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## Effect of organic manures, inorganic manures and Biofertilizers on growth and yield of cashew cv. Balbhadra at Jharkhand region

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### Abstract

An experiment was conducted to observe the effect of biofertilizer as well as of organic manure on growth and yield of cashew cv. BALBHADRA at ZRS, Darisai, E. Singhbhum, BAU, Ranchi centre during the year 2017-18 under AICRP-Cashew programme. The experiment was laid out in Randomized Block Design with three replications and eight treatments (T1-100% N as FYM, T2 - 100% N as FYM + Bio-fertilizers (Azatobacter + Azospirillum + PSB) 200 g, T3 - 50% N as FYM + Bio-fertilizers (200g), T4 - 100% N as Vermicompost + Bio-fertilizers (200g), T5 - Recycling of organic residue with the addition of 20% cow dung slurry (20% weight of organic residue as cow dung), T6 – In situ green manuring /green leaf manuring to meet 100% N, T7 - 25% N as FYM + Recycling of organic residue + In situ green manuring / green leaf manuring + Bio-fertilizers (200g), T8 - Recommended doses of fertilizer + 10 kg FYM (Control). Observations were recorded at particular stages of plant growth. Similar uniform cultivation practices were followed in all the treatments with three replication. The data were statically analyzed as per procedure and the result was found that maximum tree height (4.2m) was obtained in T6 followed by T1. On the other hand considering the ground cover maximum value was obtained by T7 followed by T8. And for all other characteristics like Mean flowering lateral/m<sup>2</sup>, Mean nut weight, Mean apple weight, Mean annual nut yield, Cumulative nut yield T8 ranks first, whereas T7 ranks second for Mean flowering laterals/m<sup>2</sup> and Mean annual nut yield and cumulative nut yield., T5 ranks second for mean nut weight and mean apple weight.

**Keywords:** Cashew, organic manure, biofertilizers, nut yield and quality

### Introduction

Cashew (*Anacardium occidentale* L.) belongs to family Anacardiaceae is originated to North East Brazil. Cashew is well said as “Gold mine of waste land” due to its dollar earning capacity in barren and fallow land also. During 2012-13, India was having total cashew production of 7.28 lakh tonnes from an area of 9.82 lakh ha with a productivity of 772 kg/ha. Maharashtra ranks first in both production and productivity (Anonymous, 2012) <sup>[1]</sup> but Andhra Pradesh ranks first in area under cultivation of cashew. This is because of the fact that in Maharashtra, major plantations have been established with high yielding varieties. Application of 10 kg of farmyard manure per plant is recommended to ensure adequate organic matter in the soil. Again Biofertilizers and organic manures are necessary to keep the soil health in good condition. Integrated use of Inorganic and organic nutrient is therefore taken as the best method to develop fertilizer use efficiency and to supply the healthiest nutrients. Researchers have demonstrated that the cashew responds to the application of organic nutrients, although the responses vary according to plant age, the genotype utilized, the conditions of cultivation, soil and climate (Barros *et al.*, 1984; Ghosh, 1990; Ximenes, 1995; Bezerra *et al.*, 1999 and Crisóstomo *et al.*, 2005) <sup>[2, 5, 10, 3, 4]</sup>. Organic materials (both organic manures as well as organic wastes) are important in improving the physical condition of soil that allows high return (Somani and Totawat, 1996) <sup>[8]</sup>. The practice to reduce chemical residue in foods, to improve quality of food and to produce food in economically sustainable manner has increased the use of organic fertilizers in agriculture. In recent trades it is necessary to access the affect of different biofertilizers either alone or in combination with other organic fertilizers. Hence an experimental trial was conducted on organic management of cashew undertaken by AICRP-

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Cashew program with an object to evaluate and standardize an organic management practices for cashew cultivation and to optimize return.

### Resource and research methods

An experiment was conducted to observe the effect of organic manure on growth and yield of cashew at ZRS, Darisai, E. Singhbhum, BAU, Ranchi centre under AICRP-Cashew program during 2017-18.

