

Research Application Summary

Effect of different types of organic fertilizers on growth, quality and yield of tomatoes in sandy soil

Khalid Hamden, M.I.¹ & Osman Elrhaman Fadni¹

¹Agriculture Research Corporation, Elobeid Research Station, Sudan

Corresponding author: fkhalidhamdan@yahoo.com

Abstract

This study was conducted in Bara locality during the period 2009-2010 to assess the impact of using different types of organic fertilizers on tomato yield growing in a sandy soil. Five treatments were compared, i.e., compost, fresh chicken manure, fresh cattle manure, fresh chicken + cattle manure and untreated control. The design of experiment was Randomized Complete Block Design (RCBD) with three replications. All treatments resulted into higher tomato yield compared to the control. Compost fertilizer gave the highest tomato yield of 13.58 t/ha.

Key words: Cattle manure, chicken manure, compost, soil fertility, Sudan, tomato yield

Résumé

Cette étude a été menée dans la localité de Bara au cours de la période 2009-2010 afin d'évaluer l'impact de l'utilisation de différents types d'engrais organiques sur le rendement des tomates dans un sol sablonneux. Cinq traitements ont été comparés, à savoir, le compost, le fumier de poule frais, le fumier de bovins frais, le fumier de bovins additionné à celui de poules et le témoin non traité. La conception de l'expérience a été la conception de block complet randomisé (RCBD) avec trois répétitions. Tous les traitements ont entraîné une hausse de rendement des tomates par rapport au témoin. Le compost a donné le rendement le plus élevé de tomates de 13,58 t / ha.

Mots clés: Fumier de bovins, fumier de poule, compost, fertilité des sols, Soudan, rendement de tomate

Background

Low soil fertility is one of the main factors for the low productivity of vegetables in North Kordofan State (Sudan). The fertility of the soil can be enhanced by application of organic fertilizers but use of any fertilizer type depends on several factors such as soil type, crop and socio-economic conditions of the area.

The use of organic manure is highly encouraged in Kordofan because it is readily available due to the presence of a high

livestock population and poultry farms. On the other hand, inorganic fertilizers are not readily available, are too costly for the majority of small-traditional vegetable producers in the area. The response of tomatoes to the different organic fertilizers in the sandy soils of North Kordofan is not known. This study evaluated the performance of tomatoes under different fertilization regimes of organic manures.

Literature Summary

Organic fertilizer supplies a natural process to strengthen the nutrients of soil (Adenawoola, 2005). Farmers in rural areas are vulnerable to hunger and poverty because of the poor fertility state of their soils. The use of fertilizers could improve agricultural productivity for these farmers. Unfortunately, many developing countries attach a low priority to the subsistence/smallholder sector such that policies that would increase access to fertilizers by farmers are often not conducive. This makes the use of organic fertilizers particularly important (FAO, 2006).

There are many types of organic fertilizers, and a greater variety is becoming available. Organic fertilizers such as compost and manures have a high ratio of organic matter to nutrient value (Adeniyani, 2005). These are used after composting which is a biological process by which microorganisms convert organic materials into a dark humus-rich soil-like material called compost (Guide, 1997). Quality composts can be produced from many different materials including feedstock, plant or animal material (Goldstein, 1998).

Study Description

The experiment was conducted during 2009 / 2010 season at Bara area, north of Kordofan State (9.50°N to 16.40°N latitudes; 27.30°E to 32.25°E longitudes). The treatments were arranged in a randomized complete block design with three replications. Plot size was 2x3m with the following treatments:

1. 10 tons per hectare compost (T1).
2. 10 tons per hectare fresh cattle manure (T2).
3. 10 tons per hectare fresh chicken manure (T3).
4. 10 tons per hectare (fresh chicken manure + fresh cattle manure) (T4).
5. Untreated Control (T5).

Preparation of the compost. Compost was prepared by the method of fermentation, which relies on aerobic decomposition by bacteria. Materials used in the preparation of the compost included: dry plants (50%), fresh cattle manure (30%), and

fresh chicken manure (20%). The materials were irrigated after three days.

The different composted materials were applied to tomatoes. Agronomic and yield components traits data collected included: plant heights (cm) at harvest, number of branches (primary and secondary), root length (cm), fresh shoot (g) weight, dry shoot (g) weight, fresh root (g) weight, and dry weight of root (g). Other data collected included: 50% flowering, total yield, marketable and unmarketable size, yield and weight of 10 fruits (g), mean number of fruits /plant, and sugar and protein contents. All data were taken from six randomly selected plants per plot. Prior to addition of soil amendments, soil samples were taken and analysed. Soil analysis was also done post-harvesting.

Research Application

The different organic fertilizers resulted in superior tomato yields compared to the untreated control. Compost resulted into the highest tomato yield (kg/plot) of 8.15 kg. This was more than twice the yield of the untreated control plots. The yield from a combination of cattle and chicken manure was 6.59 kg, followed by yields from cattle manure alone and chicken manure alone of 5.97 and 5.22 kg, respectively.

Recommendation

From the above result, it is recommended that organic fertilizer be used in Kordofan sandy soils to increase tomato yield and improve soil properties.

Acknowledgement

This study was funded by SCARDA-ECA for which we are most grateful.

References

- Adenawoola, A.R. and Adejoro, S.A. 2005. Residual effects of poultry manure and NPK Fertilizer residues on soil nutrient and performance of Jute (*Corchorus olitorius* L.). *Nigerian Journal of Soil Science* 15:133-135.
- Adeniyani, O.N. and Ojeniyi, S.O. 2005. Effect of poultry manure, NPK 15-15 and combination of their reduced levels on maize growth and soil chemical properties. *Nigeria Journal of Soil Science* 15:34-41.
- FAO (Food and Agricultural Organisation), 2006. Annual Report 2006.
- Goldstein, J. 1998. Compost suppresses disease in the lab and on the fields. *BioCycle* 39:62-64.