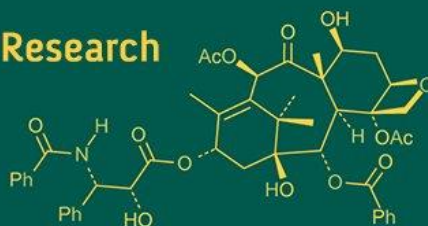


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Response of inorganic and organic fertilizers on growth and yield of pigeonpea (*Cajanus cajan* L.)

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Abstract

A field experiment entitled “Response of Inorganic and Organic Fertilizers on Growth and Yield of Pigeonpea (*Cajanus cajan* L.)” was conducted to evaluate the effect of organic manures, cow urine, and varying levels of inorganic fertilizers on the growth, yield, nutrient uptake, and economics of pigeonpea. The experiment comprised thirteen treatments including control, organic sources (farmyard manure and paddy husk compost), cow urine, and different combinations of recommended dose of fertilizers (RDF). Results revealed that growth parameters such as plant height, number of leaves, and branching, as well as physiological traits like dry matter accumulation and leaf area index, were significantly enhanced by nutrient management treatments. Among the treatments, 100% RDF (T_{13}) recorded the highest plant height (155.8 cm), dry matter accumulation (226.82 g plant⁻¹), and seed yield (1326 kg ha⁻¹), followed by 75% RDF (T_{12}) and combined application of FYM (1000 kg ha⁻¹) + cow urine (500 L ha⁻¹) (T_3). These treatments also recorded higher uptake of N, P, and K and improved soil nutrient status after harvest. The highest gross return (₹47,005 ha⁻¹), net return (₹30,383 ha⁻¹), and benefit–cost ratio (2.83) were obtained under 100% RDF, closely followed by integrated treatments. The findings highlight that integrated use of organic and inorganic nutrient sources improves pigeonpea productivity, enhances nutrient use efficiency, and sustains soil fertility, making it a viable approach for eco-friendly and profitable pigeonpea cultivation.

Keywords: Pigeonpea, integrated nutrient management, organic manures, cow urine, farmyard manure, paddy husk compost, recommended dose of fertilizer, growth attributes, yield, nutrient uptake, soil fertility, economics

Introduction

Pulse crops play an important role in Indian agriculture. Besides being rich in protein, they sustain the productivity of cropping systems. Their ability to use atmospheric nitrogen through Biological Nitrogen Fixation (BNF) is economically more sound and environmentally acceptable. Pulses constitute an important ingredient in predominantly vegetarian Indian diet. Cereals constitute the staple food and the major source of energy, while the additions of pulses, which are the main source of vegetable proteins, provide nutritionally balanced food. On an average, pulses contain 20-25 per cent protein on dry seed basis, which is almost 2.5-3.0 times of the value normally found in cereals.

In India, next to food grains, pulses are considered as major agricultural crops. India stands first in the world in area and production of pulses. But, still there is a wide gap between demand and supply of pulses and oilseeds. Annually, we need 38 kgs of pulses on per capita consumption, but at present, we are able to supply only 14 kgs of pulses per capita per annum (Hegde and Kiresur, 1999) ^[1].

The static production of pulses in India coupled with an exploding population has led to steep fall in the per capita availability of pulses from 70 gram per day in 1960 -61 to less than 40 gram per day during present decade (Pushpa, 2007) ^[3] as against FAO/ WHO's recommendation of 80 gram per day (Asthana and Chat urvedi, 1999) ^[2]. The crisis of shortage of pulses has aggravated the problem of malnutrition. Thus, there is an urgent need to increase production of pulses to meet the requirement by manipulating product ion technologies appropriately.

India has the distinction of being world's largest producer of pulses, but the average productivity lies between 550-625 kg ha⁻¹. Pulses occupy an area of 67.8 million hectares and a production of 55.2 million tonnes with a share of 34 per cent to global production (Pushpa,

2007)^[3]. The level of productivity of pulses in India is far below when compared to average productivity of the world. It is estimated that India's population will touch nearly 1350 million by 2020 AD and the country would need a minimum of 30.3 million tonnes of pulses.

