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# Effect of Municipal Solid Waste on the Growth of Cucumeropsis Mannii

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**Abstract**

This study investigated the effect of municipal solid waste dump soil on the growth of *Cucumeropsis mannii*. The pristine soil (top soil) collected from the biological garden at 0-10cm depth on a random sampling basis were pulled into a composite soil sample (stock soil) and put into 23 by 20.2cm perforated plastic bucket to a weight of 5.5kg. The municipal solid waste dumps soil (top soil).Collected from the waste dump site from 0-10cm depth on a random sampling basis were pulled into a composite soil sample (stock soil) and put into 23 by 20.2 cm to a weight of 5.5kg. 0% concentrated soil (control soil) was represented by the stock soil (pristine soil). While 100% concentrated soil was represented by the municipal solid waste dump soil obtained from the waste dump site. 50% concentrated soil was obtained by mixing the pristine soil (control soil) with municipal solid waste dump soil obtained from the solid waste dump site in the ratio 1:1. The seeds were sown to an approximate depth of 3cm in the soil samples. Five seeds per bucket with three replicates per treatment were used. The entire set up was left under the prevailing environment condition for 30days.Percentage seedling emergence was lowest in control [26.60%] when compared to 50%municipal solid waste dumped soil (33.30%) and 100% municipal solid waste dump soil (53.30%). The lowest plant height (5.83cm] was obtained from control while the highest value (6.33cm) was obtained from 100% municipal solid waste dump soil. Leaf area was lowest in control soil [62.18cm$^2$] when compared to 50% municipal solid waste dumped soil [84.5cm$^2$] and 100% municipal solid waste dumped soil (1100.00cm$^2$). These results implies that the municipal solid waste dump soil supported the growth and development of *Cucumeropsis mannii***.**

**Keywords:** *Cucumeropsis Mannii*, Solid Waste, Soil

## 1. Introduction

In developing countries such as Nigeria have open dumpsites as common practice due to the low budget for waste disposal and lack of political will. A good amount of the city garbage is dumped in low lying areas which poses serious threat to groundwater resources and soil (Akinbile, 2012; Agamuthu and Fauziah, 2011 [2]). Many studies show evidence of seriousness of hazards caused by open waste dumping ultimately affecting the plant life on the planet leading towards an irreversible erosion trend unless the present land use pattern is checked (Phil-Eze, 2010) [20]. Solid waste pollutants serve as an external force affecting the physicochemical characteristics of soil ultimately contributing towards the poor production of vegetation (Christensen *et al.*, 2014) [8]. Nigeria is generally faced with rapid deterioration of environmental conditions due to the conventional system of collection and dumping of solid wastes. Therefore, waste management has become a major concern in cities. Little efforts have been made in order to improve the waste collection and disposal facilities.

*Cucumeropsis mannii*, commonly known as white melon seed is a member of the cucubitaceae family. The plant is aspecies of melon native to tropical West-Africa where its cultivation is usually associated to banana plant, corn and cassava (Fomekong *et al.*, 2008). It is consumed largely as thickener of traditional soup called egusi soup in Nigeria, Republic of Benin and pistachio soup in Coted'Ivore (Koffi *et al.*, 2008; Hanno and Susanne, 2010). The seed constitute about 44% oil (Badifu and Ogunsua, 1990) [6]. It therefore represents a very good source of lipase. Despite its agronomic and cultural (traditional medicine) importance, the plant lack attention from research and development so that it is categorized as orphan crop (Loukou *et al.*, 2007). The Limit of proper knowledge of other possible utilization of the seed apart from consumption as food and in traditional medicine is a major deterrent to its wider production, which should result to increased income for the local farmers. Finding its use as a source of industrial material (source lipase) would encourage its production and therefore improve the local economy. Their nutritional value is associated with the presence of sugars, protein, fats, vitamins, organic acids, and mineral compounds, whose content is affected by different variability factors (Malik *et al.*, 2014; Koubala *et al.*, 2016 [11]). Melon fruits also contain numerous secondary metabolites (including antioxidants) (Alagar Raja *et al*., 2015, El-Din Ibrahim and El-Masry, 2016) [9], which allows us to include them in the group of health-promoting vegetables. The surface area cultivated with melon has increased in the last four years in many countries, as has cultivation using low-quality saline waters in some semiarid regions (Botía *et al.*, 2018). Semiarid regions with a shortage of rain and scarce good quality waters must make use of low-quality water for irrigation. This water comes from aquifers or from seawater intrusion in coastal areas.

