Journal of Novel Applied Sciences
Available online at www.jnasci.org
©2014 JNAS Journal-2014-3-4/440-443
ISSN 2322-5149 ©2014 JNAS

Effect of organic fertilizer on wet weight, dry weight and number of leaves in cowpea

Esmat Fatahi[1], Hamid Reza Mobasser[2*] and Mohammad Mehdi Akbarian[3]

1- MSc student, Department of Agronomy, Zahedan Branch, Islamic Azad University, Zahedan, Iran
2- Department of Agronomy, Zahedan Branch, Islamic Azad University, Zahedan, Iran
3- Bam Branch, Islamic Azad University, Bam, Iran

***Corresponding author*:** Hamid Reza Mobasser

ABSTRACT: Cowpea (*Vigna unguiculata*) is an important grain legume in the West African Semiarid Tropics, where it occupies 6 million hectares. Cowpea is an important component of the predominantly cereal/legume production systems in the region. Vermicompost are finely-divided mature peat like materials which are produced by a non-thermophiles process involving interactions between earthworms and microorganisms. The experiment was conducted at the bam narmashir (in Iran) which is situated between 28° North latitude and 57° East longitude and at an altitude of 1050 m above Mean Sea Level. Effect of cow manure, Chicken manure and Compost on wet weight, dry weight and number of leaves was very significant.

***Keywords*:** Compost, Cow manure, Chicken manure.

INTRODUCTION

The name “cowpea” was first used in America. The earlier English name was cavalance and was first used in West Indies.It is a leguminous crop grown through the African continent as well as in parts of south East Asia and Latin America (Rachie and Singh, 1985).Cowpea an annual legume is also commonly referred to as southern pea, black eye pea, lubia, niebe, coupe or frile (Wallace, 1972).Cowpea is a drought tolerant crop and better adapted to sandy soil (Rachie and Roberts, 1974). Cowpea (*Vigna unguiculata*) is an important grain legume in the West African Semiarid Tropics, where it occupies 6 million hectares. Cowpea is an important component of the predominantly cereal/legume production systems in the region. The most important cereals are sorghum and pearl millet and cowpea is often intercropped with these cereals (Steiner, 1984). Cowpea grain contains about 22% protein and constitutes a major source of protein for resource-poor rural and urban people. It is estimated that cowpea supplies about 40% of the daily protein requirements to most of the people in Nigeria (Muleba et al. 1997). Legumes need a high phosphorous requirement for nodule development and optimal growth (Barret, 1990) and nodulation in cowpea is generally reduced in acid-aluminum-rich soils where even tolerant strains fail to infect root hairs (Applebaum, 1990). Factors such as manganese toxicity may also be involved in reducing cowpea nodulation at low pH (Applebaum, 1990). Fertilizers can be organic composed of organic matter) or (inorganic made of simple, inorganic chemical is or minerals (Trewavas, 2004). So, organic manures like vermicomposts can be a good substitude for chemical fertilizers to overcome their adverse effects. Vermicompost are finely-divided mature peat-like materials which are produced by a non-thermophylic process involving interactions between earthworms and microorganisms (Edwards and Burrows, 1988) leading to bioxidation and stablisation of organic material (Aira, 2000). Vermicomposts are effective organic fertilizers and biocontrol agents (Edwards and Arancon, 2004; Simsek-Ersahin, 2011). Vermicomposts can improve food quality without compromising with food safety (Simsek-Ersahin , 2011). Both developed and developing countries are using vermicomposting during last 40 years (Edwards, 1995; Simsek-Ersahin, 2011). Applications of vermicompost singly or in combination with either other organic fertilizers or chemical fertilizers have been proved effective to enhance growth and yield of various plants like Urad and Soyabean (Javed and Panwar, 2013), Setaria grass (Sabrina, 2013), Lilies (Mirakalaei. 2013), Marigold (Paul and Bhattacharya 2012), Manures, in the wide sense refers to all substances added to the soil in order to increase the

