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Full Length Research Article

# EFFECT OF COW DUNG MANURE ON GROWTH AND YIELD OF COWPEA VARIETIES GROWN ON SOIL INFESTED WITH *ALECTRA VOGELII* INFESTATION

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**ABSTRACT**
This research was carried out on the effect of cow dung manure on growth and yield of cowpea varieties and *Alectra* infestation on *Alectra* inoculated soil. Two trials of pots experiments were conducted in the screen house, Department of Soil Science, Ahmadu Bello University, Zaria. Cow dung manures were applied at the rate of 15, 30 and 45kgN/ha with control (soil without *Alectra* inoculation). Cowpea varieties SAMPEA 7, SAMPEA 9 and SAMPEA 14 were planted in nylon bags of (20 x 18.9 cm) which served as pots for the experiment. All the pot soils (except the control) were inoculated with *Alectra* seeds. The treatments were laid out in completely randomize design. The cowpea plants were sampled for growth parameters at 5, 7 and 9 WAP. The parameters evaluated for vegetative growth include Plant height, Number of leaves, Number of branches, Number of root nodules, Root length, Shoot fresh weight and Root fresh weight. while yield parameters were Pods number, Pods weight, Seeds number, Seeds weight and 100 seeds weight. The result showed that, application of manures generally enhanced the vegetative growth parameters of cowpea varieties on most sampling dates, with the highest values recorded at 45kgN/ha while in most cases 15kgN/ha and control produced the lowest values in both Trials. Variety SAMPEA 7 and 14 produced the highest and lowest number of *Alectra* shoots respectively. In view of these findings, it was recommended that the manures should be considered as an efficient control measure for *Alectra* infestation on susceptible cowpea varieties.

**Keywords:** Variety, WAP, *Alectra,* Vegetative, Plant height, Cowpea

## INTRODUCTION

Cowpea (*Vigna unguiculata* (L.) Walp) is a herbaceous, prostrate, climbing or sub erect annual plant, growing 15-80 cm high. Leaves are alternate trifoliate with petiole 5-25 cm long (Boukar *et al*., 2015). The lateral leaflet is opposite and asymmetrical, while the central leaflet is symmetrical and ovate (Heuze *et al*., 2013).
The crop occupies a unique position in world agriculture by value of their high protein and starch contents and capability to fix atmospheric nitrogen (Tarawali *et al*., 2002). In many of the developing countries, cowpea is the major source of dietary protein. Their amino acids pattern is close to the perfect amino acids which is rich in lysine content. In fact, lysine is the most limiting essential amino acid in cereals, which is very well supplemented by the pulses (Steele, 1985).

The legume is consumed as a high quality plant protein source in many parts of the world. In fact, the high protein and carbohydrate contents with relatively low fat content and complementary amino acid pattern to that of cereal grains make cowpea an important nutritional food in human diet (Boukar *et al*., 2015).
The seeds contain 54.5% carbohydrates, 24.1% protein and 0.1% fat. Moreover, it is a rich source of phosphorus, calcium and iron (Joshi *et al.,* 2016). The protein in cowpea seed is rich in amino acids such as lycine and tryptophan as compared to cereal grains.
Despite its widespread cultivation, the average yields on farmers' fields are low, averaging less than 300 Kg ha-1 (Takim and Uddin, 2010). The low yields have been attributed to a number of biotic stresses such as insect pests, nematodes, diseases and parasitic weeds and abiotic stresses such as drought, high temperature, low soil fertility, low pH and aluminium toxicity (Ehlers and Hall, 1997; Hall, 2004). Damage is imposed on food and fodder plants by the parasitic members of family Scrophulariaceae. Among these are: *Striga gesnerioides* and *Alectra vogelii* which occur in West Africa, as serious pests of cowpea. These parasites divert the host nutrient into themselves through the haustorium that established contact with xylem and phloem tissues of the host (Okonkwo and Nwoke, 1978; Okwonkwo, 1966). Therefore, competition for water, organic ions and metabolites is the simplest reason for losses in host production (Stewart and Press,1990).

*Alectra vogelii* (Benth.), is a hemiparasite plant belonging to the family Scrophulariaceae and is a parasitic plant of a wide range of legumes in the West, East and South Africa (Bagnall-Oakeley *et al.,* 1991). The species of the genus *Alectra* are found mainly in tropical Africa and subtropical Southern Africa. *Alectra* and related parasitic weeds including *Striga* are presently among the most important biological constraints to food production in Africa (Emechebe *et al*., 1983). Although, crop attack by *Alectra* has less severe impact than that of *Striga*, total yield loss has been observed in fields that are heavily infested by these parasitic weed when susceptible varieties were planted (Emechebe *et al*., 1983).
Considerable work has been done on the various control methods for parasitic weeds, but *Alectra* control in cowpea has received relatively little attention. It is however apparent that no single method can adequately control this problem and a number of methods would need to be integrated for effective control. Dugje *et al*, (2006), carried out a survey of the level of *Alectra vogelii* infestation on farmers' field in North Eastern Nigeria and reported that, more than 81 % of the fields grown to cowpea in this region were infested with *Alectra vogelii* resulting in serious yield losses.
The control of *Alectra vogelii* is difficult mainly because of the unique adaptation of the parasite to its environment and the complexity of the host-parasite relationship (Botanga and Timko, 2005). General control measures for *Alectra* species include trap crops, hand pulling, cultivation of resistant cultivars and application

of herbicides (Ogborn, 1987; Parkinson *et al,* 1997, Sand *et al*, 1990; Magani and Lagoke, 2009). Among these control measures, no one method has been found to be effective for the control of parasitic weeds. However, the use of resistant cultivars seemed to be a more viable option.

Use of organic manure to meet the nutrient requirement of crops would be an inevitable practice in the years to come for sustainable agriculture since organic manure generally improvesthe soil physical, chemical and biological properties along with conserving the moisture holding capacity of the soil and thus resulting in enhanced crop productivity, along with maintaining the quality of crops produced (Maheswarappa *et al*., 1999).

Most researches focus on the effect of inorganic fertilizers on growth and yield of cowpea varieties and their effect on *Alectra* infestation in cowpea. It is essential to carry out research on the effect of organic manure on the growth and yield of different cowpea varieties and their effect to *Alectra* infestation. This research is therefore aimed at determining the effect of cow dung manure on the growth, yield and yield parameters of different cowpea varieties and their effect on *Alectra* infestation on cowpea.

## MATERIALS AND METHODS

### Study Area
Pot experiments were conducted in the Screen house at Department of Soil Science, Ahmadu Bello University, Samaru (11° 11′ N, 07°38′ E and 686m above sea level), Zaria, in the Northern Guinea Savanna ecological zone of Nigeria. The region is characterized with average annual temperature of 24.4°C, relative humidity of 49 %, wind speed of 8 km/h and with annual rainfall of 1050 mm (TWG, 2007).

