EFFECT OF SOME PLANT EXTRACTS AND TOMATO CULTIVARS ON THE GROWTH OF TOMATO (*Lycopersicon esculentum* Mill) IN OWERRI, IMO STATE, SOUTHEAST NIGERIA.

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ABSTRACT
The effects of some plant extracts and tomato (*Lycopersicon esculentum Mill*) were studied. The experiments were conducted in 2011 cropping season at the Teaching and Research Farm, and the Crop Science and Technology Laboratory of the School of Agriculture and Agricultural Technology, Federal University of Technology, Owerri, Imo State, Nigeria. The experiment was laid out in a 3x4 factorial in Randomized Complete Block Design (RCBD), with three replications. The extracts of Basil (scent leaf) plant, ginger rhizome and neem leaves were used. Tomato cultivars used were ROMA VF, RIO Grande and Tropimech. Treatments comprised the three tomato cultivars and plant extracts, namely Basil plant, ginger rhizome, neem leaves and zero plant extracts (control), respectively. Results showed significant (p=0.05) interaction between tomato cultivars and the plant extracts which affected the number of leaves and tomato height. Tomato cultivars also significantly (P=0.05) affected the mean numbers of leaves, tomato height, and leaf area, while days to first flowering were not significantly affected by plant extracts and tomato cultivars.
Key words: plants extracts, growth, tomato cultivars, cropping season.

INTRODUCTION
Tomato, *Lycopersicon esculentum* Mill, is in Solanaceae (or night shade) family. The early history of tomato is not known with certainty, and it appears to have originated in tropical America probably in Mexico or Peru (Gould, 1983). The western coast of South America in present day Peru was where eight species of tomato genus were considered to grow wild in the Andes Mountains, the principal mountains of South America and one of the greatest mountain systems of the world (Raymond, 2007). Tomato is a berry which have quite a good number of seeds well distributed within a fleshy pericarp developed from an ovary. The fruit of tomato may be red or yellow. Tomatoes are a veritable source of minerals and vitamins, especially vitamin A and C. People who eat appreciable quantity of tomatoes and/or tomato products may be at lower risk of certain kinds of cancer, cancer of the prostate gland, lungs and stomach (Adda, B. , 2019).

The soils suitable for the optimum performance of tomato are well drained soils, well supplied with organic matter, and well-fertilized, sandy loams, but they can also grow well in almost any type of fertile, well-drained soils (Amati, *et al.*). There is need for sheltering tomato from strong wind, especially in the early period of production.

The planting of tomato includes direct-seeding and/or transplanting as seedlings. The conditions for direct seeding are when soil moisture and temperature favour rapid germination, and if mechanical harvesters are used. Tomato growers with a shorter growing season and most home garden employ transplant seedlings. The influence of cultural practices on crop growth has been studied (Obasi et al., 2010).

These reports (Obasi et al., 2010) on cultural practices were directed on their effects on crop yields and yields attributes. Such cultural measures include intercropping (a form of multiple cropping), use of plant spacing or plant densities. However, the use of plant extracts, to improve the growth of tomato, has not been accorded reasonable attention. It is this gap in knowledge that this research aims to fill. The eminent researchers who had reported the effect of cultural practices on crop yields and yield attributes include Obasi *et al*., (2010).

There is therefore, the need to consider the effects of plant extracts and the type of tomato cultivars in the performance of tomato in Owerri metropolis. Consequently, the major aim of the study was to assess the effects of some plant extracts on the growth of selected cultivars of tomato in Owerri area of Southeastern Nigeria.

MATERIALS AND METHODS
The field and laboratory experiments were carried out at the Teaching and Research Farm and at the Crop Science and Technology Laboratory of the School ,of Agriculture and Agricultural Technology, Federal University of Technology, Owerri, Imo State, Nigeria (5.4881^{o}N and 7.0176^{o}E).

