Original Research Article

Effects of Organic Manure Source and Weeding Frequencies on Growth Parameters of Jute Mallow (*Corchorus olitorious*)

ABSTRACT

Field trials were carried out during 2018 and during 2019 dry season periods at Federal College of Forestry and Mechanization Afaka Kaduna, located between latitude 10^0 35"N and longitude 007^0 21"E at altitude 644m above sea level, to determine the effects of organic manure source and weeding frequencies on growth parameters 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 2WAT, cow dung + weeding at 2WAT, goat dropping + weeding at 2WAT, poultry manure + weeding at 4WAT, cow dung + weeding at 4 WAT, goat dropping + weeding at 4WAT and no organic manure application + no weeding which were laid out in a randomize complete block design (RCBD) and replicated 3 times The growth parameters observed and measured were crop vigour score, plant height, shoot diameter, number of leaves and number of primary branches. Result of the study showed that at harvest (8 WAT) all the treatments significantly affected the vigour of jute mallow crop and gave comparable score than the least observed with no nutrient + no weeding as control. The result revealed that plant growth at harvest exhibited significantly taller plant with application of poultry manure + weeding at 2 WAT. In conclusion the result obtained from the study showed that poultry manure at 4 tons /ha + weeding at 4 WAT resulted in taller plant height, wider shoot diameter, increased number of leaves, number of branches than all other treatment due to lower weed infestation, it is therefore recommended as the best treatment combination to obtained the best growth rate of jute mallow.

Keywords: Effects, Organic manures source, Weed frequencies, Growth parameters, Jute mallow.

1.0 INTRODUCTION

Weed is defined as a valueless plant growing wild especially one that grows in cultivated ground to the exclusion or injury of the desired crop (Anonymous 2017). The removal of weed is useful because these unwanted plants compete with the crop for space, light, water and nutrients. According to DAS (2011), controlling composite culture of weeds in the crop field is a difficult task since it is governed by a host of factors namely soil, temperature, rainfall, relative humidity, age of weed flora and their composition/distribution. It has been observed that weed becomes detrimental to crop growth if weeds emerge earlier than crop. However, where weed and crop germinate together, the nature, species, distribution, population of weeds and crops ultimately determine the magnitude and extent of competition. There are various methods of weed control namely physical, cultural, chemical, mechanical, soil solarisation etc. Weeding is an important control method practiced in many crops. Hand pulling of weed is considered superior to herbicide on yield output of a crop although herbicide control weeds more effectively. The time of hand weeding is as important as the time of herbicide application, since late hand weeding cannot compensate for yield loss (Fryer, 1983). A good crop is the best weed killer therefore farmers should adopt a good crop husbandry. Cultural method of weed exploits crop competitive behaviour, it's environment and crop management practices. It is pertinent that crop husbandry be adhered to according to recommendation in order to minimise losses in yield. It has been suggested that application of required quantity of organic manure (Farmyard manure, compost, goat/sheep/poultry manure, cow dung etc.) That are environmentally friendly (Lado *et al*.2010) be recommended for good growth

Organic farming is defined as the production system which avoids or largely excludes the use of synthetically compounded fertilizers, pesticides, growth regulator and livestock feed additives. It is one of the fastest growing sectors of agriculture worldwide. It relies upon crop residues, animal manures, green manure, off-farm waste, pest, diseases and weeds. Organic farming methods are

widely used in under developed and developed countries. Organic farming is one of the ways to maintain soil health while retaining the productivity levels. The use of organic manure has been reported to be safer, healthier, faster, having nutritional quality and devoid of health hazards. Animal droppings such as poultry manures, cattle dung, sheep and goat are useful in supplementing or replacing fertilizer (Cecil *et al*; 1977).

Corchorous olitorius belongs to the family of *Malvaceae;* it is also known as Tossa jute. It is a vegetable food to many. It is grown in Nigeria and many tropical countries for its nutritious leaves. It is widely used as pot-herb. It is used for soup and eaten with starchy staple foods (Schippers, 2000, Ajayi *et al*; 2016). *C.olitorius* is mainly known for its fibre product, jute and leafy vegetables. The leaves are a rich source of iron, protein, calcium, thiamine, riboflavine, folate and dietary fibre (Palada and Chang, 2003). Root scrapping of jute mallow is used for the treatment of toothache and root decortation as tonic Schippers, 2000). The dark green leaves of *C. Olitorius* have varying proportion of Ca, Fe, B-corotene, Vitamin C, fiber, and protein is required for health (Schippers, 2000). Vegetable plays significant role in our diet as such required macro and micronutrients for the plant growth.