The use of saline water sources may be limited by the salt tolerance of the crop. In many coastal areas of southern Italy where the groundwater contains high concentrations of NaCl, there is an increasing tendency among farmers to apply saline-sodic water for irrigation. Successful melon cultivation does, however, occur in Sicily's Pachino region, an area affected by salinity in the province of Siracusa; the quality of these cultivated melons is good despite the salinity. Studies of the effect of increasing salinity on key agronomic and economic parameters in this crop are scarce, but there is increasing attention from researchers. Several authors (Botía *et al*., 2005; Mendlinger and Pasternak, 1992; Mangal *et al.*, 2018; Shannon and Francois, 1978) [7, 14] who have studied melon tolerance to salinity during the full crop cycle or at particular phenological phases (del Amor *et al.*, 2019) have concluded that the melon is sensitive, to moderately sensitive, to salinity. These studies focused on crop yield response, on melon quality characteristics. (Botía *et al.*, 2005; Shannon and Francois, 2018) [7]. Greenhouse growing conditions were also examined (Nukaya *et al.*, 1980). Specific experimental results, however, are lacking for growth analysis, the salinity tolerance of melon (cv. Tendral) and the effects of salinity on melon preservability. Preservability is, for this type of melon, an essential and important characteristic being the main European producers (respectively 35%, 34%, and 13% of the total harvest). *C. melo* is characterized by significant genetic and phenotypic variability, which offers great possibilities of using this species in molecular breeding (Garcia-Mas *et al.*, 2012; Pavan *et al.*, 2017 [19]). Naudin's taxonomy divides *C. melo* into a single wild variety, *C. melo* var. agrestis, and cultivated varieties: can-talupensis, inodorus, conomon, dudaim, flexuosus and momordica (Liu, 2004).

## 2. Materials and Methods

### 2.1 Study Area

The study was conducted at the Department of Biological Sciences Laboratory Technology at Federal Polytechnic, Auchi. Auchi is located in the northern part of Edo State in Nigeria, specifically at latitude 07°04'N and longitude 06°16'E. The town has a population of over 500,000 people, as per the 2015 population census, and is situated in the south-south geographical zone of Nigeria. It is approximately 130 km away from Benin City, the capital of Edo State. Auchi is the headquarters of Etsako West Local Government Area and has experienced growth due to rural-urban migration. The town is bounded by Jattu to the north, Aviele to the south, Iyakpi to the east, and Owan Local Government Area to the west. Additionally, Auchi is the home of the Federal Polytechnic, Auchi, in Edo State, Nigeria.

### 2.2 Materials

The plant materials used for this study was *cucumeropsis manni*. The seeds were obtained from a local market in Auchi and in one purchase enough seeds were gotten for the study.

Municipal solid waste dump soil was obtained from a dumpsite located in Auchi pristine soil (top soil) was obtained from the biological garden of Department of Science Laboratory Technology, Auchi Polytechnic, Auchi.

### 2.3 Methods

#### *2.3.1 Seed Viability Test*

Seeds were placed in a bowl of water and left for 20 minutes. Submerged seed were collected and used while the ones that remained afloat were discarded.

#### *2.3.2 Soil Treatment*

The pristine soil (top soil) collected from the biological garden at 0-10cm depth on a random sampling basis were pulled into a composite soil sample (stock soil) and put into 23 by 20.2cm perforated plastic bucket to a weight of 5.5kg. The municipal solid waste dump soil (top soil) collected from the waste dumped soil from 0-10cm depth on a random sampling bases were pulled into a composite soil sample (stock soil) and put into 23 by 20.2cm to a weight of 5.5kg.0% concentrated soil (control soil) was represented by the stock soil (pristine soil). 100% concentrated soil was represented by the municipal solid waste dump soil obtained from the waste dump site. 50% concentrated soil was obtained by mixing the pristine soil (control soil) with municipal soil waste dump solid obtained from the solid waste dump site in the ratio 1:1. The seeds were sown to an approximate depth of 3cm in the soil samples. Five seeds per bucket with three replicate per treatment were used. The entire set up was left under the prevailing environmental condition for 30days.

#### *2.3.3 Seedling Emergence*

Percentage seedling emergence was the total number of seedlings per bucket divided by the total number of seeds sown (5) and multiplied by one hundred. This was taken up daily to the $15^{th}$ days. Seeds which failed to sprout after 15 days were regarded as non-viable.

#### *2.3.4 Measurement of Height*

The height was measure with meter rule from the soil level to the terminal bud. Measurement was taken on a seven days interval up to 30days after sowing.

