



Role of Differential Nutrient Management on Growth and Yield Attributes of Cashew (*Anacardium occidentale* L.) in Maidan Tracts of Karnataka

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ABSTRACT

The research on Nutrient Management for yield maximization in Cashew was conducted under Crop management, All India Co-ordinated Research Project (AICRP) on Cashew at Horticulture Research and Extension Centre, Hogalagere, Kolar district, Karnataka state, India during the period of 2020–21. There were six treatments imposed in the experiment, among the treatments, treatment-5 (T_5) i.e., cashew trees imposed with 100% RDF (500:250:250 g)+10 kg FYM along with foliar spray of major nutrients (3% Urea+0.5% MAP+1% K_2SO_4), secondary and micronutrients (0.5% $ZnSO_4$ +0.1% solubor as boron+0.5% $MgSO_4$) was found significantly superior over remaining treatments in terms of growth parameters like Stem girth (17.91 cm), Canopy height (2.66 m), Canopy spread (E-W : 7.08 m except T_4 and N-S : 7.12 m), Mean canopy diameter (7.10 m), Canopy surface area (158.55 m^2) and ground area covered by plant canopy (61.99%). Whereas, T_5 was also recorded significantly superior over other treatments and followed similar trend as in growth attributing parameters, such as Nut yield per tree (14.50 kg), Yield per hectare (18.87 q), Cumulative nut yield for six years of harvest (56.82 kg) and Cumulative yield per hectare (88.64 q). However the treatment-5 was also numerically elevated higher values in remaining all parameters and the lowest observation values were found in T_6 (control). When look at the overall performance, treatment-5 (T_5) was found to be best treatment.

KEYWORDS: Cashew, major nutrients, secondary nutrients, micronutrients, cashew apple

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Data Availability Statement: Legal restrictions are imposed on the public sharing of raw data. However, authors have full right to transfer or share the data in raw form upon request subject to either meeting the conditions of the original consents and the original research study. Further, access of data needs to meet whether the user complies with the ethical and legal obligations as data controllers to allow for secondary use of the data outside of the original study.

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1. INTRODUCTION

Cashew nut (*Anacardium occidentale* L.) belongs to family Anacardiaceae, traditionally, cashew is propagated using seeds resulting in variations (Felix et al., 2013). Soft wood grafting technique is the best for the multiplication of clones for the establishment of plantations and canopy substitution with July being the suitable period for grafting to achieve success in canopy substitution. Grafting on a root stock with retained four (4) matured leaves at base enhanced a high grafting success (Yeboah et al., 2020). Grafting techniques have continuously been developed and improved (Wang, 2011) as a routine method for the agricultural production of many types of plant including fruit trees. Cashew budding and grafting as compared to cutting and air-layering have produced some promising results and are being extensively used (Suassuna et al., 2016). Grafting techniques in cashew have been successful for the following methods: softwood grafting, side grafting and wedge grafting (Martin et al., 2019; Manga et al., 2017). Grafting as observed by Hartmann et al. (2011) hastens reproductive growth, maturity and earlier fruit production. Juvenile seedlings grow rapidly because of rapid hormonal activity and promote high success (Mina et al., 2018).

The ideal moisture content of dried cashew kernel 5.9% (Ogunbenle and Afolayan, 2015), among roasting methods most popular and currently following method is steam roasting (Gupta, 2020; Anonymous, 2020). The composition of cashew could be promoted by type of variety, geographic locality and ripening stage (Sivagurunathan et al., 2010; Adou et al., 2011; Gordon et al., 2012). Cashew production is potentially an important value for small farmers (Oliveira et al., 2020)

In India, cashew area was 11,58,900 hectare with the production of 738000 tonnes (Anonymous, 2021) and our was the largest producer and exporter of cashew nut with 26 grades (Gupta, 2020). India has exported 64836.03 thousand kg of cashew kernels different countries with value of 374033.41 lakhs rupees (Anonymous, 2020). The effect of thermal treatment and high hydrostatic pressure on cashew apple juice have been reported by various scientists (Gyedu-Akoto, 2011; Sampaio et al., 2011; Talasila et al., 2011). Ultrasound treatment has a potential to be used as an alternative non-thermal technique for traditional thermal pasteurization process (Gao and Rupasinghe, 2012). Cashlime is a cashew apple and lemon juice blend RTS/Nectar prepared using cashew apple pulp can be stored under refrigerated conditions for maximum of five months (Preethi et al., 2019). A different process has been developed for converting cashew apples into value added products (Das et al., 2017). The cashew apple shown that therapeutic and nutritional virtues and can be used as an

interesting food (Pascal, 2018). Cashew Juice preservation also has the potential for developing a village level cottage industry (Runjala and Kella, 2017).

