International Journal of Plant Pathology and Microbiology

E-ISSN: 2789-3073
P-ISSN: 2789-3065
IJPPM 2023; 3(2): 44-47
Received: 12-07-2023
Accepted: 14-08-2023

Yurica Nehanda Jeje
Department of Agricultural Sciences, College of Health, Agriculture and Natural Sciences, Zimbabwe

Mtaita Tuarira Abduel
Department of Agricultural Sciences, College of Health, Agriculture and Natural Sciences, Zimbabwe

Sebatian Chakeredza
Department of Agricultural Sciences, College of Health, Agriculture and Natural Sciences, Zimbabwe

Jefta Tabarira
Department of Agricultural Sciences, College of Health, Agriculture and Natural Sciences, Zimbabwe

Munashe Kurehwatira
Department of Agricultural Sciences, College of Health, Agriculture and Natural Sciences, Zimbabwe

Correspondence Author;
Yurica Nehanda Jeje
Department of Agricultural Sciences, College of Health, Agriculture and Natural Sciences, Zimbabwe

Growth and development of lettuce as influenced by different rates of chicken manure

Yurica Nehanda Jeje, Mtaita Tuarira Abduel, Sebatian Chakeredza, Jefta Tabarira and Munashe Kurehwatira

Abstract
The study was conducted to determine the amount of chicken manure to be applied when growing lettuce (*Lactuca sativa*) variety commander. There were four treatments arranged in a Completely Randomized Block Design with three replicates. The four treatments were: treatment A (lettuce grown with 2 kg of chicken manure), treatment B (lettuce grown with 4 kg chicken manure), treatment C (lettuce grown with 6 kg chicken manure) and treatment D (lettuce grown with inorganic fertilizer). Data were collected on: leaf number, plant height and leaf area. The results showed that treatment C (6 kg manure) had the best effects compared to the rest of the treatments. Chicken manure therefore can replace inorganic fertilizers at six (6) kilograms per square meter in producing lettuce as it equally increases lettuce growth parameters.

Keywords: Chicken manure, lettuce, inorganic fertilizer

Introduction
The lettuce (*Lactuca sativa*) belongs to the family asteraceae. It originates from Egypt and is integrated in the group of vegetables that contain a high number of dietary fibers and vitamins. Lettuce and other vegetables are vitally important for human health due to their high nutrition index (Masarirambe, 2010) [6]. It is mainly grown by smallholder farmers for food and surplus is sold as a source of income (Chipomho, 2018) [1]. Production require excessive care because of its fragility. Use of chicken manure at appropriate rates can be valuable because it increases the organic matter, bringing more nutrients to the plant and increasing soil aeration, as well as improving the development of the crop. Masarirambi *et al*. (2010) [6] indicated that, lettuce with high length, higher yield and maximum leaf number can be obtained when chicken manure is used correctly.

Use of organic fertilizers is compatible to resource poor farmers' capabilities as they lack capital to purchase synthetic pesticides and inorganic fertilizers (Svotwa and Jiyane, 2009) [8]. The production of lettuce and other leaf vegetables for both local and export markets is a profitable enterprise having the potential to increase employment and house hold income (Muchecheti, Madakadze and Soundy, 2011) [10]. Chipomho (2018) [1] observed that, lettuce has relatively low input requirement but high returns. However, the exorbitant cost of inorganic fertilizers in developing countries cannot be over-emphasized. The high level of contaminated lettuce due to application of fertilizers combined with pesticides can cause disorders in human. Therefore, when attempting to use organic manure such as chicken muck, it is imperative to determine the proper application rates. The main focus of this study was to determine the effects of different rates of chicken manure on the growth parameters of lettuce.

