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The role of Bio-intensive Technology in Minimizing the Vices of the Contributions of Traditional Agricultural Practices to Climate Change

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ABSTRACT: The traditional Agricultural Practices in the real sense is a destructive exploration/exploitation of the ecosystem. The consequences of these lead to a shift in the balance of natural replenishment of both renewable and non renewable resources. Generally, the Production system disregards conservation and sustainability. The ecology is thus subsequently challenged with pollution, flood, drought, a decline in soil fertility and global warming. In an attempt to find remedy to the general environmental degradation, the present study was conceptualized and designed to tackle the problem using a bio-intensive approach. This is with the objective of achieving conservation and sustainability as the natural resources is being simultaneously explored and exploited. A split - plot experiment was designed, and to enhance soil fertility trial, 3 sources of biological nutrients (Compost manure, Rhizobium inoculums and Mycorrhizer fungi) were assigned to the sub-plots. While the main plot which was simultaneously conceptualizes to facilitate water conservation, was assigned to 3 methods of subsistence irrigation, (watering can, pitcher pots and bucket kit drip). Green pea was used as the experimental crop, while data were taken on (i). Pod yield (ii). Nodulation (iii) Root length and (IV) Percentage seed protein. The data collected were subjected to ANOVA and treatment means were separated using LSD ($P \leq 0.05$). The result showed that there were significantly ($P \leq 0.05$) improvement in the crop performance based irrigation method and crop nutrition was biologically enhanced with the use of biological source of nutrients. It was thus suggested that bio degradable material could be decomposed for use of compost manure instead of burning (to release CO_2, CH_4 and other green house gases to the atmosphere), While seed inoculation using beneficial biological agents will also minimize pollution.

Keywords. Conservation, Bio-intensity and Environmental Degradation

Introduction

Most strategies adopted in traditional and commercial agriculture are basically targeted at achieving higher efficiency in the exploration of natural resources (Lasisi, 2010). This has party consequently led to the deterioration of the natural ecosystem. In most production system, land preparation for crop establishment is achieved by slash and burn of the vegetation on the site.

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The slash and burn agricultural production system thus grossly disregard the numerous potential of green plant in the conservation and sustainability of the ecosystem. Green plant plays a major role the control of air pollution. Green plants fixes a very large quantity of CO_2 thus minimizing it contribution to green house effects green. Petu-Ibikunle *et al*, (2011) reported that a very large volume of CO2 is librated to the atmosphere when green plants are burnt in the process of land clearing.

Another group of devastator of vegetation/ green plant is grazing animals. Unfortunately, their dropping (i.e. dung) which ordinarily are expected to contribute to soil fertility if not properly managed would rather contribute to green house gases according to pleasant and Smith (2008) and Mastandrea and Schneider (2009). This is because they liberate methane, NO2 and other green house gases during decomposition.

Based o the foregoing, it is obvious that the complete removal of vegetation depletes and derive the soil of natural fertility, while the destruction via burring contributes largely to global warming and climate change efforts made to compensate for the efforts made to compensate for the removed vegetation had been achieved via series of agro forestry projects including alley cropping system (IITA 1990) . This biotechnology could be efficient in recycling soil nutrient and checking CO2 pollution in addition to other numerous benefits of afforestration in general. The technology is however not sufficient in coping with the extent of degradation going on in the ecosystem.

The persistent use of chemical fertilizer, pesticides and irrigation facilities aimed at boosting food production is unhealthy to the environment and food produced thereafter is not very safe for consumption (Olaoye 2011). The general environmental unfriendliness is identified as contamination and wastage of water, flood, erosion, and desertification.

The adoption of bio-intensive technology/organic farming in food production will thus afford a safer food in a healthier environment.

Based on the foregoing, the present study was conceptualized to use bio-intensive technology to attain a sustainable food production with minimum damage to the ecosystem. This is with the objective of an efficient simultaneous exploration and conservation of the natural ecosystem with specific interest in climate change.

Materials And Methods

Description of the experimental site.

The experiment was conducted under a screen house condition of healing house international sponsored project site Maiduguri. The location is situated in the semi arid of the Sudan savannah region of Nigeria. It falls within latitude $14^{\circ}04'$N and longitude $13^{\circ}05'$E the annual rainfall is low (in the range of 500mm), erratic in distribution and duration .the soil s is characteristics is described by Rajar (1983), USDA (1975), Folorunsho (1986), Grema and Hess (1984).

Experimental design and procedure

The experiment was designed in a split plot and laid in a randomized block. The main plot was assigned to 3 subsistence irrigation methods. These are watering can, pitcher pots, and bucket kit drip facilities as described by Petu-Ibikunle *et al*, (2010). The sub plots were assigned to biological soil nutrients. These are Rhizobium seed inoculation, seed bed inoculation with Mycorrhizer, and compost manure. A control/check was included as the forth treatment. The treatments were replicated thrice.

Preparation of experimental materials.

(i) Isolation and culturing of Rhizobium inoculums was done according the method described by Weaver and Fredric (1982); William (1984) and Breed(1987) .

(ii) Mycorrhizer (fungi) isolation was done following Walker(1991) procedure.

(iii) Compost manure was prepared according to Petu-Ibikunle *et al*, (2011)

Data collection and analysis

At full pod maturity stage of green pea, data were taken on the following parameters (i) Fresh pod weight (ii) Nodule count (iii) Root length and (iv)Percentage seed protein content using AOAC (1984) procedure The collated data were subjected to ANOVA and mean that were significant were separated using LSD at $P \leq 0.05$.

