International Journal of Agriculture and Forestry 2020, 10(2): 49-55
DOI: 10.5923/j.ijaf.20201002.02

Growth and Yield Response of Maize (*Zea mays* L.) to Compost of Household Urban Solid Waste under Irrigation Regimes

Gbenonchi Mawussi[1,*], Ayi K. Adden[2], Komla Sanda[1]

[1]Department of Soil Sciences, Laboratory of Research on Agroresources and Environmental Health, Higher Agronomy School, University of Lome, Lome, Togo
[2]Coffee-Cocoa Technical Unit / Institute for Technical Advice and Support, Kpalime, Togo

Abstract Maize (*Zea mays* L.) remains principally a rainy season crop in Togo where soils fertility declining limits already agricultural production. This makes majority of agricultural households more vulnerable to the effects of climate change. This study explored the potential of organic fertilizer and irrigation regimes in maize cropping. Agronomic trials were performed in randomized complete block design with three replications where control plots, plots treated with compost at different levels and plots treated with mineral fertilizer constituted the treatments. Water was supplied according to three irrigation regimes of 1, 2 and 4 days interval. The growth parameters including plant height, stem girth, leaf area and number of leaves per plant were measured at the milky maize stage. The yield parameters including length and girth of cob, thousand grains weight, grain yield and straw yield were collected at harvest. All data collected were statistically analyzed. The results shown three distinct homogeneous groups of treatments both for growth and yield parameters at each level of irrigation regime. Plots treated with compost at 30 t ha^{-1} and 40 t ha^{-1} constitute the best group, which differed significantly from the second group formed by plots treated with compost at 10 t ha^{-1}, 20 t ha^{-1} and plots treated with mineral fertilizer. Control treatments constitute the last group. Growth and yield parameters values increase with compost dose increasing. The highest growth and yield parameters of maize were obtained from plots treated with compost and submitted to irrigation at two days interval while the lowest values were recorded from control plots. Far from being used alone in place of mineral conventional fertilizer, integrated fertilization based on combination of mineral fertilizer and compost of urban wastes under irrigation regime of 2 and 4 days interval will performed in maize cropping in coastal zone of Togo for more option reliable to recommend.

Keywords Togo, Maize, Agronomic trials, Household urban waste compost, Irrigation day interval

1. Introduction

Maize (*Zea mays* L.) remains most important cereal crop and staple food in Togo. As one of dominant food crop, maize can be consumed in varied forms. Freshly harvested, maize is cooked or boiled in salted water until the kernels are soft, while roasting is through hot charcoal over fire or in hot ashes until the maize turns brownish; both types are eaten on the cob. The grains of maize are ground and cooked as dough with vegetables soup. Maize is a crop able to grown in any season and is one of the most important cereal crop of the world agricultural economy both as food for human and as feed for animals (Shinde *et al*., 2014). It is principally a rainy season crop in Togo. However, the climatic variability and soil fertility declining are the major constraints to achieve its potential yield in traditional rainfall season in the country. Agricultural soils are frequently cultivated without fallow and no organic restitution (use of crop residues as household fuel). These soils are overused and do not have the necessary time to replenish their organic matter stock. Annually, the country receives rainfall for crop production. However, the production of sustainable and reliable food supply is challenged by temporal and spatial variation in rainfall distribution and erratic rainfall. Currently, chemical fertilizers are beyond the reach of farmers due to high price and limited availability. Achieving greater efficiency of water use will be a primary challenge to deliver a more accurate supply of water to crops. Information on irrigation scheduling and household solid waste compost use as integrated sources of nutrients are meager. Hypothesis that water and nutrients supplying is the key factor to increase the

* Corresponding author:
gmawussi@gmail.com (Gbenonchi Mawussi)
Published online at http://journal.sapub.org/ijaf

productivity of maize crop could be verified through this study.