The grafted cashew cv. BALBHADRA was planted at 7 x 7m during the year 2017-18. The experimental design followed was Randomized Block Design with three replications and 8 treatments: T1-100% N as FYM, T2 - 100% N as FYM + Bio-fertilizers (Azatobacter + Azospirillum + PSB) 200 g, T3 - 50% N as FYM + Bio-fertilizers (200g), T4 - 100% N as Vermicompost + Bio-fertilizers (200g), T5 - Recycling of organic residue with the addition of 20% cow dung slurry (20% weight of organic residue as cow dung), T6 – In situ green manuring/ green leaf manuring to meet 100% N, T7 - 25% N as FYM + Recycling of organic residue + In situ green manuring / green leaf manuring + Bio-fertilizers (200g), T8 - Recommended doses of fertilizer + 10 kg FYM (Control). Soil nutrient status was tested at initiation of the experimental plot and after harvest of crop treatment-wise. Observation like tree height, stem girth, canopy diameter, canopy surface area, ground coverage by canopy was taken at different stages of the crop in all the treatments. Uniform package of practices was followed for all the treatment. Analysis of data was done as per procedure given by Panse and Sukhatme (1985)<sup>[8]</sup>.

### Research Findings and Discussion

The results obtained from different investigation and discussion has been summarized under following heads:

**Table 2:** Effect of Organic manure, Inorganic fertilizers and Biofertilizers on growth attribute of cashew

Treatment	Mean tree height (m)	Mean stem girth (cm)	Mean canopy diameter (m)	Mean canopy surface area (m <sup>2</sup> )	Ground coverage by canopy (%)
T1 - 100% N as FYM	3.56	65.40	5.38	23.76	18.4
T2 - 100% N as FYM + Bio-fertilizers (Azatobacter + Azospirillum + PSB) 200 g	3.20	61.90	4.65	21.85	13.6
T3 - 50% N as FYM + Bio-fertilizers (200 g)	2.95	48.60	4.30	18.56	14.3
T4 - 100% N as Vermicompost + Bio-fertilizers (200 g)	3.40	59.80	4.76	22.61	19.60
T5 - Recycling of organic residue with the addition of 20% cow dung slurry (20.0% weight of organic residue as cow dung)	2.85	64.75	4.10	27.35	22.50
T6 – In situ green manuring / green leaf manuring to meet 100% N	4.2	68.6	5.05	19.62	24.30
T7 - 25% N as FYM + Recycling of organic residue + In situ green manuring / green leaf manuring + Bio-fertilizers (200 g)	3.51	67.40	4.9	18.78	28.60
T8 - Recommended doses of fertilizer + 10 kg FYM (Control)	3.45	63.20	4.85	19.62	26.70
SEm±	0.37	4.87	0.27	1.05	2.90
CD at 5%	1.10	14.68	0.83	3.15	8.70

### Effect of Organic manures, Inorganic fertilizers and Biofertilizers on plant characteristics

It was observed that T6 – In situ green manuring / green leaf manuring to meet 100% N has recorded significantly highest tree height and maximum stem girth among the eight treatments where as for canopy diameter T1 - 100% N as FYM has achieved maximum value. On the other hand for

### Initial soil characteristics

As per the data shown in Table 1 it indicates that the soil of the experimental site was lateritic clay loam in texture and moderately acidic (pH 5.18) in reaction and showed safe limit of electrical conductivity (0.15dSm<sup>-1</sup>) for plant growth. Soil was high in organic carbon content (0.72), medium in available nitrogen content (267.15kg/ha) and available phosphorus content (13.18kg/ha). It showed moderately high content of available potassium (218.62 kg/ha). As far as the micronutrients in soil were concerned, it indicated sufficient range of available iron (3.20 ppm), manganese (1.30 ppm), copper (0.73ppm) and zinc (0.05ppm) content. The similar finding in respect of initial soil properties of lateritic soil were also reported by Shinde *et al.* (2010).

**Table 1:** Initial soil property of experimental site

Sl. No.	Property	Content
1	pH	5.18
2	Electrical conductivity(dS/m)	0.15
3	Organic carbon	0.72
4	Initial N	267.15
5	Initial P <sub>2</sub> O <sub>5</sub>	13.18
6	Initial K <sub>2</sub> O	218.62
7	Average Fe	3.20
8	Average Mn	1.30
9	Average Cu	0.73
10	Average Zn	0.05

The various parameters such as tree height, stem girth, canopy diameter, canopy surface area, ground coverage by canopy during the period under investigation 2017-18 were recorded, data were statically analyzed and presented in Tables 2 and 3.

canopy surface area T5 - Recycling of organic residue with the addition of 20% cow dung slurry (20.0% weight of organic residue as cow dung) ranks first but for the characteristics ground coverage by canopy T7 - 25% N as FYM + Recycling of organic residue + In situ green manuring / green leaf manuring + Bio-fertilizers (200 g) has attained top position.

