Original Research Article

Effect of Different Organic and Inorganic Fertilizers on Growth Parametes of Soybean (*Glycine max* L. Merr.)

Abstract

A field experiment was conducted during *kharif* season of 2019 at the Experimental Farm, Department of Agronomy College of Agriculture, Latur to study "Integrated Nutrient Management in Soybean (*Glycine max* L.)". The objective of experiment was to find out the effect of different organic and inorganic fertilizers ongrowthandyieldofsoybean. The experiment was laid out in a randomized block design with nine treatments and replicated thrice. The treatmentswere T_1 –100% RDF,T_2 –100%RDF+FYM@5tha^{-1},T_3 – 75%RDF+FYM@5tha^{-1},T_4 – 100%RDF+FYM@ 2.5tha^{-1},T_5 –75%RDF+FYM@2.5tha^{-1},T_6 – 100%RDF+Vermicompost@2.5t ha^{-1}, T_7 – 75%RDF + Vermicompost @ 2.5 t ha^{-1}, T_8 – 100% RDF + FYM @ 5 t ha^{-1} + Vermicompost @ 1.25 t ha^{-1}, T_9 – 75% RDF + FYM @ 5 t ha^{-1}+ Vermicompost @ 1.25t ha^{-1}. The result revealed that the application of Application of100 % RDF + FYMat5tha^{-1}+Vermicompostat1.25tha^{-1} (T_8) wasrecordedhighervaluesofallthe growth parameters of soybean *viz*., plant height(42.87 cm), number of functional leaves (31.53), dry matter accumulation (24.17 g),leaf area (2.67 dm^2), leaf area index (2.77 %),number of branches plant^{-1}(6.20), Absolute Growth Rate (AGR) for plant height (0.04 cm day^{-1} plant^{-1}), Absolute Growth Rate (AGR) for dry matter (-0.55 cm day^{-1} plant^{-1}) and Relative Growth Rate (RGR) for dry matter (-0.019 g g^{-1} day^{-1}).

1. Introduction

Soybean (*Glycine max* L. Merill) is a leguminous crop and belongs to family Leguminoaceae with sub family papillionaceae. Soybean is originated in China and it is introduced in India in recent years.Soybean is an important crop in human and animal nutrition, because it is a major source of edible vegetable oil and high protein feed as well as food in the world. It is an excellent health food contains 40 - 44% protein, 20% oil, 3.3- 6.4% ash and 24-26% carbohydrate, besides, it also contains various vitamins and minerals. Soybean protein is rich in valuable amino acid lysine (5%) and can be put to a number of uses. It is rich in minerals such as phosphorus, calcium and vitamins (Vitamins B, C and E). Soybean being richest, cheapest and easiest sources of best quality protein, fat and also having a vast multiplicity of uses as food and industrial product is sometimes called as “Wonder Crop”.A total of 120.50 Mha produces 333.67 Mt of soy beans globally in 2019–20.Brazil produces the most soya beans, with 114.27 Mt, followed by Argentina 55.26Mt, and the United States 96.79 Mt. China 15.73 Mt and India 13.27 Mt accounts for34.25, 29.01, 16,56, 4, and 3,98 per cent of global production. India is fourth in theworld with 11.34 ha (28.02 million acres), or 9.41 per cent of the world's land area,and ranked fifth in terms of production with 11.22 Mt in 2019-20. According to thefirst advance estimates 2021-22 of Ministry of Agriculture, Soybean production isestimated at 127.20 lakh tonnes as compared to 128.97 lakh tonnes in 2020-21.As of September 17, 2021, India's acreage planted with soy beans for the2021-22 growing season was 121.76 lakh ha, up from 121.20 lakh ha in the 2020-21growing season. With 55.84 lakh ha, Madhya Pradesh led the states, followed byMaharashtra (46.01 lakh ha), Rajasthan, and (10.62 lakh ha), Karnataka (3.82 lakhha), Gujarat (2.24 lakh ha), and Telangana (1.51 lakh ha).Madhya Pradesh, Maharashtra, Rajasthan, Karnataka, Andhra Pradesh,Chhattisgarh, and Gujarat are the principal soybean-producing states in India. WithMaharashtra, 4.124012 Mhaof land are planted in soybeans, producing 4.82 Mt at aproductivity of 1170.13 kg/ha in 2019 20.**(*Source-http:/Krushimaharashtra.gov.in/*)**.The major soybean growing districts in Maharashtra are Nagpur, Wardha,Satara, Amravati, Chandrapur, BuldhanaParbhani and Latur. In 2019–20, the Wardhadistrict will cover 0.113028 Mha, produce 0.1474.10 Mt, and produce 1304.19 kg/ha.In the Vidarbha area, soybean is gradually replacing crops like cotton, sorghum,pigeon pea, etc. The growing demand for soybeans as a substitute crop has been oneof the most important economic motivations for moving land from these crops to itsproduction and price trends for the soy crop.**(*Source-http:/Krushimaharashtra.gov.in/*)**.The productivity of soybean in Maharashtra and other regions is hindered by climatic factors like erratic rainfall and distribution patterns, along with controllable factors such as low organic matter status due to imbalanced fertilizer usage. Integrated Nutrient Management (INM) approaches, combining organic and inorganic nutrient sources, are crucial for sustaining soil fertility and improving soybean production (Anonymous, 2016).Continuous use of chemical fertilizers contributes to soil fertility degradation, emphasizing the need for balanced fertilization strategies. Research indicates that integrating organic manures with chemical fertilizers enhances nutrient availability and sustains soil health, ultimately improving crop productivity (Alam et al., 2010; Hati et al., 2007; Ramesh et al., 2010).To meet increasing industrial demands and address challenges like population pressure and climate change, optimizing soil nutrient management becomes imperative. Efficient utilization of organic and inorganic resources, alongside biofertilizers, is essential for achieving sustainable soybean production (Anonymous, 2016).In adopting ecologically sound and economically viable farming systems, such as integrated nutrient management, is crucial for ensuring the long-term productivity and sustainability of soybean cultivation in Maharashtra and beyond (Abebe and Deressa, 2017).