Researchers have shown that application of waste composts at reasonable rates improved soil physical properties and soil water holding capacity making crops better in growth season, increased available soil nutrient levels and plant growth and yield (Hossain *et al*., 2017; Coulibaly *et al*., 2019). Compost is known for its efficacy on agricultural productivity increasing, but little information was available about its influence on maize productivity in coastal zone of Togo.

To explore potential of organic fertilizer in combination with irrigation regime on maize cropping, this study was carried out. The objective was to assess growth and yield response of maize (*Zea mays* L.), Ikenne variety, to compost of household solid waste under three irrigation regimes in Togo coastal zone.

2. Materials and Methods

2.1. Study Area and Experimental Design

Field experiments carried out at the University of Lome in the Teaching Research and Demonstration Farm of Agronomic School during two dry seasons, January to April in 2018 and 2019. The land was cropped previously for many years. The soil type was a ferralsol locally called "Terre de Barre" that developed from a continental deposit (Saragoni *et al*., 1991). This soil was red, deep and suitable for almost all crops. Soil surface layer (0 - 15 cm) of experimental site was loamy sandy. For this study, the land was manually ploughed and divided into plots with plot area of 9.60 m^2 (4.80 m × 2 m). Each plot was separated from the adjacent by 1 m interval while the replications were separated by 1.5 m interval. The treatments were arranged in a randomized complete block design with three replications. There were six treatments per block where T0 refers to control plots without any compost use, while T10, T20, T30 and T40 refer to plots treated with compost at 10 t ha^{-1}, 20 t ha^{-1}, 30 t ha^{-1} and 40 t ha^{-1} doses respectively and T_{MF} refers to plots treated with mineral fertilizers NPK 15-15-15 and Urea (46% N) applied respectively at 0.2 t ha^{-1} and 0.1 t ha^{-1} which was the national recommendation dose of mineral fertilizers for maize. These treatments were in combination with three irrigation regimes of 1, 2 and 4 days interval. The compost used was produced with 70% of household solid wastes collected from Agbalepedogan district in Lome mixed with 30% poultry manure (Alate *et al*., 2019). It was applied at the beginning of maize cultivation before sowing. It was spread on the soil surface after ploughing and mixed with the topsoil at about 15 cm depth.

2.2. Crop Management

Maize, Ikenne variety at short-cycle (90 days) widely grown in Togo, was used as a test plant. Maize grain was sowed during January and was harvested at maturity in April for both 2018 and 2019. Sowing was carried out manually according to 80 cm x 20 cm cropping pattern i.e. seeding density of 62500 plants ha^{-1} at the rate of one plant per spot. It was performed on the same day for all treatments. Three seeds per spot were used to ensure the desired crop stand in each treatment and when plants attained four fully expanded leaves, thinning was conducted to adjust plant population. Each plot contained 6 rows of 6 plants i.e. 36 plants in total. The mineral fertilizers application was carried out as following, NPK 15-15-15 applied 8 days after sowing and Urea (46% N) as a single dose at knee height stage i.e. 45 days after sowing and this only on plots treated with mineral fertilizers. These mineral fertilizers were applied at most 10 cm at the base of the plant and about 8 cm of depth. Two preventive phytosanitary treatments were performed respectively at 22 and 35 days after sowing to control the caterpillars of *Spodoptera frugiperda*, a pest of maize crops which appeared in the West African countries in recent years.

2.3. Irrigation Scheduling

Irrigation schedule, including 1, 2 and 4 days interval, was applied during all experimental period. At each irrigation event, an amount of water corresponding to field capacity water content in 15 cm soil depth was applied. Irrigation was applied manually using a watering can with known capacity in order to make sure that all the experimental plots received the same amount of water.

