22.29(4.01)	1.00(1.13)	2.14(1.48)	11.33	3.70
T2	3.43(1.85)	1.36(1.18)	1.36(1.18)	7.52	2.01
T3	10.00(2.56)	1.36(1.18)	2.43(1.47)	8.92	2.05
T4	2.21(1.44)	0.29(0.83)	0.14(0.77)	4.10	1.28

T5	5.93(2.05)	0.64(1.00)	0.57(0.97)	4.67	1.56
T6	4.43(1.91)	0.14(0.77)	0.57(0.97)	2.53	0.67
T7	8.14(2.32)	0.21(0.82)	1.86(1.24)	4.07	1.60
F-LSD$_{(0.05)}$	0.55	0.29	0.34	3.87	1.27
CD x GM	0.78	0.41	0.48	5.57	1.79

T1 = Rice husk dust + Poultry manure + River sand (3:2:1), T2 = Top soil + Poultry manure + River sand (3:2:1) as control, T3 = Top soil + Poultry manure + River sand (2:3:1), T4 = Top soil + Poultry manure + River sand (1:2:3), T5 = Sawdust + Poultry manure + River sand (3:2:1), T6 = Rice husk dust + Poultry manure + River sand (2:3:1) and T7 = Sawdust + Poultry manure + River sand (1:2:3), ns = not significant, CD x GM = composting duration x growth media, Values in parentheses are the square root transformed values.

At 8 WAP, 8 weeks duration of composting consistently recorded significantly higher number of broadleaves (3.14/bag), number of sedges (1.05/bag), weed fresh weight (8.11 g) and weed dry weight (1.57 g) when compared with the other period of composting (Table 7). Among the growth media, T1 consistently recorded significantly ($P<0.05$) higher number of broadleaves (3.20/bag), weed fresh weight (8.16 g) and weed dry weight (2.02 g) when compared with other growth media treatments while the least for these values was consistently recorded in T4 growth medium.

Table 7:Effect of duration of composting and growth media on weed data at 8 weeks after planting of tomato

Treatment					
Composting duration	Number of broadleaves/bag	Number of grasses/bag	Number of sedges/bag	Weed fresh weight (g)	Weed dry weight (g)
4 weeks	2.73(1.44)	0.73(0.97)	0.39(0.86)	1.27	0.35
8 weeks	12.63(3.14)	0.98(1.13)	0.74(1.05)	8.11	1.57
F-LSD$_{(0.05)}$	0.29	ns	0.14	1.23	0.43
Growth Media					
T1	14.79(3.20)	0.79(1.05)	0.79(1.05)	8.16	2.02
T2	4.79(1.95)	0.93(1.10)	0.64(1.00)	2.69	0.34
T3	7.00(2.21)	1.50(1.15)	0.93(1.06)	3.64	1.13
T4	1.07(1.15)	0.36(0.87)	0.29(0.86)	0.41	0.02
T5	9.36(2.60)	1.00(1.14)	0.26(0.86)	6.96	1.52
T6	6.14(2.25)	0.64(1.02)	0.71(1.01)	3.99	0.52
T7	10.64(2.69)	0.79(1.02)	0.29(0.86)	6.99	1.18
F-LSD$_{(0.05)}$	0.53	ns	ns	2.30	0.80
CD x GM	0.75	0.51	0.37	3.26	1.14

T1 = Rice husk dust + Poultry manure + River sand (3:2:1), T2 = Top soil + Poultry manure + River sand (3:2:1) as control, T3 = Top soil + Poultry manure + River sand (2:3:1), T4 = Top soil + Poultry manure + River sand (1:2:3), T5 = Sawdust + Poultry manure + River sand (3:2:1), T6 = Rice husk dust + Poultry manure + River sand (2:3:1) and T7 = Sawdust + Poultry manure + River sand (1:2:3), ns = not significant, CD x GM = composting duration x growth media, Values in parentheses are the square root transformed values.

