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YIELD AND NUTRITIVE VALUE OF CO(BN)5 INFLUENCED BY VARIOUS MANURES AND FERTILIZERS AND ITS IMPACT ON GROWTH PERFORMANCE OF CROSSBRED CALVES COMPARED TO CO (CN)4

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ABSTRACT

A study was conducted to identify the suitable planting material (stem cuttings/ root slips) for propagation of Cumbu Napier Hybrid Grass Co(BN)5 understorey Cocus nucifera with different fertilizers and manures and to examine the nutritive value of the fodder.The experiment had seven treatments replicated thrice, T_1 (Stem cuttings for propagation-Control), T_2 (Stem cuttings + Recommended dose of fertilizer), T_3 (Root slips + Recommended dose of fertilizer), T_4 (Stem cuttings + Farm yard manure@10t/ha), T_5 (Root slips + Farm yard manure @ 10t/ha), T_6 (Stem cuttings + Farm yard manure @10t/ ha + Recommended dose of fertilizer) and T_7 (Root slips + Farm yard manure @10t/ha + Recommended dose of fertilizer). No significant (P>0.05) variations were observed in the yield irrespective of planting material and manuring. Significantly highest plant height was observed in Root slips + Farm yard manure @10t/ha + Recommended dose of fertilizer (T_7), the number of tillers / plant and leaves per tiller, were significantly highest in Stem cuttings + Farm yard manure @10t/ha + Recommended dose of fertilizer (T_6), leaves per clump were significantly highest in T_6 and T_7. No significant variation existed in the fortnightly body weight, average daily gain and dry matter intake of animals fed Cumbu Napier hybrid grass Co(CN)4 Vs Cumbu Napier hybrid grass Co(BN)5. However, Feed Conversion Ratio (FCR) in the IVth week was significantly better in Cumbu Napier hybrid grass Co(BN)5 fed cattle. It was concluded that to cultivate Co(BN)5 understorey Cocus nucifera stem cutting with application of farm yard manure and recommended dose of fertilizer was the best practice.

Keywords: Understorey *Cocus nucifera,* Cumbu Napier hybrid grass Co(BN)5

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INTRODUCTION

Livestock farming is important for the livelihood and economy of farmers. Livestock sector contributes 4.11% GDP and 25.6% of total Agriculture GDP. Green fodder production is very essential for the survival of the livestock industry. In India fodder crops are cultivated in around 8.3 million hectares of land area and in Tamil Nadu, the area under fodder cultivationis around 0.17 million hectare amounting to only 1.23% of the gross cultivated area (Tensingh *et al.,* 2020). One of the main impediments in the way of improvement of livestock production is quantitative and qualitative insufficiency of fodder (Pathan *et al.,* 2012). The livestock sector has to satisfy the increasing demand for animal products while reducing its environmental impact, in the aspect of climatic changes. Over exploitation of production systems by ever increasing human and livestock population results in declined productivity of lands and increases degraded wastelands. One of the management methods for degraded wastelands lands is the establishment of horti pastoral systems, through this the degraded wastelands can be made productive and contribute to human food security and livestock production (Meena *et al*., 2019).

Fragile agro-ecosystem of degraded wastelands needs to be combated by adoption of coconut trees (*Cocus nucifera*) in association of perennial grasses under hortipasture system. Bajra Napier hybrid grass is a popular fodder for rearing livestock because of its higher biomass yield and its suitability for feeding dairy cattle, sheep and goats and is believed to be the perfect crop to meet huge fodder demands. Bajra Napier hybrid grass Co(BN)5 is an interspecific hybrid between fodder Cumbu IP 20594 (*Pennisetum glaucum*) and Napier grass FD 437 (P. *purpureum Schumach*). It is vegetatively propagated through stem and root cuttings for its production in fields. Sprouting is major potent factor contributing toward final fodder yield. It has special significance in vegetatively propagated crops where poor sprouting creates gaps, which adversely affect tonnage. Good sprouting and 100% establishment of the sprouted buds lays the foundation of the subsequent ratoon crop.