### Source of Materials
The seeds of the three varieties of cowpea that is SAMPEA 7, SAMPEA 9, and SAMPEA 14 were purchased from Seed Production Unit, Institute for Agricultural Research, Samaru- Zaria, for the study. Seeds of *Alectra* were obtained from International Institute of Tropical Agriculture, Kano. cow dung manure was collected from farmers from Kano state for the study.

### Preparation of *Alectra* Seeds Inoculum
About 10 g of *Alectra* seeds were weighed and put into polythene bag and 250 g sieved dried river sand were weighed and also put into the polythene bag. The *Alectra* seeds and 250 g sand were poured into a large polythene. These were mixed thoroughly by shaking in different direction for about 5 minutes. The same process was followed to obtain enough *Alectra* seeds inoculum for the experiment.

### Pot Preparation and Seed Planting
Top Soil obtained from the Botanical garden, Ahmadu Bello University, Samaru-Zaria, were sieved and mixed with sharp sand from nearby river in ratio 1:1. Sample of mixed sand-soil was then taken to Department of Soil Science, Institute for Agricultural Research, Samaru- Zaria, for physico-chemical analysis. The mixture was used to fill the nylon bags (20 x 18.9 cm) to be used as pots for the experiment.
The animal waste that is cow dung manure was sun dried before being used for the experiment. The manure was mixed with soil in the upper part of the pot. The manure was applied at the rates of 0, 15, 30, and 45 kgN/ha and covered with soil. This procedure was repeated for the control without manure application and *Alectra* inoculation.
A hole was made in the centre of the soil in each pot, and a soft drink bottle top full of *Alectra* inoculums was introduced into the hole. The pot soil was watered for one week to precondition the *Alectra* seeds before sowing cowpea seeds.
Cowpea seeds were dressed with Apron star prior to planting, each treatment was assigned 8 pots, and each treatment was replicated thrice. Then four seeds of cowpea were dropped in the hole and the hole was covered with soil. Cowpea seeds were planted at 2-3 cm depth in the pot. The treatments were laid out in completely randomized design. The pot soil was watered daily except when the sand was observed to have enough moisture. After germination, the seedlings were thinned to two plants per pot at three weeks after planting (WAP).

Cowpea seedlings were sprayed with benomyl and mancozeb (maneb/zinc complex) at the rate of 0.6 and 2.5 kg/ha respectively, to control fungal diseases and dimethoate at 0.75 kg/ha was applied at 3 weeks after planting (W AP), to prevent viral diseases. Cypermethrin and dimethoate (sherpa plus) was applied fortnightly at the rate of 1.0 kg/ha beginning from 7 WAP until harvest, to control insect pests during flowering and pod development. These chemicals were applied using a knapsack sprayer.

### Sampling and Data Collection
Sampling of the cowpea plants were conducted at 5, 7 and 9 WAP. On each of the sampling date, one pot was sampled per replicate from each treatment. The plants roots were gently separated from the soil and the plant was washed with water. The washed plant was spread on clean table for the water to drain off, then three plants from the replicates of each treatment were selected for determination of the vegetative growth parameters of the plants. Razor blade was used to separate the plants into root and shoot and each part was weighed on Metler balance and recorded.

### Vegetative Growth Parameters

### Plant height
Metre rule was used to measure the plant height of each sampled plants from the soil level to the stem tip at 5, 7, and 9 WAP from each treatment.

### Number of leaves
The number of leaves from sampled plants from each treatment were counted and recorded.

### Number of branches
Number of branches from sampled plant from each treatment were also counted and recorded.

### Root nodules
The root nodules were counted from each plant and recorded.

### Yield Parameters
Dried pods were harvested at intervals into labeled envelopes and at the end of the harvest the following parameters were determined:

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**Pod number**
Number of pods harvested were counted and recorded for each treatment replicate. This was used to calculate the number of pods per plant from each treatment.

**Pod weight**
The pods harvested from each treatment replicate were weighed on Metler balance. This was used to calculate pods weight per plant from each treatment. After this, the pods were threshed and winnowed to determine the following:

**Seed number**
Number of seeds from each treatment replicate were counted and used to calculate seeds number per plant.

**Total seed weight**
The cowpea total seeds obtained per treatment were weighed on Metter balance and recorded and used to calculate seeds weight per plant.

**100 seed weight**
From the threshed and winnowed seeds, 100 seeds were counted from each treatment and weighed on the weighing balance.

***Alectra* Infestation Measurement**
Reactions of the cowpea varieties to *Alectra* infestation were determined by the following parameters viz; number of plants infected, *Alectra* shoot counts and crop damage score from each treatments on each sampling date.

**DATA ANALYSES**
The data collected from the experiment was subjected to Analysis of variance (ANOVA).
Significant differences in treatment means were compared using Duncan Multiple Range Test (DMRT).

**RESULTS**

**Physicochemical Properties of the Soil used for the Experiment**
The physicochemical properties of the soil showed that, among the particle size distribution the sand recorded the highest value and this was followed by silt and the lowest value recorded was in clay (Table 1). The textural class analysis revealed that, the soil was predominantly sandy loamy. The pH of the soil showed that, the soil was slightly alkaline on both media (Table 1). The Available phosphorus (AP) and other mineral elements analyzed are as shown in Table 1

**Table 1**: Physicochemical Properties of the Soil used for the Experiment

| Soil Parameters | Value |
|---|---|
| **Particle Size** | |
| **Clay(%)** | 6 |
| **Silt(%)** | 16 |
| **Sand(%)** | 78 |
| **Textural Class** | Loamy Sand |
| **pH-$H_20$** | 7.6 |
| **pH-$CaCl_2$** | 7.46 |
| **OC(%)** | 1.537 |
| **TN(%)** | 0.21 |
| **P (ppm)** | 64.87 |
| **Ca (cmol/kg)** | 5.05 |
| **Mg (cmol/kg)** | 0.936 |
| **K (cmol/kg)** | 0.395 |
| **Na (cmol/kg)** | 0.254 |
| **H+Al** | 0.1 |
| **CEC** | 7.8 |

NB: OC= Organic Carbon, TN= Total Nitrogen, AP= Available Phosphorus, CEC= Cation Exchange Capacity, H+Al=Aluminium hydroxide

**Effect of cow dung treatments on the plant height of cowpea varieties on *Alectra* inoculated soil**
Generally, the result showed that, there was marked significant difference among plant height based on treatments on most of the sampling dates in both trials with the exception of those at 9 WAP in Trial II. Also, the control produced comparable plant height with most other treatments in both trials. Significant difference was observed among varieties in all the sampling dates of the two trials (Table 2). The 45kgN/ha cow dung treatment produced the highest plant height in the cowpea varieties on most sampling dates (Table 2).