The cashew yield recorded in India and Karnataka is very low due to imbalanced application of fertilizers and manures (Maruthi-Prasad et al., 2015). 500:250:250 NPK g tree⁻¹ of cashew recommended in Karnataka state (Saroj, 2015). Application of micronutrients have ability to increases nut yield in cashew (Rajamanickam et al., 2020). Planting density as well as levels of fertilizer have significant influence on growth and yield in cashew (Tripathy et al., 2015). Integrated nutrient of both inorganic and organic nutrients increases nut yield in cashew (Patil et al., 2020). Thus, the objectives of the experiment were to study the influence of combined effect of RDF with manure and foliar spray of major, secondary and micronutrients on vegetative, reproductive and quality traits of cashew in maidan parts of Karnataka, India.

2. MATERIALS AND METHODS

The experiment was conducted on 8 year old trees of Chintamani-1 variety of cashew plantation at All India Co-ordinated Research Project (AICRP) on Cashew, Horticulture Research and Extension Centre, Hogalagere, Kolar district, Karnataka state, India which was located at longitude-78.2741 and latitude-13.32507 during the period of 2020-21 (July, 2020 to June, 2021) by adopting Randomized block design with six treatment, four replications, number of plants per replication were six under the spacing of crop 8m × 8m and the method of irrigation was by drip irrigation, especially after the trees were reached fifty percent flowering, each row of trees were installed by drip lateral and in each tree was ensure drip emitter of 8 litres per hour and there was no irrigations were supplemented during rainy season. Whereas the details of the treatments were 100% RDF dose of NPK fertilizers (RDF) 500 : 250 : 250g NPK /tree /year (T₁), 100% RDF+10 kg FYM plant⁻¹ year⁻¹ (T₂), 100% RDF+10 kg FYM +Foliar spray of major nutrients(3% Urea+0.5% MAP+1% K₂SO₄) (T₃), 100% RDF+10kg FYM/plant/year+foliar spray of secondary nutrients(0.5% ZnSO₄+0.1% solubor as boron source+0.5% MgSO₄) (T₄), 100% RDF+10 kg FYM/plant /year+Foliar spray of major nutrients (3% urea+0.5% H₃PO₄+1% K₂SO₄)+foliar spray of secondary & micronutrients(0.5% ZnSO₄+0.1% solubor as Boron source+0.5% MgSO₄) (T₅) and control without any application of fertilizer and manures (T₆) the foliar spray of nutrients were taken at three different stages flushing, flowering and nut development stages by using tractor mounted power sprayer covering the entire canopy.

Experiment was laid out under randomized block design



with four replications. Uniform eight years old trees of cashew cv. Chintamani-1 planted at the spacing of 8×8 m² (156 plants ha⁻¹) were used for the current experimentation. The fertilizers application (500:250:250 NPK per tree⁻¹ year⁻¹) by excavating round trenches of 30× 20 cm² size under the tree and 1 m away from trunk was uniformly followed simultaneously including plant protection schedule.

The growth and yield attributing parameters data's were recorded, in different stages of the crop season, then determined and analyzed statistically by suitable the procedure (Panse and Sukhatme, 1995).

Calculations: Ground area covered by the plant canopy and Canopy diameter calculated by using following formulae

Ground area covered by the plant canopy = πr^2

Where r = radius of the canopy (r= Canopy diameter/2)

Canopy diameter=(Length of canopy EW+Length of canopy NS)/2

3. RESULTS AND DISCUSSION

The nutrient management in cashew is very important task, which should be fulfilled by major, secondary and micro nutrients, method of application as well as

stages of application, in this direction the above research was conducted on cashew crop, while experimentation different combinations of treatments were formulated which contains soil application of recommended dose of fertilizers (RDF) and also foliar spray of major nutrients, secondary and micro nutrients at different stages of crop like fleshing, flowering as well as Nut development stages. Among the treatments, the trees were fed with 100% RDF (500:250:250 gram/tree)+10 kg FYM along with foliar spray of major nutrients (3% Urea+0.5% MAP+1% K₂SO₄) and secondary, micronutrients (0.5% ZnSO₄+0.1% solubor as boron source+0.5% MgSO₄) (T₅) was found to be performed significantly in terms of growth attributing parameters like Stem girth (20.05 cm), Canopy height (2.66 m), Canopy spread North-South (7.12 m), Mean canopy diameter (7.10 m), Ground area covered by tree Canopy (61.99%) and Canopy surface area (158.55 m²), whereas remaining growth parameters were numerically higher values in T₅ compare to all other imposed treatments and those are Plant height, Canopy spread East-West and Leaf fall estimation. The least values growth attributing parameters were recorded in control treatment (T₆) compare to remaining all other treatments i.e. trees were did not applied any nutrients neither through soil nor through foliar spray (Table 1).