Material and Methods

An investigation on the "Effect of Different Organic and Inorganic Fertilizers On Growth and Yield of Soybean (*Glycine max* L. Merr.)" was conducted during *kharif* season of 2019 at theExperimental Farm, Department of Agronomy College of Agriculture, Latur, Maharashtra. The objective ofexperiment was to find out the effect of different organic and inorganic fertilizers ongrowthandyieldofsoybean. The experiment was laid out in a randomized block design with ninetreatmentsandreplicatedthrice.The treatmentswere T_1-100% RDF,T_2-100%RDF+FYM@5tha^{-1},T_3-75%RDF+FYM@5tha^{-1},T_4- 100%RDF+FYM@ 2.5tha^{-1},T_5-75%RDF+FYM@2.5tha^{-1},T_6-100%RDF+Vermicompost@2.5t ha^{-1}, T_7-75%RDF + Vermicompost @ 2.5 t ha^{-1}, T_8-100% RDF + FYM @ 5 t ha^{-1} +Vermicompost @ 1.25 t ha^{-1}, T_9-75% RDF + FYM @ 5 t ha^{-1}+ Vermicompost @ 1.25t ha^{-1}.In addition to grain and straw yield and yield attributes were also recorded. The important findings of the investigation were reported and discussed below.

Result and Discussions

Data in respect of emergence count and final plant stand of soybean as influenced by different treatments in arcsine values is presented inTable 1. The initial and final plant stand at harvest was not influenced significantly by the application of different treatments. It indicated that the crop stand was uniform and differences in the treatments on various parameters under study were more due to treatment effects. However, the mean initial and final plant population (Arcsine value) were 73.83 and 70.76 respectively.

The growth attributing characters of soybean were recorded periodically at an interval of 15 days from sowing date and are discussed below. The plant height was significantly influenced due to different treatments at all the growth stages of crop. The mean plant height at 30, 45, 60, 75 DAS and harvest were 17.60, 31.94, 35.01, 35.86 and 36.27 cm respectively. The rate of increased in plant height was very fast during 30-45 DAS, fast during 45-60 DAS and slow during 60-75 DAS and there after the plant height was constant up to harvest. Compared to late-sown crops, the early-sown crop may have an advantage of longer photoperiod for vegetative growth, which enabled plants to synthesize more photosynthetic and reach their maximum height. Application of 100% RDF + FYM at 5 t ha^{-1} + Vermicompost at 1.25 t ha^{-1}(T_8) recorded higher plant height *i.e.*, 19.27, 35.97, 40.67, 42.47, 42.87 cm at 30, 45, 60, 75 DAS and at harvest respectively. The maximum plant height was recorded at all the growth stages when 100% RDF

