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Original Article

Influence of different rates of poultry manure and weeding interval on crop vigor and yield of turmeric (*Curcuma longa* L.) at Afaka Kaduna, Nigeria

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ABSTRACT

A field experiment was carried out at the Department of Crop Science Experimental Farm Site, Federal College of Forestry, Afaka, Kaduna, Nigeria to determine the influence of different rates of poultry manure and weeding interval on crop vigor score and yield of turmeric. The experiment was carried out between 2019 and 2020 cropping/rainy seasons. Turmeric was subjected to eleven different rates of poultry manure and weeding interval regimes using randomized complete block design with three replications. Data were collected on weed samples on the experimental field, growth parameters such as crop vigor score, and yield parameters such as number of off shoot produced and dry rhizomes weight. Data collected were subjected to analysis of variance and the mean separated using Duncan multiple range test. The result showed that the weed cover score favors the plants that had no application of poultry manure and no weeding. The result also revealed that turmeric crop vigor score was significantly ($P < 0.05$) affected by weed control method regimes at 4 and 12 weeks after transplanting (WAT). Plant height was also significantly ($P < 0.05$) affected by treatment combination regimes at 4, 8, 12, and 16 WAT. The result also revealed that yield in term of number of number of off shoot and dry weight of turmeric rhizome were also significantly ($P < 0.05$) affected by the treatment combination regimes at harvest with highest yield of 15.33 g/m^2 recorded at harvest that was by the application of 8$^{th\text{-}1}$of poultry manure + weeding at 4 and 12 WAT and statistically significantly difference from all the other treatment combinations, while no weeding no poultry manure treatment gave the least (2.00 g/m^2). The study, therefore, recommends the use of 8$^{th\text{-}1}$of poultry manure + weeding at 4 and 12 WAT to farmers in the ecological zone of study area for better yield of turmeric in their farms.

Keywords: Crop vigor, influence, poultry manure, turmeric, weed cover and yield, weeding interval

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INTRODUCTION

The genus curcuma, one of the most important perennial monocotyledon members of family Zingiberaceae, is composed of approximately 110 species.[1] The genus name originated from the sanskirt "kunkuma." It is commonly grown in tropical Asia and the Asia-Pacific areas. *Curcuma longa* (L.) is the most important and famous species, generally known as turmeric. It has been shown to have various uses. It also contains essential oil responsible for flavor and preservation quality. The yellow color of turmeric is due to presence of crystalline substance known as curcumin. Turmeric rhizome is also rich in aromatic oil called tumerol, which finds its uses in food and pharmaceutical industries. At present, India is the major producer of turmeric, and it is also the major user of its own production. Nigeria is the fourth largest producer of turmeric with about 3% of the global annual production.[2]

Turmeric has a long history of medicinal use in South Asia and was widely used in Ayurvedic, Siddha, and Chinese traditional medical systems.[3] There are more than 100 species of *Curcuma* and many of them used medicinally. The extracts from *C. longa* are abundant; there are at least 20 compounds which are antibiotic, 14 are known as cancer preventives, 12 are anti-tumor, 12 are anti-inflammatory, and there are at least ten different anti-oxidants. In fact, 326 biological activities of

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turmeric are known.[4] Turmeric has antiviral, antifungal, wound healing, and antimicrobial properties. Turmeric is prescribed for the treatment of many medicinal problems ranging from constipation to skin diseases. It serves as digestive aid and treatment for fever, inflammation, wounds infection, dysentery, arthritis, injuries, trauma, jaundice, heart diseases, and other liver problems. It could lower the risk for certain cancers by attacking free radicals.[5] It is relatively broad spectrum antifungal which exhibits antioxidant activity and protection from free radical damage. Curcuma also exhibits anti-tumor activities and prevent cancer. In fact dried rhizomes, turmeric powder (ground turmeric), curcumin, oleoresin, and volatile oil are the main ingredients used for medicinal purposes.[6] Many diseases such as Alzheimer's diseases, diabetes, cirrhosis, and colitis are caused by inflammation. Adding some components of turmeric into medicine can relieve the inflammation and treat these diseases eventually. There are multiple pathways by which curcumin is effective against inflammation. First, curcumin decreases the production of inflammatory substance. Second, it can enhance or extend the reaction of the body toward inflammation, specifically, increase the secretion of adrenal hormone and cortisol. Third, curcumin can promote circulation of toxic substance.