Pigeonpea (*Cajanus cajan* (L) Millsp.) is an important crop amongst pulses and ranked second after chickpea in India in terms of area and production. It is a major protein rich legume grown throughout the tropical and subtropical regions of the world which lies between 30° N and 35° S latitudes. However, major area in India is lying between 14° and 28° N latitudes.

It provides protein rich food, firewood and income for resource poor small farmers. Karnataka is one among the important states in the country cultivating pigeonpea. Pigeonpea is grown in almost all the states. Larger portion of the area is in the states like Maharashtra, Uttar Pradesh, Madhya Pradesh, Karnataka, Gujarat, Andhra Pradesh and Tamil Nadu. The production is constrained by the use of less productive land, water logging or dry spells during critical stages of crop growth, pest and disease problems, and lack of drought-resistant, high-yielding genotypes, and appropriate agronomic management. India has a virtual monopoly in pigeonpea production by contributing 90 per cent to world's total production.

It has an important place in the farming systems adopted by dry land farmers. Endowed with several unique characters, pigeonpea finds an important place in the farming systems adopted by the farmers in a large number of developing countries including India. People use the dry grain as dhal, the green seed as vegetable, and the stalks as fuel wood and as a green manure crop for soil fertility amelioration in local cropping systems. The leaf fall at maturity adds organic matter to the soil. The outstanding deep root system allows for optimum moisture and nutrient utilization which enables it to tolerate drought. The deep root system breaks the hard pans and hence it is often called as "biological plough".

To alleviate the protein malnutrition in the country, it is very much imperative to enhance the production of pigeonpea, since it is an important pulse crop in India as well as in Karnataka. The production of pigeonpea can be increased by increasing the area and by increasing the productivity. The first option could be achieved only by substituting the area under food crops by pigeonpea, since the total cultivable area is almost constant.

Several factors are responsible for low productivity of pigeonpea, among them imbalance fertilization and terminal stress are important ones. To enhance the productivity of this crop, use of balanced fertilization by application of organic manures, NPK along with bio fertilizers viz., *Rhizobium* and PSB is of great importance. Inoculation of pulses with PGPR and *Rhizobium* causes growth stimulation of plant and enhances crop yields (Sharma *et al.*, 2007)^[4]. Since the soils are low in organic matter content, use of organic manures plays a vital role in improving soil physical condition, provides vital plant nutrients and maintains long term productivity of the soil.

Intensive agriculture with very high nutrient turn over in soil plant system coupled with low and imbalanced fertilizer use resulted in deterioration of native soil fertility and raised a serious threat to long term sustainability of crop production. Long term studies in many cropping systems have clearly indicated that, neither chemical fertilizer nor organic sources of nutrient alone could sustain high productivity of intensive cropping systems. Nevertheless, integrated use of fertilizers and organic sources have helped in maintaining yield stability through correction of marginal deficiencies of

secondary and micronutrients, enhancing the efficiency of applied nutrients and providing the favourable soil physical environment.

Modern agriculture depends on the application of fossil fuel based inputs like chemical fertilizers, pesticides and herbicides. There is growing awareness and concern over their adverse effects on soil productivity and environmental quality. The high cost of chemical fertilizers, the low purchasing power of small and marginal farmers and their adverse effect on environment has led to look for some alternative strategies. One such approach is the use of different integrated nutrient management systems, which can save the soil, environment and farmers' limited resources. In Karnataka, pigeonpea is often grown on marginal lands and is generally supplied with sub optimal doses of fertilizers in local varieties leading to low productivity of the crop. Continuous use of organics and bio fertilizers are essential in realizing the higher yield and reducing cost of production.

During last decade organic agriculture has progressed as a dynamic alternate farming system. This has been necessitated by resource degradation because of achieving high yields in various crops to meet the increasing demand of food by burgeoning population. This has resulted in degradation of soil structure, imbalanced in micro - organisms and organic matter of soil and brought in health and environmental problems. Change from conventional to organic farming takes 2-3 years for establishment of same yield magnitude. Use of organic sources of nutrients helps to conserve the soil health by maintaining equilibrium of organic matter as indicated by 59.8, 279.2, 63.0 per cent increase in mineralizable N, phosphate activity and dehydrogenase activity, respectively over chemical farming (Walia and Kler, 2009)^[5].