Sandy soils and most tropical soils have inherent low nutrient content. The high rate of leaching and soil erosion and low litter deposits has been the reason for low soil fertility resulting in low yield of most crops. According to Olaniyi (2017) agricultural soils have been modified from their natural states through human activities and most agricultural practices have impact on biological communities of the soil by damaging their habitat and disrupting their activities. Organic farming is a production system which avoids or largely excludes the use of synthetic or organic fertilizers, pesticides and growth regulators. Application of organic manure has been recommended for improvement of soil fertility in the tropics on various crops. However, application of organic manure increase weed population (DAS, 2011), and serve as weed seed store bank (Belay*et al*., 2001). Weed proliferation from introduced organic manure has been ignored over time. More so, emphasis on weed control measure has not given desired result as weedy check rebuild on crops have failed to give high crop yield. In addition, vegetables are poor weed competitors. (Das, 2011). There is paucity of information on organic manure and weed challenges in Jute mallow.

Horticultural leafy crops are good sources of energy, minerals and vitamins. *Corchorus olitorius* is one of such leafy vegetable. It's highly nutritional and a common vegetable grown in most urban cities in south west and north central Nigeria. The production of these vegetable requires high level of soil nutrient which is not readily available. Efforts to improve the fertility level have necessitated the use of organic manure which is available cheap and require limited technology in application. Over time, most farmers ignore weed proliferation from the use of organic nutrient. According to Charonjeet and Gayatri (2016), application of organic or inorganic fertilizer has definite influence on weed dynamics and weed dispersion attributes. Similarly, application of organic manure to the soil has been recommended to maintain soil fertility for a longer time than synthetic fertilizers. In Northern guinea savannah, several researchers have reported on the improvement of soil through the use of organic manure (Olorukooba *et al*., (2011) Emeghara *et al*., (2016) Olorukooba *et al*., (2017). However, such research excludes the proliferation of weed seeds on the farm thereby limiting the yield and increasing the production cost. The study therefore aimed at examining the effects of organic manure source and weeding frequencies on growth parameters of jute mallow (*Corchortus olitorious*).

2.0 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 10^0N 35'and Longitude 007^0E 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 1.2m x 1.2m 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 (4WAT) 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 2WAT, cow dung plus 2WAT, goat dropping plus 2WAT, poultry

manure plus weeding at 4WAT, cow dung plus 4WAT, goat dropping plus 4WAT 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 2m × 2m 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 24hrs. It was drained out for easy seed collection, treated with Apron star at 2kg 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 4tonne/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 25cm x 25cm in the evening.

2.3.8 Weed control

Manual weed control was done according to treatment specification at 2 WAT, 4WAT, 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 Crop Growth Indices.

2.4.1 Crop vigour score

The vigourosity of the plant was ascertained using a scale 0f 1-10 by observing the healthiness and unhealthiness of the plant at 2, 4, 6 WAT and at harvest.

2.4.2 Plant height

Four plant samples was tagged and the subtending tip to the base of the plant was measured using metre-rule to determine the height of plant at 2, 4, 6 WAT and at harvest. The mean was determined and recorded accordingly.

2.4.3 Shoot diameter

The shoot diameter per plant was determined using vernier calliper on the four tagged plants at 2, 4, 6 WAT and at harvest. The mean was determined and recorded accordingly.

2.4.4 Number of leaves

The number of leaves per plant was counted and recorded at 2, 4, 6 WAT and at harvest.

2.4.5 Number of primary branches.

The number of primary branches was counted per tagged plants at 4 WAT and 6 WAT. The mean was determined and recorded.

2.5 Statistical Analysis

The data was subjected to statistical analysis of variance (ANOVA) as suggested by Snedecor and Cochran (1996). Mean separation were carried out to compare the level of significance using Duncan Multiple Range Test as described by Duncan (1955).

