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Research Paper

The effect of cassava processing effluent on the growth performance of *Abelmoschus esculentus* L. Moench.

[1]Eremrena, P.O. and [2]Etukudo, M.M.
[1]*Department of Plant Science and Biotechnology, Faculty of Science, University of Port Harcourt, P.M.B.5323, Choba, Port Harcourt, Rivers State, Nigeria.*
[2]*Department of Biological Sciences, Federal University Otuoke, P.M.B. 126, Yenagoa, Bayelsa State, Nigeria*

ABSTRACT: *The effect of cassava processing effluent on the growth performance of Abelmoschus esculenlus L. Moench was studied at the University of Port Harcourt Botanical Garden. Experimental treatments were obtained by mixing thoroughly 3kg of loam- sandy soil with 0, 25, 50, 75 and 100% of cassava processing effluent. 0% (unpolluted soil) was used as control. One seed was maintained in a polybag containing the various levels of cassava processing effluent with garden soil. Each level of treatment was replicated three times and maintained for 7 weeks, significant (P=0.05) reduction in the leaf number, fresh weight, dry weight, moisture content, plant height, root length were recorded from cassava processing effluent treated soils. Increase in the concentration of the effluent at 100% level of pollution did not support any growth of Abelmoschus esculenlus. This study therefore, shows that cassava effluent is injurious to the growth of Abelmoscus esculenlus.*

KEYWORDS: *Cassava processing effluent, Growth performance, Abelmoscus esculenlus.*

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I. INTRODUCTION

In Nigeria cassava *(Manihot esculenta* Crantz) is regarded as a staple food crop due to its rich carbohydrate content. [10]. However the processing of cassava into usable products has generated a lot of liquid waste. These waste product generated from the processing activities get disposed on land and have been shown to constitute negative impacts on soil and plants growth [11].

Fresh cassava roots contain 60-70% water which make them to deteriorate within 2-4 days after harvest. They also contain Cyanogenic glucosides (Linamarin and Lotaustralin) and endogenous enzyme linamarase, when the enzyme comes in contact with the cyanogenic glucosides, a poisonous substance, hydrogen cyanide (HCN) is released. Processing of cassava root after harvest is therefore very necessary to reduce the risk of cyanide poisoning during their consumption. However, the waste water generated in the process still contains considerable quantity of Cyanogenic glucoside, which has been known to suppress plant growth [11]. Incidents of deleterious impacts of liquid wastes discharged into the environment are prevalent and thus require serious consideration. The anticipated directional upset of the ecosystem balance may now become emergent or alter the growth and physiological processes in plants as a result of the negative impact of toxic liquid waste [5]..

It is on this basis that this research is conducted in order to evaluate the effects of waste water generated from cassava processing mills on the growth and nutrient contents of *Abelmoschus esculenlus* L. Moench.

II. Materials and Methods

The mature seeds of *Abelmoschus esculentus* were collected from Akwa Ibom State, Agricultural Development Project (AKADEP). The obtained seeds were pretreated by picking out infected seeds and the viable once were used for the research. Loam - sandy soil was obtained from the University of Port Harcourt Botanical Garden. Waste water cassava processing effluent was obtained from cassava processing mill in Ini Local Government Area. The effluent was analyzed for physico-chemical properties [1].

*Corresponding Author: Eremrena, P.O.

Department of Plant Science and Biotechnology, Faculty of Science, University of Port Harcourt,

Three kilogram (3kg) of the loam-sandy soil was weighed using a triangular weighing balance. The treatment were obtained by mixing thoroughly 3kg of loam-sandy soil with 0, 25, 50, 75 and 100% of cassava processing effluent, samples with or without cassava processing effluent were placed in perforated polybags. The seeds were sterilized with approximately 0.01% mercuric chloride Solution for 30 seconds, thoroughly washed several times with sterile distilled water and air dried [7]. During this treatment floating seeds or those that had bubbles were discarded and the good once were used for the research, three (3) seed of *Abelmoschus esculentus* were sown directly in each perforated polythene bag containing the various levels of cassava effluent and after germination it was thinned down to one (1) seedling per bag. Each level of treatment was replicated three times using randomized complete block design. The experimental work was maintained under light condition. The plant watered as need arose and allowed to grow' for 7 weeks in order to determine the growth and yield performance.