Numerous plant species are considered weeds in agronomic cropping systems. Weeds have many attributes undesirable to crop producers, not the least being the ability to reduce crop yields through competition for resources such as sunlight, water, nutrients, and space.[7] Weeds may harbor insects and provide a host for certain plant pathogens. Some weed species, such as wild garlic and eastern black nightshade, can reduce the quality of the harvested crop. Eliminating or reducing the deleterious effects of weeds on agronomic crops is the ultimate goal of weed management. Integrated weed management includes all practices that enhance a crop's competitive ability and decrease weeds' ability to reduce yield. Successful weed management requires identifying relevant species and understanding their biological characteristics so that management can be tailored to the weeds present in individual fields. Accurate identification is critical: identification of seedling weeds is necessary for selecting an appropriate post emergence herbicide, while identifying mature weeds often indicate, in which species will populate a particular field the following season.[8]

Organic farming practices use local available resources as such it becomes relevant to small scale farmers who produce for themselves and local markets. Organic manures can be used as an alternative to the inorganic fertilizers. They usually have relatively lower nutrient concentration, release nutrient rather slowly and steadily over a longer period, and also improve the soil fertility status by activating the soil microbial biomass.[9] Poultry manure is a good source of major mineral elements that are capable of enhancing soil fertility.[10] The fertility of the soil could be sustained with the addition of poultry manure; its application in the soil may contribute to combat soil organic matter decline and soil erosion.[11] Poultry manure, if properly handled, is the most valuable of all manures produced by livestock. It has historically been used as a source of plant nutrients and for soil amendment. It has been reported that 30% of nitrogen from poultry litter is in urea or ammonium form and hence readily available[10] Poultry manure also increased soil organic matter, nitrogen, pH, phosphorous, and cation exchange capacity.[10] It also has a fairly high nutrient composition when compared with other sources of animal manure. The quantity of NPK in the poultry manure in 1 tonne is considered to be 30 kg/ton N, 4 kg/ton P, and 24 kg/ton K, respectively.[12] This work was conducted to determine the influence of varying levels of poultry manure and weeding interval on crop vigor score and yield of turmeric rhizome.

MATERIALS AND METHODS

Experimental Site

The experiment was carried out at Afaka. It is situated in the northern guinea savannah ecological zone. Global positioning system of Afaka is in Igabi Local Government Area of Kaduna State and its geographical coordinates are as follows: 10° 39' 59" North and 7° 23' 16" East.

Soil Analysis

The soil sample was bulked, mixed thoroughly, and air dried in the Soil Science Laboratory. A composite soil sample was taken and analyzed for the determination of physical and chemical characteristics.

Poultry Manure Sampling Analysis

Sample of poultry manure of about 1 kg was taken from the decomposed sample collected from the college poultry farm within the premises. This was also air dried at room temperature in the Soil Science Laboratory workbench. The air dried sample was crushed and sieved, then poured into sealed, and marked envelope for routine chemical analysis.

Experimental Treatment and Design

The experiment consists of combination of two factors poultry manure and weeding intervals to give ten treatments and one control. Details are as follows:

1. 4 ton/ha of poultry manure + weeding interval at 3, 6, 9, and 12 WAT
2. 4 ton/ha of poultry manure + weeding interval at 4, 8, 12, and 16 WAT
3. 4 ton/ha of poultry manure + weeding interval at 3 and 9 WAT
4. 4 ton/ha of poultry manure + weeding interval at 4 and 12 WAT
5. 8 ton/ha of poultry manure + weeding interval at 3, 6, 9, and 12 WAT

6. 8 ton/ha of poultry manure + weeding interval at 4, 8, 12, and 16 WAT
7. 8 ton/ha of poultry manure + weeding interval at 3 and 9 WAT
8. 8 ton/ha of poultry manure + weeding interval at 4 and 12 WAT
9. 4 ton/ha of poultry manure + weed free plot
10. 8 ton/ha of poultry manure + weed free plot
11. No weeding No poultry manure.