#### *2.3.5 Measurement of Leaf Area*

The leaf area was determined by measuring the length and width (at the widest point) of each leaf. The product of this was multiplied by a correction factor of 0.75 to cater for leaf shape (Wath, 1973).

#### *2.3.6 Measurement of Leaf Number*

The number of leaves per plant was physically counted on a 7days interval up to 30days after sowing.

## 3. Result and Discussion

### 3.1 Results

**Table 1:** Effect of municipal solid waste dumpsite on seedling emergence of *Cucumeropsismannii*

| MSW Concentration | Seedling emergence (%) in days | | | | |
|---|---|---|---|---|---|
| | 3 | 6 | 9 | 12 | 15 |
| 100% | 0.00 | 40.00 | 46.60 | 53.30 | 53.30 |
| 50% | 0.00 | 13.30 | 20.00 | 26.60 | 33.30 |
| Control | 0.00 | 0.00 | 6.600 | 20.00 | 26.60 |

**Table 2:** Effect of municipal solid waste dumpsite on the height of *Cucumeropsis mannii*

| MSW Concentration | Height (cm) in days | | | | |
|---|---|---|---|---|---|
| | 3 | 7 | 14 | 21 | 28 |
| 100% | 2.33 | 4.83 | 5.66 | 5.66 | 6.33 |
| 50% | 0.83 | 3.16 | 4.83 | 4.83 | 5.86 |
| Control | 0.66 | 2.83 | 3.16 | 3.16 | 5.83 |

**Table 3:** Effect of municipal soil waste on dumpsite the leaf area of *Cucumeropsis mannii*

| MSW Concentration | Leaf area ($cm^2$) in days | | | |
|---|---|---|---|---|
| | 7 | 14 | 21 | 28 |
| 100% | 8.00 | 22.87 | 76.00 | 110.00 |
| 50% | 4.73 | 21.37 | 46.50 | 84.50 |
| Control | 2.30 | 16.23 | 46.12 | 62.18 |

**Fig 1:** *Cucumeropsis mannii* at 30 days after sowing in control and treated soil

**Table 4:** Effect of municipal solid waste on dumpsite on the leaf number of *Cucumeropsismannii*

| MSW Concentration | Leaf number in days | | | |
|---|---|---|---|---|
| | 7 | 14 | 21 | 28 |
| 100% | 1.30 | 5.00 | 6.30 | 7.60 |
| 50% | 0.60 | 3.00 | 4.60 | 7.30 |
| Control | 0.60 | 2.60 | 3.60 | 6.00 |

### 3.2 Discussion

Table 1 shows the result of seedling emergence of *cucumeropsismannii* when sown in municipal solid waste dump soil. It was observed that percent seedling emergence of *Cucumeropsismannii* was lowest when sown is control (26.60%) than in 50% municipal solid waste dump soil (33.30%). The highest percent seedling emergence (53.30%) was observed in 100% municipal solid waste dump site. This result is in agreement with Ogbeibu *et al.*, (2003). Who stated that the used of dumpsite soil on farmland is common practice in urban and sub-urban countries such as Nigeria because of the belief that decayed and composited wastes enhance soil fertility.

Table 2 and Fig 1shows the result of the plant height when *cucumeropsismannii* was sown in municipal solid waste dump soil. It was observed that percent plant height of *cucumeropsismannii* was lowest in control (5.83cm) than in 50% municipal solid waste dump soil (5.86cm). The highest plant height was observed in 100% municipal solid waste dump soil (6.33cm).

Table 3 shows the result of leaf area of *cucumeropsismannii* when sown in municipal solid waste dump soil. It was observed that the leaf area of *cucumeropsismannii* was lowest in control (62.18$cm^2$) thanin 50% municipal solid waste dump soil (84.5$cm^2$). The highest leaf Area is (110.00 $cm^2$) was observed in 100% municipal solid waste dump soil.

Table 4 shows the result of the leaf number of *cucumeropsismannii* sown in municipal solid waste dump soil. It was observed that the leaf number of *cucumeropsismannii* was lowest control soil (6.00) than in 50% municipal solid waste dump soil (7.30).The highest number was observed for 100% municipal solid waste dump soil (7.60).

## 4. Conclusion and Recommendations

This study shows the performance of *Cucumeropsismannii* on soil amended with municipal solid waste dump soil. It was observed that the percent seedling emergence plant height, leaf area, and leaf number increased in municipal solid waste dump soil. This implies that municipal solid waste dump soil support the growth and development of *Cucumeropsismanniii.* It is therefore recommended that the application of municipal solid waste dump soil for plant growth should be encouraged.

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