10. Effect of storage temperature on quality parameters of liquid organic fertilizer prepared from Mexican sunflower (*Tithonia diversifolia*)

Thambura, Joshua[1] and Kirui, Onesmus[1]

[1]Meru University of Science and Technology, Department of Agriculture,
Corresponding author email: jthambura@must.ac.ke

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Abstract

Objectives: To determine the effect of storage temperature on physical-chemical properties of tithonia liquid organic fertilizer. To determine the effect of storage temperature on microbial population in tithonia liquid organic fertilizer. To evaluate the effect of tithonia liquid organic fertilizer on kales crop. **Problem Statement:** *Tithonia diversifolia* has been used as green manure in soil fertilization and improvement of crop performance. Attempts have been made to extracts tithonia liquid organic fertilizer (LOF) to ease storage and transport. However, not much was known about quality parameters of liquid organic fertilizer (LOF) during storage. This study established the effect of storage temperature on the quality parameters of LOF from *Tithonia diversifolia.* **Methodology:** Tithonia LOF was prepared by fermenting 2 kg of tithonia leaves in 20litres of water for 2 weeks to maintain leaf water ratio of 1:10. The fermented extract was filtered using a clean cloth and transferred into 36 one litre specimen jars. Eighteen of the specimen jars were placed in the refrigerator at temperature of 0^0 C to 5^0 C while another batch of 18 in the specimen cabinet at room temperature at 23^0C. Specific laboratory analysis procedures were used to determine the nutritional chemical content of the sampled LOF. Total nitrogen(N) was analyzed by ISO 5315-trimetric method, phosphorus (P) by ultraviolet visible spectrophotometer at λ-420nm, and potassium (K) by AAS ISO17319:2015. Other chemical analysis done were Magnesium (Mg) using method EN 16197:2012 AAS, Calcium by ISO method 17025 AAS and total reducing sugars by normal- phase chromatography HPLC method. The pH of the LOF was analyzed by handheld pH meter. Microbial analysis used plate count agar for bacterial and potato dextrose agar (PDA) for fungus count. Kale plants were arranged in a randomized block design of 9 plots each with 9 potted plants. The treatment was replicated three times for samples stored in the refrigerator and three times for the room temperature storage repeatedly for six months. Plant parameters measured were; plant height, number of leaves and the plant girth. **Key findings:** The study established that there was a significant change in LOF pH during storage, however correlation was higher for room storage than fridge storage. The study also established that there was no significant change in chemical properties of LOF in both storage conditions however, the room stored LOF had negative correlation with storage time an indicating that plant nutrients in LOF reduced with increase in storage time. In regards to microbial properties, it was found that there was no significant change in microbial count in LOF in both storage temperature

experiments. The study also established that treatment of kales with LOF stored at room temperature had higher growth variance than for the fridge stored and control treatment. **Discussion** There was a significant change in LOF pH during storage where p=0.012. Correlation was higher for room storage than fridge storage. Freshly prepared LOF was slightly acidic at pH 6.5 attaining pH 7.88 and 7.1 at room and fridge temperatures respectively. Change in chemical properties of LOF in both storage conditions was not significant whereas, the room stored LOF had negative correlation with storage time indicating how plant nutrients in LOF reduced with increase in storage time. The microbial count in LOF in both storage temperature experiments had no significant change. The relationship between microbial count and storage period was weak. **Application:** This study is useful to organic agriculture farmers, researchers and policy makers. **Conclusion:** The study established that the quality of LOF during storage deteriorated. LOF stored in room temperature reduced in quality faster than the refrigerated one. Therefore, the quality of the LOF is best when freshly prepared. Despite kales performing marginally better when treated with room stored LOF, there was no significant difference with fridge stored LOF. Investment in cold storage of LOF therefore does not make economic sense. **Recommendation:** The study recommends further research on effect of LOF concentration on crop growth to ensure optimum nutrients for production.

Keywords: *Liquid Organic Fertilizer (LOF), Tithonia diversifolia, Quality parameters, Storage temperature, physical-chemical properties, microbial population*