Agronomic practices are required to be constantly revised/ refined for realizing yield potential. Among them, use of organic manures and inorganic fertilizers are most important factors in determining the yield. Organic matter has favorable effect on nutrient availability, nutrient uptake and yield. Continuous use of organic materials such as cow urine, FYM, paddy husk etc. helps to build up soil humus and beneficial microbes and besides, improves the soil physical properties. Well decomposed FYM in addition to supplying plant nutrients acts as binding material and improves the soil physical properties.

Materials and Methods

The present experiment is laid out in the field of the Research Farm of Department of Agronomy, Sardar Patel University Balaghat-481331, M.P. during *kharif* season, 2025. The land topography of the experimental site almost uniform with an adequate surface drainage. The internal drainage of the experimental site is medium. The field experiment was laid out in a Randomized Block Design (RBD) with three replications to statistically evaluate the treatment effects.

- Design: RBD
- Replications: 3
- Gross Plot size: 7.2 x 5.4 m
- Net plot size: 5.4 x 4.6 m
- Variety: TJT-501
- Spacing: 90 x 20 cm

Treatment Details

A total of ten treatments involving different sources and combinations. The treatments were as follows:

- T₁: Control
- T₂: CM of Paddy husk (500kg/ha) + Cow urine (250 litre/ha)
- T₃: CM of FYM (500kg/ha) + Cow urine (250 litre /ha)
- T₄: CM of Paddy husk (1000kg/ha) + Cow urine (500 litre /ha)
- T₅: CM of FYM (1000kg/ha) + Cow urine (500 litre /ha)
- T₆: Paddy husk (500kg/ha)
- T₇: FYM (500kg/ha)
- T₈: Paddy husk (1000kg/ha)
- T₉: FYM (1000kg/ha)
- T₁₀: 25% RDF
- T₁₁: 50% RDF
- T₁₂ : 75% RDF
- T₁₃ : 100% RDF

Observations on growth components:- Five plants were tagged at random in net plot area for recording various observations on growth parameters at 45, 90, 135 DAS and at harvest. growth parameters are Plant height, Number of leaves per plant, Number of primary branches per plant, Number of secondary branches per plant, Leaf area per plant, Leaf Area Index (LAI), Dry matter production and its distribution in different plant parts. Observations on yield components and yield:- The plants selected for growth studies were utilized for recording the observations on the following yield components. Number of pods per plant, Number of seeds per pod, Seed weight per plant, 100-seed weight, Seed yield (kg ha⁻¹), Stalk yield per hectare, Husk yield per hectare.

Result and Discussion

In the present study, pigeonpea plants exhibited significant variations in plant height under different treatments. The maximum plant height was recorded under 100% RDF (T₁₃), closely followed by 75% RDF (T₁₂) and CM of FYM (1000 kg/ha) + cow urine (500 L/ha) (T₅), while the lowest was observed in the control. (Ahlawat & Saraf, 1981; Bhagwan Singh & Karla, 1980; Patil & Padmani, 2007) [6, 7, 9]. The progressive increase in plant height with higher nutrient supply can be attributed to the enhanced availability of essential nutrients such as nitrogen, phosphorus, and potassium. Nitrogen plays a vital role in the synthesis of chlorophyll and amino acids, which are essential for cell division and elongation, thereby promoting vertical growth. Phosphorus contributes to root proliferation and energy metabolism, improving nutrient uptake efficiency. Potassium regulates osmotic balance and enzymatic activity, which maintains turgidity and accelerates metabolic functions. Together, these nutrients create an environment conducive to vigorous vegetative development. (Ahlawat & Saraf, 1981; Bhagwan Singh & Karla, 1980; Patil & Padmani, 2007) [6, 7, 9] (Subbaiah & Asija, 1956; Mahajan *et al.*, 1985; Sarkar *et al.*, 1997) [10, 11, 12]. The number of leaves per plant directly influences the photosynthetic capacity of pigeonpea, as leaves are the primary organs responsible for carbon assimilation. The present findings indicated a gradual increase in leaf number up to 90 DAS, followed by a decline toward harvest due to natural senescence. The highest leaf count was recorded in T₁₃ (100% RDF), followed by T₁₂ (75% RDF) and T₅ (FYM + cow urine), while the lowest was observed in the control. (Reddy & Nivedita, 1989; Rana *et al.*, 1998; Singh *et al.*, 1998) [15, 16, 17]. The results revealed that branching increased progressively up to harvest. The maximum number of