**Treatments**
At 5 WAP of Trial I, the lowest plant height due to control was only significantly lower than the highest due to 45 kgN/ha Cow dung treatment. At 7 WAP, the lowest plant height due to 45 kgN/ha was only significantly lower than the highest due to 30 kgN/ha cow dung treatment. At 9 WAP there was no significant difference across all treatments (Table 2). At 5 WAP of Trial II, the highest plant height due to 15 kgN/ha cow dung treatment was not significantly higher than that due to all the other treatments. At 7 WAP, the highest plant height due to 45 kgN/ha cow dung treatment was significantly higher than that due to all the other treatments. This was followed by the plant height due to control which was similar to those due to 15 kgN/ha and 30 kgN/ha cow dung treatments (Table 2). The control produced the lowest plant height. At 9 WAP cow dung treatments had no significant effect on plant height as the highest plant height due to 45 kgN/ha was similar to those due to all the other treatments (Table 2).

**Varieties**
At 5 WAP of Trial I, there was no significant difference in plant height among the varieties in the sense that, the highest plant height variety due to SAMPEA 9 was comparable with that due to SAMPEA 7 and 14. Similar trend was observed at 7 and 9 WAP in Trial I in the sense that, the lowest plant height due to SAMPEA 7 was only significantly lower than the highest due to SAMPEA 9 at the two sampling dates. Similar trend was equally observed in all the sampling dates of the Trial II in the sense that, the highest plant height due to SAMPEA 7 was only significantly higher than the lowest due to SAMPEA 9 in all the sampling dates (Table 2).

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**Table 2**: Effect of cow dung treatments on the Plant height of cowpea varieties on *Alectra* inoculated soil

| Trial | Cow dung Treatments (KgN/ha) | Plant age (WAP) Plant height(cm) 5 | 7 | 9 |
|---|---|---|---|---|
| I | 0 | 21.39[b] | 29.91[ab] | 31.42[a] |
| | 15 | 24.94[ab] | 30.43[ab] | 32.60[a] |
| | 30 | 25.64[ab] | 31.81[a] | 36.68[a] |
| | 45 | 28.20[a] | 28.90[b] | 40.96[a] |
| | Mean | 25.04 | 30.26 | 35.42 |
| | SE ± | 1.89 | 1.26 | 4.22 |
| | Varieties | | | |
| | SAMPEA 7 | 25.81[a] | 26.13[b] | 30.46[b] |
| | SAMPEA 9 | 27.23[a] | 35.82[a] | 48.42[a] |
| | SAMPEA 14 | 21.29[ab] | 26.81[b] | 34.70[b] |
| | Mean | 24.78 | 29.59 | 37.86 |
| | SE ± | 1.46 | 0.98 | 3.27 |
| II | 0 | 15.08[a] | 17.02[b] | 15.57[a] |
| | 15 | 16.23[a] | 15.96[b] | 15.68[a] |
| | 30 | 15.56[a] | 16.26[b] | 15.96[a] |
| | 45 | 15.39[a] | 19.17[a] | 16.09[a] |
| | mean | 15.57 | 17.10 | 15.83 |
| | SE ± | 1.99 | 2.45 | 2.37 |
| | Varieties | | | |
| | SAMPEA 7 | 16.70[a] | 18.09[a] | 15.75[a] |
| | SAMPEA 9 | 12.63[b] | 14.39[b] | 14.16[b] |
| | SAMPEA 14 | 15.23[a] | 16.99[a] | 17.07[a] |
| | Mean | 14.85 | 16.49 | 15.66 |
| | SE ± | 1.68 | 1.87 | 1.56 |

NB: Means with the same letter(s) within each column, under each factor are not significantly different (P=0.05), using DMRT. 0 = Control without *Alectra* inoculation, WAP= Weeks after planting

**Effect of cow dung treatments on the number of leaves of cowpea varieties on *Alectra* inoculated soil**

Generally, the data showed that, there was no significant difference in the number of leaves due to cow dung treatments on most of the sampling dates in both trials with the exception of that at 7 WAP in Trial II. Also, control produced comparable number of leaves with most of the other treatments in both trials. The 45kgN/ha treatment, followed by 30kgN/ha cow dung treatment produced the highest number of leaves in cowpea varieties on most sampling dates. There was no significant difference in the number of leaves among cowpea varieties on most of the sampling dates in the two trials (Table 3).

**Treatments**

The result showed that, cow dung treatments had no significant effect on the number of leaves at all the sampling dates in Trial I and 5 and 9 WAP sampling dates in Trial II (Table 3). At 7 WAP in Trial II, the lowest number of leaves due to the control was only significantly lower than the highest due to 45 kgN/ha cow dung treatment (Table 3).

**Varieties**

At 5 WAP in Trial I, there was no significant difference in number of leaves among varieties in the sense that, the highest number of leaves in SAMPEA 14 was comparable with that due to SAMPEA 7 and SAMPEA 9. This was also the case at 5 and 9 WAP in Trial II (Table 3). Similar trend was observed at 7 and 9 WAP in Trial I in the sense that, the comparable number of leaves due to SAMPEA 7 and SAMPEA 14 at 7 and 9 WAP respectively were only significantly lower than the highest due to SAMPEA 9 in the two sampling dates. At 7 WAP of Trial II, the highest number of leaves due to SAMPEA 9 was only significantly higher than the lowest due to SAMPEA 7 (Table 3).

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**Table 3**: Effect of cow dung treatments on the Number of leaves of cowpea varieties on *Alectra* inoculated soil

| Trial | Cow dung Treatments (KgN/ha) | Plant age (WAP) Number of leaves 5 | 7 | 9 |
|---|---|---|---|---|
| I | 0 | 16.11[a] | 27.00[a] | 25.22[a] |
| | 15 | 17.56[a] | 21.44[a] | 21.78[a] |
| | 30 | 18.44[a] | 26.33[a] | 26.11[a] |
| | 45 | 21.89[a] | 18.33[a] | 29.00[a] |
| | Mean | 18.50 | 23.27 | 25.53 |
| | SE ± | 2.45 | 2.87 | 3.87 |
| | Varieties | | | |
| | SAMPEA 7 | 19.33[a] | 19.07[b] | 24.33[b] |
| | SAMPEA 9 | 20.40[a] | 26.93[a] | 38.07[a] |
| | SAMPEA 14 | 24.93[a] | 22.20[ab] | 18.40[b] |
| | Mean | 21.55 | 22.73 | 26.93 |
| | SE ± | 1.89 | 2.22 | 2.99 |
| II | 0- | 8.22[a] | 12.56[b] | 14.22[a] |
| | 15 | 8.89[a] | 15.56[ab] | 16.44[a] |
| | 30 | 9.56[a] | 14.22[b] | 16.22[a] |
| | 45 | 8.89[a] | 18.89[a] | 19.00[a] |
| | mean | 8.89 | 15.30 | 16.47 |
| | SE ± | 1.34 | 1.45 | 1.67 |
| | Varieties | | | |
| | SAMPEA 7 | 9.33[a] | 13.67[b] | 18.13[a] |
| | SAMPEA 9 | 8.53[a] | 17.47[a] | 14.40[a] |
| | SAMPEA 14 | 7.93[a] | 14.53[ab] | 15.73[a] |
| | Mean | 8.60 | 15.22 | 16.09 |
| | SE ± | 1.55 | 1.35 | 1.44 |

