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EFFECT OF BIOCHAR WITH POULTRY MANURE ON MORPHOLOGICAL PARAMETERS AND BIOCHEMICAL CONSTITUENTS OF COWPEA (*VIGNA UNGUICULATA* L.) IN INCEPTISOL SOILS

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Abstract– The research work was conducted during *Kharif* season 2020-2021 at the Naini Agricultural Institute Research Farm of the Department of Soil Science and Agricultural Chemistry in Prayagraj (U.P). The data was recorded on 27 plots using 9 treatments including control having 3 levels of Biochar and Poultry Manure respectively (0%, 50%, 100% /ha). This research trial data was recorded based on mean performances in T_9 (B_3 P_3) @ 100% Biochar + 100% Poultry Manure was showed the highest yield (98.05 q/ha). The combination effect of both soil amendment (Biochar and poultry Manure) shown highest results in plant height (cm), number of leaves, number of pods per plant, pod length(cm), weight of pods per plant (cm). The results showed that mean performances of growth parameters of cowpea are shown highest in 75 DAS was found significant. It can be concluded that from this research it is possible to recommend the treatment (T_9) combination of Biochar (5 t/ha) + Poultry Manure (2 t/ha). It shows effective response to soil fertility and increase in plant growth parameters and yield of cowpea.

INTRODUCTION

Cowpea (*Vigna unguiculata*) with chromososme number 2n=22, belongs to the family Leguminosae sub family Fabaceae and genus *Vigna*. It is self pollinated and response to photoperiod. It is mainly grown for its long pods, seeds and foliage and for fodder. It is commonly known as southern bean, yard- long bean, asparagus bean. It is also known as vegetable meat. (Goud *et al*., 2020).

Cowpea (*Vigna unguiculata*), is an important arid legume with a good source of energy, protein, vitamins, minerals and dietary fibre. Sprouts of legume crop (cowpea) enhances the bioavailability and digestibility of nutrients and therefore plays an important role in human nutrition. (Devi *et al*., 2015).

Cowpea, because of its excellent ability to fix atmospheric Nitrogen, has the ability to maintain soil fertility and thus does not require very fertile land for growing. Cowpea is an important part of sustainable agriculture and land use. (Farouk and Amany. 2012).

Biochar and Poultry Manure play an important role in maintenance of biological environment of soil and supply macro and micro nutrients to crops. (Uma devi *et al*., 2019). Recently, much emphasis has been placed on the use of organic fertiliser in cowpea production in order to reduce plant and soil contamination. (Ahmed and Elzaawel., 2010).

Biochar is an optimum level of soil organic matter and biological cycling of nutrients is critical to the success of any soil management. Application of Biochar (a Soil amendment) to agricultural soils isintended to improve soil fertility and sustain crop productivity. (Jaiswal and Singh, 2018). Poultry Manure is an inexpensive source of Nitrogen, Phosphorus and Potassium. Also, soil high in organic matter is less prone to erosion and retains fertilizer better. It in turn makes them available to

plants more quickly as compared to use of inorganic fertilizer only (Alabadan *et al*., 2009).

Cowpea crop getting more economic important all over the country. Due to high protein content, resistance to drought, adaptability of different soil types (Kumari *et al*., 2018).

MATERIALS AND METHODS

The field experiment was carried out at the Soil Science and Agricultural Chemistry research farm at Naini Agricultural Institute, SHUATS, Prayagraj during the *kharif* season (July- October 2021). This experimental trial entitled Effect of Biochar with Poultry Manure on Morphological parameters and biochemical constituents of Cowpea (*Vigna unguiculata* L.) in Inceptisol Soils. Kashi kanchanwas selected as test variety. The main sources of biochar are maize stover(raw material) which improves growth parameters of sandy loam soils. (Ahmed *et al.,* 2020). It was conducted in 3X3 Randomized Block Design. The Nine treatment comprises of T_1- (Control), T_2 - (0 t/haBiochar + 1 t/ha Poultry Manure),T_3 -(0 t/haBiochar + 2 t/haPoultry Manure), T_4 - (2.5 t/haBiochar + 0 t/haPoultry Manure), T_5 - (2.5 t/haBiochar^{-1} + 1 t/haPoultry Manure), T_6 -(2.5 t/ haBiochar + 2 t/haPoultry Manure), T_7 - (5 t/ haBiochar+ 0 t/haPoultry Manure), T_8 - (5 t/ haBiochar + 1 t/ha Poultry Manure), andT_9 - (5 t/ haBiochar + 2 t/haPoultry Manure). Treatments were replicated three times, with each replication being assigned at random with three levels of Biochar and poultry Manure (0%, 50%, 100%) respectively. Data were analyzed stastically using ANOVA technique. (Fisher, 1960).