The climate of the study area is mainly tropical, characterized by a heavy bimodal rainfall pattern (FDALR, 1985). Owerri records mean annual rainfall of about 2,500mm, which spans a period from early March to October, with a dry spell, (August Break). The minimum and maximum mean annual temperatures are, respectively, 22.5^{0}C and 31.9^{0}C (Nwosu and Adeniyi, 1980).

The experiment design used was a 3x4 factorial in Randomized Complete Block Design (RCBD) with

three (3) replications. The total combinations being 3x4x3 = 36. The tomato cultivars used were ROMA VF, RIO GRANDE, and TROPIMECH cultivars. These made up the three levels of factor A (Tomato cultivar). Factor B (plant extracts) were in four levels, Basil plant, ginger rhizome, neem leaves, no plant extracts (Control).

Preparation of plant Extracts

Fresh samples of the treatment, namely, Basil plant leaves and ginger rhizome were obtained from the Owerri local market, while neem leaves were collected from the trees in the premises of the University.

Water extracts of the fresh samples were prepared by washing them in tap water respectively, and then later washed with distilled water, and homogenized using a grinder. In order to prepare the extracts, 50g of the ground sample each of the Basil plant leaves, ginger rhizome and neem leaves were weighted using a sensitive adventure electronic weighing balance into each of the three 250ml conical flask and 100ml of distilled water was added to each flask to give 50% w/v (weight by volume) (Onekutu *et al*., 2001). The infusions were then allowed to stand for 24 hours after which they were filtered through a double layer cheese cloth into 250ml conical flash.

Transplanting of the Tomato Cultivars

The three tomato cultivars (ROMA VF, RIO GRANDE and TROPIMECH) were transplanted at six (6) weeks. Transplanting to experimental plots was done in the month of May, 2011. The spacing distance was 0.75 x 0.50m, between and within rows respectively, giving a plant population of 12 plants per plot. Five (5) ml each of the extracts were applied to each of the tomato seedlings at one week after transplanting (WAT). The control plots did not receive any plant extract. Treatments were applied using sterile syringes on the above ground parts of each cultivar. Each plot was closely monitored to determine the effect of the treatments (water extracts from Basil plant leaves, ginger rhizome and neem leaves) on the growth of tomato plant.

RESULTS AND DISCUSSION

Table 1 shows the effect of plant extracts and tomato cultivars on the number of tomato leaves produced per plant. The table shows that tomato cultivars and plant extracts did not significantly affect the mean number of tomato leave in the second week after transplanting (WAT). However, the reverse was the case, in the 4th, 6th and 8th weeks WAT, where the mean numbers of tomato leaves significantly ($p=0.05$) affected by tomato cultivars and plant extracts interactions per plant. Also, at 8 WAT, the mean number of tomato leaves was significantly($p=0.05$) affected by tomato cultivars. The highest mean number of tomato leaves was observed in the ROMA VF tomato cultivar under ginger rhizome plant extract treatment. The different plant extracts did not reflect any statistical differences among the mean number of tomato leaves at 4th and 8th ($P<0.05$). In a similar work, Mitali *et al*., (2012), reported that the application some plant extracts resulted to the promotion of the growth of tomato in ago - ecosystem.

Table 1: Effect of Plant extracts and tomato cultivars on the number of tomato leaves produced per Plant

