Influence of Different Types of Organic Manure and Weeding Frequencies on Weed Parameters and Leafy Yield of Jute Mallow (Corchorus olitorious)

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Authors’ contributions

This work was carried out in collaboration among all authors. Authors MMO, RS and OO designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors RM, EA and JE managed the analyses of the study. Authors CAD and SOO managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Field trials were carried out during 2018 and during 2019 dry season period at Federal College of Forestry and Mechanization Afaka Kaduna, located between latitude 10° 35"N and longitude 007° 21"E at altitude 644 m above sea level, to determine the influence of different types of organic manure and weeding frequencies on weed parameters and leafy yield of jute mallow (Corchorus olitorious). The experimental treatments consists of ten combinations of poultry manure + weed free, cow dung + weed free, goat dropping + weed free, poultry manure + weeding at 2 WAT, cow dung + weeding at 2 WAT, goat dropping + weeding at 2 WAT, poultry manure + weeding at 4 WAT, cow dung + weeding at 4 WAT, goat dropping + weeding at 4 WAT and no organic manure application + no weeding which were laid out in a randomized complete block design (RCBD) and replicated 3 times. The weed parameters and yield component observed and measured were common weeds that infested the plots, weed dry weight, weed control index, weed competition index and cumulative leaf yield at 2, 4, 6 WAT and at harvest. The result revealed that the plots were highly infested with three major weed species namely Synedrella nodiflora Gaertn.
Gomphrena celosiodes and Cyperus esculentus. Highest weed completion index was obtained from poultry manure + weeding at 2 WAT while the least weed competition index was observed with application of cow dung + weeding at 4 WAT and goat dropping + weeding at 4 WAT respectively. The result also revealed that application of poultry manure + weed free plots had the highest mean cumulative yield value of 236 kg per hectare, closely followed by plots with application of poultry manure + weeding at 4 WAS (223 kg) per hectare compared to the control treatment that plots that have no organic manure + no weeding that had the least mean cumulative yield value of 111 kg per hectare. The study concludes that the use of poultry manure plus weed free gave the best yield of jute mallow compared to other types of organic manure and the control. It is therefore recommended that farmers in the study area should adopt the use of poultry manure plus weed free treatment to obtain bumper harvest from cultivation of jute mallow (Corchorus olitorious).

Keywords: Influence; organic manures; weed frequencies; weed parameters; leafy yield; jute mallow.

1. INTRODUCTION

Weeds pose serious problems in crop production and in most instances the success of crop production depends entirely on the effectiveness of weed control. Weeds are the most under estimated crops pests in tropical agriculture, although they cause higher reduction or loss in the yields of crops than other pest and disease. In Nigeria, weed and disease have been identified as major problem in crop production. Vegetables are generally poor competitors of weed because they have less plant density. They initially grow very slowly; they are generally short statured [1]. Weed competition at the early growth stage of vegetables smoothers crop plants and results in poor growth and yield of the crops. Although hand weeding is common in most vegetable farm, however, due to the repeated flushes of weed species, manual weeding may fall short in weeding out the vegetable fields [1].

According to Lombin [2], low organic matter content, low cation exchange capacity and low inherent fertility characteristic in Nigeria soils, with Nitrogen and phosphorous often limit nutrients. Farmers have adopted the use of organic manures especially cow dung. However, the use of cow dung as manure increase weed infestation in crop field as weed seed pass through the digestive tract of ruminant animals without losing their viability. Several noxious weeds especially Cynodon dactylon, Rottboellia cochinchinesis, Cyperus rotundus are dispersed in this process which results in increase in weed infestation in agricultural lands thereby increasing weeding regimes or higher dose of herbicides [3]. Weeds and poor soils fertility appear to be the most deleterious of all the constraints limiting okra production, the cumulative effects of weeds on crop production may eventually lead to crop competitions, allelopathy, as well as alternate host to pests, pathogen and adulteration of farm produce.

According to Adeyemi et al. [4], on a field study conducted to investigate the influence of poultry manure and weeding regimes on yield and yield components of okra, the results showed that application of poultry manure at 10 t/ha and weeding at 3, 5 and 7 weeks after planting in okra.

The use of inorganic fertilizers in crop production have been observed to cause the destruction of soil structure as well as wide spread problems of soil acidification. In order to alleviate these problems, the resource poor farmers use farm yard manure in combination with integrated weed management which help in reducing soil bulk density responsible for low nutrients uptake, thereby reducing growth and yield in Okra grown field. According to Akande et al. [5], tropical soils are adversely affected by -optimal soil fertility and erosion, causing deterioration of the nutrient status and changes in soil organism population. It was reported by Iren et al. [6], that animal manure had been used as a source of local fertilizer in many developing countries across the globe for many centuries [7].