Table 1: Influence of nutrient management practices on vegetative parameters of cashew

Treatments	Plant height (m)	Stem girth (cm)	Canopy height (m)	Canopy spread (m)		Mean Canopy diameter (m)	Ground area covered by plant canopy (%)	Canopy surface area (m ²)	Leaf fall estimation (kg)
				E-W	N-S				
T ₁	3.85	18.04	2.20	6.21	6.30	6.26	48.33	110.51	8.81
T ₂	3.87	18.10	2.28	6.33	6.35	6.34	49.59	114.87	9.16
T ₃	3.90	18.19	2.37	6.42	6.38	6.40	50.23	116.62	9.52
T ₄	3.95	18.72	2.45	6.56	6.47	6.51	52.10	123.34	9.86
T ₅	4.16	20.05	2.66	7.08	7.12	7.10	61.99	158.55	12.24
T ₆	3.68	17.91	2.05	6.09	6.16	6.12	46.01	101.59	8.56
SEm±	0.07	0.25	0.04	0.20	0.20	0.19	2.96	9.64	0.87
CD (p=0.05)	0.22	0.76	0.13	0.60	0.59	0.57	8.92	29.09	2.63

While majority of yield attributing parameters were significantly elevated in treatment -5 (T₅) such as Nut yield per tree (14.50 kg), Nut yield per hectare (22.62 q), Cumulative nut yield per tree (56.82 kg for 6 seasons harvest) and cumulative yield per hectare (88.64 q for 6 seasons harvest). And lowest values were found in both growth and yield attributing parameters were in control treatment (T₆). Whereas other yield attributing parameters were also recorded numerically higher values in T-5 such as flowering duration (130 days), Apple weight (39.03g) Mean nut weight (7.20 g) and shelling percent (30.23%). The tea mosquito bug infestation was low in irrespective of

treatments. During the period of experimentation, the least values yield parameters were recorded in control treatment (T₆) compare to remaining all treatments i.e. trees were did not applied any nutrients neither through soil nor through foliar spray (Table 2).

Whereas, the Cashew Cultivation being done in different parts of the India, the recommended dose of fertilizers is 500:250:250 g tree⁻¹+10 kg FYM tree⁻¹ after 6 years of plantation, but the application of recommended dose fertilizer+10 kg FYM supplemented with foliar spray of major nutrients (3% Urea+0.5% MAP+1% K₂SO₄)+Secondary and



Table 2: Influence of nutrient management practices on vegetative parameters of cashew

Treatments	Flowering duration (Days)	Apple weight (g)	Mean nut weight (g)	Nut yield tree ⁻¹ (kg)	Nut yield ha ⁻¹ (q)	Shelling (%)	TMB Infestation (Low/Medium/High)	Cumulative yield (kg tree ⁻¹) (3 No. of harvests)	Cumulative yield ha ⁻¹ (q) (6 numbers of harvest)
T ₁	121	36.21	7.00	11.26	17.56	30.05	Low	45.14	70.42
T ₂	124	37.00	7.12	12.10	18.88	30.10	Low	47.62	74.29
T ₃	127	38.05	7.15	12.08	19.96	30.14	Low	50.50	78.79
T ₄	128	38.85	7.15	13.40	20.90	30.17	Low	51.61	80.51
T ₅	130	39.03	7.20	14.50	22.62	30.23	Low	56.82	88.64
T ₆	114	35.17	6.80	8.50	13.26	29.63	Low	37.27	58.16
SEm±	1.43	0.81	0.05	0.34	0.53	0.18	-	1.17	1.88
CD (p=0.05)	4.30	2.43	0.16	1.02	1.59	0.54	-	3.51	5.65

micronutrients (0.5% ZnSO₄+0.1% solubor as Boron+0.5% MgSO₄) (T₆) at different stages crop period like fleshing stages, flowering stages and nut developmental stages were very beneficial influence on growth and yield attributing parameters and similar findings noticed such as application of Zinc would be promoted Auxin synthesis in the plant system which might delayed the formation of Abscission layer during early stage of fruit development (Nason and Mc Elroy, 1963). The application of Zinc might have encouraged the endogenous production of Axin thereby reducing the fruit drop (Awasthi et al., 1975).

The above results were in accordance with the research findings of Talang et al. (2017) in mango fruit crop and Palsande et al. (2015), Dhanasekaran et al. (2018), Gavit et al. (2020), Gajbhiye et al. (2022) and Ramteke et al. (2022) and in cashew. Since it is highly immobile in the plant, hence it requires continuously, meanwhile reproductive parts need more boron (Rerkasem et al., 2015).

Hence treatment-5 was the best treatment among the six imposed treatments and this treatment certainly helpful in enhance the cashew productivity and production, and also very helpful in uplifting of the stages of cashew growing farming community.

4. CONCLUSION

The treatment-5 (T₅) i.e. cashew trees were imposed with 100% RDF (500:250:250 g)+10 kg FYM along with foliar spray of major nutrients (3% Urea+0.5% MAP+1% K₂SO₄), secondary and micronutrients (0.5%ZnSO₄+0.1% solubor as boron+0.5% MgSO₄) was found significantly superior over remaining all other treatments for most of the growth and yield attributing parameters. And the treatment-5 was found as best treatment compare to other treatments.

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