At 12 WAP, 8 weeks composting duration consistently recorded significantly higher number of broadleaves (2.88/bag), number of grasses (1.63/bag), number of sedges (1.43/bag), weed fresh weight (10.09 g) and weed dry weight (2.84 g) while the least values were recorded at 4 weeks composting duration (Table 8). Among the growth media, T1 growth media consistently recorded significantly higher number of broadleaves (3.12/bags), number of sedges (1.43/bags), weed fresh weight (14.30 g) and weed dry weight (4.40 g) while the least values for these parameters were consistently recorded in T4 growth media. It might be due to mixtures with rice hulls and poultry manure maintained the desirable water holding capacity and aeration by preventing the crusting and compacting of the media and also released available nutrients which enhanced the production of more

weeds in the media. The more weed number and weight observed in the T1 growth media than in other media might be due to the mixture of the rice hulls with some weed seeds during rice harvesting and processing which now increased the number of weeds that emerged and their number.

Table 8:Effect of duration of composting and growth media on weed data at 12 weeks after planting of tomato

Treatment					
Composting duration	Number of broadleaves/bag	Number of grasses/bag	Number of sedges/bag	Weed fresh weight (g)	Weed dry weight (g)
4 weeks	2.63(1.33)	0.53(0.94)	0.51(0.91)	2.67	0.71
8 weeks	9.45(2.88)	2.49(1.63)	1.88(1.43)	10.09	2.84
F-LSD$_{(0.05)}$	0.43	0.20	0.18	3.61	1.03
Growth Media					
T1	2.14(1.51)	0.79(1.09)	0.43(0.93)	0.14	0.12
T2	3.93(1.72)	1.07(1.15)	0.86(1.04)	5.03	1.51
T3	4.64(1.57)	1.79(1.19)	0.50(0.94)	7.06	1.84
T4	11.50(3.12)	2.29(1.57)	1.93(1.43)	14.30	4.40
T5	7.29(2.39)	1.86(1.41)	1.90(1.35)	7.13	1.65
T6	4.64(2.01)	1.43(1.29)	0.93(1.13)	3.99	0.60
T7	8.14(2.42)	1.36(1.26)	1.79(1.37)	6.99	2.32
F-LSD$_{(0.05)}$	0.81	ns	0.34	6.76	1.92
CD x GM	1.14	ns	0.48	9.56	2.72

T1 = Rice husk dust + Poultry manure + River sand (3:2:1), T2 = Top soil + Poultry manure + River sand (3:2:1) as control, T3 = Top soil + Poultry manure + River sand (2:3:1), T4 = Top soil + Poultry manure + River sand (1:2:3), T5 = Sawdust + Poultry manure + River sand (3:2:1), T6 = Rice husk dust + Poultry manure + River sand (2:3:1) and T7 = Sawdust + Poultry manure + River sand (1:2:3), ns = not significant, CD x GM = composting duration x growth media, Values in parentheses are the square root transformed values.

Conclusion

Result of the study indicated that T2 treatment combination produced enhanced plant morphological characteristics such as plant height, days to emergence, number of branches and number of leaves. T4 treatment combination enhanced the crop yield parameters while the T1 combinations with other rice hull dust combinations increased the weed incidence, diversity and biomass. Therefore, it is concluded that suggested agricultural waste material can be used as growing media for better tomato growth and can be explored further for other combinations.

REFERENCES

Abbasi, N.A., Zafar,L., Khan, H.A. and Qureshi, A.A. (2013). Effects of naphthalene acetic acid and calcium chloride application on nutrient uptake, growth, yield and post-harvest performance of tomato fruit. *Pak. J. Bot.*, 45(5): 1581-1587.

Abad, M., Noguera, P., Puchades, R., Maquieira, A. and Noguera, V. (2002). Physico-chemical and chemical properties of some coconut dusts for use as a peat substitute for containerized ornamental plants. *Bioresour Technol* 82:241–245.

