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Assessment of integrated nutrient management practices on yield and growth, on *Abelmoschus esculentus* building and storability in agroecological systems

Kashif Ali¹, Muhammad Shuaib^{1*}, Firasat Hussain², Muhammad Romman³, Rainaz Parvez⁴, Naila Azam⁵, Ikramullah Khan⁶, Saraj Bahadur⁷, Abdur Rauf⁶ Sajjad Ali⁸ and Fida Hussain⁹

¹School of Ecology and Environmental Science, Yunnan University, Kunming, **China**

²Department of Microbiology, Cholistan University of Veterinary and Animals Sciences, Bahawalpur 63100, **Pakistan**

³Department of Botany, University of Chitral, **Pakistan**

⁴Department of Botany, Government girls Degree College Dargai, Malakand, **Pakistan**

⁵Center of Plant Biodiversity, University of Peshawar, **Pakistan**

⁶Department of Botany, Abdulwali Khan University, Mardan, **Pakistan**

⁷Institute of Tropical Agriculture and Forestry, Hainan University Haikou, **China**

⁸Department of Botany, Bacha Khan University, **Pakistan**

⁹Department of Botany, Qurtuba University Peshawar, **Pakistan**

*Correspondence: zeyadz44@yahoo.com Received 09-06-2020, Revised: 09-09-2020, Accepted: 15-09-2020 e-Published: 30-09-2020

The sustainability of a farm arrangement significantly be dependent on fertilizers and other participation. The various factors of soil including texture, soil water and, along with other related factor s such as soil organic matter, collective stability and agriculture activity, all of these have a combined impact on the sustainability of, particularly farmland than do the type or amount of soil alterations. Cultivators practice and implemented an extensive variety of methods to uphold or recover soil health for agriculture production and yield. These methods are generally part of long-term, site-specific administration programs that purpose to establish the best soil which have decent amount of organic matter, nutrients and also capture the water moisture for the plant growth as well as hinder the plant parasite. The field experiment was lead over three uninterrupted years (2016 and 2017), to notice the impact of organic alterations, industrial fertilizers and decayed organic matter on crop health, especially productivity and storability of commonly used *Abelmoschus esculentus*. Treatments included various fertilizer of cattle manure, goat and also collect some manure from poultry, green-waste and household decayed organic matter and industrial fertilizers of urea and superphosphate; a part from that six liquid extracts from cattle manure, poultry manures, green-waste, and household composts plus water as a control. After implementation the treatment, the result clarifies and showed that yield production is different between organic and chemical fertilizer. Comparatively the yield of chemical fertilizer treated plants are high than organic fertilizer. In the perspective of health of plants, the poultry manure showed lower diseases comparatively to chemical fertilizer. The goat manure and chemical fertilizer led to the highest total ladyfinger yield. Marketable yield was highest in poultry manures, of 18 t/ha, and lowest in chemical fertilizer, of 7t/ha, 6 weeks after storage. While the impact of liquid solution was not significant on any parameter of the ladyfinger the results were inconsistent. The compost made of poultry manure,

therefore, appears to be a promising ecological alternative to classical fertilizers

Keywords: *Abelmoschus esculentus*, Organic and chemical fertilizer, yield

INTRODUCTION

The development of technology is needed for the fulfillment of plant nutrients through organic resources and their application in a balanced way for maintaining soil productivity. Organic farming proves many advantages for soil as well as it improves plant and animal health. It also recycles and regenerate the waste into wealth and can wipe out the use of chemicals in the form of fertilizers or pesticides and help to build a balanced sustainable model for ecofriendly environment. Vermicomposting is a safe and nonpolluting method for disposal and recycling of organic waste by its conversion into organic fertilizers. It is an excellent form of natural manure, which is cost-effective, easy to make and effective in promoting waste management. This application could be one of the most economical and attractive methods of solving problems like waste disposal and the requirement to increase the organic matter content of soil (Narkhede et al. 2011; Shuaib et al. 2014)