Materials and Methods
The experiment was conducted at Africa University farm, Mutare, Zimbabwe located at 18°53'38.3" south, 32°36'14" East, with elevation of 1131 m. The average annual precipitation is around 800-1000mm, with majority of the rain falling between December and February. The average summer temperature is 27 °C, while, the average winter temperature is around 7 °C. The soils are clay loamy with a pH range between 6.11 and 6.9. A tractor drawn roam disc was used for land preparation and a hand hoe was used to raise the beds while a rake was employed to break the big clods. Transplanting was done in the evening to avoid wilting of seedlings.

Nutrient analysis

Chicken manure analysis was done to quantify the level of nitrogen, phosphorous and potassium to be applied per treatment.

Table 1: Nutrient composition of chicken manure

Analysis	Results	Unit	Method
Total Nitrogen (N)	2.86	%	Titrimetric
Crude Protein (CP)	17.88	%	Titrimetric
Potassium (k)	2.45	%	Spectrophotometric
Phosphorus (P)	1.349	%	Spectrophotometric

Experimental Design

The experiment was laid out in a Completely Randomized Block Design (RCBD) with four treatments replicated three times. Each treatment was planted to 1m x 1 m plot. The four treatments were; A (2 kg/plot), B (4 kg/plot), C (6 kg/per plot) and D (60 g). Seedlings of lettuce cultivar commander was transplanted 30 days from seeding. Each plot within the block contained 8 plants, with spacing of 25 cm intra-row and 40 cm inter-row. The field plan was as shown in figure one (1) below. Standard management practices of watering, weeding, pest and disease control were followed.

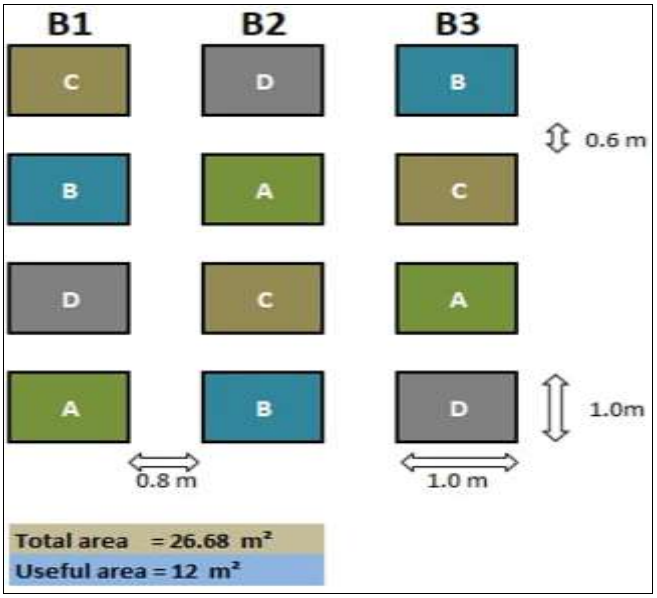

Fig 1: Field plan

Data collection

The following variables were measured:

Number of leaves per plant; Number of leaves per plant were computed as the mean of four randomly selected plants per plot on a weekly basis.

Leaf length, Mean leaf length on four randomly selected plants per plot was computed. A ruler was used to take the measurements every week after transplanting.

Plant height (cm): Using a ruler, plant height was measured from the base of the plant to the terminal portion. Four plants from each plot were selected randomly and their heights were averaged.

Sampling was done at 5 days' interval after transplanting until the leaves were ready to harvest. Data collected was statically analyzed using GENSTAT 3.0 statistical package.

RCBD model: $Yij = \mu + Ti + Bj + eijk$

Yij- it's any observation for which

i-is the treatment factor

j-is the blocking factor

eijk is the random error

Results

Table 2 and figure 1 depicts the number of leaves, plant height and leaf length on days 25, 35 and 48. These were influenced by the different quantities of organic and inorganic fertilizer treatment.