+ FYM at 5 t ha^{-1} + Vermicompost at 1.25 t ha^{-1}(T_8). This treatment was found significantly superior over rest of all the treatments except T_9, T_2, T_6, and T_4 at all the growth stages whereas the plant height did not differ significantly at initial stage (30 DAS). The significantly lowest plant height was noticed under control treatment (T_1) at all the growth stages of crop.Aziz *et al.* (2015); Meshram *et al*. (2016); Teshome (2016); Dhadave*et al*. (2018); Ghodke *et al*. (2018); Manekar*et al*. (2018); Chaudhari *et al*. (2019) and Meshram and Sapre (2019)observed the similar results.

Data on mean number of functional leaves per plant was recorded atvarious growth stages of the crop are presented in Table 1. Thenumber of functional leaves $plant^{-1}$ was gradually increased up to 45 DAS, thereafterincreasedveryfastupto60DAS.Atharvest,leaveswereabsentduetoleafsenescence.The mean number of functional leaves per plant at 30, 45, 60 and 75DAS were 12.88, 14.90,20.18 and 27.87 respectively. Effect of different treatments onnumber of functional leaves of soybean was found to be significant at all growthstages.At30DAS,applicationof100%RDF+FYMat5tha^{-1}+Vermicompost at 1.25 t ha^{-1}(T_8) recorded significantly higher number of functionalleaves (15.20) which was found significantly superior over T_9, $T_{2,}$ T_6 and remains atparwiththerest of the treatments.At 45 and 75 DAS, application of 100% RDF + FYM at 5 t ha^{-1} +Vermicompost at 1.25 t ha^{-1}(T_8) recorded significantly higher number of functionalleaves (18.07) which was found significantly superior than T_1 and T_2 and remains atparwiththerest of the treatments. At 60 DAS, application of 100% RDF+ FYM at 5tha^{-1}+ Vermicompost at 1.25 t ha^{-1} (T_8) recorded significantly higher number of functional leaves $plant^{-1}$(23.03) which was found at par with the T_4, T_7, T_2 and T_9 and was significantly superior over rest of the treatments. The significantly lowest number of functional leaves $plant^{-1}$ 11.07, 12.53, 18.67, and 26.00.Meshram *et al*. (2016); Teshome (2016); Dhadave*et al*. (2018); Ghodke *et al*. (2018); Manekar*et al*. (2018) and Meshram and Sapre (2019)observed the similar results.

Mean leaf area $plant^{-1}$ as influenced by different treatments are presented in Table 1. The mean leaf area $plant^{-1}$ at 30, 45, 60 and 75 DAS were 2.44, 3.79, 6.46 and 2.21 dm^2 respectively. The leaf area $plant^{-1}$ was increased at faster rate between 30 to 60 DAS and it was lowest at 75 DAS and then declined till harvest due to leaf senescence.The data presented in Table 1 showed that the treatment 100% RDF + FYM at 5 t ha^{-1} + Vermicompost at 1.25 t ha^{-1} (T_8) was found significantly superior over rest of all the treatments and was at par with treatments of T_9, T_2, T_6 and T_4 at all the stages of crop growth except at 30 DAS. The significantly lowest leaf area $plant^{-1}$ were 2.04, 3.01, 5.99 and 1.70 dm^2 observed at 30, 45, 60 and 75 DAS due to the treatment of control (T_1). Similar result revealed by Meshram *et al.* (2016); Teshome (2016); Dhadave*et al.* (2018); Ghodke *et al.* (2018); Manekar*et al.* (2018) and Meshram and Sapre (2019).