In Nigeria, farmers realise the need for soil amendments by using available resources such as crop wastes, farm yard manure and poultry waste [8]. Organic fertilizer are recognized to improve soil physical chemical and biological conditions which in turn improve crop growing environment and culminate in the better production of economic plants. Similarly, Alasiri and Ogunkeye [9], advocated the use of organic manures as a useful soil amendments and
fertility conservation source. Animal manures when used efficiently, ensures sustainable crop production by immobilizing nutrients contained in manure as the nutrients are slowly released. Animal manures regarded as wastes could be channelled towards improving the fertility of the soil and crop production. In addition, poultry manure contain nutrient element that can support crop production and enhance the physical and chemical properties of the soil [10]. Poultry manure has been proved to be good supplement for chemical fertilizers [11]. It contains not only N, but also other elements like P, K, S, Ca, Mg and micronutrients. The study is carried out to determine the influence of different types of organic manure and weeding frequencies on weed parameters and leafy yield of jute mallow (Corchorus olitorious).

2. METHODOLOGY

2.1 Experimental Site

The field experiment was carried out at Federal College of Forestry Mechanisation Teaching and Research farm, located at Afaka, in the Northern Guinea Savannah Ecological Zone of Nigeria. The area experiences 5 to 7 months of rainfall and 7 to 5 months of dry season. The farm is located at 644 meter above sea level at Latitude 10°N 35’ and Longitude 007°E 21’ Agro-ecological zone in the Northern Guinea Savannah.

2.2 Experimental Design and Treatments

The experimental site was arranged according to Randomised Complete Block Design. The field layout consists of plot size of 1.2 m x 1.2 m with 25 cm gap between plot and 50 cm between replicate. The sources of organic manure were four (4) tonnes per hectare for each of cow dung, poultry manure and goat droppings while the weeding frequency were weeding at two (2) weeks after transplanting (2WAT), weeding at four (4) weeks after transplanting (4 WAT) and weed free plot. The experimental treatments were ten (10) replicated three times making a total of (30) plots. The treatments were poultry manure plus weed free, cow dung plus weed free, goat droppings plus weed free, poultry manure plus weeding at 2 WAT, cow dung plus 2 WAT, goat dropping plus 2 WAT, poultry manure plus weeding at 4 WAT, cow dung plus 4 WAT, goat dropping plus 4 WAT and no organic manure application plus no weeding.

2.3 Cultural Practices

2.3.1 Soil sampling

Soil sampling from the experimental plot was taken randomly across the field using the soil augur at a depth of 0-20 cm. The composite soil sample was air dried sieved and physico-chemical analysis was done at soil laboratory.

2.3.2 Organic manure

The organic manure required for the experiment was sourced from the college farm (cow dung, poultry and goat dropping) and air dried, crushed into pieces and sieved. It was analyzed in the soil laboratory for chemical composition.

2.3.3 Land preparation

The experimental site was cleared of weeds, debris from last season’s growth. The land was ridged manually and tilth to fine texture. It was further leveled to basin. Bunds were constructed by the side of the plot to avoid run-off. The plot was pegged out according to treatment specifications using sunken beds.

2.3.4 Nursery establishment

Three nursery beds of 2 m x 2 m dimension was measured, soil broken to fine tilth and bunds made to obtain sunken beds. The nursery bed was watered profusely to attain field capacity. Corchorus olitorious seeds supplied from reputable seed company at Kawo market was purchased and pre-germination treatment was carried out by soaking in simmering water for 24 hrs. It was drained out for easy seed collection, treated with Apron star at 2 kg a.i/1kg and sowing was done on the nursery bed by broadcasting method.

2.3.5 Nutrient application

The cured nutrients, application based on the treatment of manure sources were applied on the prepared and tagged plots at the recommended rate of 4 tonne/ha [12]. The manure was applied two weeks prior to planting.

2.3.6 Water application

Watering was carried out using watering hose attached to the water source to ensure that field capacity was attained.
2.3.7 Transplanting
Seedlings of Corchorus olitorious obtained, were readily transplanted at 3-4 leaves stage of growth on each plot. Transplanting was carried out on watered soil at a spacing of 25 cm x 25 cm in the evening.