NB: Means with the same letter(s) within each column, under each factor are not significantly different (P=0.05), using DMRT. 0 = Control without *Alectra* inoculation, WAP= Weeks after planting

**Effect of cow dung treatments on the number of branches of cowpea varieties on *Alectra* inoculated soil**

Generally, the data showed that, there was marked significant differences among number of branches based on cow dung treatments on most of the sampling dates in both trials with the exception of those at 9 WAP and 5 WAP in Trial I and II respectively. The 45kgN/ha cow dung treatment resulted in the highest number of branches in cowpea varieties on most sampling dates. Also, there was no significant difference observed in number of branches among the cowpea varieties on all the sampling dates in the two trials with the exception of that at 9 WAP in Trial II (Table 4).

**Treatments**

At 5 WAP the lowest number of branches due to the control was only significantly lower than the highest due to 45KgN/ha cow dung treatment. At 7 WAP in Trial I, the lowest number of branches due to 30 kgN/ha was only significantly lower than the highest due to 45 kgN/ha Cow dung treatment. At 9 WAP in Trial I, cow dung treatments had no significant effect on the number of branches (Table 4). This was also the case at 5 WAP in Trial II. At 7 WAP, the lowest number of branches due to the control was only significantly lower than the highest due to 45 kgN/ha cow dung treatment (Table 4). At 9 WAP of Trial II, the lowest number of branches due to control was only significantly lower than the highest due to 30 kgN/ha cow dung treatment (Table 4).

**Varieties**

There was no significant difference in the number of branches among varieties in all the sampling dates in both trials with the exception of that at 9 WAP in Trial II where the highest number of branches due to SAMPEA 7 was only significantly higher than the lowest due to SAMPEA 9 (Table 4).

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**Table 4**: Effect of cow dung treatments on the Number of branches of cowpea varieties on *Alectra* inoculated soil

| Trial | Cow dung | Plant age (WAP) Number of branches | | |
|---|---|---|---|---|
| | Treatments(KgN/ha) | 5 | 7 | 9 |
| I | 0 | 5.22[b] | 8.44[ab] | 10.11[a] |
| | 15 | 6.56[ab] | 8.56[ab] | 12.89[a] |
| | 30 | 5.89[b] | 6.67[b] | 10.89[a] |
| | 45 | 6.89[a] | 9.78[a] | 12.44[a] |
| | Mean | 6.14 | 8.36 | 11.58 |
| | SE ± | 0.45 | 0.81 | 1.48 |
| | Varieties | | | |
| | SAMPEA 7 | 6.40[a] | 7.20[a] | 11.87[a] |
| | SAMPEA 9 | 6.47[a] | 9.07[a] | 13.60[a] |
| | SAMPEA 14 | 6.53[a] | 8.60[a] | 10.93[a] |
| | Mean | 6.47 | 8.29 | 12.13 |
| | SE ± | 0.34 | 0.63 | 1.15 |
| II | 0 | 3.33[a] | 6.11[b] | 7.11[b] |
| | 15 | 3.33[a] | 7.00[b] | 9.33[ab] |
| | 30 | 3.67[a] | 7.22[b] | 10.00[a] |
| | 45 | 3.22[a] | 9.00[a] | 9.22[ab] |
| | Mean | 3.39 | 7.33 | 8.92 |
| | SE ± | 0.93 | 1.35 | 1.66 |
| | Varieties | | | |
| | SAMPEA 7 | 3.53[a] | 7.40[a] | 9.67[a] |
| | SAMPEA 9 | 3.73[a] | 7.87[a] | 7.80[b] |
| | SAMPEA 14 | 3.20[a] | 7.33[a] | 9.07[ab] |
| | Mean | 3.49 | 7.53 | 8.85 |
| | SE ± | 0.94 | 1.65 | 1.76 |

NB: Means with the same letter(s) within each column, under each factor are not significantly different (P=0.05), using DMRT. 0 = Control without *Alectra* inoculation, WAP= Weeks after planting.

**Effect of cow dung treatments on the number of root nodules of cowpea varieties on *Alectra* inoculated soil**

Generally, the data showed that, there was no significant difference among number of root nodules based on treatments in most of the sampling dates in both trials with the exception of those at 5 WAP in Trial I and II and at 9WAP in Trial II. The 45kgN/ha cow dung treatment produced the highest number of root nodules on most sampling dates. Also, significant difference was observed in number of root nodules among cowpea varieties in all the sampling dates in the two trials (Table 5).

**Treatments**

At 5 WAP in Trial I, the highest number of root nodules due to 15 kgN/ha was only significantly higher than the lowest due to control. However, at 7 and 9 WAP, cow dung treatments had no significant effect on number of root nodules (Table 5). This was also the case at 5 and 7 WAP in Trial II. At 9 WAP in Trial II, the lowest number of root nodules due to control was only significantly lower than the highest due to 30 kgN/ha cow dung treatments (Table 5).

**Varieties**

SAMPEA 14 had significantly higher number of root nodules than that of other varieties on each sampling date in Trial II. Also, the result of the first trial followed similar pattern in the sense that, the highest number of root nodules due to SAMPEA 7 variety at 5 WAP and SAMPEA 9 at 7 and 9 WAP were only significantly higher than the lowest due to SAMPEA 14 at all the sampling dates. However, in Trial II the lowest number of root nodules due to SAMPEA 9 on all the sampling dates was only significantly lower than the highest due to SAMPEA 14 on all the sampling dates (Table 5).