Okra (*Abelmoschus* L. Moench) is also utilized widely vegetable crop in the massive part of the world apart from that its seed is also used for the oil. *Abelmoschus* L. Moench is also cultivated in tropical, subtropical and warm temperate regions of the world known in English speaking countries as ladies's fingers. Organic fertilizers are introducing as those consequential exclusively from decomposed or decomposing plant or animal remains (Buob, 2008). To make sure a sustained supply of healthful and fresh food while maintaining conservational or environmental integrity and social accord has become a huge task and a massive issue in the agricultural sector for scientist and many countries as well (Begum et al. 2019). The basic principles for making a farm more maintainable is reducing the utilization of synthetic fertilizers by increasing on-farm nutrient cycling and avoiding vector and diseases by building healthy and biologically active soil (Neeson, 2004; Shuaib et al. 2018). Okra's flower can be very attractive and used in decorating the room (Schippers, 2000). After the green revolution, the production increase was accomplished at the cost of soil health. It has been identified that indiscriminate use of inorganic fertilizers cause in reduction in soil fertility and rise in soil acidity with exhaustion of organic humus content in addition to reduced crop quality.

Implementation of organic manures to fulfill the nutrient requirements of crop would be an inevitable practice in the years to come for sustainable agriculture since organic manures not only improve the soil physical, chemical and biological properties (Heitkamp et al. 2011). The uses of inorganic fertilizer become increase in order to

Accomplish a higher yield (Stewart et al. 2005). The indiscriminate uses of the chemical fertilizer also directly related to create imbalance of various factor on soil (Miah, 1994; Ali et al. 2019). Uses of sensible combinations of chemical fertilizer and organic fertilizer sources is vital not only to uphold the soil health but also sustain the productivity (Malewar et al. 1998).

Objective

Evaluate the growth and yield figure type of chemical and organic fertilizer which enhance both the yield and growth of *A. esculentus*.

MATERIALS AND METHODS

The experiment was conducted out in the Field Research Stations during the period growing seasons of 2016 and 2017.

Soil Type

The field area of the experiment was a clay loam which show the different proportion organic from 0.4 to 0.5 and having a pH of 8.

Treatments

The treatments, consist of various kinds of soil amendments, poultry manure , goat and other green compost also including chemical fertilizer urea and superphosphate, were given to main plots and poultry manure , goat and other green compost plus water as control were kept in sub-plots.

Soil plugging

For preparation of soil deep ploughing was implemented to the entire. Two week before weeks before transplanting *A. esculentus*, five dissimilar soil amendments were applied and immediately after that a rotary cultivator was used. Based on the results of soil tests, 130 kg/ha of nitrogen and 115 kg/ha phosphorus (Heeb et al. 2005) were giving provided by utilizing chemical fertilizers of urea and superphosphate at seed bed preparation.

Table 1: Features of organic fertilizers used as soil amendments.

	Mg %	Ca%	K%	P%	N%
Cattle manure	0.56	22.12	3.08	1.60	3.36
Goat manure	0.58	33.12	3.03	1.69	2.55
Poultry manure	0.84	11.10	2.03	1.33	1.95
Household compost	0.82	7.00	1.49	1.44	1.30