primary branches (23.12) was recorded in 100% RDF (T₁₃), followed closely by 75% RDF (21.78, T₁₂) and CM of FYM (1000 kg/ha) + cow urine (500 L/ha) (21.69, T₅). The minimum number of branches (14.78) was noted in the control. A steady increase was recorded with advancing growth stages, reaching the maximum at harvest. The highest number of secondary branches (24.07) was recorded in T₁₃ (100% RDF), followed by T₁₂ (22.63) and T₅ (22.56). The control recorded the lowest number (15.02). The increase in branching under these treatments may be due to better nutrient status of the soil, which enhanced photosynthate production and promoted secondary branching. The number of primary and secondary branches was significantly affected by the nutrient management practices. The highest number of both primary and secondary branches was observed under 100% RDF, followed by 75% RDF and FYM + cow urine treatments, while the control recorded the least. Branch initiation is a meristematic activity that depends on the availability of nutrients and photosynthates. Adequate nitrogen and phosphorus promote cell differentiation and lateral bud development, thereby enhancing branching. The improved soil condition due to organic manure application further facilitated better root development and moisture conservation, leading to increased nutrient uptake and enhanced vegetative growth. (Patil & Padmani, 2007; Gondalia *et al.*, 1988; Pujari *et al.*, 1998) [9, 18, 19] (Subbaiah & Asija, 1956; Mahajan *et al.*, 1985; Sarkar *et al.*, 1997) [10, 11, 12]. Dry matter accumulation is a comprehensive measure of crop productivity potential, as it reflects both the photosynthetic efficiency and the assimilate translocation ability of the plant. (Mathan *et al.*, 1994; Babhulkar *et al.*, 2000; Meena *et al.*, 2003) [13, 20, 21]. The partitioning of dry matter into leaves, stems, and reproductive organs provides insights into how efficiently the plant allocates assimilates. In the present study, dry matter accumulation in leaves increased up to 90 DAS and declined thereafter due to leaf aging and translocation of assimilates to reproductive structures. Treatments receiving 100% RDF, 75% RDF, and FYM + cow urine recorded higher leaf dry weights, indicating prolonged photosynthetic activity and delayed senescence.

Yield is the cumulative result of all physiological and biochemical processes occurring throughout plant growth. In this study, 100% RDF recorded the highest seed, stalk, and husk yields, followed by 75% RDF and FYM + cow urine treatments. The increased seed yield under these treatments can be directly attributed to enhanced vegetative growth, increased leaf area, and higher dry matter accumulation, which collectively improved the supply of assimilates to developing pods. Adequate nitrogen and phosphorus availability during reproductive stages favored better flowering, pod formation, and seed filling. (Vivekanandan *et al.*, 1972; Sestak *et al.*, 1971) [22, 23] (Pujari *et al.*, 1998) [18]. The maximum seed yield (1326 kg/ha) was obtained with 100% RDF (T₁₃), followed by 75% RDF (1271 kg/ha, T₁₂) and CM of FYM (1000 kg/ha) + cow urine (500 L/ha) (1261 kg/ha, T₅). The minimum yield (930 kg/ha) was recorded in the control. Similarly, stalk yield and husk yield were also highest in T₁₃ (3198 kg/ha and 1008 kg/ha respectively).

The increased yield under RDF and integrated nutrient treatments may be attributed to enhanced vegetative growth, higher leaf area, and greater dry matter accumulation, which collectively improved photosynthetic efficiency and assimilate translocation to reproductive organs. Organic sources might have improved the soil's physical structure,

moisture retention, and microbial activity, while inorganic fertilizers supplied readily available nutrients, resulting in synergistic effects that improved productivity.