3.0 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 (H_2O) 6.20 and pH ($cacl_2$ $2H_2O$) 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 below

Table 1: The physio-chemical properties of the soil at the experimental site

Soil properties	Mean **value (0.15cm Depth)**
Clay (%)	13.00
Silt (%)	23.00
Sand (%)	63.00
Textural class	Sandy loam
PH (H_20) and ($Cacl_2 2H_20$)	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

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 2: Nutrient composition of different Organic manure

Content (%)	Poultry	Cow dung	Goat
N	2.56	2.2	2.02
P	0.40	0.23	0.21
K	0.70	0.08	0.09
Na	0.07	0.08	0.08
Ca	4.0	0.41	1.42
Mg	1.1	1.21	2.22
Zn	0.03	0.01	0.02

3.3 Crop Growth Parameters

3.3.1 Crop vigour score

The effects of source of organic manure on mean crop vigour score at 2,4,6 weeks after transplanting (WAT) and at harvest on Jute mallow at Afaka is shown In Table 3. Crop vigour score of Jute mallow

was significantly affected by sources of nutrient at all the sampling periods. Application of goat dropping at 4 tonnes/ha + weed free plot, poultry manure + weeding at 2 WAT, goat dropping + weeding at 4 WAT all produced significantly higher vigorous crop and were comparable to cow dung + weed free plot, cow dung + weeding at 2 WAT, goat dropping +weeding at 2 WAT, cow dung + weeding at 4 WAT. Other treatment had higher vigorous crop compared to the control that recorded the least vigorous crop. At 4 WAT, application of cow dung + weeding at 4 WAT, poultry manure + weeding at 2 WAT, goat dropping and weeding at 2 and 4 WAT which gave higher vigorous score and was comparable to all other treatment except no nutrient + weeding check with the least vigorous crop. Sources of organic manure and weeding frequency had better vigour score at 6 WAT on all the treatment investigated compared to the control plot with the least vigour score. At harvest (8 WAT) all the treatments significantly affected the vigour of jute mallow crop and gave comparable score than the least observed with no nutrient + no weeding as control.

3.3.2 Plant height

During the sampling periods of 2, 4, 6 and at harvest, sources of organic manure and weeding frequency had significant influence on plant height of jute mallow as contained in Table 4. At 2 WAT, application of poultry manure + weeding at 4 WAT gave taller plants and was comparable to all other treatment combination except cow dung + weed free plot, goat dropping + weeding at 2 WAT, cow dung + weeding at 4 WAT and the control that had shorter plants. At 4 WAT poultry manure + weed free plot produced taller plant, followed by goat dropping + weed free compared to all other treatments that produced shorter plant and were at par to the shortest from no nutrient + weedy check. The observation carried out at 6 WAT indicated that goat dropping + weed free plot gave significantly taller plants and was comparable to poultry manure + weed free plot, poultry manure + weeding at 2 and 4 WAT, goat dropping + weeding at 2 and 4 WAT respectively. Shorter plants were observed on all the cow dung plots + weed free, weeding at 2 and 4 WAT and the control plot. The plant growth at harvest exhibited significantly taller plant with application of poultry manure + weeding at 2 WAT. All other treatment gave shorter plant height and was comparable to the least recorded in the control.

Table3 : Effects of source of organic manure and weeding frequencies on crop vigour score of jute mallow at 2, 4, 6 WAT and harvest during 2018 and 2019 dry season periods at Afaka.

Treatments	Crop vigour score 2WAT	4WAT	6WAT	Harvest
Poultry manure + weed free	4.00b	5.00ab	5.33a	5.66a
Cow dung + weed free	5.00ab	3.66bc	5.33a	6.00a
Goat dropping + weed free	6.33a	6.00ab	7.33a	7.00a
Poultry manure + weeding at 2 WAT	6.33a	6.33a	6.33a	7.00a
Cow dung + weeding at 2 WAT	5.33ab	5.66ab	5.00a	6.33a
Goat dropping + weeding at 2 WAT	5.00ab	633a	6.66a	6.33a
Poultry manure + weeding at 4 WAT	4.00b	4.66ab	5.66a	6.00a
Cow dung + weeding at 4 WAT	5.66ab	6.33a	6.66a	6.33a
Goat dropping + weeding at 4 WAT	6.00a	6.66a	7.33a	8.00a
No nutrient + no weeding	1.33c	2.00c	2.00b	2.66b
SE±	0.03	0.03	0.04	0.04

[1]Week after Transplanting [2]Mean followed by similar letter are not significantly different at p≤0.05 using Duncan Multiple Range Test.

Table 4: Effects of source of organic manure and weeding frequencies on plant height of jute mallow at 2, 4, 6 WAT and harvest during 2018 and 2019 dry season periods at Afaka.