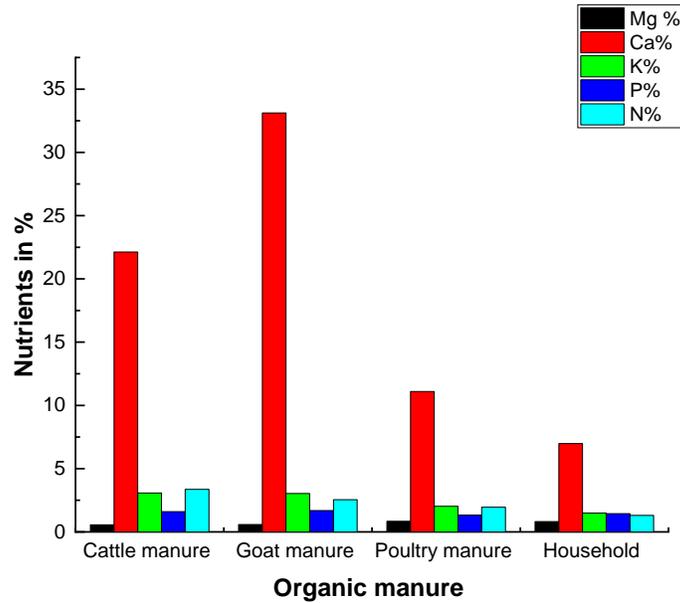


Figure 1 :Texture and nutrients composition of soil

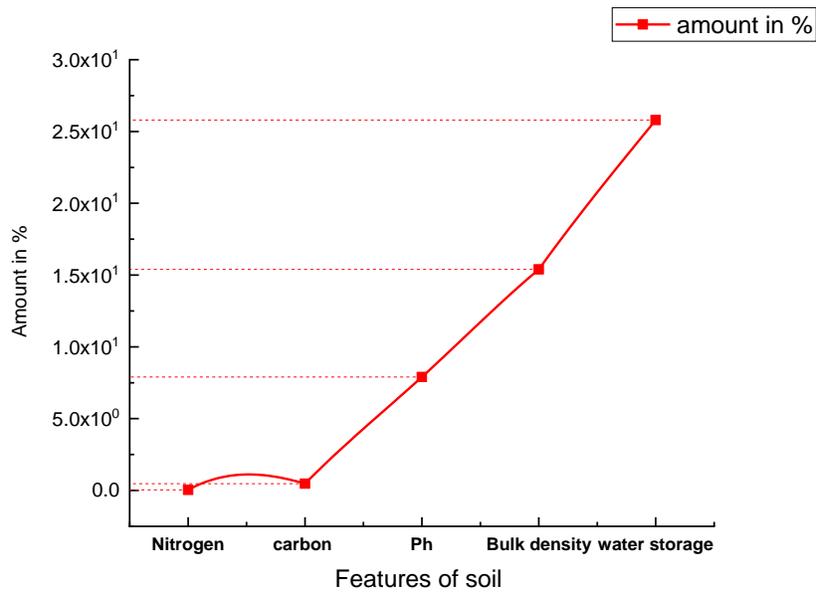


Figure 2: amount of different

The given quantity of organic fertilizer were based on usual application by local farmers, 20 t/ha. The features of the organic fertilizers which is incorporated as soil amendments are shown in Table 1. Each sub-plot contained 6 rows 60 cm apart and five meter in length. *A. esculentus* were planted and grown in a field of loamy sand soil under a plastic tunnel for several weeks.

Transplanted into field

The seedling was transplanted to the farm field in the month of May. *A. esculentus* were water edproximately after transplanting and then twice a week until the end of fruiting.

Hoare-ridging was in progress manually utilizing a locally synthetic to three weeks after transplanted. During the growing season no pesticides were used and controlled of weed via.

During the whole experimental work *A. esculentus* plots were thoroughly observed and any disease, pest or disorders were recorded based on the percentage of necrotic or disordered plants. Three weeks before the third harvest *A. esculentus* plants were evaluated for general health based on the percentage of non-healthy plants in each plot. For the determination of *A. esculentus* yield, 7m in the middle of every plot was marked and *A. esculentus* fruits were selected and weighed five times when they had reached maturity stage. In directive to measure the *A. esculentus* storability, the size of sample from 8 kg from the 2ndharvest (5-10°C) temperatures for 5 weeks. Healthy and infected Percentages of *A. esculentus* were determined after 7 weeks' storage and then marketable yield was assessed based on this percentage and the total yield of three harvests.

Locally produced manure and composts were kept in barrel after keeping barrel was topped off with tepid water tepid water (1:10W/V). The extract was allowed to ferment atambient temperatures for 40 hours. The ended product was strained through two layers of cheesecloth and applied as a foliar spray. Liquid compost extract were applied three times at the start of flowering and the beginning of *A. esculentus* fruit production.