supply of plant nutrients (Ahn, 1993). Organic manures supplies most of the nitrogen, sulphur and half phosphorus needed by unfertilized crops (Hseih, 1996). The value of organic amendments in crop production is centered on the ability of animals and plants to provide nutrients and to improve the chemical, physical and biological properties of soils (IFIA, 1992). The regular addition of organic amendments to soil is very important in the developing world of the tropics, where most traditional farming systems are not sustainable (Sangakkara, 1993). Organic manure improves soil tilth, infiltration rate and soil water holding capacity; contributes nutrient to the crop and it is an important source of raw or partially decomposed organic matter (Bill, 2001). The earthworm-processed organic wastes, often referred to as vermicomposts, are finely divided peat-like materials with high porosity, aeration, drainage, and water holding capacity (Edwards and Burrows, 1988). The vermicomposting is biooxidation and stabilization of organic material involving the joint action of earthworms and microorganisms. Although, microbes are responsible for the biochemical degradation of the organic matter, earthworms are the important drivers of the process, conditioning the substrate and altering biological activity (Aira, 2002; Suthar, 2008c). The studies have revealed that vermicompost may be potential sources of nutrients for field crops if applied in suitable ratios with synthetic fertilizers. Also, vermicompost may contain some plant growth-stimulating substances. The plant-hormone-like is extensively reported in worm-processed materials possibly due to higher microbial populations (Krishnamoorthy and Vajranabhaian, 1986; Tomati, 1987; Mascolo, 1999). Also, Suthar, (2005) reported a hormone like effect of earthworm body fluid on seedling growth of some legumes. Integrated use of organic manures and fertilizers has been found to be promising not only in maintaining higher productivity but also for providing stability in crop production. Long term manorial experiments conducted in India showed a declining trend in productivity with application of N.P. and K fertilizers alone (Nambiar and Abrol, 1989). An application of manure usually shows a favorable influence on crop yields for several years. Greater efficiency of manure is obtained when applied in small amounts and more often (Gibberd, 1995).These beneficial effects are distributed over a longer time than those of chemical fertilizers. Use of organic manures such as compost, vermicompost, dry leaf powder on growth and yield of crop was also studied and result into increased productivity (Naikwade, 2011a, 2011b Ghadge, 2013).

MATERIALS AND METHODS

The experiment was conducted at the bam narmashir (in Iran) which is situated between 28° North latitude and 57° East longitude and at an altitude of 1050 m above Mean Sea Level. Composite soil sampling was made in the experimental area before the imposition of treatments and was analysed for physical and chemical characteristics. The field experiment was laid out in randomized complete block design with factorial design with three replications. The factor of municipal solid waste compost the three levels (0, 5, 10 ton/ha), manure factor with three levels (0, 3, 6 ton/ha) and chicken manure factor with two levels (0, 2 ton/ha). Final thinning was done two weeks after emergence to maintain only one healthy seed-ling per hill. To check weed growth, intercultivation was carried out two times at 15 and 30 DAS using blade hoe and hand weeding was done at 25 and 45 DAS. Data collected were subjected to statistical analysis by using a computer program MSTATC. Least Significant Difference test (LSD) at 5 % probability level was applied to compare the differences among treatments` means.

RESULTS AND DISCUSSION

Wet weight

Effect of cow manure, Chicken manure and Compost on wet weight was very significant (Table 1). The greatest amount of Treatment of municipal solid waste compost 10 t ha with 3 tons of cow manure and Chicken manure treatments 2 tons per hectare, respectively. The least amount of wet weight was obtained from the control treatment (Table 2). The interaction between Compost and cow manure on wet weight was significant (Table 1). In an experiment that examines the impact of avian and ovine animal manure on growth and yield cowpea in Tanzania was the results were similar to the survey results showed that more weight was significantly increased by application of chicken manure. Other indicators of growth such as leaf stem diameter and dry weight also increased with the use of sheep manure was more than Chicken manure. Similar research in municipal compost and its leachate significantly higher shoot wet weight in cowpea plants were produced.