2.4. Growth and Yield Parameters Data Collection

In this study, the growth parameters concerned plant height, stem girth, leaf area and number of leaves per plant while the yield parameters relate to length and girth of cob, thousand grain weight, grain yield and straw yield. The straw yield related to the aerial parts and the roots of the plant. Leaf area was estimated nondestructively from leaf length (cm), from the collar to the tip of fully expanded leaves and leaf width (cm) at the widest point. It was calculated as the product of leaf length and widest middle portion of the leaf and multiplied by the correction factor (0.75) (Elings, 2000). The harvesting method consisted in detaching the cob from the spathes and keeping the spathes on the stems. The plants of two central rows were used for data collection. Plant height, stem girth, leaf area and number of leaves per plant were measured in each plot at the maize milky stage. Length and girth of cob, thousand grains weight, grain yield and straw yield were recorded at harvest. Grain yield was recorded by threshing the crop after 10-15 days of air-drying the cobs. The grain yield was adjusted at 14% grain moisture content. Thousand grains weight (g) was taken from the three grain lot of each treatment and weighed by using electronic digital balance. For recording straw yield (t ha^{-1}), aerial parts and roots of plants of central row of each treatment were harvested at maturity. Bundles were tied, air-dried and weighed by spring balance.

2.5. Statistical Analysis

All data collected on various growth and yield parameters were grabbed into the Excel spreadsheet and subjected to analysis of variance (ANOVA) which was carried out with the CropStat software. Means comparisons between treatments were performed with Newman & Keuls test at the threshold of 5%.

3. Results

The results of growth parameters including plant height, stem girth, leaf area and number of leaves per plant from trials were presented in Table 1. It was observed at level of each irrigation regime three distinct homogeneous groups of treatments both for plant height, stem girth, leaf area and number of leaves per plant. The plots treated with compost at dose of 30 t ha^{-1} and 40 t ha^{-1} constituted the best group which differed significantly from the second group formed by the plots treated with compost at dose of 10 t ha^{-1} and 20 t ha^{-1} and the plots treated with mineral fertilizers. The control treatments constituted the third group (Table 1). Moreover, the number of leaves increased from one irrigation regime to another. There was no significant difference ($p > 0.05$) in the number of leaves for the different treatments at the level of each irrigation regime. However, between irrigation regimes, the number of leaves were significantly different ($p < 0.05$) (Table 1).

The results of yield parameters including length and girth of cob, thousand grain weight, grain yield and straw yield from the trials were presented in Tables 2 & 3. In these Tables, it was observed at level of each irrigation regime three distinct homogeneous groups of treatments both for the length and girth of cob, thousand grain weight, grain yield and straw yield. The plots treated with compost at dose of 30 t ha^{-1} and 40 t ha^{-1} constituted the best group which differs significantly from the second group formed by the plots treated with compost at dose of 10 t ha^{-1} and 20 t ha^{-1} and the plots treated with chemical fertilizer. The control treatments constitute the last group (Tables 2 & 3).

Table 1. Effects of fertilizers and irrigation regimes on growth parameters of maize (*Zea mays* L.) Ikenne variety