RESULTS AND DISCUSSION

Application of the organic fertilizers including composts and animal manure and by product materials have two distinguish features providing given nutrients and a good resistance to pathogen

and diseases , help control weeds, retain soil moisture, and ensure produce quality (Sarkar et al. 2003).The overall results of *A. esculentus* general health (pathogenically or physiologically diseased) in this field experiment showed that the impact of soil amendments and extracts on *A. esculentus* health were not significant in the leading period of the experiment (Fig. 3).Though, the impact of soil amendment was significant ($P < 0.06$) during 2016. No significant diseases were detected, Plots with poultry manure showed significantly lower disease incidence (less than 15%) comparatively with the other soil amendments. Meanwhile no pesticides were implemented against pests and diseases; the incidence level of leaf diseases on average was 40–60% in 2016 and 20–30% of plants in 2017.

Organic farmer and the ecologist have to tolerate having a field which is not composed of pests and diseases and therefore should be patient and trade short-term economic returns for longer-term “ecological” Credits while improving the health of soil. Impact of liquid extract and various kinds of soil amendments were very limited, inconsistent and non-significant on crop health. The accomplishment of consistent effects depends upon producing extracts that are exactly the same from group to group from a distinct compost feed-stock (Sanwal et al. 2007). The Composts' influence to nutrient fertility must also be taken into account because nutrient effects may influence the severity of pathogens (Anjanappa et al. 2012).The treatment of poultry manure plant were much healthier than others and this might be connected to sophisticated levels of Ca and P compared with the other soil amendments (figure 1). The implementation of organic soil amendments can result in a better soil quality and superior plant disease suppressiveness (Oyewole et al. 2011) but in this field experiment it depended on the type of organic fertilizer. There are references provided evidence that fertilization with organic amendments caused lesser populations of pests in *A. esculentus* than the rate of population produced on the synthetic fertilizers, showing that organic fertilizers have the ability to reduce pest attacks in the long term. In the present research it is also noticed that the application either organic or synthetic fertilizers did not increase pest populations in tomatoes in both years.

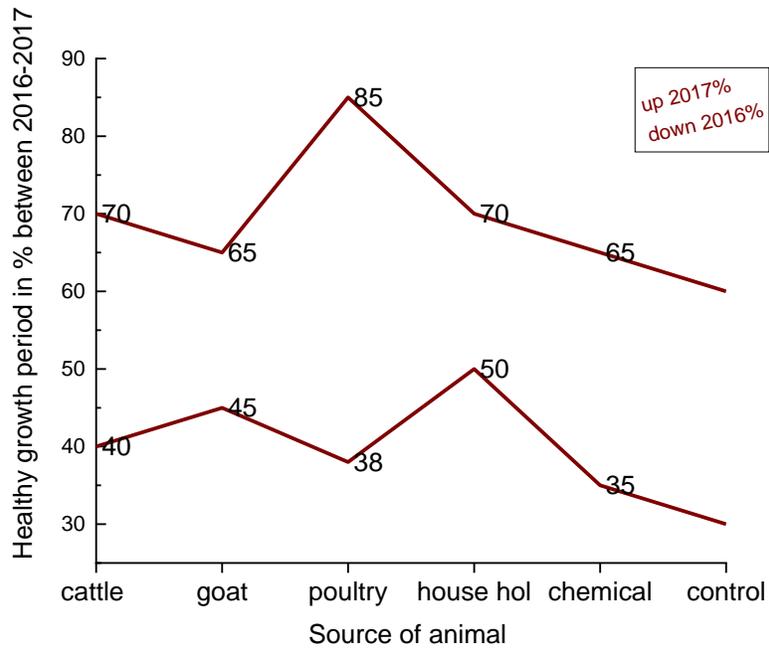


Figure 3: Effects of soil amendments on *Abelmoschus esculentus* general health during the two-year trial