Though this fodder is one of the highest yielding perennial fodder grass considered as cut and carry forage for stall fed systems, its biomass yield under agroforestry system has not been documented. Moreover, the effect of different planting material (stem cuttings/ root slips) and combination of organic and inorganic fertilizers in boosting the fodder biomass yield and enriching the nutrient value of Cumbu Napier Hybrid Grass Co(BN)5 has also not been studied under agroforestry system. In this background a study was conducted to identify the suitable planting material (stem cuttings/ root slips) for propagation of Cumbu Napier Hybrid Grass Co(BN)5 understorey *Cocus nucifera* with different fertilizers and manures and to examine the nutritive value of the fodder.

MATERIALS AND METHODS

Experimental location and design

A field experiment was conducted during two consecutive years 2016-17 and 2017– 18 at Institute of Animal Nutrition, Kattupakkam, Chengalpattu district, Tamil Nadu, India. The study location had tropical climate. Soil of the experimental field was calcareous with 0.39% organic carbon, 367.5 kg/ha available nitrogen, 15.0 kg/ha available phosphorus and 57.5 kg/ha available potassium.

The experiment was conducted to determine the effects of planting material (stem cuttings/ root slips) and fertilizers and manures on biomass yield and nutrient composition of Cumbu Napier Hybrid Grass Co(BN)5 when grown on a calcareous soil in degraded wasteland understorey of *Cocus nucifera*. The experiment was carried out in a Randomized Block Design involving two different planting materials of stem cuttings and root slips and three different manurial combinations. The experiment with seven treatment combinations was replicated thrice. The treatments included T_1 (Stem cuttings for propagation-Control), T_2 (Stem cuttings + Recommended dose of fertilizer), T_3 (Root slips + Recommended dose of fertilizer), T_4 (Stem cuttings + Farm yard manure@10t/ha), T_5 (Root slips + Farm yard manure @ 10t/ha), T_6 (Stem cuttings + Farm yard manure @10t/ ha + Recommended dose of fertilizer) and T_7 (Root slips + Farm yard manure @10t/ha + Recommended dose of fertilizer).

Management, yield and growth measurements

The experimental field was ploughed three times to get good tilth and produce a fine seed bed. Farm yard manure (FYM) @10 tonnes/hectare was applied and the land was ploughed twice before planting. The recommended dose of 150: 50: 40 kg NPK ha^{-1} was applied. Fifty per cent of the recommended N and full dose of P_2O_5 and K_2O were applied basally prior to planting. Top dressing of fertilizers was applied on 30th day of planting. The planting materials *viz.,* stem cuttings/ root slips were planted at 50 X 50 cm spacing. All the plots were irrigated once in a week to ensure adequate soil moisture for crop growth.

Fodder was first harvested on 75^{th} day and subsequently harvested once in 45 days for five times, at different places of one square meter area in each experimental plot and the weight of fresh fodder biomass was measured using digital electronic weighing balance and sampling for estimation of moisture was done (AOAC, 2012) on the experimental plots itself. The dry fodder biomass yields were calculated based on the moisture content of respective treatment group fresh fodder biomass yields.

The growth and yield parameters *viz.,*plant height (cm), number of tillers / clumps, number of leaves / tillers, number of leaves per clump, leaf length (cm), leaf breadth (cm) and Leaf to stem ratio were measured in the field itself. The cost of fodder production was determined based on the prevailing market prices.

Nutritive evaluation of Co(BN)5

Samples of the Co(BN)5 grass grown across various treatments under *Cocus nucifera* were estimated for their proximate principles as per AOAC (2000). For nutritive evaluation of Co(BN)5**,** twelve crossbred male calves at the age of four months were randomly divided in to two groups (T_1 and T_2) with six calves in each group. The study period was for 45 days. The animals were housed in well ventilated calf shed fulfilling standard floor space, water space and feed space requirements. Other routine managemental practices were uniform for both the treatments. The animals were fed ration at the rate of 2.5 % dry matter intake. One third of the ration was concentrate mixture and the remaining two third of the ration comprised of roughage. The control group (T_1) was offered *ad libidum* Cumbu Napier Hybrid grass Co(CN)4 as roughage and treatment group (T_2) was offered *ad libidum* Cumbu Napier hybrid grass Co(BN)5 as roughage. Daily feed offered and left over was recorded to arrive at feed intake and expressed as DMI as percent body weight. Biweekly body weight gain was recorded.