Treatments	Plant height (cm)		stem girth (cm)		number of leaves per plant		Leaf area (cm^2)	
	2018	2019	2018	2019	2018	2019	2018	2019
				Daily irrigation				
T0	91.5±2c	90.8±1c	09.6±2c	09.5±3c	10.5±1c	10.4±2c	237±3c	235±1c
T10	122.8±4b	125.7±2b	10.0±3b	10.4±2b	10.6±3c	10.7±1c	368±2b	375±1b
T20	124.2±3b	129.1±2b	10.2±2b	10.5±2b	10.7±2c	10.8±2c	371±1b	379±2b
T30	149.3±2a	150.6±1a	10.6±1a	10.8±1a	11.0±2c	11.1±3c	474±1a	480±3a
T40	151.9±2a	153.4±3a	10.7±2a	10.9±1a	11.1±1c	11.2±2c	479±3a	485±2a
T_{MF}	125.5±3b	126.8±1b	10.3±2b	10.5±2b	10.7±1c	10.8±1c	369±1b	381±1b
				Irrigation at two days interval				
T0	101.5±1c	100.8±1c	10.8±2c	10.3±3c	14.3±1a	14.4±1a	374±3c	369±1c
T10	191.2±1b	191.4±1b	11.3±3b	11.4±2b	14.3±2a	14.5±1a	553±2b	559±1b
T20	192.4±1b	192.9±1b	11.4±2b	11.6±2b	14.5±1a	14.7±2a	559±1b	561±2b
T30	208.5±1a	210.8±1a	13.0±1a	13.2±1a	14.8±1a	14.9±1a	639±1a	680±3a
T40	210.8±1a	213.5±1a	13.2±2a	13.5±1a	15.0±2a	15.1±1a	644±3a	688±2a
T_{MF}	190.9±1b	192.4±1b	11.3±2b	11.6±2b	14.4±2a	14.8±2a	555±1b	560±1b
				Irrigation at four days interval				
T0	98.3±3c	97.9±3c	09.5±2c	09.1±3c	12.5±2b	12.4±1b	246±3c	249±1c
T10	125.7±1b	129.7±1b	10.0±3b	10.2±2b	12.7±1b	12.8±3b	420±2b	452±1b
T20	129.1±2b	132.1±2b	10.3±2b	10.6±2b	12.8±2b	12.8±1b	425±1b	459±2b
T30	166.6±1a	170.6±1a	11.1±1a	11.8±1a	13.0±1b	13.2±2b	543±1a	556±3a
T40	169.5±1a	171.5±1a	11.2±2a	11.5±1a	13.2±2b	13.4±1b	549±3a	558±2a
T_{MF}	126.8±1b	130.4±1b	10.3±2b	10.5±2b	12.8±3b	12.9±1b	422±1b	457±1b

In Table 1, T0 refers to control plot without any compost use while T10, T20, T30 and T40 refer to compost applied at 10 t ha^{-1}, 20 t ha^{-1}, 30 t ha^{-1} and 40 tha^{-1} doses respectively. T_{MF} refers to mineral fertilizers NPK 15-15-15 and Urea (46%) applied at 0.2 t ha^{-1} and 0.1 t ha^{-1} respectively. In a column, treatment mean values followed by same letter, at level of each irrigation regime, are not significantly different at the threshold of 5%. Each letter determines one distinct homogeneous group of treatments at level of each irrigation regime.

Table 2. Effects of fertilizers and irrigation regimes on length and girth of cob of maize (*Zea mays* L.) Ikenne variety

Treatments	Length of cob (cm)		Girth of cob (cm)	
	2018	2019	2018	2019
		Daily irrigation		
T0	10.3±1c	10.0±2c	12.5±3c	12.2±2c
T10	12.4±3b	12.5±3b	13.5±1b	13.6±2b
T20	12.4±1b	12.6±1b	13.6±2b	13.6±1b
T30	14.3±2a	14.5±3a	15.3±2a	15.7±3a
T40	14.5±2a	14.6±3a	15.5±1a	15.9±2a
T_{MF}	12.3±3b	12.5±2b	13.5±1b	13.7±3b
		Irrigation at two days interval		
T0	14.4±1c	14.2±2c	15.0±3c	14.8±2c
T10	16.3±1b	16.4±3b	17.2±1b	17.3±2b
T20	16.4±3b	16.7±1b	17.3±2b	17.6±1b
T30	18.3±2a	18.4±3a	20.0±2a	20.2±3a
T40	18.5±2a	18.7±3a	20.3±1a	20.6±2a
T_{MF}	16.5±3b	16.6±2b	17.4±1b	17.5±3b
		Irrigation at four days interval		
T0	12.5±1c	12.0±2c	13.3±3c	13.2±2c
T10	14.0±1b	14.3±3b	15.4±1b	15.5±2b
T20	14.3±3b	14.5±1b	15.5±2b	15.7±1b
T30	16.2±2a	16.4±3a	18.0±2a	18.3±3a
T40	16.4±2a	16.5±3a	18.4±1a	18.4±2a
T_{MF}	14.2±3b	14.5±2b	15.3±1b	15.6±3b

In Table 2, T0 refers to control plot without any compost use while T10, T20, T30 and T40 refer to compost applied at 10 t ha^{-1}, 20 t ha^{-1}, 30 t ha^{-1} and 40 tha^{-1} doses respectively. T_{MF} refers to mineral fertilizers NPK 15-15-15 and Urea (46%) applied at 0.2 t ha^{-1} and 0.1 t ha^{-1} respectively. In a column, treatment mean values followed by same letter, at level of each irrigation regime, are not significantly different at the threshold of 5%. Each letter determines one distinct homogeneous group of treatments at level of each irrigation regime.