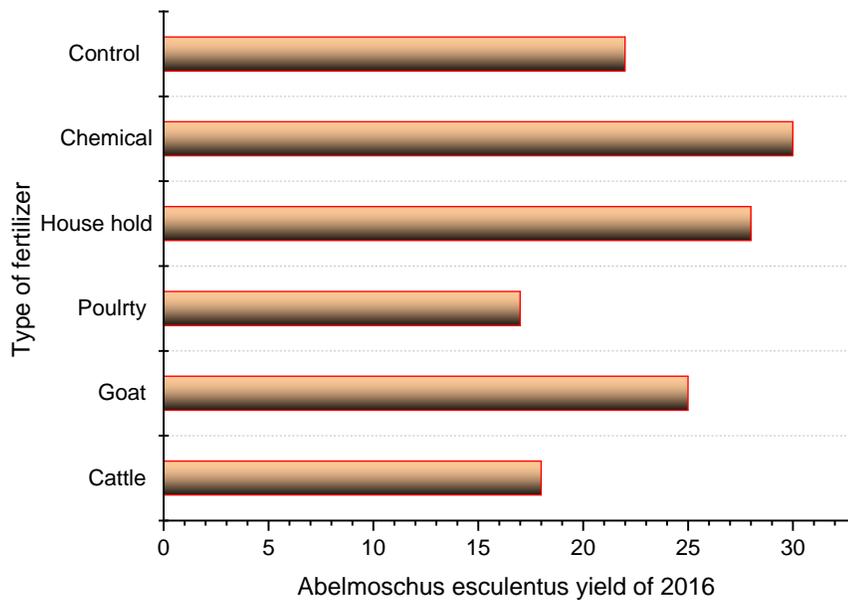


Figure 4: Effects of different soil amendments on *Abelmoschus esculentus* tomato yield m(t/ha)

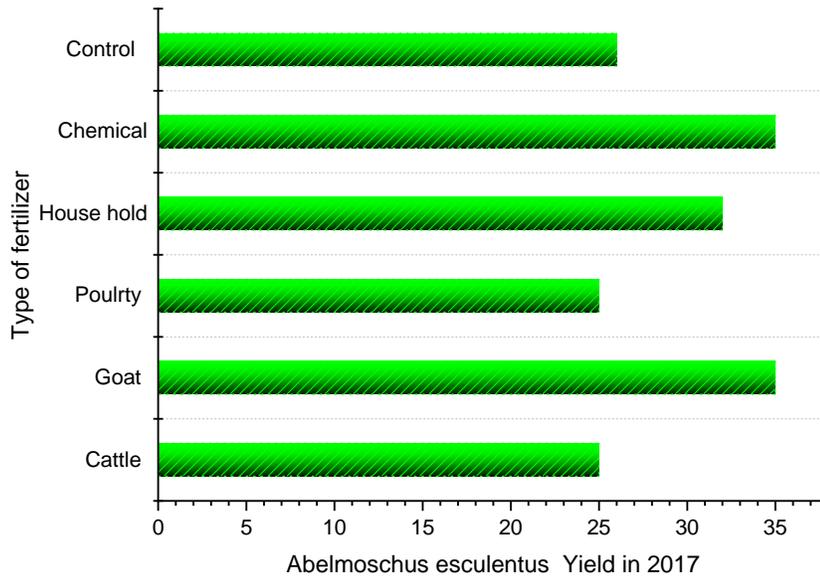


Figure5: Effects of different soil amendments on total *Abelmoschus esculentus* yield m(t/ha).