2.3.8 Weed control
Manual weed control was done according to treatment specification at 2 WAT, 4 WAT, weed free plot and no weeding was kept weedy throughout the experiment.

2.3.9 Pruning and pinching
Pruning and pinching was carried out at week four (4) to allow secondary branching.

2.4 Observation and Data Collection on Weed Parameters

2.4.1 Weed samples
Different weed samples were collected at various sampling periods, identified and classified according to level of intensity and types of weeds.

2.4.2 Weed dry weight
Weed dry weight was determined by collecting weed samples of known unit area dried at 80°c in an oven and weigh.

2.4.2.1 Weed
The weed dry weight was used to further determine weed control index (WCI) as described by [13]. It is a derived parameter that compares different treatments of weed control on the basis of weed dry weight across them. It is determined by the equation

\[
\text{Weed Control Index (WCI)} = \frac{(\text{WDMC} - \text{WDMT}) \times 100}{\text{WDMC}}
\]

Where WDMC is the weed dry weight (unit/m²) in control plot. Where WDMT is the weed dry weight (unit/m²) in treated plot. In both WDMC and WDMT, the unit should be the same or uniform.

2.4.3 Weed competition index
Weed competition index is a derived parameter from the crop yields obtained across the treatments of weed control researches [14]. It determines the crop yield loss accrued across treatments in comparison to a weed free plot or the minimum weed infested plot (weed free check). It is determined using the equation

\[
\text{Weed competition Index (WI)} = \frac{(\text{YWF} - \text{YT}) \times 100}{\text{YWF}}
\]

Where YWF is the crop yield in weed free plot; YT is the crop yield in treatment plot for which WI is to be worked out. In both YWF and YT, the unit should be the same or uniform.

2.5 Fresh Plant Weight
Fresh plant was harvested sequentially at maturity and weight was taken and recorded accordingly. Cumulative weight was carried out per m² and per hectare.

2.6 Statistical Analysis
The data was subjected to statistical analysis of variance (ANOVA) as suggested by [15]. Mean separation were carried out to compare the level of significance using Duncan Multiple Range Test as described by [16].

3. RESULTS AND DISCUSSION

3.1 Soil Sample
Table 1 shows the physio-chemical properties of the soil on analysis of the composite soil sample taken. The result obtained from soil analysis of physio-chemical properties is contain in Table 1. The textural class of the farm of the soil was sandy loam other are pH (H₂O) 6.20 and pH (cacl₂ 2H₂O) 5.70, total N (%) 0.19 available p (ppm) 710.0 organic carbon (%) 0.77 and organic matter 1.18 other soil properties are contain in Table 1.

3.2 Nutrient Composition of Organic Manure
The analysis shows that all manures have lower nitrogen while poultry manure supply more total nutrient. This is in agreement of Ewulo, (2005) who reported that all manures have essential elements for boosting crop production, for both subsistence and commercial purpose. However, poultry manure has the highest value of essential nutrient such as N, P, K, Ca, Mg.
Table 1. Physio-chemical properties of the soil at the experimental site

| Soil properties                              | Mean value (0.15 cm Depth) |
|----------------------------------------------|-----------------------------|
| Clay (%)                                     | 13.00                       |
| Silt (%)                                     | 23.00                       |
| Sand (%)                                     | 63.00                       |
| Textural class                               | Sandy loam                  |
| PH (H₂O) and (Cacl₂H₂O)                     | 6.20 and 5.70               |
| Organic Carbon (%)                           | 0.77                        |
| Organic matter (%)                           | 1.18                        |
| Total N (%)                                  | 0.19                        |
| Available P (ppm)                            | 710.00                      |
| Exchangeable K (cmolkg⁻¹)                    | 0.023                       |
| Exchangeable Na (cmolkg⁻¹)                   | 0.34                        |
| Exchangeable Ca (cmolkg⁻¹)                   | 2.28                        |
| Exchangeable Mg (cmolkg⁻¹)                   | 0.67                        |
| CEC (cmolkg⁻¹)                               | 4.99                        |

Table 2. Nutrient composition of different organic manure

| Contents (%)                  | Poultry manure | Cow dung | Goat droppings |
|-------------------------------|----------------|----------|----------------|
| N                             | 2.56           | 2.20     | 2.02           |
| P                             | 0.40           | 0.23     | 0.21           |
| K                             | 0.70           | 0.08     | 0.09           |
| Na                            | 0.07           | 0.08     | 0.08           |
| Ca                            | 4.00           | 0.41     | 1.42           |
| Mg                            | 1.10           | 1.21     | 2.22           |
| Zn                            | 0.03           | 0.01     | 0.02           |