Growth parameters were measured and recorded at the end of the studies (7weeks). The plant height (cm), root length (cm), leaf number, shoot/root ratio, fresh weight (g), dry weight (g), moisture contents were determined and recorded.

Data generated from this study were subjected to analysis of variance (ANOVA) according to the method of [16].

III. RESULTS AND DISCUSSION

The physico-chemical properties of the cassava processing effluent showed that the effluent was acidic with a pH of 4.50. The proportions of calcium, sodium, magnesium, potassium, lead and iron were high, while the copper and manganese contents were low. The cyanide contents (0.61 MgL^{-1}) and the total dissolve solids content (9, 600 MgL^{-1}) of the effluent were high (Table 1).

Table 1:Physico-Chemical Characteristics of Cassava Processing Effluent

Characteristics	Concentration (mgL)
pH	4.50
Cyanide (μgML^{-1})	0.61
Total dissolved solids	9,600
Total suspended solids (ppm)	1,800
Biological Oxygen Demand (ppm)	66.40
Magnesium	20.30
Calcium	46.91
Potassium	52.70
Sodium	72.14
Copper	1.32
Manganese	0.63
Iron	1.74
Lead	6.47

The effluent used in this study is characterized by an acidic pH, and a biological oxygen demand level that is within the permissible level of 30-70ppm for river discharge [19].

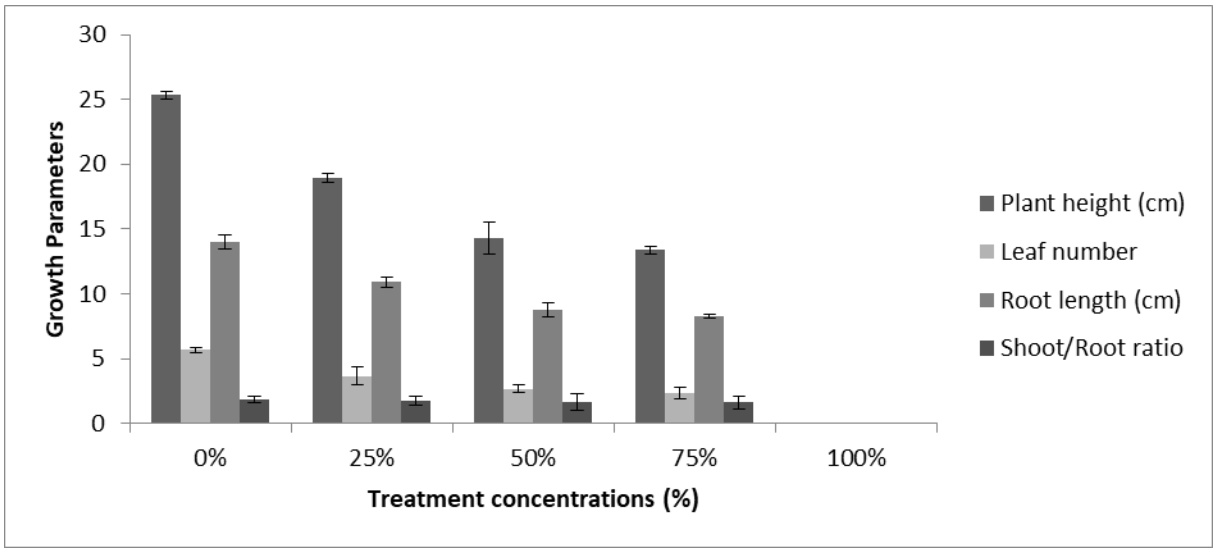

Fig. 1: Growth Parameters of *Abelmoschus esculentus* grown in soil treated with cassava effluent.