RESULTS AND DISCUSSION

The growth and yield parameters as influenced by cutting time irrespective of the planting material and manuring to Cumbu Napier hybrid grass Co(BN)5 understorey of *Cocus nucifera* is presented in table 1.

No significant (P>0.05) variations were observed in the plant height between different cutting time irrespective of planting material and manuring. Irrespective of planting material and manuring the number of tillers increased with cutting time, significantly highest number of tillers were in the IVth and Vth cutting. The number of leaves per tiller was highest in first cutting and gradually showed a decline with cutting time. No significant (P>0.05) variations were observed in the number of leaves per clump. The leaf length was significantly higher at first cutting time compared to other cutting time, which was also reflected in the leaf to stem ratio. No significant (P>0.05) variations were observed in the yield between different cutting time irrespective of planting material and manuring.

The growth and yield parameters as influenced by different planting material and manuring to Cumbu Napier hybrid grass Co(BN)5 understorey of *Cocus nucifera* irrespective of cutting time is presented in table 2.

Significantly highest plant height was observed in T_7, the number of tillers / plant and leaves per tiller, were significantly highest in T_6, leaves per clump were significantly highest in T_6 and T_7. The leaf length was higher than control in all treatments. Leaf breadth, leaf: stem ratio and yield were significantly highest in T_6. It can thus be concluded that to cultivate Co(BN)5 understorey *Cocus nucifera* stem cutting with application of farm yard manure and recommended dose of fertilizer is the best practice.

Table 1. Growth and yield of Co(BN)5 as influenced by cutting time understorey of *Cocus nucifera* (Mean* ± SE)

Growth and yield parameters	Cutting time				
	I	II	III	IV	V
Plant Height (cm) ^{NS}	303.57 ±8.86	301.43 ±8.523	300.84 ±8.51	298.14 ±8.276	299.63 ±8.30
No of tiller	6.28^{a} ±0.31	16.19^{b} ±0.51	17.6190^{b} ±0.62	20.00^{c} ±0.73	20.14^{c} ±0.85
No of leaves per tiller	21.00^{d} ±1.08	19.90^{cd} ±0.96	18.04^{bc} ±0.85	16.23^{ab} ±0.68	15.33^{a} ±0.61
No of leaves per clump ^{NS}	103.90 ±4.69	101.52 ±4.66	98.19 ±4.51	96.38 ±4.22	93.09 ±3.99
Leaf length (cm)	121.42^{b} ±3.34	101.14^{a} ±4.83	97.29^{a} ±3.98	95.72^{a} ±3.93	93.44^{a} ±3.75
Leaf breadth (cm)^{NS}	5.82 ±0.19	5.90 ±0.20	5.61 ±0.18	5.72 ±0.20	5.55 ± 0.20
Leaf to stem ratio	0.69^{b} ±0.02	0.64^{ab} ±0.02	0.61^{a} ±0.02	0.63^{ab} ±0.02	0.58^{a} ±0.02
Yield MT/Ha^{NS}	25.97 ±1.38	26.57 ±1.50	25.41 ±1.45	26.15 ±1.24	23.41 ±1.17

*Mean of 21 observations (Pooled data of all treatments in each cutting)

Mean values bearing different alphabets as superscripts within rows differ significantly (P< 0.05) NS - No significant variation

Table 2. Growth and yield of Cumbu Napier hybrid grass Co(BN)5 understorey of *Cocus nucifera* as influenced by different planting material and manuring