Field Layout and Plot Size

The field layout comprises 2.25 m × 2.0 m plot dimension per treatment. The spacing of 25 cm was made between plots and 50 cm between replicate.

Experimental Design

The experimental design was laid out on the basis of Randomized Complete Block Design (RCBD), all treatment were replicated 3 times.

Nutrient Application

Poultry droppings removed from college poultry farm to the dump pit were collected, mixed thoroughly, and bagged. It was placed under the shade for 6 weeks to enable decomposing of the droppings to manure. It was broken to fine tilth. Poultry manure at the treatment rates of 4t/ha and 8t/ha, respectively, was applied to the marked plots by broadcasting manually. It was incorporated within the soil and slightly watered to ensure uniformity in spread.

Cultural Practices

Seed and seed treatment

Turmeric seed was purchased from reputable Kawo market seed shop. This was cut to 5 cm uniform size with two to three nodes. The seeds were treated with apron star at 10g/3kg seed in a gourd and were mixed thoroughly.

Land preparation

The site was cleared of debris, tilth and prepared by ploughing, harrowing, and ridging. The plot was demarcated into rows of inter-row and intra-row spacing of 45 cm by 25 cm, respectively, making a total of 5 rows with 8 plant per row.

Watering

Watering of the field to field capacity was done using watering can to allow the release of nutrient into the soil. This was before transplanting.

Transplanting

Planting was done with treated seed setts on the prepared land. Rhizome sets of uniform of 5 cm length with 3–5 nodes. The setts were pre sprouted by covering with moist sack underneath the tree with shade for 4 weeks before transplanting of seedling was carried out at 5 weeks after sowing by selecting the vigorous and uniform size. This was done in the early morning, hole was dug to 5 cm depth, and the seedling transplanted at spacing of 45 cm * 25 cm.

Nursery preparation

Nursery beds were prepared close to the experimental field; dimension of 1.5 m × 1.5 m was measured.

Weed control

Manual weed control was done by hoeing at the recommended treatments 3, 4, 6, 8, 12, and 16 WAT on specific plots only. Weed free plot was weeded throughout the experimental period. Un-weeded plot was kept weeded throughout.

Harvesting

Turmeric was harvested at 7 months after planting. Harvested rhizomes are cleaned of mud and other extraneous matter adhering to them. The harvested rhizomes were weighed per plot using Salter scale.

Observations and Data Collection

Weed cover score

The weed coverage on each plant was observed usually using a scale of 1–10, where 1 indicated least weed cover and 10 maximum weed cover during each sampling period.

Crop vigor score

A scale was considered on the assessment of vigorosity of the plants at 4, 8, 12, and 16 WAT. Where 1 represented the least vigorous plant and 9 represented most vigorous plant.

Number of off-shoot

Number of plant off shoot was observed manually and counted per three tagged plants and mean recorded.

Dried rhizome yield

This was determined by taking dried weight of turmeric rhizome per plot size and recorded per hectare. Initially, the rhizome was cleared of soil particles.

Statistical analysis

Data collected were subjected to statistical analysis using analysis of variance as described by Snedecor and Cochran (1994).[13] Mean was separated according to Duncan multiple range test as suggested by Duncan (1955).[14]

RESULTS AND DISCUSSION

Nutrients Analysis

The result of soil sample and poultry manure analysis at the experimental site are as contained on Table 1, on study carried out on influence of poultry manure and weeding interval on the growth and yield of turmeric during 2019 and 2020 rainy seasons at Afaka. The $_{P}$H determination was carried out using the $_{P}$H meter at 25°C showed that the $_{P}$H is 6.40 and 7.85 for soil and

Table 1: The physicochemical characteristics of soil sample, poultry manure on influence of poultry manure, and weeding regime on turmeric (*Curcuma longa* L.) during sample period of 2019 and 2020 rainy seasons at Afaka