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**Table 5**: Effect of cow dung treatment on the Number of root nodules of cowpea varieties on *Alectra* inoculated soil

| Trial | Cow dung Treatments(KgN/ha) | Plant age (WAP) Number of root nodules 5 | 7 | 9 |
|---|---|---|---|---|
| I | 0 | 37.67[b] | 55.22[a] | 59.76[a] |
| | 15 | 53.56[a] | 38.67[a] | 58.00[a] |
| | 30 | 49.11[ab] | 45.00[a] | 60.76[a] |
| | 45 | 52.78[a] | 43.22[a] | 64.33[a] |
| | Mean | 48.28 | 45.53 | 60.71 |
| | SE ± | 4.54 | 6.22 | 6.35 |
| | Varieties | | | |
| | SAMPEA 7 | 61.07[a] | 49.87[a] | 58.77[a] |
| | SAMPEA 9 | 57.93[a] | 52.67[a] | 65.33[a] |
| | SAMPEA 14 | 29.33[b] | 31.67[b] | 36.67[b] |
| | Mean | 49.44 | 44.73 | 53.59 |
| | SE ± | 3.52 | 4.82 | 4.35 |
| II | 0 | 21.90[a] | 22.28[a] | 21.83[b] |
| | 15 | 19.86[a] | 22.07[a] | 25.62[ab] |
| | 30 | 21.07[a] | 22.68[a] | 33.48[a] |
| | 45 | 22.53[a] | 23.27[a] | 27.38[ab] |
| | Mean | 21.34 | 22.58 | 27.08 |
| | SE ± | 1.95 | 1.97 | 2.23 |
| | Varieties | | | |
| | SAMPEA 7 | 19.64[b] | 22.38[b] | 22.77[b] |
| | SAMPEA 9 | 17.02[b] | 19.05[b] | 21.97[b] |
| | SAMPEA 14 | 24.41[a] | 26.13[a] | 33.93[a] |
| | Mean | 20.36 | 22.58 | 26.22 |
| | SE ± | 2.13 | 2.32 | 2.45 |

NB: Means with the same letter(s) within each column, under each factor are not significantly different (P=0.05), using DMRT. 0 = Control without *Alectra* inoculation, WAP= Weeks after planting

**Effect of cow dung treatments on the root length of cowpea varieties on *Alectra* inoculated soil**

Generally, the data showed that, there was no marked significant difference in root length of cowpea varieties under cow dung treatments on most of the sampling dates in both trials with the exception of those at 5 WAP in Trial I and 5 and 7 WAP in Trial II. However, most of the treatments resulted in comparable root length in cowpea varieties on each sampling date in both trials. Also, significant difference in root length among varieties was not observed on most sampling dates of the two trials (Table 6).

**Treatments**

At 5 WAP sampling date in Trial I, the highest root length due to control was only significantly higher than the lowest due to 45 kgN/ha cow dung treatment (Table 6). No significant difference in the root length due to cow dung treatment at 7 WAP in Trial I. At 9 WAP in Trial I, cow dung treatments had no significant effect on root length as the highest root length due to 15 kgN/ha was similar to those at all the other treatments. (Table 6). This was also the case at 9 WAP in Trial II. However, at 5 WAP in Trial II, the highest root length due to 30 kgN/ha cow dung treatment was comparable with that due to 45 kgN/ha cow dung treatment. At 7 WAP, the lowest number of root length due to control was only significantly lower than the highest due to 45 kgN/ha cow dung treatment (Table 6)

**Varieties**

At all the sampling dates in Trial I, there was no significant difference in root length among cowpea varieties. This was also the case at 7 WAP in Trial II (Table 6). At 5 WAP in Trial II, the lowest root length due to SAMPEA 9 was only significantly lower than the highest due to SAMPEA 7. Also, at 9 WAP, the highest root length due to SAMPEA 14 was only significantly higher than the lowest due to SAMPEA 9 (Table 6).

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**Table 6**: Effect of cow dung treatments on Root length of cowpea varieties on *Alectra* inoculated soil

| Trial | Cow dung Root length(cm) Treatments (KgN/ha) | Plant age (WAP) 5 | 7 | 9 |
|---|---|---|---|---|
| I | 0 | 42.41[a] | 43.46[a] | 41.84[a] |
| | 15 | 32.27[ab] | 53.00[a] | 42.59[a] |
| | 30 | 29.67[ab] | 38.51[a] | 30.47[a] |
| | 45 | 24.78[b] | 42.98[a] | 32.30[a] |
| | Mean | 32.31 | 44.49 | 36.80 |
| | SE ± | 5.58 | 4.64 | 6.06 |
| | Varieties | | | |
| | SAMPEA 7 | 36.96[a] | 38.98[a] | 39.93[a] |
| | SAMPEA 9 | 30.49[a] | 47.81[a] | 46.15[a] |
| | SAMPEA 14 | 36.16[a] | 38.86[a] | 32.09[a] |
| | Mean | 34.54 | 41.88 | 39.39 |
| | SE ± | 4.32 | 3.59 | 4.69 |
| II | 0 | 13.89[b] | 23.00[b] | 24.22[a] |
| | 15 | 10.8[ab] | 32.00[ab] | 35.00[a] |
| | 30 | 16.22[a] | 31.56[ab] | 28.78[a] |
| | 45 | 15.78[a] | 38.33[a] | 35.78[a] |
| | Mean | 14.17 | 31.22 | 30.95 |
| | SE ± | 1.23 | 3.90 | 2.35 |
| | Varieties | | | |
| | SAMPEA 7 | 24.07[a] | 49.20[a] | 56.13[a] |
| | SAMPEA 9 | 16.93[b] | 32.13[a] | 46.60[b] |
| | SAMPEA 14 | 18.67[b] | 39.00[a] | 58.47[a] |
| | Mean | 19.89 | 40.11 | 53.73 |
| | SE ± | 1.34 | 3.97 | 4.05 |

NB: Means with the same letter(s) within each column, under each factor are not significantly different (P=0.05), using DMRT. 0 = Control without *Alectra* inoculation, WAP= Weeks after planting

**Effect of cow dung treatments on the shoot fresh weight of cowpea varieties on *Alectra* inoculated soil**

Generally, the result showed that, there was no significant difference among shoot fresh weight based on treatments on most of the sampling dates in both trials with the exception of that at 7 WAP in Trial II. The 30kgN/ha cow dung treatment produced the highest shoot fresh weight in cowpea varieties compared with other treatments in most sampling dates in Trial I. Also, significant difference was observed among varieties in most of the sampling dates of the two trials (Table 7).

**Treatments**

At 5, 7 and 9 WAP in Trial I, cow dung treatments had no significant effect on shoot fresh weight of cowpea varieties as the highest shoot fresh weight was similar to those at all the other treatments on these sampling dates. (Table 7). This was also the case at 5 and 9 WAP of Trial II. At 9 WAP of Trial I. At 7 WAP in Trial II, the lowest shoot fresh weight due to control was only significantly lower than the highest due to 45 kgN/ha cow dung treatment (Table 7).