There were significant (P=0.05) reductions in plant height of *Abelmoschus esculcntus* with increase in the concentration of cassava effluent (Fig.1).100% concentration of cassava effluent treatment did not support the growth of *Abelmoschus esculentus* (0.00). The leaf number of *Abelmoschus esculentus* was significantly reduced with increase in the concentration of cassava effluent.Values recorded in cassava effluent treatment were comparatively lower than the control as shown in Fig.1. The root length of *Abelmoschus esculentus* was significantly (P=0.05) reduced with increase in the concentration of cassava effluent as shown in Fig.1. Similarly, the shoot/root ratio decreased with increased in the concentration of cassava effluent.

In this study, cassava processing exhibit deteriorative effect on the growth parameters of *Abelmoschus esculentus.* This result agrees with the work of [19] who reported that cassava processing effluent posed an inhibitory effect on the germination of some cereal crops.

There was significant (P=0.05) reduction in fresh weight of *Abelmoschus esculentus* with increase in the concentration of cassava effluent. The dry weight of *Abelmoschus esculentus* decreased with increase in the concentration of cassava effluent. There were slight increase in moisture content ot *Abelmoschus esculentus* at 25% concentration above the control treatment. In addition the moisture content of *Abelmoschus esculcntus* increased at 50% and 75% concentrations of effluent above those of the control (Fig.2).

The overall decrease in the growth *of Abelmoschus esculentus* in cassava processing effluent agrees with the work of [18]. This shows that nutrient unavailability is one the factors that limit growth of crops in acidic medium (Bannister, 1980). In this study the characteristics of the cassava effluent showed the presence of some heavy metals as well as cyanide content. These physico-chemical properties are consistent with the work of [20]. Thus, the presence of heavy metals in the cassava effluent together with cyanide contents could have contributed significantly to the reduced growth of *Abelmoschus esculentus.*

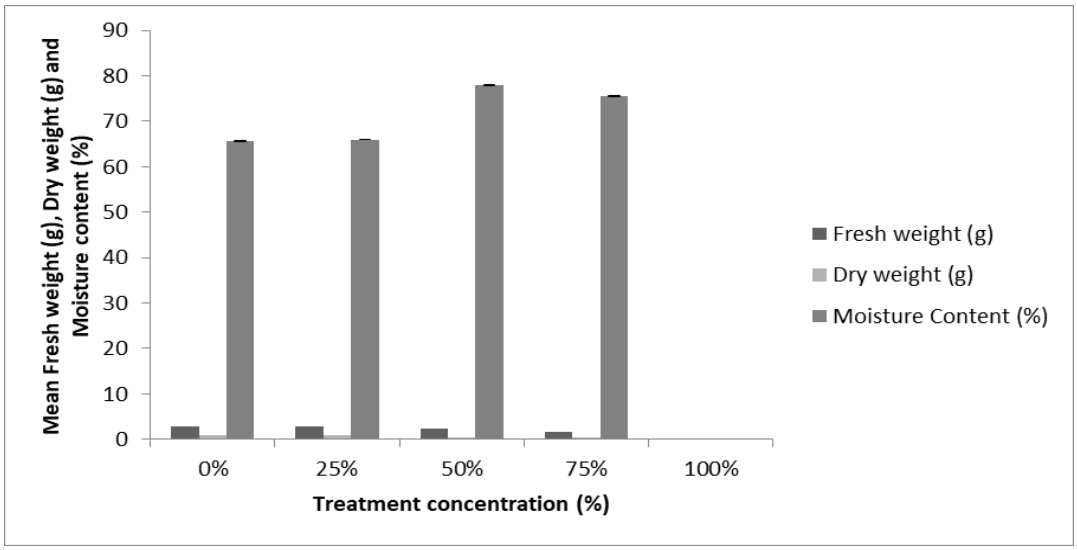

Fig. 2: Mean Fresh weight (g), Dry weight (g), and Moisture content (%) of *Abelmoschus esculentus* grown in cassava effluent treated soil

IV. CONCLUSION

This study showed that cassava processing effluent inhibited the growth of *Abelmoschus esculantus.*The growth parameters such as plant height, leaf number, root length, shoot/root ratio, fresh weight, dry weight and moisture content of the crop were negatively affected by cassava processing effluent. Therefore, this study suggests that cassava processing effluent should be disposed off properly to avoid contamination of the environment.

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