Chemical Characteristic	Soil	Poultry manure
P^H (H_2O)	6.40	7.85
Total Nitrogen (%)	0.03	1.26
Calcium (cmol/kg) (%)	0.71	0.52
Magnesium (cmol/kg) (%)	0.06	0.08
Organic Matter (%)	0.65	6.69
Organic Carbon (%)	0.38	3.87
Potassium (K_2O%)	0.03	0.21
Phosphorus (mg/kg)		7.41
Exchangeable acidity (cmol/kg)	0.50	
Effective cation exchange capacity (cmol/kg)	1.35	
Electrical Conductivity (ds/m)	0.09	
Sand	80.40	
Clay	3.60	
Silt	16.00	
Textural Class	Loamy sand	

poultry manure, respectively, while cumulative total nitrogen was 0.03% from soil to 1.26% for poultry manure, organic matter is 0.65% and 6.69%, respectively. Others are organic carbon 0.38% and 3.87%. Potassium (k2O) is 0.03 (cmol/kg) and 0.21%, respectively. The available phosphorus includes 7.41 (mg/kg) in poultry manure. The textural class was loamy sand. The soil had lower $_pH$ value than poultry manure indicating slightly acidity. However, the nitrogen content of surface soils ranges from 0.02 to 0.5% which is below the critical level of plant nutrient requirement of 2.0%. The mineral forms of nitrogen are soluble in water and are easily lost from soil through leaching and volatilization.[15] There is, therefore, need for nitrogen fertilizer to supplement the natural deficiencies. All other nutrient elements could increase nutrient status of the crop, therefore beneficial to crop uptake. The effective cation exchange capacity was also available and relevant to soil fertility that could sustain the soil due to continuous cultivation. The presence of considerable amount of organic matter of 6.69 and organic carbon of 3.37% could ameliorate the soil content that was initially poor, as indicated in Table 1. In addition, loamy sand obtain during the soil analysis and structure required for good root penetration and ensure improve crop growth.

Weed Cover Score

The result of mean value of weed cover score obtained on turmeric crop indicated that nutrient application of poultry manure + weeding interval during the sampling period of 4, 8, 12, and 16 WAT was significant, as shown in Table 2. At 4 WAT, influence of poultry manure and weeding interval of weed cover score on turmeric during 2019 and 2020 rainy seasons was significant. No nutrient application and no weeding as control had the highest weed cover score of 9.30 compared to all other treatments. The least mean value of weed cover score of 4.00 was obtained with treatments application of 8 ton/ha of poultry manure + weed free. During the sampling period at 8 WAT, the least weed cover score of 5.0 obtained was significant with treatments application of 8ton/ha of poultry manure + weed free and 4ton/ha of poultry manure + weeding 3, 6, 9, and 12 WAT, respectively, while no nutrient application and no weeding had the highest weed cover score of 9.73. At 12 WAT, investigation conducted resulted is significant with weed cover for no nutrient application and no weeding had the highest weed cover score of 10.00, followed by 8 ton/ha of poultry manure + weeding at 4, 8, 12, and 16 WAT with a value of 7.77. The least weed cover score (5.50) was recorded in 8 ton/ha of poultry manure + weed free. At 16 WAT, influence of poultry manure and weeding regime on weed cover score of turmeric indicated level of significance. 4 ton/ha of poultry manure + weeding 3 and 9 WAT had the highest weed cover score of 5.90 compared to all other treatments. The least was experienced in 8ton/ha of poultry manure + weed free WAT with a value of 3.02. Lower weed cover score was obtained in all other treatments except the control of no weeding no poultry manure that experienced high weed cover score.

Crop Vigor Score

The result of the mean value of crop vigor score as influenced by application of different rate poultry manure and weeding interval in the study area during 2019 and 2020 rainy seasons is presented in Table 3. At 4 WAT, application of 8^{th-1} of poultry manure + weeding interval at 3 and 9 WAT resulted in the highest mean value of crop vigor score of 6.87, but statistically comparable to all the other treatment combinations except no weeding, no poultry manure that gave the least (.3.30). At 8 WAT, application $8th^{-1}$poultry plus weeding at 4 and 12 WAT produced the highest mean value of crop vigor score of 7.77 that is, however, statistically comparable to all the other treatments combination except the no weeding, no poultry manure treatments that gave the least value of crop vigor score of 4,00. Similarly, at 12 WAT, the result showed that application of $8t\ h^{-1}$ poultry manure plus weeding at 4 and 12 WAT significantly resulted in the highest mean value of crop vigor score of 8.53 that was significant and comparable to all the other treatment combinations except for no weeding no poultry manure that resulted in the least crop vigor score of 4.27. Similar result was obtained at16 WAT, the highest mean value of crop vigor score of 8.47 recorded was also from the application of $8th^{-1}$ poultry manure plus weeding at 4 and 12 WAT but statistically similar to all the other treatment combinations except no weeding no poultry manure treatment that gave the least score of 5.00.