3.3 Weed Species and Level of Infestation

The common weed species observed on influence of sources of organic manure and weeding frequency during the trial of dry seasons 2018 at Afaka is contained in Table 3. Prominent weed species at high level of infestation encountered during the period of investigation were Synedralla nodiflora Gaertn., Gomphrena celosiodes and Cyperus esculentus. Similarly weed species that had moderate infestation were Eleusine indica Gaertn., Amaranthus spinosus Linn., Solanum nigrum L, Euphorabia hirta Linn and Setaria barbata (lam) Kunth. Weed species with low infestation were Leucas martinicensis (Jacq.) Alt.F., Ipomea asorifolia (Desr.), Sida acuta Burm. F., Eclipta alba (L), Panicum maximum jacq. Echinochloa aegyptium and Mariscus longibracteatus chem.

3.4 Weed Dry Weight

Weed dry weight observed at the experiment site are shown in Table 4. At 2 WAT, the control treatment of no nutrient + no weeding had higher weed dry weight than all the other treatment, followed by Goat dropping + weeding at 4 WAT. The least weed dry weight (1.43 g/m²) was recorded with application of goat dropping + weed free period and was comparable to all other treatment except application of cow dung + weeding at 4 WAT. At 4 WAT, plot treated with Goat dropping + weed free and Goat dropping + weeding at 2 WAT resulted in lower weed dry matter than all other treatment, and no nutrient + no weeding gave the highest weed dry weight. All other treatment had comparable weed dry weight except cow dung + weeding at 4 WAT and Goat dropping + weeding at 4 WAT. During the period of investigation at 6 WAT and at harvest, all the treatment experienced lower weed dry weight compared to no nutrient + no weeding.

3.5 Weed Control Index

Weed control index (WCI) at 2, 4, 6 WAT and at harvest were significantly affected by all the nutrient applied at various weeding frequency (Table 5) 4 at 2 WAT, application of cow dung at 4 ton/ha + weeding at 2 WAT and 4 WAT respectively had lower weed control index of 39.87% and 43.32% respectively than all other treatment that recorded higher weed control index. The highest weed control index was obtained with goat dropping + weed free plots (80.94). However, poultry manure + weed free (79.67) and poultry manure + weeding at 4 WAT,
goat dropping + weeding at 2 WAT and cow dung + weeding at 2 WAT gave higher weed control index. The least weed control index was recorded in no nutrient + no weeding as control.

3.6 Weed Competition Index

During the period of investigation at harvest, sources of organic manure and weeding frequency influenced weed competition index significantly as showed in Table 6. Poultry manure + weed free plot, cow dung + weed free plot and Goat dropping + weed free plot has lower weed competition index compared to the result highest obtained with poultry manure + weeding at 2 WAT. The least weed competition index was observed with application of cow dung + weeding at 4 WAT and Goat dropping + weeding at 4 WAT that recorded negative.

Table 3. Common weed species and the level of infestation

| Common weed species                      | Level of infestation |
|-----------------------------------------|----------------------|
| **Grasses**                             |                      |
| Eleusine indica Gaetn                   | ++                   |
| Eragrostis tenella (Linn.)              | +                    |
| Pteridium laxum sw                      | +                    |
| Panicum maximum jacq.                   | +                    |
| Pennisetum pedicellatum Trin           | ++                   |
| **Broadleaves**                         |                      |
| Synedrella nodiflora Gaertn             | +++                  |
| Gomphrena celosioides                  | +++                  |
| Tridax procumbens Linn                 | ++                   |
| Ipomoea asorifolia (Desr.)              | +                    |
| Ludwigia decurrens walt                | ++                   |
| Amaranthus spinosus linn               | ++                   |
| Commelila benghalensis L.               | ++                   |
| Sida acuta Burn. F                      | +                    |
| Hyptis suaveolens poit.                | +                    |
| Solanum nigrum L.                      | ++                   |
| Euphorbia hirta Linn                   | ++                   |
| Eclipta alba (L)                        | +                    |
| **Sedges**                              |                      |
| Cyperus esculentus                      | +++                  |
| Setaria barbata (Lam.) kunth            | ++                   |
| Mariscus longibracteatus cherm         | +                    |
| Echinochloa aegyptium                   | +                    |
| Leucas martinicensis (jacq.) Ait. F    | +                    |

*The higher level of infestation is +++*, *the moderate ++* and *low level infestation is +*