**Varieties**

At 5 and 9 WAP in Trial I, there was no significant difference in the shoot fresh weight among the cowpea varieties on the two sampling dates (Table 7). At 7 WAP in Trial I, the lowest shoot fresh weight due to SAMPEA 7 and SAMPEA 14 was only significantly lower than the highest due to SAMPEA 9. At 5 WAP in Trial II, the highest shoot fresh weight due to SAMPEA 7 was significantly higher than that due to all the other varieties and it was followed by that due to SAMPEA 14 (Table 7). Similar trend was observed at 7 and 9 WAP in Trial II in the sense that, the lowest shoot fresh weight due to SAMPEA 9 was only significantly lower than the highest due to SAMPEA 7 on both sampling dates (Table 7).

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**Table 7**: Effect of cow dung treatments on the shoot fresh weight of cowpea varieties on *Alectra* inoculated soil

| Trial | Cow dung Treatments (KgN/ha) | Plant age (WAP) Shoot fresh weight (g) 5 | 7 | 9 |
|---|---|---|---|---|
| I | 0 | 8.57[a] | 17.38[a] | 14.13[a] |
| | 15 | 10.38[a] | 16.31[a] | 18.46[a] |
| | 30 | 26.58[a] | 17.74[a] | 19.54[a] |
| | 45kg | 13.73[a] | 16.47[a] | 21.30[a] |
| | Mean | 14.82 | 16.98 | 18.36 |
| | SE ± | 6.67 | 1.74 | 3.64 |
| | Varieties | | | |
| | SAMPEA 7 | 23.34[a] | 15.22[b] | 23.69[a] |
| | SAMPEA 9 | 11.27[a] | 19.86[a] | 23.51[a] |
| | SAMPEA 14 | 10.63[a] | 15.22[b] | 22.64[a] |
| | Mean | 15.08 | 16.77 | 23.28 |
| | SE ± | 5.16 | 1.35 | 2.82 |
| II | 0 | 2.17[a] | 3.61[b] | 4.26[a] |
| | 15 | 2.39[a] | 3.90[b] | 4.99[a] |
| | 30 | 2.46[a] | 3.82[b] | 5.40[a] |
| | 45 | 2.41[a] | 5.91[a] | 5.57[a] |
| | Mean | 2.36 | 4.31 | 5.06 |
| | SE ± | 0.32 | 1.38 | 1.15 |
| | Varieties | | | |
| | SAMPEA 7 | 2.81[a] | 5.09[a] | 5.92[a] |
| | SAMPEA 9 | 1.65[c] | 3.63[b] | 3.91[b] |
| | SAMPEA 14 | 2.12[b] | 3.68[b] | 4.50[b] |
| | Mean | 2.19 | 4.13 | 4.78 |
| | SE ± | 0.73 | 1.38 | 1.41 |

NB: Means with the same letter(s) within each column, under each factor are not significantly different (P=0.05), using DMRT. 0 = Control without *Alectra* inoculation, WAP= Weeks after planting

**Effect of cow dung treatments on the root fresh weight of cowpea varieties on *Alectra* inoculated soil**

Generally, the data showed that, there was no significant difference in root fresh weight among the cowpea varieties based on treatments on most of the sampling dates in both trials with the exception of 9 WAP and 7 WAP in Trial I and II respectively. Also, significant difference was observed in root fresh weight among cowpea varieties in all the sampling dates of the two trials (Table 8).

**Treatments**

At 9 WAP in Trial I, the lowest root fresh weight due to control was only significantly lower than the highest due to 30 kgN/ha cow dung treatment. At 5 and 7 WAP of Trial I, cow dung treatments had no significant effect on root fresh weight as the highest shoot fresh weight due to 45 kgN/ha cow dung treatment was similar to those due all the other treatments (Table 8). This was also the case at 5 and 9 WAP of the Trial II. At 7 WAP sampling date in Trial II, the lowest root fresh weight due to control was only significantly lower than the highest due to 45 kgN/ha cow dung treatment (Table 8).

**Varieties**

At all the sampling dates in Trial I, the lowest root fresh weight due to SAMPEA 14 was only significantly lower than the highest due to SAMPEA 7 at 5 WAP, SAMPEA 9 at 7 WAP and SAMPEA 7 and SAMPEA 9 at 9 WAP respectively. This was also the case at 7 and 9 WAP in Trial II where the lowest root fresh weight due to SAMPEA 9 was only significantly lower than the highest due to SAMPEA 7. At 5 WAP in Trial II the highest root fresh weight due to SAMPEA 7 was significantly higher than that due to all the other varieties but this was followed by that due to SAMPEA 14 (Table 8).

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**Table 8**: Effect of cow dung treatments on the Root fresh weight of cowpea varieties data on *Alectra* inoculated soil

| Trial | Cow dung | Plant age (WAP) Root fresh weight (g) | | |
|---|---|---|---|---|
| | Treatments(KgN/ha) | 5 | 7 | 9 |
| I | 0 | 1.53[a] | 2.83[a] | 3.53[b] |
| | 15 | 1.64[a] | 2.98[a] | 4.05[ab] |
| | 30 | 1.60[a] | 3.11[a] | 6.14[a] |
| | 45 | 2.03[a] | 4.58[a] | 4.91[ab] |
| | Mean | 1.70 | 3.38 | 4.66 |
| | SE ± | 0.31 | 0.68 | 0.69 |
| | Varieties | | | |
| | SAMPEA 7 | 2.76[a] | 3.53[ab] | 6.89[a] |
| | SAMPEA 9 | 1.93[b] | 4.57[a] | 6.57[a] |
| | SAMPEA 14 | 1.85[b] | 2.71[b] | 3.91[b] |
| | Mean | 2.18 | 3.60 | 5.79 |
| | SE ± | 0.24 | 0.52 | 0.54 |
| II | 0 | 0.19[a] | 0.48[b] | 0.61[a] |
| | 15 | 0.20[a] | 0.63[ab] | 0.79[a] |
| | 30 | 0.23[a] | 0.50[b] | 0.82[a] |
| | 45 | 0.21[a] | 0.88[a] | 0.80[a] |
| | Mean | 0.21 | 0.62 | 0.76 |
| | SE ± | 0.08 | 0.09 | 0.10 |
| | Varieties | | | |
| | SAMPEA 7 | 0.27[a] | 0.78[a] | 0.97[a] |
| | SAMPEA 9 | 0.14[c] | 0.44[b] | 0.55[b] |
| | SAMPEA 14 | 0.21[b] | 0.57[ab] | 0.61[b] |
| | Mean | 0.21 | 0.60 | 0.71 |
| | SE ± | 0.06 | 0.08 | 0.10 |

NB: Means with the same letter(s) within each column, under each factor are not significantly different (P=0.05), using DMRT. 0 = Control without *Alectra* inoculation, WAP= Weeks after planting

**Effect of cow dung treatments on the yield parameters of cowpea varieties (combined data) on *Alectra* inoculated soil**