Table 2: Leaf number and leaf lengths as influenced by different levels of organic and inorganic fertilizers

Treatments	Leaves at 25 days	Leaves at 35 days	Leaves at 48 days	Leaf length at 25 days	Leaf length at 35 days	Leaf length at 48 days
Chicken manure2kg	8.75 ^{c}	8.00^{b}	7.33^{b}	1.07^{a}	1.33^{a}	1.42^{b}
Chicken manure 4kg	13.83^{b}	12.33^{ab}	13.42^{a}	1.02^{a}	1.18^{a}	1.45^{b}
Chicken manure 6kg	16.60^{a}	14.83^{a}	16.00^{a}	1.01^{a}	1.28^{a}	1.75^{a}
Comp. D (60g)	6.50^{d}	10.00^{b}	13.58^{a}	0.89^{a}	1.15^{a}	1.58^{ab}
Mean	7.65	12.40	15.25	0.10	1.23	1.550
P value (0.05)	*	*	*	Ns	Ns	*
LSD (0.05)	1.60	3.62	4.30	0.18	0.22	0.2338
CV (%)	0.05	0.05	0.05	0.05	0.05	0.05

Note:

Means followed by same letter in the same column are not significantly different at $p< 0.05$

* Denote significant differences at $p<0.05$

Ns, Denotes non-significant differences at $p<0.05$

There were significant differences ($p< 0.05$) in the number of leaves per plant at 25 days after transplanting. Application of chicken manure at 6 kg m^2 resulted in significantly more number of leaves per plant across all treatments. The least average number of leaves per plant was observed in lettuce where inorganic fertilizer was applied. The performance ranking was different when number of leaves were recorded 35 days after planting. Lettuce applied with 60 g of Comp D and chicken manure at 2 kg and 4 kg per plot recorded the same number of leaves 35 days after transplanting. Applying 6 kg of chicken manure per plot gave same number of leaves per plant as 4kg per plot but significantly ($p<0.05$) higher number of leaves per plant compared to 2 kg of chicken manure and 60g of compound D respectively. However, leaf count at 48days after transplanting revealed that applying 2kg per m^2 had the lowest number of leaves across all treatments. This implies that a farmer wishing to harvest lettuce 48 days after transplanting can apply 4 kg of chicken manure without any reduction in yield.

With respect to leaf length, there was no significant differences at 25 and 35 days after transplanting across all treatments. Lettuce harvested 48 days after transplanting from the 6 kg chicken manure treatment plot recorded significantly higher leaf length among the manure treatment plots. The leaf length from the comp D treatment plot was not significantly different from lettuce harvested from plots applied with 6kg chicken manure per m^2.

Table 3: Plant measured at different dates after transplanting as influenced by different levels of organic and inorganic fertilizers

Treatments	Plant height at 25 days	Plant height at 35 days	Plant height at 48 days
Chicken manure 2 kg	0.75^{b}	1.23^{b}	1.28^{b}
Chicken manure 4 kg	1.03^{ab}	1.30^{ab}	1.40^{ab}
Chicken manure 6 kg	1.21^{a}	1.37^{a}	1.58^{a}
Inorganic fertilizer	1.07^{ab}	1.31^{ab}	1.50^{a}
Mean	0.02	1.30	1.44
P value (0.05)	*	*	*
LSD (0.05)	0.28	0.15	0.29
CV (%)	0.05	0.05	0.05

Note: Means followed by same letter in the same column are not significantly different at $P < 0.05$

* Denote significant differences at $p<0.05$

Lettuce plants applied 4kg, 6kg and 60g compound D recorded the same plant height across all observation intervals.