Table 4. Influence of sources of organic manure and weed frequency on mean weed dry weight of jute mallow at 2, 4, 6 WAT and harvest during 2018 and 2019 dry season periods at Afaka

| Treatments                                      | Weed dry weight (g/m²) |
|------------------------------------------------|------------------------|
|                                                 | 2 WAT      | 4 WAT      | 6 WAT      | At harvest |
| Poultry manure + weed free                      | 1.56cd     | 1.95c      | 2.04b      | 2.13de     |
| Cow dung + weed free                            | 1.86cd     | 1.36c      | 1.50b      | 1.63e      |
| Goat dropping + weed free                       | 1.43d      | 1.34d      | 2.94b      | 2.00de     |
| Poultry manure + weeding at 2 WAT               | 1.70cd     | 2.20c      | 2.82d      | 3.39bc     |
| Cow dung + weeding at 2 WAT                      | 1.96bcd    | 2.06c      | 3.00b      | 3.98b      |
| Goat dropping + weeding at 2 WAT                 | 1.97bcd    | 1.33d      | 2.38b      | 3.72bc     |
| Poultry manure + weeding at 4 WAT               | 1.53bc     | 2.33c      | 1.66b      | 2.92bcd    |
| Cow dung + weeding at 4 WAT                       | 1.53bc     | 3.26b      | 1.94b      | 2.78cd     |
| Goat dropping + weeding at 4 WAT                 | 2.85b      | 3.33b      | 2.31b      | 2.92bcd    |
| No organic manure + no weeding                   | 3.76a      | 4.36a      | 4.77a      | 8.69a      |
| SE±                                             | 0.01       | 0.01       | 0.03       | 0.02       |

*Week after transplanting* "Mean followed by similar letter are not significantly different at p<0.05 using Duncan Multiple Range Test"
Table 5. Influence of sources of organic manure and weeding frequency on weed control index of jute mallow at 2, 4, 6 WAT and harvest during 2018 and 2019 dry season periods at Afaka

| Treatments                          | Weed control index (%) |     |     |     |
|-------------------------------------|------------------------|-----|-----|-----|
|                                     | 2 WAT                  | 4 WAT | 6 WAT | At harvest |
| Poultry manure + weed free          | 79.67a                 | 49.28ab | 91.92a | 82.25ab   |
| Cow dung + weed free                | 50.23ab                | 89.00a  | 89.47a | 92.35a    |
| Goat dropping + weed free           | 80.94a                 | 49.86ab | 80.88ab | 85.11ab   |
| Poultry manure + weeding at 2 WAT   | 70.82ab                | 54.25ab | 59.22de | 71.86de   |
| Cow dung + weeding at 2 WAT         | 39.87b                 | 68.02ab | 48.65e  | 64.53d    |
| Goat dropping + weeding at 2 WAT    | 59.70ab                | 89.93a  | 69.58bcd | 67.34d    |
| Poultry manure + weeding at 4 WAT   | 78.11a                 | 67.14ab | 76.69bc | 76.95bc   |
| Cow dung + weeding at 4 WAT         | 43.32b                 | 32.52bc | 71.03bc | 78.93bc   |
| Goat dropping + weeding at 4 WAT    | 52.83ab                | 67.47ab | 67.34cd | 77.60bc   |
| No organic manure + no weeding      | 0.00c                  | 0.00c   | 0.00e  | 0.00e     |
| SE±                                 | 0.13                   | 0.16    | 0.08   | 0.07      |

1Week after transplanting *Mean followed by similar letter are not significantly different at p≤0.05 using Duncan Multiple Range Test

Table 6. Influence of sources of organic manure and weeding frequency on weed competition index of jute mallow at harvest 2018 and 2019 dry season periods at Afaka

| Treatments                          | Weed competition index at harvest (%) |
|-------------------------------------|-------------------------------------|
|                                     | 2 WAT                 | 4 WAT                 | 6 WAT                 |
| Poultry manure + weed free          | 0.00d                 | 0.00d                 | 0.00d                 |
| Cow dung + weed free                | 0.00d                 | 0.00d                 | 0.00d                 |
| Goat dropping + weed free           | 0.00d                 | 0.00d                 | 0.00d                 |
| Poultry manure + weeding at 2 WAT   | 5.20a                 | 3.78c                 | 3.37c                 |
| Cow dung + weeding at 2 WAT         | 3.78c                 | 3.78c                 | 3.78c                 |
| Goat dropping + weeding at 2 WAT    | 3.78c                 | 3.78c                 | 3.78c                 |
| Poultry manure + weeding at 4 WAT   | 3.37c                 | 3.37c                 | 3.37c                 |
| Cow dung + weeding at 4 WAT         | -22.00e               | -21.39f               | -21.39f               |
| Goat dropping + weeding at 4 WAT    | -21.39f               | -21.39f               | -21.39f               |
| No organic manure + no weeding      | 4.40b                 | 4.40b                 | 4.40b                 |
| SE±                                 | 0.07                  | 0.07                  | 0.07                  |