Organic manures provided a steady supply of nutrients and improved soil microbial activity, which facilitated efficient nutrient uptake during critical growth phases. Cow urine, acting as a bio-enhancer, may have stimulated enzymatic activity and improved photosynthetic efficiency. The resulting synergistic effect of organic and inorganic sources created a balanced nutrient environment that enhanced both source (photosynthate production) and sink (pod and seed

development) capacities. The higher stalk and husk yields recorded under these treatments reflect the overall improvement in plant vigor and biomass production. This finding supports the concept that integrated nutrient management enhances both vegetative and reproductive growth, resulting in increased total productivity. Similar trends have been reported in pigeonpea and other legumes where balanced nutrition led to significant yield advantages over control. (Pujari *et al.*, 1998) ^[18] (Patil & Padmani, 2007; Aruna Kumar & Uppar, 2007) ^[9, 25].

Table 1: Influence of inorganic and organic fertilizers on growth and yield of pigeonpea

Treatments	Number of Leaves per Plant			
	45 DAS	90 DAS	135 DAS	At harvest
T ₁ – Control	20	197	161	88
T ₂ – CM of Paddy husk (500 kg/ha) + Cow urine (250 litres/ha)	21	216	185	108
T ₃ – CM of FYM (500 kg/ha) + Cow urine (250 litres/ha)	22	232	205	125
T ₄ – CM of Paddy husk (1000 kg/ha) + Cow urine (500 litres/ha)	22	234	205	127
T ₅ – CM of FYM (1000 kg/ha) + Cow urine (500 litres/ha)	22	241	215	134
T ₆ – Paddy husk @ 500 kg/ha	20	205	170	96
T ₇ – FYM @ 500 kg/ha	21	213	180	105
T ₈ – Paddy husk @ 1000 kg/ha	20	205	170	97
T ₉ – FYM @ 1000 kg/ha	21	223	194	116
T ₁₀ – 25% RDF	21	214	182	106
T ₁₁ – 50% RDF	21	224	195	118
T ₁₂ – 75% RDF	22	243	215	135
T ₁₃ – 100% RDF	22	251	225	144
S.Em ±	0.57	5.37	4.65	3.47
C.D @ 5%	1.68	15.67	13.59	10.12

Treatments	Plant Height (cm)				Number of Primary Branches per Plant			
	45 DAS	90 DAS	135 DAS	At harvest	45 DAS	90 DAS	135 DAS	At harvest
T ₁ – Control	42.0	81.3	107.3	118.9	3.5	9.08	13.45	14.78
T ₂ – CM of Paddy husk (500 kg/ha) + Cow urine (250 litres/ha)	43.7	100.8	122.3	133.2	3.84	11.57	15.58	17.73
T ₃ – CM of FYM (500 kg/ha) + Cow urine (250 litres/ha)	44.0	115.9	134.1	144.8	3.96	13.85	17.32	20.34
T ₄ – CM of Paddy husk (1000 kg/ha) + Cow urine (500 litres/ha)	44.1	116.1	135.5	145.7	3.98	13.89	17.37	20.42
T ₅ – CM of FYM (1000 kg/ha) + Cow urine (500 litres/ha)	44.8	123.7	141.6	150.3	4.04	15.05	18.11	21.69
T ₆ – Paddy husk @ 500 kg/ha	42.3	89.3	112.3	123.9	3.58	10.05	14.27	15.82
T ₇ – FYM @ 500 kg/ha	43.0	98.3	119.1	130.7	3.68	11.28	15.29	17.31
T ₈ – Paddy husk @ 1000 kg/ha	42.5	90.7	113.0	125.5	3.61	10.19	14.34	16.13
T ₉ – FYM @ 1000 kg/ha	43.8	108.5	127.3	137.7	3.86	12.43	16.31	18.9
T ₁₀ – 25% RDF	43.6	99.4	121.9	132.7	3.81	11.53	15.52	17.54
T ₁₁ – 50% RDF	43.8	108.5	128.3	138.7	3.89	12.65	16.52	19.03
T ₁₂ – 75% RDF	44.9	123.8	142.3	151.0	4.06	15.12	18.18	21.78
T ₁₃ – 100% RDF	45.4	131.3	147.7	155.8	4.12	16.33	19.08	23.12
S.Em ±	1.23	2.74	3.52	3.78	0.10	0.44	0.45	0.55
C.D @ 5%	3.59	8.01	10.28	11.04	0.29	1.27	1.31	1.61