Adalid, A.M., Rosello, S. and Nuez, F. (2004). Breeding tomatoes for their high nutritional value. Rec. Res. Dev. in pl. Sci., 2: 33-52.

Adigun, L.A., Lagoke, S.T.O., Kumar, V. and Erinle, I.D.(1993). Weed management in transplanted tomato in the Nigeria Savanna. *Samaru J.Agric. Res.*10:20-39.

Agbo, C.U. and Omaliko, C.M (2006). Initiation and Growth of Shoots of *Geogronema latifolia*Benth Stem Cuttings in Different Rooting Media, *Africa Journal of Biotechnology* (5), 425-428.

Ahmad, I., Ahmad, T., Gulfam, A. and Saleem, M. (2012). Growth and flowering of gerbera as influenced by various horticultural substrates. *Pak J Bot* 44:291–299.

Akobundu, I.O. and Agyakwa, C.W. (1998). A Handbook of West Africa Weeds. IITA, Ibadan, Nigeria. pp 556.

Alegbejo, M.D. (1987). Identification of a weed host of pepper veinal mottle virus in Northern Nigeria. Sarnaru Journal of Agricultural Research, 5:65- 70.

Babiker, N.N., Babiker, H.M. and Mukhtar, N.O. (2009). Effect of rhizobialinoculation,chicken manure and nitrogen fertilizer on growth and yield of guar (*Cyamopsistetragonoloba* L. Taub). Gezira Journal of Agriculture 7(1):1−10.

Baiyeri, K.P. and Mbah, B. N. (2006). Effects of soilless and soil-based nursery media on seedling emergence, growth and response to water stress of African breadfruit (TreculiaafricanaDecne). African J. Biotech., 5(15): 1405-1410.

Borah, A. S., Nath, A., Ray, A. K., Bhat, R.,Maheswarappa, H. P., Subramanian, P.,Dileep, M., sudhakara, K.,Santhoshkumar, A. V., Nazeema, K. K.and Ashokan, P. K. (1994). Effect of seedsize, rooting medium and fertilizers onthe growth of seedlings of silk cotton(Ceiba pentandra Linn.). Indian J.Forestry. 17(4): 293-300.

Dickens D. (2011). Effect of propagation media on the germination and seeding performance of *Irvingiawombolu*(Vermoesen), *American Journal Biotechnology and Molecular Sciences*; 1 (2): 51-56.

Erinle, I.D. (1982). The potential for integrated pest management in Nigeria with special reference to tomato. (*Lycopersicon esculantum* Mill). Proceedings of 5th Annual conference of Horticultural Society of Nigeria. Ahmadu Bello Univ. Zaria- Nigeria: 62 - 71.

Frusciante, L.,Carli P., Maria, R., Ercolano, S., Pernice, R., Matteo, A.D., Fogliano, V. and Pellegrini, N. (2007). Antioxidant nutritional quality of tomato. Mol. Nutr. and Food Res., 51(5): 609-617.

Hernandez-Apaolaza, L., Gasco´, A.M., Gasco´, J.M. and Guerrero, F. (2005). Reuse of waste materials as growing media for ornamental plants. *Bioresour Technol* 96(1):125–131.

Hirpa A. (2021). Effects of Pot Size and Planting Media on the Early Seedling Growth Performance of *Azadirachta indica* A. Juss. *Journal of Plant Sciences*, 9 (4): 208-213. doi: 10.11648/j.jps.20210904.21
.

Isack, M.E. and Lyimo, M. (2015). Effect of postharvest handling practices on physicochemical composition of tomato. *International Journal of Vegetable Science* 21(2):118-127.

Jamil, M.K., Mizanur,R. M. , Hossain, M.M., Hossain, T. M. and Sirajul Karim, A.J.M. (2016). Effect of potting media on growth, flowering and bulb production of Hippeastrum (*Hippeastrumhybridum* Hort.) *Int. J. Appl. Sci. Biotechnol*., Vol 4(3): 259-271 DOI: 10.3126/ijasbt. v4i3.14545.