Treatments	Plant height (cm) 2WAT	4WAT	6WAT	Harvest
Poultry manure + weed free	17.30ab	31.60a	32.71ab	54.55a
Cowdung + weed free	12.49bcd	23.37bcd	25.49bcd	43.87bcd
Goat dropping + weed free	18.01ab	25.55b	34.77a	43.83bcd
Poultry manure + weeding at 2 WAT	16.21abc	25.29bc	31.35abc	49.38ab
Cowdung + weeding at 2 WAT	13.38abcd	23.04bcd	26.00bc	41.50cde
Goat dropping + weeding at 2 WAT	11.16cd	21.55bcd	28.66abc	38.66de
Poultry manure + weeding at 4 WAT	18.78a	23.16bcd	30.50abc	46.16bc
Cowdung + weeding at 4 WAT	12.89bcd	20.33cd	23.69cd	36.69e
Goat dropping + weeding at 4 WAT	14.12abcd	23.98bcd	31.18abc	37.30e
No nutrient + no weeding	10.24d	19.62d	19.93d	27.65e
SE±	0.05	0.05	0.06	0.05

[1]week after transplanting [2]mean followed by similar letter are not significantly different at p≤0.05 using Duncan multiple range test

3.3.3 **Shoot diameter**

Sources of organic manure and weeding frequency influence on shoot diameter of jute mallow during the dry season of 2018 and 2019 at Afaka are shown in Table 5. At 2 WAT, all the treatment had significantly wider shoot diameter comparable to the widest obtained with poultry manure + weed free plot. The least shoot diameter was observed with the control of no nutrient + weedy check comparable only to cow dung + weeding at 2 WAT. At 4 WAT goat dropping + weed free plot and poultry manure + weeding at 2 WAT gave wider shoot diameter and was comparable only to the minimum obtained from the control plot 6 WAT investigation of shoot diameter gave wider diameter using poultry manure + weeding at 2 WAT and was comparable to cow dung + weed free, goat dropping + weed free, poultry manure + weeding at 4 WAT and cow dung + weeding at 4 WAT respectively. all other treatment had narrow shoot diameter and was comparable to no nutrient + no weeding. At harvest poultry manure + weeding at 2 WAT resulted in significantly wider shoot diameter and was comparable to all other treatment sources of organic manure and weeding frequency except no nutrient + no weeding that narrow shoot diameter that was also comparable to cow dung + weed free and goat dropping + weeding at 4 WAT.

3.3.4 Number of leaves

The result obtained during the period of investigation at 2,4,6 and at harvest from sources of organic manure and weeding frequency on number of leaves indicated that goat dropping + weed free plot gave significant higher number of leaves and was comparable to all other treatment except cow dung + weed free and the control that resulted in significantly lower number of leaves as shown in Table 6.

3.3.5 Number of primary branches

At 2 WAT, number of primary branches produced did not differ significantly with application of different organic manure and weeding frequency (Table 7). At 4 and 6 WAT, goat dropping + weed free plot gave higher number of primary branches compared to other treatment considered. It was however comparable to all other treatment except cow dung + weed free plot and control at 4 WAT. At harvest, cow dung + weed free, Poultry manure + weeding at 4 WAT and goat dropping + weeding at 4 WAT had higher number of primary branches that was comparable to all other treatment except the least observed with no nutrient + no weeding.

Table 5: Effects of source of organic manure and weeding frequencies on shoot diameter of jute mallow at 2, 4, 6 WAT and harvest during 2018 and 2019 dry season periods at Afaka.

	Shoot diameter (cm)			
Treatments	**2 WAT**	**4WAT**	**6WAT**	**Harvest**
Poultry manure + weed free	1.70a	2.62ab	2.43bc	3.06ab
Cow dung + weed free	0.61ab	2.29bc	2.61ab	2.60bc
Goat dropping + weed free	1.40ab	2.87a	2.65ab	2.98ab
Poultry manure + weeding at 2 WAT	0.75ab	2.85a	2.95a	3.12a
Cow dung + weeding at 2WAT	0.26b	2.37bc	2.46abc	2.73ab
Goat dropping + weeding at 2 WAT	0.49ab	2.30bc	2.39bc	2.75ab
Poultry manure + weeding at 4 WAT	1.05ab	2.70ab	2.77ab	3.00ab
Cow dung + weeding at 4 WAT	0.44ab	2.54ab	2.70ab	2.90ab
Goat dropping + weeding at 4 WAT	0.63ab	2.35bc	2.29bc	2.59bc
No nutrient + no weeding	0.18b	2.00c	2.09c	2.24c
SE±	0.02	0.01	0.01	0.01

[1]week after transplanting [2]mean followed by similar letter are not significantly different at p≤0.05 using Duncan multiple range test

Table 6: Effects of source of organic manure and weeding frequencies on number of leaves of jute mallow at 2, 4, 6 WAT and harvest during 2018 and 2019 dry season periods at Afaka.