Table 2: Influence of poultry manure and weeding interval on mean value of weed covers score of turmeric (*Curcuma longa* L.) during the 2019 and 2020 rainy seasons at Afaka

Treatments	Weed cover score			
	4	8	12	16(WAT)
4t/ha[1] of poultry manure + weeding at 3, 6, 9, and 12 WAT	5.00[f]	5.00j	6.30[h]	4.20[f]
4t/ha[1] of poultry manure + weeding at 4, 8, 12 and 16 WAT	5.07[f]	6.20[f]	6.73[e]	3.53[g]
4t/ha[1] of poultry manure + weeding at 3 and 9 WAT	5.10[e]	5.70[h]	7.20[d]	5.90[a]
4t/ha[1] of poultry manure + weeding at 4 and 12 WAT	4.90[g]	6.00[g]	6.50[g]	4.95[e]
8t/ha[1] of poultry manure + weeding at 3, 6, 9, and 12 WAT	4.90[g]	6.93[c]	8.47[b]	4.95[c]
8t/ha[1]of poultry manure + weeding at 4, 8, 12, and 16 WAT	6.87[b]	7.77[b]	8.30[c]	4.53[e]
8t/ha[1] of poultry manure + weeding at 3 and 9 WAT	5.87[d]	6.43[e]	6.67[f]	4,76[e]
8t/ha[1]of poultry manure + weeding at 4 and 12 WAT	6.20[c]	6.73[d]	7.20[d]	5.00[b]
4t/ha[1] of poultry manure + weed free	4.77[h]	5.53[i]	6.73[e]	4.77[d]
8t/ha[1] of poultry manure + weed free	4.00[i]	5.00[j]	5.50[i]	3.02[i]
No weeding No poultry manure	9.30[a]	9.73[a]	10.00[a]	3.12[h]
SE ±	0.036	0.041	0.030	6.23

[1]Means with the same letter within a column are not significantly different at 5% level of significance according to (DMRT), [2]Week after transplanting (WAT)

Table 3: Influence of poultry manure and weeding interval on mean value of crop vigor score of turmeric (*Curcuma longa* L.) during the 2019 and 2020 rainy seasons at Afaka

Treatments	Crop vigor score			
	4	8	12	16 (WAT)
4ton/ha of poultry manure + weeding at 3, 6, 9, and 12 WAT	5.17[ab]	6.20[ab]	6.97[ab]	7.77[a]
4ton/ha of poultry manure + weeding at 4, 8, 12, and 16 WAT	5.07[ab]	6.67[a]	7.10[ab]	7.23[ab]
4ton/ha of poultry manure + weeding at 3 and 9 WAT	3.40[ab]	6.43[a]	7.20[ab]	7.20[a]
4ton/ha of poultry manure + weeding at 4 and 12 WAT	5.63[ab]	6.73[a]	6.67[b]	7.77[a]
8ton/ha of poultry manure + weeding at 3, 6, 9, and 12 WAT	5.87[a]	6,93[a]	7.43[ab]	7.77[a]
8ton/ha of poultry manure + weeding at 4, 8, 12, 16 WAT	6.43[a]	6.83[a]	8.30[ab]	8.33[a]
8ton/ha of poultry manure + weeding at 3, 9 WAT	6.87[a]	6.40[a]	7.43[ab]	7.97[a]
8ton/ha of poultry manure + weeding at 4 and 12 WAT	6.20[a]	7.77[a]	8.53[a]	8.47[a]
4ton/ha of poultry manure + weed free	4.77[ab]	5.87[ab]	6.73[b]	7.23[a]
8ton/ha of poultry manure + Weed free	5.63[ab]	6.73[a]	7.20[ab]	7.90[a]
No weeding No poultry manure	3.30[b]	4.00[b]	4.27[c]	5.00[b]
SE±	0.037	0.038	0.026	0.02