Discussion

The significant differences among treatments in most parameters studied signifies the importance of chicken manure. High chicken manure treatment gave taller plants and, higher number of leaves per plant compared to the control. The lowest number of leaves was obtained from lettuce supplied with inorganic fertilizer. These responses might be due to equally high content of nitrogen, phosphorus and potassium in chicken manure (Schjegel, 1992) [7] as found in inorganic fertilizers. The nitrogen from the poultry manure increased the height of the plants. Hassan, (2002) [4] also reported that chicken manure fertilizer significantly increased plant height. Higher rate of chicken manure (6 kg) significantly increased a number of growth attributes of lettuce than the control. However, the higher number of leaves observed in treatment C (6 kg) was not significantly different to B (4 Kg). Average number of the leaves per plant was not significantly different across all treatments. The highest number of leaves was obtained from lettuce treated with 6 kg chicken manure. Increased number of leaves as a result of chicken manure application is critical because leaves are considered to be the main component of plants as they produce and store the green pigment chlorophyll that is used in the photosynthetic process to produce dry matter. According to Elamin (1991) [3], organic matter decomposition improved the physical and chemical proprieties of the soil leading to good performance of the crop. Huang *et al*. (2016) [5] also acknowledged that chicken manure increases lettuce yield in contrast to inorganic fertilizers where the yield remains the same or decreases. This shows that reasonable amount of chicken manure results in high yields. Better response of plants treated with chicken manure could be due to the nitrogen content in chicken manure which is comparable to that of inorganic fertilizer that promotes rapid growth and increases lettuce's size and quality. Nitrogen is also an essential part of the chlorophyll manufacturing process through photosynthesis (Doerge, Roth, and Gardener 1991) [2]. Hassan, (2002) [4] also observe that chicken manure fertilizer significantly increases lettuce growth attributes. Contrary, Worthington (2001) [9] noted that effects of organic and inorganic fertilizers on yield and nutritive value of head lettuce were equivalent regardless of the type of fertilizer used. The high weed infestation in chicken manure treated plots might be because chicken manure provides high water holding capacity and nutrient release compared to inorganic fertilizer.

Conclusion

Lettuce treated with chicken manure showed better vegetative growth in terms of leaf number, plant height and leaf length as compared to lettuce treated with inorganic fertilizers. The application of six (6) kg chicken manure per square meter is preferred as it was associated with higher leaf number, best plant height, and leaf length. Further work may be done to examine the influence of rates above six (6) kg per square meter.

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

1. Chipomho J. Influence of organic and inorganic amendments on rape leaf yield and weed dynamics in a highly degraded sandy soil in Marondera Zimbabwe; c2018.
2. Doerge TA, Roth, Gardner BR. Nitrogen fertilizer management in Arizona. College of Agr., Univ. of

Arizona, Tucson Publ; c1991. p. 191025.
3. Elamin EE. Effect of Organic Manure Decomposition on Some Soil Properties. M.Sc. (Agric). Thesis, Faculty of Agriculture, University of Khartoum; c1991.
4. Hassan EAH. Effect of chicken manure and season on the performance and HCN Content of two Forage sorghum cultivar, Ph.D. Thesis, Faculty of Agriculture; c2002.
5. Huang Y, Liu J, Dana MN, Yang X. Chicken manure application rate on lettuce yield and quality. International journal of recycling of organic waste in Agriculture. 2016;5(3):197-203.
6. Masarirambi MT, Hlawe MM, Oseni OT, Sibiya TE. Effects of organic fertilizers on growth, yield, quality and sensory evaluation of red lettuce (*Lactuca sativa*); c2010.
7. Schjegel AJ. Effect of composted manure on soil chemical properties and nitrogen use by grain sorghum. J. Prod. Agric. 1992;5:153-157.
8. Svotwa E, Baipai R, Jiyane J. Organic farming in the small holder farming sector of Zimbabwe; c2009. https://www.organic-systems.org/journal/Vol_4(1)/pdf/08-14_Svotwa-et-al.pdf
9. Worthington V. Nutritional quality of organic versus conventional fruits, vegetables and grains. J Altern. Complem. Med. 2001;7(2):342-353.
10. Muchecheti F, Madakadze C, Soundy P. Leaf chlorophyll readings as an indicator of nitrogen status and yield of spinach (*Spinacia oleracea* L.) grown in soils amended with *Leucaena leucocephala* prunings. Journal of Plant Nutrition. 2016 Mar 20;39(4):539-61.