1Week after transplanting *Mean followed by similar letter are not significantly different at p≤0.05 using Duncan Multiple Range Test

Table 7. Influence of sources of organic manure and weeding frequency on mean cumulative leafy yield of jute Mallow during 2018 and 2019 dry season periods at Afaka

| Treatments                          | Cummulative leafy yield (kg) |
|-------------------------------------|------------------------------|
| Poultry manure + weed free          | 236.00a                      |
| Cow dung + weed free                | 161.66d                      |
| Goat dropping + weed free           | 146.66e                      |
| Poultry manure + weeding at 2 WAT   | 132.00f                      |
| Cow dung + weeding at 2 WAT         | 154.33de                     |
| Goat dropping + weeding at 2 WAT    | 136.66f                      |
| Poultry manure + weeding at 4 WAT   | 223.33b                      |
| Cow dung + weeding at 4 WAT         | 181.33c                      |
| Goat dropping + weeding at 4 WAT    | 178.00c                      |
| No organic manure + no weeding      | 111.33g                      |
| SE±                                 | 0.16                         |

1Week after transplanting *Mean followed by similar letter are not significantly different at p≤0.05 using Duncan Multiple Range Test
3.7 Cumulative Leafy Yield
At harvest, significant cumulative leafy yield was obtained during the investigation period. Poultry manure + weed free plot produced the highest cumulative leafy yield compared to all the yield that were higher than the least obtained with no nutrient + no weeding. Number of leaves was recorded in plot treated with cow dung + weeding at 4 WAT and the control plot respectively throughout the investigation period. All other treatment gave statistically comparable number of leaves to the maximum obtained in plot treated with poultry manure + weed free and weeding at 2 WAT respectively and goat dropping + weeding at 4 WAT.

3.8 Discussion
The incidence of prominent weed species observed could be due to their growth habit, as perennials that are often longer after growth of crop. Typical example of perennials weeds observed *Gomphrena celosioides*, *Ipomoea asorifolia* (Desr.), *Commelina benghalensis* L, *Panicum maximum* Jacq, *Cyperus esculentus* while the other weeds are annual example are *Tridax procumbens* Linn, *Euphorbia hirta* Linn, *Eleusine indica* Gaatt. Furthermore, proliferation of weed could have resulted in lower weed control indices obtained on cow dung and weedy regime. This could be due to increased weed seeds that passed through the ruminant gut without being digested, which was repeated to contribute to high weed incidence as the seed of plants grazed or browsed by cow may still have been viable even after passing through it digestive system [3]. Akobundu [17] also reported that use of organic manure influenced weed growth as it introduced weed to the farm. Weed is generally more productive in fertile soil, leading to more seeds being added to the soil seed bank [18]. The higher weed control index obtained with goat dropping and poultry manure and weed free plots could be due to the effectiveness of the weed control that ensured negation of reducing effect of weed. The minimum weed competition index obtained with poultry manure + weeding at 4 WAT and goat dropping + weeding at 4 WAT, could be an indication that detrimental effects of weed crop competition was reduced during the treatment period. It could also be associated with the ability of the weeds to have completed its life cycle. In effect, weed could have been smothered with better growth performance of the crop. Similar trend was observed with weed dry weight especially at 6 WAT that experienced lower weed dry weight with all the treatment except weedy check. The competitive ability of jute mallow could be as a result of the morphological characteristic of the crop with ability to branch profusely and being deep.

4. CONCLUSION AND RECOMMENDATION
In conclusion the result obtained from the study showed that poultry manure at 4 tons /ha + weed free resulted in mean higher cumulative yield of jute mallow (*Corchorus olitorious*) compare to all other treatments due to lower weed infestation. Farmers are therefore encourage adopting the use of poultry manure as source of organic manure plus weed free for cultivation of jute mallow, since it had low weed competition and produce the highest mean cumulative yield value.

COMPETING INTERESTS
Authors have declared that no competing interests exist.

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