[1]Week after transplanting (WAT), [2]Means with the same letter within a column are not significantly different at 5% level of significance according to (DMRT)

Number of Off-Shoot

The result of the mean value of number of off shoot as influenced by application of different rate poultry manure and weeding interval in the study area during 2019 and 2020 rainy seasons is presented in Table 4. The result of number of off-shoot obtained on turmeric crop indicated that nutrient application of poultry manure + weeding interval during the sampling period of 4, 8, 12, and 16 WAT was significant at 8,12, and 16 WAT but not statistically significant ($P > 0.05$) at 4WAT. At 4 WAT application of 8 t h^{-1}poultry manure + weeding of 4 and 12 WAT and 8^{th-1}poultry manure + weeding of 3, 6, 9, and 12 WAT gave the highest mean value of number of off shoot of 4.00, respectively, however, statistically non-significant in comparable to all the other treatments combinations. The no weeding and no poultry manure treatment at 4 WAT gave the least number of off shoot of 2.33 but statistically similar to all other treatment combinations. At 8 WAT, the result shows that application of 8t h^{-1}poultry manure + weeding at 4 and 12 WAT significantly ($P < 0.05$) resulted in the highest mean value of number of off-shoot (10.00) but combination at no wee ding no poultry manure that gave the least (4.33). At 12 WAT, application of $8th^{-1}$poultry manure + Weed free gave the highest mean value number of off shoot (18.00); however, it is statistically comparable to all the other treatments combination except the no weeding no poultry manure treatments which gave the least value (7.00). Similarly, also at 16 WAT, the

Table 4: Influence of poultry manure and weeding interval on mean value of number of off-shoot of turmeric (*Curcuma longa* L.) during the 2019 and 2020 rainy seasons at Afaka

Treatment	Number of off shoot			
	4	8	12	16(WAT)
4t/ha1of poultry manure + weeding at 3, 6, 9, 12WAT	2.67^{a}	5.67^{bc}	8.00^{de}	11.00^{c}
4t/ha1of poultry manure + weeding at 4, 8, 12 and 16WAT	3.00^{a}	5.33^{bc}	9.00^{cde}	11.67^{c}
4t/ha1of poultry manure + weeding at 3, 9, WAT	3.00^{a}	6.33^{bc}	8.00^{de}	11.67^{c}
4t/ha1of poultry manure + weeding at 4, 12 WAT	2.67^{a}	6.00^{bc}	10.33^{cde}	11.00^{c}
8t/ha1of poultry manure + weeding at 3, 6, 9, 12WAT	4.00^{a}	6.27^{bc}	11.00^{cd}	12.00^{bc}
8t/ha1of poultry manure + weeding at 4, 8, 12, 16WAT	3.00^{a}	8.00^{ab}	12.00^{c}	10.00^{c}
8t/ha1of poultry manure + weeding at 3, 9 WAT	3.33^{a}	7.00^{bc}	10.00^{cde}	15.67^{ab}
8t/ha1of poultry manure + weeding at 4, 12 WAT	4.00^{a}	10.00^{a}	15.00^{b}	16.00^{a}
4ton/ha of poultry manure + weed free	3.00^{a}	4.33^{c}	9.00^{cde}	10.00^{c}
8ton/ha of poultry manure + weed free	3.00^{a}	5.33^{bc}	18.00^{a}	19.00^{a}
No weeding No poultry manure	2.33^{a}	4.33^{c}	7.00^{e}	9.00^{c}
SE	0.035	0.047	0.053	0.062

[1]Week after transplanting (WAT), [2]Means with the same letter within a column are not significantly different at 5% level of significance according to (DMRT)

highest mean value of number of off-shoot recorded (19.00) was by the application of 8th^{-1}poultry manure + weed free, but statistically similar to all the other treatments combination except no weeding no poultry manure treatment that gave the least value of 9.00.

Dried Rhizome Yield g/m^2

The result of the mean value of number of off shoot as influenced by application of different rate poultry manure and weeding interval in the study area during 2019 and 2020 rainy seasons is presented in Table 5. The result shows that the highest mean value of dried weight of turmeric (15.33 g/m^2) recorded at harvest was by the application of 8th^{-1} of poultry manure + weeding of 4 and 12WAT and statistically significantly difference from all the other treatment combinations, while no weeding no poultry manure treatment gave the least (2.00 g/m^2).