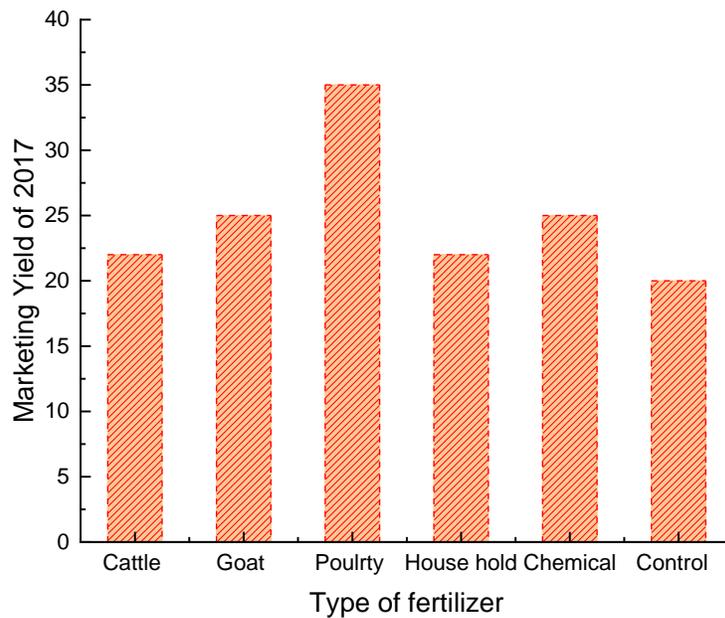


Figure 6: Effects of different soil amendments on total *Abelmoschus esculentus* marketable yield (t/ha) after keeping for 6 weeks in storage

Abelmoschus esculentus yield

The investigation of different results provided that the effect of fertilizer type on *A. esculentus* yield was significant in whole duration of the experiment ($P = 0.005$); however, the impacts of different compost extracts ($P = 0.135$) and contact between the type of fertilizer and compost extracts were not significantly dissimilar ($P=0.133$). While the application of organic fertilizers did not obtain a huge yield as compared with application of chemical fertilizers, and goat manure led to the highest total *A. esculentus* yield (Fig. 3,4). Except the goat manure treatment, the yields of the chemical fertilizer were more than the organically fertilized yields of *A. esculentus* (Amir et al. 2018; Azam et al.,2020). This is may be because of slowly release of the nutrients by organic fertilizer as compared to the chemical fertilizer, which cause in lower p and s concentrations in the leaves, which created limited growth and yield in the organic fertilizers (Gardner and Drinkwater, 2009).The progress in plant growth and development in fruit yield in organic amendments could also be due moderately to huge increases in soil microbial biomass after organic fertilizer submissions, leading to manufacture of hormones or humates in the composts acting as plant-growth independent of the nutrient supply (Sarhan et al. 2011; Naeem et al. 2020).it is more beneficial the fertilization with composts for improving development g plant when the compost is enhanced with nutrients (Malik et al. 2018; Jan et al. 2018). As whole it can have concluded that suitable supply of nutrients, either organic or mineral, is crucial to reach high yields in *A. esculentus*. During this experimental work it was noticed that goat manure same as mineral fertilizer significantly *A. esculentus* yield by at least 10 t/ha, especially in the second year of the experiment (Naz et al. 2019). However, storability and marketable yield of *A. esculentus* might be dissimilar between various soil amendments.

CONCLUSION

we analysis the short term impact of chemical fertilizer based and organic fertilizer on plant performances and *A. esculentus* market yield in low input and agro ecosystem. The experiment showed that optimal quality and quantity of *A. esculentus* fruit and desired sensory shelf life are affected by is greatly affected by production input. Goat manure application provided the highest yield over, over 30 t/ha. The organic treatment of poultry form represented a significant impact on the health of crop post. The treatment of organic

fertilizer is generally represented quite stimulation *A. esculentus* yield and other parameter as well. The treatment of poultry manure treatment was the best to all other organic manure in term of storability and final market yield for therefore, on the light of this result of current experiment application of goat manure, similarly to mineral fertilizers, caused an average of 5 t/ha higher yield. However, in the case where the aim of the *A. esculentus* production is being processed and/or being used in another season, treatment of household compost and poultry manure in soil could be a viable alternative to chemicals for improving *A. esculentus* shelf life in stores.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

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AUTHOR CONTRIBUTIONS

KA, MS designed and performed the experiments and also wrote the manuscript. FH, RP, NA and IK performed Analysis, Experiment design and field work and data management. SB, AR, SA and FH designed the initial draft and reviewed the manuscript. All authors read and approved the final version.

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