**Treatments**

The data on yield parameters in Trial I showed that, cow dung treatment especially at 30 and 45 kgN/ha had a non-significant increase compared with the control on pods number, pods weight and seeds number produced (Table 9). However, cow dung at 30 and 45 kgN/ha had a significant increase in seeds weight and 100 seeds weight above the control and 15kgN/ha treatment. The seeds weight and 100 seeds weight followed similar trend in the sense that, the lowest value of the two parameters due to 15kgN/ha treatment was only significantly lower than the highest due to 30 kgN/ha cow dung treatment. Also, in Trial II, cow dung treatment especially at 30 and 45 kgN/ha had a non-significant increase in seeds number and 100 seeds weight. Pods number and seeds weight followed similar pattern in the sense that the lowest value due to 15kgN/ha was only significantly lower than the highest due to 30 and 45 kgN/ha treatments (pod number) and 30 and 45 kgN/ha (seed weight). The lowest pods number due to 15 kgN/ha was similar to that due to control but significantly lower than the highest due to 30 and 45 kgN/ha cow dung treatments (Table 9).

**Varieties**

In Trial I, all the yield parameters of cowpea varieties under cow dung treatments followed similar pattern. The lowest value of all the yield parameters due to variety SAMPEA 9 was only significantly lower than the highest due to SAMPEA 14. In Trial II, SAMPEA 14 had the highest values in pods number, pods weight, seeds number, seeds weight and 100 seed weight which was significantly higher than the lower value produced by varieties SAMPEA 7 and SAMPEA 9 in most of the yield parameters (Table 9). Variety SAMPEA 9 produced significant lower values in most of the yield parameters than the other varieties (Table 9).

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**Table 9**: Effect of cow dung treatments on the Yield parameters of cowpea varieties (combined data) on *Alectra* inoculated soil

| | | Yield parameters | | | | |
|---|---|---|---|---|---|---|
| Trial | Treatments (kgN/ha) | Pods number | Pods weight (g) | Seeds number | Seeds weight (g) | 100 seeds weight(g) |
| I | 0 | 13.33$^{a}$ | 10.39$^{a}$ | 62.67$^{a}$ | 7.96$^{b}$ | 12.54$^{b}$ |
| | 15 | 11.22$^{a}$ | 10.34$^{a}$ | 60.22$^{a}$ | 7.47$^{b}$ | 12.15$^{b}$ |
| | 30 | 14.75$^{a}$ | 13.38$^{a}$ | 70.25$^{a}$ | 46.31$^{a}$ | 15.53$^{a}$ |
| | 45 | 12.00$^{a}$ | 11.34$^{a}$ | 63.38$^{a}$ | 43.25$^{a}$ | 14.45$^{ab}$ |
| | Mean | 12.83 | 11.36 | 64.13 | 26.25 | 13.67 |
| | SE ± | 1.65 | 1.45 | 4.89 | 1.72 | 1.65 |
| | Varieties | | | | | |
| | SAMPEA 7 | 10.75$^{b}$ | 9.26$^{b}$ | 54.00$^{b}$ | 6.42$^{b}$ | 13.14$^{b}$ |
| | SAMPEA 9 | 9.15$^{b}$ | 6.63$^{b}$ | 40.77$^{b}$ | 5.52$^{b}$ | 12.14$^{b}$ |
| | SAMPEA 14 | 18.43$^{a}$ | 19.14$^{a}$ | 98.86$^{a}$ | 54.72$^{a}$ | 15.20$^{a}$ |
| | Mean | 12.78 | 11.68 | 64.54 | 22.22 | 13.49 |
| | SE ± | 1.45 | 1.35 | 4.98 | 1.98 | 1.36 |
| II | 0 | 8.44$^{b}$ | 2.30$^{b}$ | 21.00$^{a}$ | 1.87$^{b}$ | 8.64$^{a}$ |
| | 15 | 7.44$^{b}$ | 1.96$^{b}$ | 20.67$^{a}$ | 1.58$^{b}$ | 9.16$^{a}$ |
| | 30 | 12.89$^{a}$ | 3.31$^{b}$ | 29.33$^{a}$ | 2.70$^{a}$ | 10.66$^{a}$ |
| | 45 | 11.78$^{a}$ | 3.43$^{a}$ | 28.11$^{a}$ | 2.86$^{a}$ | 10.91$^{a}$ |
| | Mean | 10.14 | 2.75 | 24.78 | 2.25 | 9.84 |
| | SE ± | 1.22 | 0.42 | 2.13 | 0.41 | 1.23 |
| | Varieties | | | | | |
| | SAMPEA 7 | 10.00$^{a}$ | 2.76$^{b}$ | 22.50$^{b}$ | 2.33$^{b}$ | 10.76$^{a}$ |
| | SAMPEA 9 | 7.29$^{b}$ | 2.06$^{c}$ | 20.93$^{b}$ | 1.78$^{c}$ | 8.54$^{a}$ |
| | SAMPEA 14 | 12.14$^{a}$ | 3.66$^{a}$ | 31.86$^{a}$ | 2.95$^{a}$ | 11.01$^{a}$ |
| | Mean | 9.81 | 2.83 | 25.10 | 2.35 | 10.10 |
| | SE ± | 1.22 | 0.61 | 1.78 | 0.53 | 1.12 |

NB: Means with the same letter(s) within each column, under each factor are not significantly different (P=0.05), using DMRT. 0 = Control without *Alectra* inoculation, WAP= Weeks after planting

**Effect of cow dung manure treatments on *Alectra* infestation of different cowpea varieties**

Generally, the result showed that, the highest number of *Alectra* shoots produced due to variety SAMPEA 7 and all the other treatments was significantly higher than the lowest *Alectra* shoots produced due to the control and variety SAMPEA 9 and SAMPEA 14 in Trial I. In Trial II the two varieties SAMPEA 7 and SAMPEA 9 produced the highest number of *Alectra* shoots which was significantly higher the then lowest due to SAMPEA 14 (Table 10). The highest number of *Alectra* shoots produced due to cow dung manure was at 45 kgN/ha treatment and it was only significantly higher than the lowest due to control in the two trials.

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**Table 10**: Effect of cow dung manure treatments on *Alectra* infestation (combined data) of cowpea varieties

| Trial | Treatments (KgN/ha) | Alectra Shoots Number |
|---|---|---|
| I | 0 | 0.00[b] |
| | 15 | 5.22[a] |
| | 30 | 6.78[a] |
| | 45 | 8.44[a] |
| | Mean | 5.11 |
| | SE± | 1.15 |
| | Varieties | |
| | SAMPEA 7 | 9.80[a] |
| | SAMPEA 9 | 3.00[b] |
| | SAMPEA 14 | 0.00[c] |
| | Mean | 4.27 |
| | SE± | 0.99 |
| II | 0 | 0.00[c] |
| | 15 | 2.78[b] |
| | 30 | 4.44[ab] |
| | 45 | 5.89[a] |
| | Mean | 3.28 |
| | SE± | 0.89 |
| | Varieties | |
| | SAMPEA 7 | 4.93[a] |
| | SAMPEA 9 | 4.57[a] |
| | SAMPEA 14 | 0.00[b] |
| | Mean | 3.17 |
| | SE± | 0.87 |

NB: Means with the same letter(s) within each column, are not significantly different (P=0.05) using DMRT. 0 = Control without *Alectra* inoculation.