Jiregna, T., Derbew, B. and Kassahun B (2012). Genetic Associations Analysis among Some Traits of Tomato (Lycopersicon esculentum Mill.) Genotypes in West Showa, Ethiopia. Int. J. Plant Breed. Genet. 6:129-139.

Law-Ogbomo, K.E, Remison, S.U. (2008). Growth and yield of white guinea yam (*Dioscorearotundata*Poir.) influenced by NPK fertilization on a forest site in Nigeria.*Journal of Tropical Agriculture*, 46 (1-2): 9-12.

Masarirambi, M. T., Hlawe, M. M., Oseni, O. T. and Sibiya, T. E. (2010). Effects of organic fertilizers on growth, yield, quality and sensory evaluation of red lettuce (*Lactuca sativa* L.)'VenezaRoxa'. *Agriculture and Biology Journal of North America, 1*(6), 1319-1324.

Mathowa, M., Bosenakitso, M., Mojeremane, W., Mpofu, C. and Legwaila, M. 2014. (2014) Effect of media on seedling growth of African baobab (*Adansonia digitata* L). *International Journal of Advance Research in Biological Sciences;* 1 (7): 94-104.

Meena, A.K., Garhwal, O.P., Mahawar, A. R. and Singh, S.P. (2017) Effect of Different Growing Media on Seedling Growth Parameters andEconomics of Papaya (*Carica papaya* L) cv. Pusa Delicious. *International Journal of Current Microbiology and Applied Sciences* 6(6): 2964-2972.

Ngwuta, A.A, Peter-Onoh, C.A., Obiefuna, J.C., Chigbundu, N.I., Nwokeji, E.M., Chris Emenyonu, C.M. and Metu, C.N. (2016). Juvenile phenology of Jatropha curcas as by selected nursery growth media, *International Journal of Agriculture and Rural Development*; 19 (1): 2506- 2510.

Ojiako, F., Agu, C., Ngwuta, A., Ogoke, I., Anyanwu, C., Onweremadu, E., &Ibeawuchi, I. Enhancing Jatropha curcas (Linnaeus) Cultivation and Seed Yield among Farmers in Nigeria: A Review.

Okunlola, A. I. (2016). Evaluation of the effect of different nursery media on the emergence and growth of three tropical tree species. Global Journal of Science Frontier Research: D. Agriculture and Veterinary 16 (3)

Okunomo K. (2010). Germination response of soursop (*Annona muricata*) to various nursery techniques. Proceedings of the 2nd Biennial National Conference of the Forest and Forest Products Society. 2010; 112-116.

Shamet, G.S., Chauhan, P.S. and Sood, R. 1994. Nursery-studies on potting mixture, mulching and fertilizer requirements of chilgoza pine (*Pinus gerardiana* Wall.). Indian
Journal of Forestry 17(3):225−229.

Sinha, R.K., Heart, S., Valani, D.B., Chauhan,K.A. 2009. Earthworm‟s vermicompost:A powerful crop nutrient over the conventional compost and protective soil conditioner against the destructive chemical fertilizers for food safety and security. American-Eurasian Journal ofAgricultural & Environmental Sciences,5: 14-22.

Sudhakara, K., Mammen, W., Santoshkumar, A.V. and Ashokan, P.K. 1995. Effect of seed size, rooting medium and fertilizers on containerized seedling of silk cotton (*Ceibapentandra* Linn.). *Indian Forester* 21(12):1135−1142.

Syahida.M. (2012). Sour sop (*Annona muricata* L. C. V. Elita): Blood Haematological and Serum Biochemistry of Spargue-Dawley Rats, *International Food Research Journal* 19(3): 955-959.

Tariq, U., Rehman, S., Khan, M.A., Younis, A., Yaseen, M. and Ahsan, M. (2012). Agricultural and municipal waste as potting media components for the growth and flowering of Dahlia hortensis ‘Figaro’. *Turk J Bot* 36:378–385.