Table 5: Influence of poultry manure and weeding interval on mean value of dried rhizome yield of turmeric (*Curcuma longa* L.) during the 2019 and 2020 rainy seasons at Afaka

Treatments	Weight of Turmeric g/m^2
4t/ha of poultry manure + weeding at 3, 6, 9, and 12 WAT	4.33^{de}
4t/ha of poultry manure + weeding at 4, 8, 12, and 16 WAT	6.33^{bcde}
4t/ha of poultry manure + weeding at 3 and 9 WAT	9.67^{bcde}
4t/ha of poultry manure + weeding at 4 and 12 WAT	4.00^{e}
8t/ha of poultry manure + weeding at 3, 6, 9, and 12 WAT	11.67^{ab}
8t/ha of poultry manure + weeding at 4, 8, 12, and 16 WAT	9.63^{abcd}
8t/ha of poultry manure + weeding at 3, 9 WAT	10.33^{ab}
8t/ha of poultry manure + weeding at 4, 12 WAT	15.33^{a}
4t/ha of poultry manure + weed free	5.00^{cde}
8t/ha of poultry manure + weed free	10.67^{abc}
No weeding No poultry manure	2.00^{e}
SE±	0.093

[1]Week after transplanting (WAT), [2]Means with the same letter within a column are not significantly different at 5% level of significance according to (DMRT)

DISCUSSION

The influence of poultry manure and weeding interval is to control or suppress weed species (annual grasses, sedges, and broadleaf weeds in turmeric). Lower weed cover score experienced could be due to the significant effect of minimal weeding at 12 WAT and better growth performance of turmeric with 8 t ha poultry manure application. Nutrient enhanced crop growth thereby limiting weed challenges on the crop. Continuous weeding for period of four interval could disturb the crop growth, thereby hindering turmeric growth and yield. The result conform with,[15] who suggested that weeding be done in turmeric field as early as 30 days after planting and 60 to 70 days after planting. Similarly,[16] was also of the opinion that the critical period for weed interference in turmeric culitivation was between 8-12 WAP Better performance on crop vigor score that occurred as observed during the investigation period with treatment application of 8 t ha poultry manure +

weeding interval 4 and 12 WAT could be due to the ability of the plant to utilize the higher nutrient application. This finding corroborates the report of [17] and[9] who reported that poultry manure when applied at high rate provide nutrient required for the growth and yield of crops. The vigorous plants obtained could compete favorably with the weeds that were suppressed with weeding at the early stage of the growth with continuous weeding and lower nutrient application of 4 t ha could be seen to be less beneficial to turmeric growth thereby hindering the performance of the crop vigor score. The result is in accordance with[18,19] who suggested that poultry manure was reported to possess high nutrient content, lack of weed seeds, cheap, and available. The improved crop vigor score experienced during the trial could have allowed higher number of offshoot of turmeric plant, thereby producing higher dried rhizome yield with 8 t ha poultry manure at + weeding at 4 and 12; in addition, minimal weed competition could have occurred with early weed removal that suppressed weed infestation allowed better utilization of the nutrient application. Similarly, the high yield achieved in the study could be due to delayed and slow growth of the crop at the initial stage and lack of nutrient competition by the crop due to early weeding at 4 WAT. The result is in accordance with[17] that the critical period of weed interference was between 8 and 12 WAP in the growth and yield of turmeric.

CONCLUSION

From the result obtained in the study carried out at the Federal college Forestry Mechanization Afaka Kaduna, Crop Production Department experimental farm site on the influence of poultry manure and weeding interval on the crop vigor score and yield of *Curcum longa* L revealed that nutrient application of 8 t ha poultry manure + weeding interval at 4 and 12 WAT gave lower weed cover score than all other treatments observed thereby improving the growth with more vigorous crops producing higher number of offshoot and higher dried rhizome yield of 15.33g/m^2. Based on conclusion drawn from the research finding, it is here by suggested that the farmers within the northern guinea savannah ecological zone could produce turmeric with 8 t ha poultry manure + weeding interval of 4 and 12 WAT for improved crop vigor score and yield of turmeric.

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