Table 1. Analysis of variance for cowpea characteristic as affected by manure

S.O.V	df	Wet weight	MS dry weight	Number of leaves
Replication	2	1.374^{ns}	3.56**	3.52^{ns}
Compost (A)	2	116.37**	87.6**	207.9**
Cow manure (B)	2	24.116**	7.342**	20.65**
Interaction (AB)	4	1.669*	3.287**	3.608*
Chicken manure (C)	1	519.56**	20.78**	943.34**
Interaction (AC)	2	5.704**	1.612**	64.819**
Interaction (BC)	2	1.164**	0.341**	15.365**
Interaction (ABC)	4	4.883**	3.650**	17.435**
Error	34	0.640	0.196	2.185
C.V (%)	-	8.58	7.45	12.56

*, **, ns: significant at p<0.05 and p<0.01 and non-significant, respectively. C.V: Coefficient of Variation

Dry weight

Effect of cow manure, Chicken manure and Compost on dry weight was very significant (Table 1). The greatest amount of treatment of municipal solid waste compost 10 t ha with 3 tons of cow manure and Chicken manure treatments 2 tons per hectare, respectively. The least amount of dry weight was obtained from the control treatment (Table 2). The interaction between Compost and cow manure on dry weight was significant (Table 1). Perhaps one reason is that these two types of fertilizers in terms of nutrients, they complement each other. The effects of different amounts of bovine manure, poultry and municipal solid waste compost also showed that by increasing the use of organic fertilizer alone the impact of each of these a significant increase in dry weight (Table 2). Due to organic matter in manure Compost improves soil aeration are also organic acids and nutrients in the soil is ready to plant uptake.

Table 2. Means comparison for cowpea characteristic as affected by manure

Treatments	Wet weight (gr)	dry weight (gr)	Number of leaves
control	44	14.9	21
Cow manure (3 ton)	47.6	15.93	20.5
Cow manure (3 ton) + Compost (5 ton)	46.1	14.8	19.93
Cow manure (6 ton)	46.23	17	20.93
Compost (5 ton)	46.23	18	23.53
Cow manure (6 ton)	48.33	19	24.4
Cow manure (6 ton) + Compost (5 ton)	48.1	19	23.83
Cow manure (6 ton) + Compost (10 ton)	51	17.4	24.06
Cow manure (3 ton) + Compost (10 ton)	52.33	20.96	23.33
chicken manure (2 ton)	49	15.4	24.4
Cow manure (3 ton) + chicken manure (2 ton)	51.8	15.96	26
Cow manure (3 ton) + chicken manure (2 ton)+ Compost (5 ton)	52.23	17.16	28.03
Cow manure (6 ton) + chicken manure (2 ton)	53.83	18.9	31.33
Compost (5 ton)+ chicken manure (2 ton)	54.7	16.16	27
Cow manure (6 ton) + chicken manure (2 ton)	54.4	18.3	30.66
Cow manure (3 ton) + Compost (5 ton)+ chicken manure (2 ton)	55.53	19.86	33
Cow manure (6 ton) + Compost (10 ton)+ chicken manure (2 ton)	54.16	20.83	36
Cow manure (3 ton) + Compost (10 ton)+ chicken manure (2 ton)	57.13	22.33	40.33

Any two means not sharing a common letter differ significantly from each other at 5% probability

Number of leaves

Effect of cow manure, Chicken manure and Compost on number of leaves was very significant (Table 1). The greatest amount of treatment of municipal solid waste compost 10 t ha with 3 tons of cow manure and Chicken manure treatments 2 tons per hectare, respectively. The least amount of number of leaves was obtained from the control treatment (Table 2). The interaction between Compost and cow manure on number of leaves was significant (Table 1). The amount of heat absorbed by the soil, the soil light and dark Therefore fertilizers and poultry cow contributed much to global warming and ultimately more growth and fertilizer plant due to increased humus and water retentively food is dirt. The benefits of manure and Compost on growth of cowpea are probably the main reason.

REFERENCES

Ahn PM. 1993.Tropical soils and fertilizer, Tropicultural Agricultural Sciences, pp 86.

Aira M, Monroy F, Dominguez J, Mato S. 2000. How earthworm density affects microbial biomass and activity in pig manure. European J Soil Biol 38:7–10

Applebaum E. 1990. The Rhizobium and Bradyrhizobium legume symbiosis pp. 131-158 in P. Gresshof (ed) Molecular biology of symbiotic Nitrogen fixation. CRC. Press Boca Raton, F L.

Barrett RP. 1990. Legume species and leaf vegetables In: Advances in new crops. (Eds.) J. Janick and J.F. Simon. Timber Press. Portland.

Bill U. 2001. Manure and soil organic matter. Pennsylvania Stat Field Crop News: 01:11.