Data on mean number of branches plant^{-1} as influenced by different treatments are presented in Table 1. The mean number of branches at 30, 45, 60, 75 DAS and at harvest were 1.60, 4.56, 5.43, 5.53 and 5.55 respectively.Effect of different treatments on number of branches of soybean was found to be significant at all growth stages. The maximum increase in number of branches was observed between 30-45 DAS and there after gradually increase in number of branches up to 75 DAS and remained constant up to harvest.Application of 100% RDF + FYM at 5 t ha^{-1} + Vermicompost at 1.25 t ha^{-1} (T_8) recorded significantly maximum number of branches at all the growth stages of crop. Mean number of branches per plant recorded at 30, 45, 60, 75 DAS and at harvest were 1.60, 4.54, 5.43, 5.53 and 5.55 respectively.The treatment of 100% RDF + FYM at 5 t ha^{-1} + Vermicompost at1.25 t ha^{-1} (T_8) was recorded higher number of branches as compared to rest of treatments at all the growth stages of crop. Similar result revealed by Meshram *et al.* (2016); Teshome (2016); Dhadave*et al.* (2018); Ghodke *et al.* (2018); Manekar*et al.* (2018) andMeshram and Sapre (2019).

Data on total dry matter accumulation per plant as influenced various treatments at various growth stages are given in Table 1.The data in Table 1 revealed that the mean total dry matter increased continuously up to 75 DAS and later on decreased up to harvest. The mean dry matter weight recorded at 30, 45, 60, 75 DAS and at harvest was 2.88, 9.30, 19.89, 28.22 and17.61 respectively.Effect of different treatments on number of dry matter of soybean was found to be significant at all growth stages. The maximum increase in number of dry matter was observed between 45-60 DAS and there after gradually increase in number of dry matter up to 75 DAS and remained constant up to harvest.Application of 100% RDF + FYM at 5 t ha^{-1} + Vermicompost at 1.25 t ha^{-1} (T_8) recorded significantly maximum number of dry matter at all the growth stages of crop. The treatment of 100% RDF + FYM at 5 t ha^{-1} + Vermicompost at1.25 t ha^{-1} (T_8) was recorded higher number of dry matter as compared to rest of treatments at all the growth stages of crop. None of the treatment was found significant at 30 DAS and lowest numbers of dry matter were observed with control (T_1). Similar result revealed by Meshram *et al.* (2016); Teshome (2016); Dhadave*et al.* (2018); Ghodke *et al.* (2018); Manekar*et al.* (2018) andMeshram and Sapre (2019).

Data on AGR for plant height (cm day^{-1} plant^{-1}) at various growth periods of crop presented in Table 1.At beginning, the AGR for plant height was slow (0-30 DAS). The absolute growth rate for plant height was very fast between 31- 45 DAS and then showed declined till maturity. The mean value of AGR for plant height between 0-30,31-45, 46-60, 61-75 and at harvest were 0.53, 0.82, 0.13, 0.03 and 0.02 cm day^{-1} plant^{-1} respectively.The value of AGR for plant height indicated that application of 100% RDF + FYM at 5 t ha^{-1} + Vermicompost at 1.25 t ha^{-1}(T_8) was effective in increasing value of AGR based on plant height at all growth stages of crop. The lowest values of AGR for plant height were obtained due to control treatment (T_1). Similar result revealed by Meshram *et al*. (2016); Teshome (2016); Dhadave*et al*. (2018); Ghodke *et al*. (2018); Manekar*et al*. (2018); Meshram and Sapre (2019).

The values of absolute growth rate for dry matter (g day^{-1} plant^{-1}) obtained at various growth periods are presented in Table 1.The mean values of AGR for dry matter between 0-30, 31-45, 46-60, 61-75, 76 to at harvest were 0.10, 0.43, 0.71, 0.56 and -0.62 g day^{-1}plant^{-1} respectively. The AGR based on dry matter accumulation plant-1 was slow during 0- 30 DAS, rapid between 46-60 DAS and decreased during 61-75 DAS till maturity. Maximum value of AGR based on dry matter accumulation plant^{-1} was recorded during 46-60 DAS.The maximum values of AGR for dry matter accumulation were obtained due to the application of 100% RDF + FYM at 5 t ha^{-1} + Vermicompost at1.25 t ha^{-1} (T_8) whereas, lowest values of AGR were obtained due to control treatment (T_1) at all the growth stages.Similar result revealed by Meshram *et al*. (2016); Teshome (2016); Dhadave*et al*. (2018); Ghodke *et al*. (2018); Manekar*et al*. (2018) and Meshram and Sapre (2019).