Table 3. Effects of fertilizers and irrigation regimes on thousand grain weight, grain yield and straw yield of maize (*Zea mays* L.) Ikenne variety

Treatments	Thousand grain weight (g)		Grain yield (t ha^{-1})		Straw yield (t ha^{-1})	
	2018	2019	2018	2019	2018	2019
			Daily irrigation			
T0	200.4±2c	199.3±1c	0.91±1c	0.89±1c	1.10±3c	1.00±3c
T10	221.5±1b	226.6±2b	1.03±1b	1.05±2b	2.21±2b	2.48±1b
T20	224.5±1b	227.4±3b	1.05±2b	1.07±3b	2.25±1b	2.52±2b
T30	250.8±2a	254.2±3a	2.52±1a	2.60±2a	3.32±3a	3.59±1a
T40	253.7±3a	256.3±2a	2.56±2a	2.69±1a	3.34±2a	3.64±3a
T_{MF}	222.4±2b	229.6±1b	1.05±3b	1.08±1b	2.29±3b	2.50±2b
			Irrigation at two days interval			
T0	222.5±3c	220.5±1c	1.55±2c	1.41±1c	2.23±2c	2.05±3c
T10	292.7±1b	295.2±2b	3.25±3b	3.49±2b	4.13±2b	4.31±1b
T20	294.8±1b	298.3±3b	3.29±2b	3.50±3b	4.15±1b	4.39±2b
T30	300.5±2a	306.4±3a	4.05±1a	4.20±2a	5.14±3a	5.26±1a
T40	305.2±1a	310.5±2a	4.15±2a	4.29±1a	5.19±2a	5.31±1a
T_{MF}	293.2±2b	296.3±1b	3.31±3b	3.45±1b	4.19±3b	4.35±2b
			Irrigation at four days interval			
T0	227.3±2c	225.5±1c	1.05±2c	1.00±1c	1.51±2c	1.48±3c
T10	243.5±1b	244.5±2b	2.49±3b	2.66±2b	3.30±2b	3.63±1b
T20	245.3±1b	246.2±3b	2.55±2b	2.70±3b	3.35±1b	3.69±2b
T30	290.5±2a	292.6±3a	3.29±1a	3.43±2a	4.13±3a	4.55±1a
T40	291.2±3a	295.5±2a	3.31±2a	3.49±1a	4.15±2a	4.60±1a
T_{MF}	244.4±2b	245.6±1b	2.53±3b	2.69±1b	3.29±3b	3.62±2b

In Table 3, T0 refers to control plot without any compost use while T10, T20, T30 and T40 refer to compost applied at 10 t ha^{-1}, 20 t ha^{-1}, 30 t ha^{-1} and 40 tha^{-1} doses respectively. T_{MF} refers to mineral fertilizers NPK 15-15-15 and Urea (46%) applied at 0.2 t ha^{-1} and 0.1 t ha^{-1} respectively. In a column, treatment mean values followed by same letter, at level of each irrigation regime, are not significantly different at the threshold of 5%. Each letter determines one distinct homogeneous group of treatments at level of each irrigation regime.