Treatments	Number of Secondary Branches per Plant			Dry Matter Production (g / plant)			
	90 DAS	135 DAS	At harvest	45 DAS	90 DAS	135 DAS	At harvest
T ₁ – Control	6.08	11.47	15.02	5.84	58.4	138.51	182.48
T ₂ – CM of Paddy husk (500 kg/ha) + Cow urine (250 litres/ha)	8.25	14.07	18.4	6.64	65.83	149.74	198.2
T ₃ – CM of FYM (500 kg/ha) + Cow urine (250 litres/ha)	10.26	16.28	21.04	7.07	74.04	159.61	212.36
T ₄ – CM of Paddy husk (1000 kg/ha) + Cow urine (500 litres/ha)	10.36	16.34	21.22	7.16	74.59	160.07	212.8
T ₅ – CM of FYM (1000 kg/ha) + Cow urine (500 litres/ha)	11.37	17.56	22.56	7.47	77.45	164.84	219.64
T ₆ – Paddy husk @ 500 kg/ha	7.01	12.57	16.32	6.01	61.52	143.23	189.29

T ₇ – FYM @ 500 kg/ha	8.09	13.85	17.84	6.31	64.85	148.92	196.88
T ₈ – Paddy husk @ 1000 kg/ha	7.12	12.73	16.46	6.12	61.74	144.05	190.04
T ₉ – FYM @ 1000 kg/ha	9.17	15.13	19.62	6.73	68.53	154.47	204.96
T ₁₀ – 25% RDF	8.15	13.98	18.13	6.5	65.46	153.73	197.74
T ₁₁ – 50% RDF	9.33	15.17	19.73	6.93	71.2	154.79	205.43
T ₁₂ – 75% RDF	11.46	17.67	22.63	7.63	77.86	165.46	219.98
T ₁₃ – 100% RDF	12.34	18.85	24.07	7.77	80.59	170.11	226.82
S.Em ±	0.3	0.5	0.6	0.18	2.16	4.82	7.25
C.D @ 5%	0.8	1.3	1.7	0.52	6.30	14.06	21.17

Treatments	Dry matter accumulation in leaves (g / plant)				Dry matter accumulation in stem (g / plant)			
	45 DAS	90 DAS	135 DAS	At harvest	45 DAS	90 DAS	135 DAS	At harvest
T ₁ – Control	1.85	20.03	17.42	7.87	3.69	38.07	82.62	121.23
T ₂ – CM of Paddy husk (500 kg/ha) + Cow urine (250 litres/ha)	2.33	22.91	20.24	9.97	4.01	42.62	86.6	129.92
T ₃ – CM of FYM (500 kg/ha) + Cow urine (250 litres/ha)	2.57	25.64	22.92	11.71	4.2	48.1	89.87	137.72
T ₄ – CM of Paddy husk (1000 kg/ha) + Cow urine (500 litres/ha)	2.64	25.71	22.97	11.79	4.22	48.58	90.05	137.97
T ₅ – CM of FYM (1000 kg/ha) + Cow urine (500 litres/ha)	2.8	26.88	24.19	12.66	4.37	50.27	91.63	141.64
T ₆ – Paddy husk @ 500 kg/ha	1.92	21.19	18.68	8.75	3.79	40.03	84.12	124.91
T ₇ – FYM @ 500 kg/ha	2.12	22.62	20.09	9.75	3.89	41.93	86.25	128.98
T ₈ – Paddy husk @ 1000 kg/ha	1.99	21.33	18.81	8.88	3.83	40.11	84.69	125.31
T ₉ – FYM @ 1000 kg/ha	2.39	24.01	21.61	10.82	4.04	44.22	88.18	133.61
T ₁₀ – 25% RDF	2.24	22.82	20.14	9.87	3.96	42.34	86.46	129.67
T ₁₁ – 50% RDF	2.54	24.5	21.67	10.87	4.09	46.4	88.29	133.85
T ₁₂ – 75% RDF	2.93	26.91	24.24	12.76	4.4	50.65	91.85	141.78
T ₁₃ – 100% RDF	2.99	28.02	25.44	13.66	4.48	52.27	93.4	145.41
S.Em ±	0.1	0.7	0.5	0.4	0.09	1.34	2.39	3.22
C.D @ 5%	0.2	2.0	1.5	1.1	0.29	3.92	6.97	9.41