The values of relative growth rate for dry matter (g g^{-1} day^{-1}) obtained at various growth periods are presented in Table 1. The mean values of relative growth rate for dry matter were 0.035, 0.078, 0.051, 0.023 and -0.029 between 0-30, 31-45, 46-60, 61-75 and 76 to atharvest.The mean values of relative growth rate for dry matter were more during 31-45 days (0.078 g g^{-1} day^{-1}), there after declined during the later stages of crop growth.The value of RGR for dry matter indicated that treatment of the application of 100% RDF + FYM at 5 t ha^{-1} + Vermicompost at 1.25 t ha^{-1} (T_8) was found effective in increasing the value of RGR. The lowest values of RGR for dry matter were obtained due to control treatment (T_1). Similar result revealed by Meshram *et al*. (2016); Teshome (2016); Dhadave*et al*. (2018); Ghodke *et al*. (2018); Manekar*et al*. (2018) andMeshram and Sapre (2019).

The data on mean leaf area index influenced by different treatments is presented in Table 1.The leaf area index was low at initial stage of crop growth. Leaf Area Index was increased progressively during 31-60 DAS. Thereafter there was no leaf area due to leaf senescence and drying of leaves. The mean values of leaf area index were 1.069, 1.649, 2.839 and 2.495 at 30, 45, 60 and 75 DAS.The treatment of the application of 100% RDF + FYM at 5 t ha^{-1} + Vermicompost at 1.25 t ha^{-1} (T_8) recorded higher values of leaf area index at all the growth stages of crop. The treatment control (T_1) recorded lowest values of leaf area index 0.905, 1.339, 2.664 and 2.252 at 30, 45, 60 and 75 DAS.Meshram *et al*. (2016); Teshome (2016); Dhadave*et al*. (2018); Ghodke *et al*. (2018); Manekar*et al*. (2018) andMeshram and Sapre (2019)observed the similar results.

Conclusion

Application of 100% RDF + FYM at 5 t ha^{-1} + Vermicompost at 1.25 t ha^{-1} was recorded higher values of all the growth parameters of soybean followed by the application of 75% RDF + FYM at 5 t ha^{-1} + Vermicompost at 1.25 t ha^{-1}, 100% RDF + FYM at 5 t ha^{-1}, 100% RDF + FYM at 2.5 t ha^{-1} and 100% RDF + Vermicompost at 2.5 t ha^{-1} under rainfed condition.Above conclusion are based on single season research finding and it needs further confirmation by repeating the trial for at least one more season.

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Table 1: Growth parameters of soybean as influenced by different treatments

Treatment	Emergence count	Final plant stand	Plant height (cm) Days after sowing (DAS)					Number of functional leaves plant^{-1}			
			30	**45**	**60**	**75**	**AH**	**30**	**45**	**60**	**75**
T_1- 100% RDF	71.38	69.14	16.00	28.33	30.33	30.83	31.10	11.07	12.53	18.67	26.00
T_2- 100% RDF + FYM at 5 t ha^{-1}	74.00	71.21	18.20	33.90	37.30	38.13	38.63	13.37	15.80	20.53	29.07
T_3- 75% RDF + FYM at 5 t ha^{-1}	72.54	69.35	16.90	30.00	32.50	33.10	33.43	11.57	13.53	19.20	26.53
T_4- 100% RDF + FYM at 2.5 t ha^{-1}	73.60	71.30	17.60	31.83	34.87	35.60	36.00	12.87	15.30	19.93	26.83
T_5- 75% RDF + FYM at 2.5 t ha^{-1}	78.02	69.23	16.77	29.33	31.57	32.17	32.47	11.27	13.00	18.90	26.53
T_6- 100% RDF + Vermicompost at 2.5 t ha^{-1}	74.12	71.94	17.77	32.63	35.87	36.77	37.20	13.33	15.33	20.00	28.20
T_7- 75% RDF + Vermicompost at 2.5 t ha^{-1}	71.53	70.00	17.33	30.67	33.47	34.13	34.47	12.83	13.53	19.33	26.60
T_8- 100% RDF + FYM at 5 t ha^{-1} + Vermicompost at 1.25 t ha^{-1}	75.24	72.68	19.27	35.97	40.67	42.27	42.87	15.20	18.07	23.03	31.53
T_9- 75% RDF + FYM at 5 t ha^{-1} + Vermicompost at 1.25 t ha^{-1}	74.05	72.01	18.60	34.77	38.53	39.70	40.23	14.40	17.00	22.00	29.57
SE$\pm$m	**1.79**	**0.81**	**0.67**	**1.22**	**1.41**	**1.44**	**1.40**	**0.55**	**0.62**	**0.76**	**0.97**
CD at 5%	**NS**	**NS**	**1.85**	**3.37**	**3.89**	**3.99**	**3.88**	**1.53**	**1.73**	**2.11**	**2.68**
General Mean	**73.83**	**70.76**	**17.60**	**31.94**	**35.01**	**35.86**	**36.27**	**12.88**	**14.90**	**20.18**	**27.87**