	Number of leaves			
Treatments	**2WAT**	**4WAT**	**6WAT**	**Harvest**
Poultry manure + weed free	12.58ab	65.83a	67.08ab	69.75ab
Cow dung + weed free	9.83b	45.91abc	47.66bcd	50.75bc
Goat dropping + weed free	15.08a	55.58ab	70.16a	71.66a
Poultry manure + weeding at 2 WAT	3.33ab	67.41a	69.16a	71.08a
Cow dung + weeding at 2 WAT	9.50b	50.25abc	50.25abcd	52.91abc
Goat dropping + weeding at 2 WAT	12.16ab	52.83abc	54.16abc	56.16abc
Poultry manure + weeding at 4 WAT	13.25ab	48.25abc	51.00abc	53.25abc
Cow dung + weeding at 4 WAT	12.25ab	36.08bc	38.00cd	41.25c
Goat dropping + weeding at 4 WAT	13.08ab	59.50a	51.33abcd	55.08abc
No nutrient + no weeding	8.58b	32.08c	30.91d	37.41c
SE±	0.05	0.11	0.11	0.10

[1]week after transplanting [2]mean followed by similar letter are not significantly different at p≤0.05 using Duncan multiple range test

Table 7: Effects of source of organic manure and weeding frequencies on number of primary branches of jute mallow at 2, 4, 6 WAT and harvest during 2018 and 2019 dry season periods at Afaka.

	Number of branches			
Treatments	**2WAT**	**4WAT**	**6WAT**	**Harvest**
Poultry manure + weed free	4.58a	12.91abc	14.08ab	15.16ab
Cowdung + weed free	1.91a	10.66bc	12.25ab	18.16a
Goat dropping + weed free	5.33a	13.75a	15.50a	17.75ab
Poultry manure + weeding at 2 WAT	3.83a	13.08ab	14.50ab	17.91ab
Cowdung + weeding at 2 WAT	3.25a	11.00abc	12.91ab	17.66ab
Goat dropping + weeding at 2 WAT	2.25a	11.58abc	13.25ab	17.41ab
Poultry manure + weeding at 4 WAT	5.25a	11.91abc	13.00ab	18.25a
Cowdung + weeding at 4 WAT	2.25a	11.08abc	12.66ab	17.91ab
Goat dropping + weeding at 4 WAT	2.16a	12.08abc	13.33ab	18.91a
No nutrient + no weeding	1.91a	10.08c	11.58b	13.33b
SE±	0.04	0.04	0.04	0.05

[1]week after transplanting [2]mean followed by similar letter are not significantly different at p≤0.05 using Duncan multiple range test

3.4 Discussion

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 rooted. The ability of the crop to compete with weed could allow better growth performance with enhanced growth parameters of plant height, number of leaves, number of branches and shoot diameter with goat dropping + weeding at 4 WAT thereby resulted in higher leafy yield. Several workers have reported on improved crop yield where weed crop competitive ability was reduced. The findings corroborate with Gill and Vijayakumar, (1969) whereby season long weed control could indicate superiority of the treatment than even weed free check. The slow growth of the crop encountered could be ability to grow fast at early stage compared to weeds that are often aggressive in growth there by making the vegetable crop poor competitive. Das (2011) had reported that vegetables are generally poor competitors of weed, due to the initials slow growth and being shoot statured.

4.0 CONCLUSION AND RECOMMENDATION

The result obtained from the study showed that poultry manure at 4 tons /ha + weeding at 4 WAT resulted in taller plant height, wider shoot diameter, increased number of leaves, number of branches than all other treatment due to lower weed infestation. From the result obtained from this trial, if a farmer is given choice from sources of organic manure of goat droppings, cow dung and poultry manure, poultry manure at 4 tons /ha plus weeding at 4 weeks per hectare could be recommended, since it had higher nutrient content and lower weed infestation and weed competition.

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