Cultivar	Basil plant	Ginger rhizome	Neem leaf	No plant extracts	Mean of cultivar
		2WAT			
		Plant extracts			
ROMA VF	4.67	8.00	5.33	5.33	5.83
RIO GRANDE	7.67	6.67	6.67	7.00	7.00
TROPIMECH	8.67	6.33	5.67	4.67	6.33
Mean of plant extracts	7.00	7.00	5.89	5.67	
LSD $_{(0.05)}$ for cultivar= ns,					
LSD $_{(0.05)}$for plant extracts= ns					
LSD $_{(0.05)}$for cultivar x plant extracts=ns					
		4WAT			
ROMA VF	8.67	12.33	9.33	7.67	9.50
RIO GRANDE	11.00	7.67	7.00	9.67	8.83
TROPIMECH	10.00	9.00	10.00	7.67	9.17
Mean of plant extracts	9.89	9.67	8.78	8.33	
LSD $_{(0.05)}$ for cultivar = ns,					
LSD $_{(0.05)}$for plant extracts= ns					
LSD $_{(0.05)}$for cultivar x plant extracts = 3.23					
		6WAT			
ROMA VF	12.00	15.00	8.67	8.33	11.00
RIO GRANDE	10.67	8.67	7.67	10.33	9.33
TROPIMECH	10.33	10.67	12.33	9.33	10.67
Mean of plant extracts	11.00	11.44	9.56	9.33	
LSD $_{(0.05)}$ for cultivar= ns,					
LSD $_{0.05)}$ for (plant extracts= ns					
LSD $_{(0.05)}$ for cultivar x plant extracts 4.27					
		8WAT			
ROMA VF	10.67	19.33	13.00	11.33	13.58
RIO GRANDE	10.33	8.33	10.00	13.00	10.42
TROPIMECH	15.00	11.33	18.00	9.67	13.50
Mean of plant extracts	12.00	13.00	13.67	11.33	
LSD $_{(0.05)}$ for cultivar = 2.592					
LSD $_{(0.05)}$ for plant extracts= ns					
LSD $_{(0.05)}$ for cultivar x plant extracts4.49					

Table 2 shows the effect of plant extracts and tomato cultivars on the height (cm) of tomato. In the experiment with plant extracts, tomato heights were significantly ($P<0.05$) affected by cultivars at 2nd and 8th WAT, by plant extracts at 6 WAT and interactions between the cultivars and plant extracts at 6th and 8th WAT. RIO GRANDE tomato cultivars recorded the highest height at 2nd WAT (18.50 cm) treated with neem leaves as plant extracts; while ROMA VF cultivars recorded the lowest height (13 cm) under control plot. Neem plant has been reported by Yar'adura (2017) to be with wide application in sustainable management of land resources and soil fertility under agro-forestry system. Also, Jukatko and Vasela, 1992, Tangan *et al.*, 1992, Tangan *et al.*, 2002, reported the effect of plant extracts on the growth and development of fungi as it affects plant growth.

Table 2: Effect of plant extracts and tomato cultivars on the height (cm) of tomato

Cultivar	Basil plant	Ginger rhizome	Neem leaf	No plant extracts	Mean of cultivar
		2WAT			
		Plant extracts			
ROMAVF	14.03	15.73	15.20	13.00	14.49
RIO GRANDE	16.10	16.00	18.50	15.53	16.53
TROPIMECH	16.47	15.03	14.67	13.77	14.98
Mean of Plant extracts	15.53	15.59	16.12	14.10	
LSD $_{(0.05)}$ for cultivar=1.86					
LSD$_{(0.05)}$for Plant extracts= ns					
LSD $_{(0.05)}$ for cultivar x Plant extracts= ns					
		4WAT			
ROMAVF	22.33	27.43	20.00	20.33	22.52
RIO GRANDE	24.67	18.77	20.10	20.23	20.94
TROPIMECH	24.87	19.33	23.23	16.67	21.02
Mean of Plant extracts	23.96	21.84	21.11	19.08	
LSD $_{(0.05)}$ for cultivar= ns,					
LSD $_{(0.05)}$for Plant extracts= ns					
LSD $_{(0.05)}$ for cultivar x Plant extracts= ns					
		6WAT			
ROMAVF	28.4	42.9	26.4	25.0	30.7
RIO GRANDE	37.1	21.6	22.3	27.4	27.1
TROPIMECH	34.8	33.7	44.9	20.3	33.4
Mean of Plant extracts	33.4	32.7	31.2	24.3	
LSD $_{(0.05)}$ for cultivar= ns,					
LSD $_{(0.05)}$ for Plant extracts=6.93					
LSD $_{(0.05)}$or cultivar x Plant extracts=12.01					
		8WAT			
ROMAVF	31.1	45.4	29.6	30.3	34.1
RIO GRANDE	34.5	20.0	23.7	31.2	27.3
TROPIMECH	36.6	25.5	56.5	27.1	36.4
Mean of Plant extracts	34.1	30.3	36.6	29.5	
LSD $_{(0.05)}$ for cultivar=6.63					
LSD $_{(0.05)}$for Plant extracts= ns					
LSD $_{(0.05)}$ for cultivar x Plant extracts=13.25					