Treatments	Dry matter accumulation in reproductive parts (g / plant)		Leaf area per plant			
	135 DAS	135 DAS	45 DAS	90 DAS	135 DAS	At harvest
T ₁ – Control	34.77	34.77	5.44	25.55	24.5	11.22
T ₂ – CM of Paddy husk (500 kg/ha) + Cow urine (250 litres/ha)	39.2	39.2	5.71	29.05	27.35	13.93
T ₃ – CM of FYM (500 kg/ha) + Cow urine (250 litres/ha)	43.11	43.11	5.88	32.17	29.65	16.29
T ₄ – CM of Paddy husk (1000 kg/ha) + Cow urine (500 litres/ha)	43.35	43.35	5.94	32.33	29.78	16.34
T ₅ – CM of FYM (1000 kg/ha) + Cow urine (500 litres/ha)	45.31	45.31	6.02	33.52	31.04	17.4
T ₆ – Paddy husk @ 500 kg/ha	36.73	36.73	5.52	26.79	25.76	12.47
T ₇ – FYM @ 500 kg/ha	38.88	38.88	5.61	28.44	27.14	13.7
T ₈ – Paddy husk @ 1000 kg/ha	36.86	36.86	5.54	27.21	25.94	12.57
T ₉ – FYM @ 1000 kg/ha	40.99	40.99	5.75	30.38	28.47	15.09
T ₁₀ – 25% RDF	39.09	39.09	5.68	28.73	27.25	13.83
T ₁₁ – 50% RDF	41.13	41.13	5.77	30.46	28.52	15.18
T ₁₂ – 75% RDF	45.67	45.67	6.06	33.64	31.12	18.51
T ₁₃ – 100% RDF	47.57	47.57	6.18	34.8	32.3	19.55
S.Em ±	1.19	1.19	0.17	0.79	0.89	0.46
C.D @ 5%	3.46	3.46	0.49	2.32	2.62	1.35

Treatments	Leaf Area Index				yield		
	45 DAS	90 DAS	135 DAS	At harvest	Seed yield (kg ha ⁻¹)	Stalk yield (kg ha ⁻¹)	Husk yield (kg ha ⁻¹)
T ₁ – Control	0.31	1.42	1.36	0.63	930	2835	796
T ₂ – CM of Paddy husk (500 kg/ha) + Cow urine (250 litres/ha)	0.32	1.62	1.52	0.78	1077	2971	874
T ₃ – CM of FYM (500 kg/ha) + Cow urine (250 litres/ha)	0.33	1.79	1.65	0.91	1195	3076	939
T ₄ – CM of Paddy husk (1000 kg/ha) + Cow urine (500 litres/ha)	0.33	1.80	1.66	0.91	1209	3092	945
T ₅ – CM of FYM (1000 kg/ha) + Cow urine (500 litres/ha)	0.34	1.87	1.73	0.97	1261	3141	974
T ₆ – Paddy husk @ 500 kg/ha	0.31	1.49	1.43	0.70	989	2886	826
T ₇ – FYM @ 500 kg/ha	0.31	1.58	1.51	0.76	1058	2959	864
T ₈ – Paddy husk @ 1000 kg/ha	0.31	1.51	1.44	0.70	1004	2909	839

T ₉ – FYM @ 1000 kg/ha	0.32	1.69	1.58	0.84	1131	3019	903
T ₁₀ – 25% RDF	0.32	1.60	1.52	0.77	1067	2965	869
T ₁₁ – 50% RDF	0.32	1.70	1.59	0.85	1140	3027	910
T ₁₂ – 75% RDF	0.34	1.87	1.73	1.03	1271	3148	981
T ₁₃ – 100% RDF	0.35	1.94	1.80	1.09	1326	3198	1008
S.Em ±	0.01	0.05	0.03	0.02	28.99	78.61	29.39
C.D @ 5%	0.03	0.15	0.12	0.07	84.63	229.45	85.79

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