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Treatment	Number of branches plant^{-1}					Mean leaf area plant^{-1}			
	30	**45**	**60**	**75**	**AH**	**30**	**45**	**60**	**75**
T_1- 100% RDF	1.30	3.60	4.67	5.40	5.03	2.04	3.01	5.99	1.7
T_2- 100% RDF + FYM at 5 t ha^{-1}	1.70	4.73	5.53	5.57	5.60	2.64	3.99	6.66	2.32
T_3- 75% RDF + FYM at 5 t ha^{-1}	1.33	4.20	5.30	5.03	5.23	2.3	3.35	5.9	2.07
T_4- 100% RDF + FYM at 2.5 t ha^{-1}	1.67	4.70	5.43	5.67	5.57	2.46	3.88	6.44	2.24
T_5- 75% RDF + FYM at 2.5 t ha^{-1}	1.33	4.20	5.13	5.17	5.23	2.19	3.27	6.14	1.89
T_6- 100% RDF + Vermicompost at 2.5 t ha^{-1}	1.67	4.73	5.50	5.47	5.60	2.52	3.97	6.61	2.31
T_7- 75% RDF + Vermicompost at 2.5 t ha^{-1}	1.37	4.30	5.33	5.37	5.37	2.3	3.59	6.25	2.13
T_8- 100% RDF + FYM at 5 t ha^{-1} + Vermicompost at 1.25 t ha^{-1}	2.13	5.50	6.07	6.20	6.20	2.79	4.62	7.1	2.67
T_9- 75% RDF + FYM at 5 t ha^{-1} + Vermicompost at 1.25 t ha^{-1}	1.90	5.07	5.90	5.93	6.13	2.67	4.39	7.07	2.58
SE$\pm$m	**0.08**	**0.26**	**0.19**	**0.19**	**0.19**	**0.12**	**0.19**	**0.23**	**0.12**
CD at 5%	**0.24**	**0.74**	**0.53**	**0.54**	**0.55**	**0.34**	**0.54**	**0.64**	**0.34**
General Mean	**1.60**	**4.56**	**5.43**	**5.53**	**5.55**	**2.44**	**3.79**	**6.46**	**2.21**

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Treatment	Total dry matter plant^{-1}					Absolute Growth Rate (AGR) for plant height (cm day^{-1}plant^{-1})				
	30	**45**	**60**	**75**	**AH**	**0-30**	**30-45**	**45-60**	**60-75**	**75-AH**
T_1- 100% RDF	2.33	7.50	15.50	22.33	10.97	0.53	0.82	0.13	0.03	0.02
T_2- 100% RDF + FYM at 5 t ha^{-1}	3.10	10.10	22.30	31.40	20.97	0.61	1.05	0.23	0.06	0.03
T_3- 75% RDF + FYM at 5 t ha^{-1}	2.47	8.17	17.17	25.03	13.93	0.56	0.87	0.17	0.04	0.02
T_4- 100% RDF + FYM at 2.5 t ha^{-1}	2.87	9.50	20.00	28.33	17.67	0.59	0.99	0.22	0.06	0.03
T_5- 75% RDF + FYM at 2.5 t ha^{-1}	2.37	8.00	16.50	24.00	12.83	0.56	0.84	0.15	0.04	0.02
T_6- 100% RDF + Vermicompost at 2.5 t ha^{-1}	2.93	9.83	22.00	30.83	20.33	0.59	0.95	0.2	0.05	0.02
T_7- 75% RDF + Vermicompost at 2.5 t ha^{-1}	2.73	8.50	18.33	26.40	15.50	0.58	0.89	0.19	0.04	0.02
T_8- 100% RDF + FYM at 5 t ha^{-1} + Vermicompost at 1.25 t ha^{-1}	3.73	11.30	24.20	33.50	24.17	0.64	1.11	0.31	0.11	0.04
T_9- 75% RDF + FYM at 5 t ha^{-1} + Vermicompost at 1.25 t ha^{-1}	3.40	10.77	23.00	32.13	22.17	0.62	1.08	0.25	0.08	0.03
SE$\pm$m	**0.12**	**0.35**	**0.87**	**1.14**	**0.95**	-	-	-	-	-
CD at 5%	**0.34**	**0.97**	**2.43**	**3.16**	**2.65**	-	-	-	-	-
General Mean	**2.88**	**9.30**	**19.89**	**28.22**	**17.61**	**0.53**	**0.82**	**0.13**	**0.03**	**0.02**

Continue….