Table 3 shows the effect of plant extracts and tomato cultivars on the number of flowers per tomato plant. The result on the table shows that the effect of plant extracts was significant (P=0.05) on the number of flowers produced by each tomato plant at 6 WAT. The plant extract that produced the highest number of flower was ginger rhizome in the ROMA VF cultivar (8.33 flowers). On the other hand, plant extracts did not have any significant effect on the number of flowers at 2nd, 4th and 8th WAT. Also, the number of flowers was not significantly affected by cultivars, plant extracts and cultivars x plant extracts interactions at 2nd, 4th, 6th and 8th WAT (excepted at 6 WAT) where plant extracts had a significant effect, as indicated above.

Table 3: Effect of plant extracts and tomato cultivars on the number of tomato flowers per plant in 2011

			2WAT		
			Plant extracts		
Cultivar	Basil plant	Ginger rhizome	Neem leaf	No plant extracts	Mean of cultivar
ROMA VF	0.00	1.17	0.00	0.67	0.46
RIO GRANDE	0.83	0.00	0.00	0.00	0.21
RIO GRANDE	0.00	1.83	1.33	0.43	0.90
Mean of plant extracts	0.28	1.00	0.44	0.37	
LSD $_{(0.05)}$for cultivar = ns,					
LSD $_{(0.05)}$ for plant extracts= ns					
LSD $_{(0.05)}$for Cultivar plant extracts =ns					
			4WAT		
ROMA VF	2.33	8.33	3.00	1.00	3.67
RIO GRANDE	3.33	1.33	0.67	2.00	1.83
TROPIMECH	1.00	4.00	1.33	0.67	1.75
Mean of plant extracts	2.22	4.56	1.67	1.22	
LSD $_{(0.05)}$for cultivar = ns,					
LSD $_{(0.05)}$for = plant extracts= ns					
LSD $_{(0.05)}$for cultivar x plant extracts = ns					
			6WAT		
ROMA VF	1.67	8.33	1.33	1.67	3.25
RIO GRANDE	0.00	4.00	0.33	1.33	1.42
Topimech	2.33	2.67	2.67	3.33	2.75
Mean o plant extracts f	1.33	5.00	1.44	2.11	
LSD $_{(0.05)}$ for cultivar = ns,					
LSD $_{(0.05)}$ for plant extracts = 2.67					
LSD $_{(0.05)}$for Cultivar x plant extracts =ns					
			8WAT		
ROMA VF	0.00	3.00	1.67	0.00	1.17
RIO GRANDE	0.00	1.33	0.00	4.33	1.42
Topimech	1.67	0.67	0.67	0.00	0.75
Mean of plant extracts	0.56	1.67	0.78	1.44	
LSD$_{(0.05)}$ for cultivar= ns,					
LSD $_{(0.05)}$for plant extracts= ns					
LSD $_{(0.05)}$ for cultivar x plant extracts =ns					

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CONCLUSION

The performance of ROMA VF tomato cultivar could be enhanced when treated with ginger rhizome plant extract. Tomato height was also influenced by tomato cultivars, the highest being recorded by RIO GRANDE tomato cultivar (18.50cm).

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