Edwards CA. 1995. Historical overview of vermicomposting. Biocycle 36:56–58

Edwards CA, Arancon NQ. 2004. Vermicomposts suppress plant pest and disease attacks. Biocycle 45:51–55

Edwards CA, Burrows I. 1988. The potential of earthworm composts as plant growth media. In: Neuhauser CA (ed) Earthworms in Environmental and Waste Management. SPB Academic Publishing, The Hague, the Netherlands, pp 211–220.

Ghadge SA, Naikwade PV, and Jadhav BB. 2013. Utilization of problematic weed for improved yield of fenugreek, Indian Stream research Journal 3(4): 1-8.

Gibberd V. 1995. Yield responses of food crops to animal manure in semi-arid Kenya. Tropical Sciences, 35: 418-426.

IFIA. 1992. Sustainable agricultural system for the 21st century – the role of mineral fertilizer. International Fertilizer Industry Association. Pans, France, 16pp.

Javed S, Panwar A. 2013. Effect of biofertilizer, vermicompost and chemical fertilizer on different biochemical parameters of Glycine max and Vigna mungo. Recent Research in Science and Technology 5(1):40–44

Krishnamoorthy RV, Vajranabhaian SN. 1986. Biological activity of earthworm casts. An assessment of plant growth promotes or levels in the casts. Proceedings of Indian Academy of Sciences (Animal Science), 95(3), 341-351.

Kumar A, Bohra B. 2006. Green technology in relation to sustainable agriculture. In: Kumar A, Dubey P (eds) Green Technologies for sustainable agriculture. Daya Publishing house, Delhi.

Mascolo A., Bovalo F, Gionfriddo F, Nardi S. 1999. Earthworm humic matter produces auxin like effects on Daucus carota cell growth and nitrogen metabolism. Soil Biology & Biochemistry, 31, 1303-1313.

Mirakalaei SMM, Ardebill ZO, Mostafavi M. 2013. The effects of different organic fertilizers on the growth of lilies (Lillium longiflorum). International Research Journal of Applied and Basic Sciences 4(1):181–186

Muleba N, Dabire C, Suh JB, Drabo I and Ouedraogo JT. 1997. Technologies for cowpea production based on genetic and environmental manipulations in the semi-arid tropics. Pages 195–206 .

Naikwade PV, Mogle UP and Jadhav BB. 2011a. Improving Total chlorophyll, ascorbic acid and β -carotene in spinach by applying weed manures, Bioscience discovery, 2(2):251-255.

Naikwade PV, Mogle UP and Jadhav BB. 2011b. Effect of Ipomoea weed manures on quality of fodder crop maize, Research journal of agricultural science, 2(4):927-930.

Nambiar KKM and Abrol IP. 1989. Long term fertilizer experiments in India: An overview. Fert. News. 34(4): 11-20.

Sabrina DT, Hanafi MM, Gandahi AW, Mohamed MTM, Aziz NAA. 2013. Effect of mixed organic–inorganic fertilizer on growth and phosphorous uptake of grass (Setaria -splendida). Australian Journal of Crop Science 7(1):75–83

Sangakkara UR. 1993. Effect of EM on Nitrogen and Potassium levels in the Rhizosphere of Bush Bean. Third International Conference on Kyusei Nature Farming 1993. Sanat Barbara, California, USA. 5-7 October 1993.

Simsek-Ersahin Y. 2011. The Use of Vermicompost Products to Control Plant Diseases and Pests. In: Karaca A (ed) Biology of Earthworms, Soil Biology Springer-Verlag Berlin Heidelberg.

Steiner KG. 1984. Intercropping in tropical smallholder agriculture with special reference to West Africa. Stein, West Germany. 304 pp.

Suthar S. 2008c. Bioremediation of aerobically treated distillery sludge mixed with cow dung by using an epigeic earthworm Eisenia fetida. Environmentalist 28, 76 – 84

Suthar S, Choyal R, Singh S, Sudesh. 2005. Stimulatory effect of earthworm body fluid (vermiwash) on seed germination and seedling growth of two legumes. Journal of Phytological Research, 18(2), 219-222.

Tomati U, Grappelli A, Galli E. 1987. The presence of growth regulators in earthworm-worked wastes.