## DISCUSSIONS

### Vegetative growth parameters of cowpea varieties grown under varying concentration of Cow dung manure

In the two trials, the application of cow dung manure enhanced the growth parameters of all the cowpea varieties. The improvement in the growth parameters is associated with the increase in plant nutrients as affirmed by Reyhan and Amiraslani (2006). This was also in line with the report by Abayomi *et al*. (2008) that, application of the manure enhanced the growth parameters of cowpea varieties. The availability of sufficient growth nutrients from inorganic fertilizers lead to improved cell activities, enhanced cell multiplication and enlargement and luxuriant growth (Fashina *et al*., 2002). Nitrogen fertilizer reduced the severity of *Striga* attack while simultaneously increased the host performance (Lagoke and Isah, 2010). The increase in growth parameters of cowpea varieties in *Alectra* inoculated soil with increased cow dung manure rates is not unexpected and might be more possible due to the direct effect of nutrient on vegetative growth and its indirect effect by reducing *Alectra* infestation which was reported to have negative effect on growth of plant (Olupot *et al*., 2003). *Alectra* inoculation caused a slight increase in growth of cowpea especially at 9 WAP compared with the other sampling ages in both Trials I and II. The increase in growth parameters at 9 WAP could be attributed to low nutrient demand or low *Alectra* infestation at the age. This is in line with Bashir (2008), who reported an increase in plant height in *Alectra* inoculated cowpea varieties as compared with the uninoculated cowpea varieties. In Trial I, cowpea variety SAMPEA 9 produced the highest values in most growth parameters, excluding Root Fresh Weight. On the other hand, in Trial II SAMPEA 7 produced the highest Number of Leaves, Root Length, Shoot Fresh Weight and Root Fresh Weight, but SAMPEA 9 produced the lowest Plant Height, Number of Root Noodles, Root Length, Shoot Fresh Weight and Root Fresh Weight in Trial II. These differences could be the character resulting from the crop genetic makeup and their differences in response to the effect of manure and this agrees with the findings of Abayomi *et al* (2008) that, application of fertilizer leads to more leaves and branches of cowpea. Also, Omotosho (2014) reported that, the number of leaves and number of branches per plant were also significantly increased with the increased rate of fertilizer application. Control resulted with the lowest values of parameters recorded especially at the Trial II when compared with the *Alectra* inoculated soil.

**Yield and Yield Components of Cowpea Varieties grown under varying concentration of animal waste**

Cow dung manure application significantly improved seeds weight in Trial I, and it significantly increased the all the yield parameters in Trial I. This is due to the activities of the manure on root/vegetative growth and root nodulation. These growth parameters were significantly improved by the application of manure and hence significant increase in grain yield and yield parameters. This is in line with the report of Abayomi *et al*. (2008) that, yield parameters and consequently grain yield were significantly increased by fertilizer application at 30-15-15-kgN-P-K/ha. *Alectra vogelii* inoculation did not significantly reduced the yield parameters of cowpea varieties on *Alectra* inoculated soil in Trials I and II. This is not in accordance with the report that, *A. vogelii* infestation causes a reduction in number of pods per plant, weight of pod, number of seeds per pod, weight of seeds and chlorophyll contents of the leaves among susceptible genotypes (Kutama *et al*., 2013).

The SAMPEA 14 generally produced the highest yield parameters when compared with the other cowpea varieties, this might be as a result of difference in genetic make-up and the variety resistance to the *Alectra*.

There was reduction in pod weight of cowpea varieties on *Alectra* inoculated soil under the cow dung manure treatment, this could be attributed to reduction in the number of root nodules, shoot and root growth weight observed in this study. This finding is in line with the reports of Karanja *et al.* (2012) that, the devastation of cowpea grain yield at 0 tonne/ha of farmyard manure by *Alectra* could be attributed to the reduced root nodulation, root and shoot growth and nutrients uptake exhibited by susceptible varieties (K80 and M66) at stages of vegetative growth as compared to 5 and 10 tonnes/ha where there was more supply of nutrients.

**Effect of Cow dung manure on Alectra infestation of the cowpea varieties**

Control produced the lowest *Alectra* shoot when compared with the other treatments in the two Trials. This might be a result of absence of *Alectra* infestation in the treatment. The 15kgN/ha in the two trials generally resulted in the lowest *Alectra* shoot growth compared with the other treatments. The highest growth of *Alectra* shoot due to 45kgN/ha followed by 30kgN/ha in the two trials could be due to the presence of high level of Nitrogen in the soil. This is in contrast to the efficacy of nitrogen in reducing *Alectra* shoots in Soybean as reported by Tarfa *et al*. (1996). Similar effect of the nutrient was observed on cowpea by Magani (1994). Similarly, Kwaga *et al*. (2010), reported significant reduction in of *Alectra vogelii* shoots when 25 kgN/ha was applied to groundnut. The suppressing effect of nitrogen on parasitic weeds has to do with the lethal effect of the nutrient on the weeds. However, it was shown that, variety SAMPEA 14 exhibited the highest resistance to *Alectra* having shown the lowest *Alectra* incidence in Trials I and II. This could be attributed to the possibility of its producing the least germination stimulant (Kwaga *et al*., 2010). However, SAMPEA 7 was found to support the highest number of *Alectra* shoots throughout the growth period.

**Conclusion and Recommendations**

In conclusion, Application of manure at 15 – 45 kgN/ha generally enhanced the vegetative growth and yield parameters of the three cowpea varieties on *Alectra* inoculated soil. Also, application of cow dung manures at 45 kgN/ha had the highest incidence of *Alectra vogelii* that was generally similar to that due to 15 and 30kgN/ha treatment on SAMPEA 7 and 9 indicating that SAMPEA 14 is a resistant variety.

In view of the above findings, it was recommended that, the cow dung manure should be considered as an efficient control measure for *Alectra* infestation on susceptible cowpea varieties due to its ability to supply adequate nutrient to the soil to enhance its fertility, which in turn reduced the adverse effects of *Alectra vogelii* infestation thereby enhancing good growth and yield of cowpea plants. For better yield and growth of cowpea, resistant varieties such as SAMPEA 14 should be cultivated most especially for commercial purposes.

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