The means of plant height, stem girth and leaf area for all treatments increased with compost dose increasing. The dose of 30 t ha^{-1} and 40 t ha^{-1} of compost gave the greatest means of plant height (149.3 to 213.5 cm), stem girth (10.6 to 13.5 cm) and leaf area (474 to 688 cm^2) across irrigation regimes. These values were followed by those of 10 t ha^{-1}, 20 t ha^{-1} of compost and those of mineral fertilizer treatments which ranged respectively from 122.8 to 192.9 cm; 10.0 to 11.6 cm and 368 to 561 cm^2 while the least means of these parameters for the three irrigation regimes were recorded on control plots which ranged from 90.8 to 101.5 cm; 09.5 to 10.8 cm and 235 to 374 cm^2 respectively (Table 1). The means of length and girth of cob, thousand grain weight, grain yield and straw yield for all treatments increased with compost doses. The dose of 30 t ha^{-1} and 40 t ha^{-1} of compost gave the greatest means of cob length (14.3 to 18.7 cm), cob girth (15.3 to 20.26 cm), thousand grain weight (250.8 to 310.5 g), grain yield (2.52 to 4.29 t ha^{-1}) and straw yield (3.32 to 5.31 t ha^{-1}) across irrigation regimes (Tables 2 & 3). These values were followed by those of 10 t ha^{-1}, 20 t ha^{-1} of compost and those of mineral fertilizers which ranged respectively from 12.4 to 16.7 cm; 13.5 to 17.6 cm; 221.5 to 298.3 g; 1.03 to 3.50 t ha^{-1} and 2.21 to 4.39 t ha^{-1} while the least means of these parameters for the three irrigation regimes were recorded on control plots which ranged from 10.0 to 14.4 cm; 12.2 to 15.0 cm; 199.3 to 222.5 g; 0.89 to 1.55 t ha^{-1} and 1.00 to 2.23 t ha^{-1} respectively (Tables 2 & 3).

4. Discussion

The homogeneous and identical groups of treatments for both growth parameters and yield parameters at any irrigation regime suggested the relationship between growth and yield parameters. In fact, this explained that the yield parameters were the expression of growth parameters.

The results pertaining to the growth parameters (plant height, stem girth, leaf area and number of leaves per plant) and the yield parameters (length and girth of cob, thousand grain weight, grain yield and straw yield) revealed that application of compost influenced significantly growth parameters of maize Ikenne variety. This explained that organic fertilizers used improved the chemical and physical properties of the soil, thereby increasing the growth and yield parameters of maize. These findings were corroborated with the previous results in literature (Laekemariam and Gidago, 2012; Okoroafor *et al*., 2013; Muhammad and Jan, 2016; Mahmood *et al*., 2017; Coulibaly *et al*., 2019; Jjagwe *et al*., 2020). According to Okoroafor *et al*. (2013) the application of organic manure highly increase plant height, number of maize leaves, stem girth, number of cob and weight of fresh maize at harvest. Similar results were reported by Coulibaly *et al*. (2019) who stated that the tallest growth parameters of maize were obtained with compost of pig. Our results were in harmony with those found by Muhammad and Jan (2016) who revealed that compost amendment enhanced maize crop yield and yield components.

Although, results variated between treatments, the growth and yield parameters of plots treated with compost at doses of 10 t ha^{-1} and 20 t ha^{-1} were statistically at par with plots treated with mineral fertilizers. These results were in line with the findings of Mahmood *et al*. (2017) who reported that increased organic matter due to application of organic fertilizers improved soil characteristics and crop performance. There was no significant difference ($p > 0.05$) in the number of leaves for the different treatments at the level of each irrigation regime. This agreed with the assertion of Jjagwe *et al*. (2020) who reported that there was no significant difference ($p > 0.05$) in the number of leaves of maize for the different treatments in comparative performance of organic fertilizers in maize (*Zea mays* L.) growth and yield.

The stem girth of maize is an important criterion, which determines its strength and ability to resist to lodging. It increased with compost dose increasing. This suggests that compost use in maize cropping at a suitable dose will contribute to reduce stalk lodging (Adeniyan, 2014). The photosynthetic activity in the leaf was the driver of crop yield and was dependent on leaf area (Laekemariam and Gidago, 2012). Thus, any treatment pertaining to increasing leaf area was likely contributed towards to raising crop growth and crop yield. This was observed through the results recorded on leaf area and cob size. The mean of cob length and girth of maize Ikenne variety increased with increasing of the height of plant, girth of stem and leaf area of plant. This means the growth parameters affected significantly cob size. This was confirming the findings of Laekemariam and Gidago (2012) and Coulibaly *et al.* (2019) after compost application.