Results and Discussion

Nodulation in green pea was significantly ($P \leq 0.05$) increased by irrigation (Table 1). The highest was recorded from bucket kit which had 23.67 nodules. Nodulation was lowest in the use of watering can. Nodulation was also significantly ($P \leq 0.05$) affected by biological/organic fertility agents. The highest nodule count of 25 was recorded from Rhizobium. The nodulation from Mycorrhizer and compost were not significantly ($P \leq 0.05$) different from one another, rated second next to the count from Rhizobium inoculation. The check recorded the least nodule count.

The protein content of green pea was significantly affected by subsistence irrigation methods, the seed protein from bucket kit and pitcher (4.45 and 4.647%) although were rated the highest, but not significantly ($P \leq 0.05$) from one another. But they both recorded the highest (nodulation) in superiority to watering can with the least protein content of 4.16%.

Green pea protein content was significantly ($p \leq 0.05$) increased by fertility material. All the 4 treatment means were significantly ($p \leq 0.05$) different from one another. The highest protein content was recorded from compost with 5.89%, Mycorrhizer recorded 4.39% protein while the least protein content of 3.49%, was recorded from the check. Pod yield of green pea was significantly ($p \leq 0.05$) affected by subsistence irrigation methods. There are 2 groups in which the means are not significantly ($p \leq 0.05$) different form one another. Specifically, the bucket kit drip with 11.96kg and pitchers with 14.01kg pod yield were statistically similar and rated significantly ($p \leq 0.05$) higher than watering can which has 11.96kg..

Root length was significantly ($p \leq 0.05$)) affected by the subsistence irrigation methods. The use of bucket kit with 19.58 and 20.88cm from pitcher were not significantly ($P \leq 0.05$) different from are another. The root length of 15.58cm recorded from the use of watering can significantly ($p \leq 0.05$) the lowest.

The biotechnologically prepared source of fertility nutrients significantly ($p \leq 0.05$) increased the root length of green pea. The longest root (22.5cm) was recorded from compost manure. (($p \leq 0.05$ While the use of Mycorrhizer and Rhizobium inoculums treated Green pea which were not significantly ($p \leq 0.05$) different from one another was rated second. The shortest roots (13.5cm) were however recorded from the check.

Discussion

The relatively superior performance of bucket kit drip and pitcher irrigation methods over the use of watering can in enhancing higher nodulation is consistent with the works and explanations of Siverding(1981) and Sprent (1983). Optimum moisture and temperature (soil environmental factors) are capable of affecting nodulation. Nodulation was reported irrigation methods according to Petu–Ibikunle *et al* (2010) were affected by water/irrigation method. Drip competently regulates soil moisture, Steady in filtration, and deep percolation is facilitated while lateral flow water logging and run off is negligible. Soil microbes specifically the nodule forming bacteria are aerobic thus cannot flourish under water logged condition.

The superior performance of Rhizobium inoculated plant in nodulating may be due to the initial inoculums-root/radicle proximity. The inoculums having the advantage over compost and Rhizobium of been stock to the seed may have a faster location and root infection of the roots. Compost and Mycorrhizer however gave the highest pod yield, protein, and root length. This result is consistent with Akintokun *et al* (2010). It was reported that Mycorrhizer increased the (growth hormones) auxin and gibberellins levels of the root. The result can be explained citing Pleasant and Smith (2008) .Compost contains up to 300 species of bacteria mixed with a large population of fungi species, both topping the list of plant growth promoting fungi and bacteria. A group of compost bacteria called siderospores enhances phosphorus absorption and as well boost the plants immune system. It galvanizes the root to be enabled to chelate large molecules like iron. The enhanced increase in seed protein is also justified. Some high protein seed loving insects (cricket) and some slugs and insect devourers (Ground beetles) are active participants in compost preparation site. This could be responsible for the higher nutritional value contained in organic food. (Olaoye, 2011).

Conclusion

Bio-degradable residues (plant materials, saw dust, cow dung, kitchen wastes, etc.) could be very harmful to the environment when not properly disposed. Burning or leaving them to decompose under an uncoordinated condition may lead to environmental contamination/pollution including the release of green house gases. These biodegradables when properly handled will change status from 'waste to wealth'. The micro organisms in them are activated to convert heavy harmful molecules and compounds to plant nutrients. While some of the micro organisms will associate directly with the roots of the crops to enhance a higher nutrient uptake and utilization efficiency.

Table1: The use of Bio-intensive Technology in Minimizing the Vices of Traditional Agricultural Practices to Climate Change.

		NODULE COUNT	PROTEIN CONTENT%	POD YIELD (Kg)	ROOT LENGTH(CM)
A.	IRRIGATION METHOD				
	Watering Can	14.60c	4.16b	11.96b	15.58b
	Bucket Kit drip	23.70a	4.45a	13.27a	19.82a
	Pitcher	21.80b	4.62a	14.01a	20.88a
	SE±	0.44	0.06	0.38	1.24
B.	FERTILITY SOURCE				
	Control	14.80c	3.49d	5.94b	13.50c
	Rhizobium	25.00a	3.88c	15.22b	18.77b
	Mycorrhizer	20.80b	4.39b	15.82a	20.12b
	Compost	19.40b	5.89a	15.36a	22.65a
	SE±	1.35	0.51	0.45	0.79
C.	Interaction (A x B)	*	*	*	*

*Significant (at $P \leq 0.05$).

*Means sharing the same letter alphabets within the rows are not significantly ($P \leq 0.05$) different from one another.

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