RESULTS AND DISCUSSION

Post-harvest analysis of the soil was observed as depicted in (Table 1), growth parameters are recorded based on the mean performances of crop the highest plant height of cowpea (cm) was recorded 59.67 cm at 75 DAS for the treatment T_9 [Biochar 5 t/ha$_+$ Poultry Manure 2 t/ha] and lowest plant height was observed 52.16 cm at 30 DAS for the treatment T_1[control]. Number of leaves per plant as depicted in Table 1, the result recorded that the highest number of leaves was observed 29.54 at 75 DAS for the treatment T_9[Biochar 5 t/ha +Poultry Manure 2 t/ha] and lowest number of leaves was observed 38.73 at 30 DAS for the treatment T_1[control]. (Miheretu *et al.,* 2017). Number of pods per plantas depicted in the table, the result explained that the highest number of fruits was observed 22.2 at 75 DAS for the treatment T_9 [Biochar 5 t/ha +Poultry Manure 2 t/ha] and lowest number of fruits was observed 13.45 at 30 DAS for the treatment T_1[control]. (Ahmed *et al*., 2010). Weight of the pods (g)as depicted in the table, the result explained that the highest weight of the fruit was observed 23.62 at 75 DAS for the treatment T_9 [Biochar 5 t/ha$_+$ Poultry Manure 2 t/ha] and lowest weight of the fruit was observed 13.0at 30 DAS for the treatment T_1[control]. Length of the pods(cm)as depicted in Table 1, the result explained that the highest length of the fruit was observed 32.07 at 75 DAS for the treatment T_9 [Biochar 5 t/ha$_+$ Poultry Manure 2 t/ha] and lowest length of the fruit was observed 25.37 at 30 DAS for the treatment T_1[control]. Yield of the pods (q ha^{-1}) as depicted in the table, the result explained that the highest yield of fruits was observed 98.25 at 75 DAS for the treatment T_9 [Biochar 5 t/ha +Poultry Manure 2 t/ha] and lowest yield of fruits was observed 27.43 at 30 DAS for the treatment T_1[control].(Miheretu, A. *et al.,* 2017). (Alves, R, B. *et al.,* 2019). In this research work, the biochemical properties of cowpea such as photosynthetic pigments chlorophyll (mg/g) are high in treatment (t_9) which was (6.02) and biochemical content such as protein (%) are estimated which was (25.85%) in treatment (t_9). It resulted the increases the biochemical properties of cowpea with increase the application of Biochar and Poultry Manure. So the treatment (t_9) was recommendable to enhance the growth parameters of cowpea crop.

CONCLUSION

The research study has resulted the growth parameetrs and Biochemical contents of cowpea was found significant in combination of application of Biochar and Poultry Manure. It could be beneficial for improving growth parameters, biochemical constituents, and increasing cowpea production. Hence, combined application of Biochar and Poultry Manure is a viable management practice to improve soil fertility and nutrient status.

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Table 1. Growth Parameters of Cowpea (*Vignaunguiculata*)

Treatments	Plant height (cm)			Number of leaves			Number of pods			Weight of the pods (g)	Length of the pods (cm)	Yield of pods (q ha^{-1})
	30DAS	60 DAS	75 DAS	30DAS	60 DAS	75 DAS	45 DAS	60 DAS	75 DAS	75 DAS	75 DAS	75 DAS
T_1	24.63	49.60	52.16	14.57	24.20	29.54	7.84	10.20	13.45	13.0	25.37	27.43
T_2	26.67	51.52	54.45	16.30	26.60	31.79	7.46	11.76	13.65	16.63	26.30	35.56
T_3	27.65	50.67	53.79	15.80	26.80	32.68	9.54	12.26	16.99	18.20	26.40	42.76
T_4	29.62	53.44	54.96	16.57	28.50	33.73	8.93	13.05	14.56	16.77	27.67	50.92
T_5	32.58	54.37	56.59	17.50	30.33	35.91	9.52	13.34	18.85	18.53	28.50	56.32
T_6	34.67	55.72	57.91	18.30	32.10	34.86	10.56	14.13	19.09	18.80	29.50	60.89
T_7	33.76	55.15	57.30	17.70	31.60	33.52	9.24	12.76	14.13	16.60	28.63	74.58
T_8	35.56	56.94	58.54	18.87	33.83	36.45	13.56	15.22	19.6	22.10	30.50	80.87
T_9	37.09	56.96	59.67	19.60	35.77	38.73	11.08	15.37	22.2	23.62	322.07	98.25
F test	S	S	S	S	S	S	S	S	S	S	S	S
SEm ±	0.04	0.11	0.14	0.04	0.05	0.08	0.04	0.07	0.10	0.37	0.10	0.45
CD (P=0.05)	0.09	0.26	0.44	0.19	0.21	0.24	0.08	0.23	0.29	1.10	1.33	1.31

Table 2. Effect of Protein and chlorophyll content of cowpea due to application of Biochar and Poultry Manure.

Treatments	Protein content (%)	Chlorophyll content (mg/g)
T_1	18.07	2.52
T_2	19.65	2.67
T_3	20.62	3.44
T_4	22.58	3.87
T_5	23.67	4.12
T_6	24.46	4.54
T_7	24.86	5.94
T_8	25.08	5.96
T_9	25.85	6.02
F test	S	S
SEm ±	0.04	0.01
CD (P=0.05)	0.09	0.03

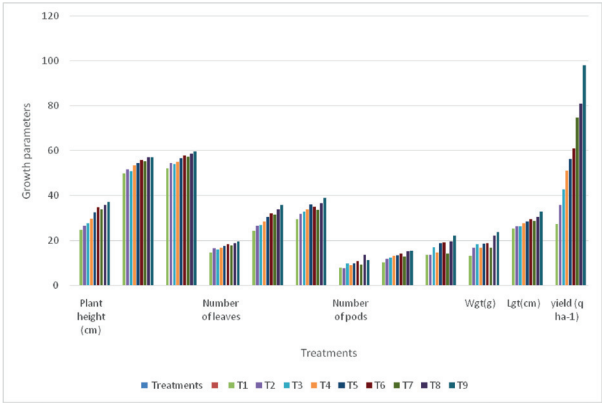

Fig. 1. Growth Parameters of Cowpea (*Vignaunguiculata*)

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