Treatment	Leaf area index (%)				Absolute Growth Rate (AGR) for dry weight (cm $day^{-1}plant^{-1}$)				
	30	**45**	**60**	**75**	**0-30**	**30-45**	**45-60**	**60-75**	**75-AH**
T_1- 100% RDF	0.91	1.34	2.66	2.25	0.08	0.34	0.53	0.46	-0.67
T_2- 100% RDF + FYM at 5 t ha^{-1}	1.12	1.76	2.96	2.62	0.10	0.47	0.81	0.61	-0.61
T_3- 75% RDF + FYM at 5 t ha^{-1}	1.02	1.49	2.62	2.41	0.08	0.38	0.60	0.52	-0.65
T_4- 100% RDF + FYM at 2.5 t ha^{-1}	1.09	1.73	2.86	2.58	0.10	0.46	0.81	0.59	-0.62
T_5- 75% RDF + FYM at 2.5 t ha^{-1}	0.97	1.45	2.73	2.43	0.08	0.38	0.57	0.50	-0.66
T_6- 100% RDF + Vermicompost at 2.5 t ha^{-1}	1.17	1.77	2.94	2.65	0.10	0.44	0.70	0.56	-0.63
T_7- 75% RDF + Vermicompost at 2.5 t ha^{-1}	1.02	1.59	2.78	2.25	0.09	0.38	0.66	0.54	-0.64
T_8- 100% RDF + FYM at 5 t ha^{-1} + Vermicompost at 1.25 t ha^{-1}	**1.24**	**2.05**	**3.16**	**2.77**	**0.12**	**0.50**	**0.86**	**0.62**	**-0.55**
T_9- 75% RDF + FYM at 5 t ha^{-1} + Vermicompost at 1.25 t ha^{-1}	1.19	1.95	3.14	2.76	0.11	0.49	0.82	0.61	-0.59
SE$\pm$m	-	-	-	-	-	-	-	-	-
CD at 5%	-	-	-	-	-	-	-	-	-
General Mean	**1.07**	**1.65**	**2.84**	**2.50**	**0.10**	**0.43**	**0.71**	**0.56**	**-0.62**

Continue….

Treatment	Relative Growth Rate (RGR) for dry matter (g g^{-1} day^{-1})				
	0-30	**30-45**	**45-60**	**60-75**	**75-AH**
T_1- 100% RDF	0.028	0.078	0.048	0.024	-0.042
T_2- 100% RDF + FYM at 5 t ha^{-1}	0.038	0.079	0.053	0.023	-0.024
T_3- 75% RDF + FYM at 5 t ha^{-1}	0.03	0.08	0.05	0.025	-0.034
T_4- 100% RDF + FYM at 2.5 t ha^{-1}	0.036	0.081	0.054	0.022	-0.024
T_5- 75% RDF + FYM at 2.5 t ha^{-1}	0.029	0.081	0.048	0.025	-0.037
T_6- 100% RDF + Vermicompost at 2.5 t ha^{-1}	0.035	0.08	0.05	0.023	-0.028
T_7- 75% RDF + Vermicompost at 2.5 t ha^{-1}	0.033	0.076	0.051	0.024	-0.031
T_8- 100% RDF + FYM at 5 t ha^{-1} + Vermicompost at 1.25 t ha^{-1}	**0.044**	**0.074**	**0.051**	**0.022**	**-0.019**
T_9- 75% RDF + FYM at 5 t ha^{-1} + Vermicompost at 1.25 t ha^{-1}	0.041	0.077	0.051	0.022	-0.022
SE±m	-	-	-	-	-
CD at 5%	-	-	-	-	-
General Mean	**0.035**	**0.078**	**0.051**	**0.023**	**-0.029**