**Table 3:** Effect of Organic manures, Inorganic fertilizers and Biofertilizer on flowering and yield attributes of cashew plant

Treatment	Mean flowering laterals/m <sup>2</sup>	Mean nut wt (gm)	Mean apple wt (gm)	Mean annual nut yield (kg/plant)	Cumulative nut Yield (kg/plant) for two harvest
T1 - 100% N as FYM	17.76	7.20	56.30	2.10	4.10
T2 - 100% N as FYM + Bio-fertilizers (Azatobacter + Azospirillum + PSB) 200g	20.54	7.70	59.70	2.75	4.40

T3 - 50% N as FYM + Bio-fertilizers (200 g)	18.86	7.40	56.25	2.60	4.00
T4 - 100% N as Vermicompost + Bio-fertilizers (200 g)	16.30	7.70	61.80	1.90	3.90
T5 - Recycling of organic residue with the addition of 20% cow dung slurry (20.0% weight of organic residue as cow dung)	18.30	7.85	63.30	1.95	3.95
T6 – In situ green manuring / green leaf manuring to meet 100% N	19.50	7.6	57.50	2.20	3.70
T7 - 25% N as FYM + Recycling of organic residue + In situ green manuring / green leaf manuring + Bio-fertilizers (200 g)	20.85	6.9	54.80	2.90	4.50
T8 - Recommended doses of fertilizer + 10 kg FYM (Control)	22.65	8.27	65.7	3.20	4.90
SEm+	1.35	0.32	1.76	0.24	0.15
CD (5%)	4.10	1.05	5.30	0.72	0.45

### Effect of Organic manures, Inorganic fertilizers and Biofertilizers on Flowering laterals /m<sup>2</sup> area

From the analysis of the data it was observed that T8 - Recommended doses of fertilizer + 10 kg FYM (Control) ranks first (22.65 laterals/ m<sup>2</sup>) followed by T7 - 25% N as FYM + Recycling of organic residue + In situ green manuring / green leaf manuring + Bio-fertilizers (200 g) with (20.85 laterals /m<sup>2</sup>) and T2 - 100% N as FYM + Bio-fertilizers (Azatobacter + Azospirillum + PSB) 200 g with 20.54 laterals/m<sup>2</sup>.

### Effect of Organic manures, Inorganic fertilizer and Biofertilizers on nut weight

Statistically analyzed data shows that T8 - Recommended doses of fertilizer + 10 kg FYM (Control) possesses significantly highest value for nut weight.(8.27g) followed by T5 - Recycling of organic residue with the addition of 20% cow dung slurry (20.0% weight of organic residue as cow dung) with 7.85g.

### Effect of Organic Manures, Inorganic fertilizer and Biofertilizers on apple weight, cumulative nut yield per plant:

The data revealed that T8 - Recommended doses of fertilizer + 10 kg FYM (Control) has maximum value in apple weight (65.7g) and cumulative nut yield (4.90kg/plant) among the treatments, which is followed by T5 - Recycling of organic residue with the addition of 20% cow dung slurry (20% weight of organic residue as cow dung) for apple weight and T7 - 25% N as FYM + Recycling of organic residue + In situ green manuring / green leaf manuring + Bio-fertilizers (200 g) for cumulative nut yield which is statistically at par.

This result indicate that cashew can absorb the readily available nutrient present in inorganic fertilizers as compared to organic and biofertilizer. The current finding do follows the results of Suge *et al.* (2011)<sup>[9]</sup> who reported that by increasing inorganic fertilizers from 50% to 100% amplify growth and yield and fruit quality parameters of eggplant. But Lal *et al.* (2012)<sup>[6]</sup> found out the contrary result that maximum fruit yield (125.06 kg/tree) was obtained with soil application of vermicompost @ 75kg/tree, followed by application of poultry manure @75kg/tree (124.23 kg/tree), and the minimum value was found out in control (110.24 kg/tree).

From the experiment it was observed that the effect of organic manures on numbers of flowering laterals, nut and apple weight (g), nut yield of cashew cv. BALBHADRA was not significant and might be due to slow rate of mineralization. The reduction in values of yield of cashew in other organic treatments probably due to the nutrients applied to the soil were immobilized by soil micro-fauna, soil organic matter and other edaphic factors as a result of which making them unavailable to the cashew. This observation is consistent with the findings of Ibiremo *et al.* (2012).