Thousand grains weight constitutes a significant factor in maize economic yield determination (Muhammad and Jan, 2016). The mean maize thousand grains weight from our trials experimental was significantly affected by application of compost and mineral fertilizers in comparison with control. The minimum in thousand grains weight from control plots might be attributed to deficiency of macro nutrients throughout the plant life especially at the time of flowering and seed setting. The mean maize grain yield from compost treatments and chemical fertilizer treatments was highly superior to the control treatments average. These results were in line with the findings of Laekemariam and Gidago (2013) who demonstrated the growth and yield response of maize to variable rates of compost in Wolaita in Southern Ethiopia. An increase in maize yield related to compost application compared to the control suggest that compost might contain more essential available nutrients for maize productivity (Adjei-Nsiah, 2012).

Straw yield can be considered as the whole harvesting residues resulting from many morphological and physiological processes of growth and development of crop. The increase in straw yield of maize could reflect the better growth and harmonious development of the plants due to availability of nutrients throughout the growing period related to compost effect. Growth and yield response of maize Ikenne variety to compost of household solid urban wastes during the two years of agronomic trials may be explained by soil organic matter increasing and increase of microbial activity in the soil with concomitant increased availability of nitrogen (N), phosphorus (P) and potassium (K) necessary to maize plants development (Ojeniyi *et al*., 2010).

Overall, highest growth and yield parameters of maize Ikenne variety were obtained from plots treated with compost and irrigated two days interval while the lowest values were recorded both from control plots and treated plots irrigated daily and four days interval. The tendency of these results may be attributed to the fact that adequate watering conditions led to the development of growth parameters consequently higher yield under irrigation regime of two days interval. In fact, water and nutrients have been shown to exhibit interactions in respect of yield.

Decreasing yield recorded on plots irrigated every day may be explained by the excess irrigation witch would lead to water draining past the root zone, leaching nutrients and reducing nutrient use efficiency. This explains that water use efficiency rides with increase of water supply up to a certain point. According to Prihar *et al*. (1985), water supply has been observed to increase fertilizer use efficiency by increasing the availability of applied nutrients. Too much water in the root zone would reduce also the amount of oxygen available and leading to plant stress (Morard *et al*, 2000; Boru *et al*., 2003; Iwasaki, 2008; Rajanna *et al*., 2018). In conditions of too frequent irrigation, the roots were without air after each irrigation until the free water has drained from the soil profile. During this time, plant growth and development nearly would stop. The reduction in yield of plants irrigated at four days interval indicates that these plants were subjected to water deficit stress and yield decreasing may be explained by effect of water deficit stress (Bouazzama *et al*., 2012; Dhakar *et al*., 2018).

5. Conclusions

Based on these preliminary results, hypothesis that water and nutrients supplying were the key factors to increase the productivity of maize crop has been verified by this study because compost and irrigation application improved significantly the growth and yield parameters of maize Ikenne variety tested. We noted that the irrigation regime of two interval days seems the best option whatever the dose of compost applied. Far from being used alone in place of mineral conventional fertilizer, further works will investigate under irrigation regime of 2 and 4 days interval the integrated fertilization based on combination of mineral fertilizer and compost of household solid urban wastes on maize crop in coastal zone of Togo for more option reliable to propose.

ACKNOWLEDGEMENTS

The authors thank Laboratory of Management, Treatment and Value of Waste, University of Lomé (GTVD/UL), Laboratory of Research on Agroresources and Environmental Health of the Higher Agronomy School of University of Lome, and Non-Governmental Organization ENPRO (Naturel Ecosystem Clean), for their cooperation in conducting the study.

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