### Effect of organic manures on NPK status of soil after crop harvest

From the data presented in Table 4, it is indicated that T7 achieved maximum available soil N (313.63 kg/ha) closely followed by T4 (295.52 kg/ha). Again T7 ranks first in available K<sub>2</sub>O (306.58kg/ha) content followed by T1 (271.53kg/ha) whereas available P<sub>2</sub>O<sub>5</sub> was found significantly maximum in T5 (18.98 kg/ha) which is statistically at par with T<sub>4</sub>(18.04kg/ha)

**Table 4:** Soil analysis of cashew under organic management trial at ZRS, Darisai, E. Singhbhum, BAU, Ranchi centre during the year 2017-18

Treatment	pH	EC Dsm-1	Organic Carbon	N Kg/ha	P <sub>2</sub> O <sub>5</sub> Kg/ha	K <sub>2</sub> O Kg/ha
T1 - 100% N as FYM	4.98	0.136	0.88	234.61	17.46	271.53
T2 - 100% N as FYM + Bio-fertilizers (Azatobacter + Azospirillum + PSB) 200 g	5.07	0.132	0.64	210.25	17.82	211.42
T3 - 50% N as FYM + Bio-fertilizers (200 g)	5.00	0.101	0.74	289.14	17.08	223.46
T4 - 100% N as Vermicompost + Bio-fertilizers (200 g)	4.70	0.105	0.48	295.52	18.04	215.17
T5 - Recycling of organic residue with the addition of 20% cow dung slurry (20.0% weight of organic residue as cow dung)	4.95	0.091	0.43	235.58	18.98	249.92
T6 – In situ green manuring / green leaf manuring to meet 100% N	5.17	0.079	0.26	213.82	16.62	215.74
T7 - 25% N as FYM + Recycling of organic residue + In situ green manuring / green leaf manuring + Bio-fertilizers (200 g)	4.86	0.097	0.48	313.63	16.46	306.58
T8 - Recommended doses of fertilizer + 10 kg FYM (Control)	5.87	0.086	0.59	283.57	16.87	234.78

### Conclusion

From the current experiment it is observed that only organic nutrient cannot full fill the plant nutritional requirement. Growers should use organic in combination with inorganic fertilizer to get higher return which is obtained from T<sub>8</sub> (4.90 kg/plant). Again for other yield characteristics like flowering laterals/m<sup>2</sup>, nut weight, apple weight too T<sub>8</sub> ranks first. For plant growth characteristics tree height and stem girth was highest in T<sub>6</sub>, where as T<sub>1</sub> ranks first in canopy diameter and

T<sub>5</sub> ranks first in canopy surface area, and T<sub>7</sub> possess highest value for ground coverage by canopy.

### References

- Anonymous. Indian horticulture database, National Horticulture Board, Gurgaon, New Delhi, India 2012.
- Barros LM, Araújo FE, Almeida JIL, Teixeira LMS. A cultura do cajueiro anão. EPACE, Fortaleza (EPACE Documentos 3) 1984.

3. Bezerra FC, Fragoso HA, Hernandez FFF. Avaliação do estado nutricional de cajueiro anão-precoce, clones CP-76 e CP-09. Rev. Bras. Frut 1999;21:208-211.
4. Crisóstomo LA, Rossetti AG, Pimentel CRM, Barreto PD, Lima RN. Produtividade, avaliação econômica, teores foliares de nitrogênio e potássio e atributos industriais de castanha em cajueiro anão-precoce adubado com doses crescentes de nitrogênio e potássio em cultivo sob sequeiro. In: Yamada T, Roberts TL (Eds), Potássio na Agricultura, Potafos, Piracicaba 2005, 823-831.
5. Ghosh SN. Studies on the NPK requirement of cashew (*Anacardium occidentale* L.) in lateritic tract of West Bengal. Cashew 1990;4:6-9.
6. Lal RL, Mishra DS, Rathore Nidhi, Chand S. Effect of organic manures on fruit yield and quality of litchi cv. Rose Scented. Pantnagar J Res 2012;10(2):256-258.
7. Murugamani P, Ravi G. Role of organic cashew nut cultivation: A study in cuddalore district International Journal of Management, IT & Engineering 2017;7(9):379-386.
8. Somani LL, Totawat KL. Soil conditioners and amendments. Agrotech Pub. Academy, Udaipur 1st Ed. Agboola and Omueti, 1985-1996, 28-160.
9. Suge JK, Omunyin ME, Omami EN. Effect of organic and inorganic sources of fertilizer on growth, yield and fruit quality of eggplant (*Solanum melongena* L). Archiv. Appl. Sci. Res 2011;3(6):470-479.
10. Ximenes CHM. Adubação mineral de mudas de cajueiro anão precoce cultivadas em diferentes substratos. Fortaleza, Universidade Federal do Ceará. M.Sc. dissertation 1995.