Growth and yield parameters	Treatments						
	T_1	T_2	T_3	T_4	T_5	T_6	T_7
Plant Height (cm)	290.49^{a}	298.40^{a}	290.44^{a}	297.60^{a}	279.91^{a}	343.39^{a}	304.84^{b}
	± 8.74	± 6.72	± 11.95	± 4.38	± 7.30	± 8.21	± 11.90
No of tiller	12.80^{a}	17.73^{bc}	14.93^{abc}	17.13^{abc}	14.40^{ab}	19.06^{c}	16.26^{abc}
	± 1.13	± 1.59	± 1.53	± 1.43	± 1.35	± 1.69	± 1.47
No of leaves per tiller	16.33^{b}	20.13^{c}	18.73^{c}	16.20^{b}	12.60^{a}	22.80^{d}	19.93^{c}
	± 0.52	± 0.84	± 0.99	± 0.46	± 0.54	± 1.17	± 1.00
No of leaves per clump	73.26^{a}	112.80^{c}	108.73^{c}	80.93^{ab}	87.93^{b}	115.80^{c}	110.86^{c}
	± 2.27	± 2.72	± 4.74	± 1.52	± 2.59	± 2.86	± 4.56
Leaf length (cm)	86.31^{a}	112.38^{b}	107.64^{b}	87.89^{a}	91.39^{a}	118.11^{b}	108.90^{b}
	± 5.28	± 2.63	± 4.82	± 4.49	± 4.63	± 3.60	± 5.16
Leaf breadth (cm)	4.80^{a}	6.42^{d}	6.04^{cd}	5.20^{a}	5.33^{ab}	6.45^{d}	5.83^{bc}
	± 0.16	± 0.15	± 0.25	± 0.08	± 0.14	± 0.16	± 0.25
Leaf to stem ratio	0.50^{a}	0.68^{c}	0.64^{bc}	0.59^{b}	0.62^{bc}	0.74^{d}	0.65^{bc}
	± 0.02	± 0.02	±0.02	±0.01	±0.01	±0.02	±0.02
Yield MT/Ha	16.27^{a}	26.89^{c}	26.22^{c}	26.00^{c}	21.75^{b}	35.18^{d}	26.22^{c}
	±0.55	±0.65	±1.09	±0.44	±0.70	±1.18	±1.02

Values bearing different superscripts in column differ significantly (P< 0.05)

NS-No significant variation

Table 3. Proximate composition of Cumbu Napier hybrid grass Co(BN)5 understorey *Cocus nucifera* influenced by different planting material and manuring

Treatments	Moisture	% Dry matter basis				
		Crude protein	Crude fibre	Ether extract	Total Ash	Nitrogen free extractives
T_1	78.81	7.06	32.3	1.9	10.01	48.73
T_2	79.41	6.53	37.2	2.07	11.91	42.29
T_3	82.68	6.96	33.79	2.09	11.69	45.47
T_4	78.61	6.75	36.65	2.11	9.45	45.04
T_5	79.65	6.98	38.26	2.87	8.35	43.59
T_6	77.89	6.9	34.69	2.13	10.67	45.61
T_7	79.55	7.06	36.75	2.15	9.77	44.27
Mean ± SE	76.62 ± 0.58	6.98 ± 0.07	32.58 ± 0.80	2.09 ± 0.11	11.52 ± 0.48	46.82 ± 0.76

Nutritive evaluation of Co(BN)5

The results of proximate composition of Cumbu Napier hybrid grass Co(BN)5 grown under the various treatments ispresented in table 3. Crude fibre is an indirect indication of digestibility of the forage and occupies prime position in the evaluation of forage material. Crude fibre mainly consists of cellulose, hemicellulose and lignin and reduces the digestibility of forage. Crude fibre content was not influenced significantly by different planting methods. These results concurred with the findings of Varshini *et al*. (2020).

The growth and feed intake of cross bred calves fed Cumbu Napier hybrid grass Co(CN)4 Vs Cumbu Napier hybrid grass Co(BN)5 is presented in table 4.

No significant variation existed in the fortnightly body weight, average daily gain and dry matter intake of animals fed Cumbu Napier hybrid grass Co(CN)4 Vs Cumbu Napier hybrid grass Co(BN)5. However, FCR in the IVth week was significantly better in Cumbu Napier hybrid grass Co(BN)5 fed animals. Higher FCR could be due to increased digestibility and nutrient utilization in Co(BN)5 grass fed animals.

CONCLUSION

The results obtained from this trial indicates that Cumbu Napier hybrid grass Co(BN)5 could be better option for integration in *Cocus nucifera* based hortipasture. One hectare of this pasture in a year can support the active growth of 30 cross bred calves.

Table 4. Growth and feed intake parameters of cross bred calves fed Cumbu Napier hybrid grass Co(CN)4 Vs Cumbu Napier hybrid grass Co(BN)5

Parameters		Treatments	
		Cumbu Napier hybrid grass Co(CN)4	Cumbu Napier hybrid grass Co(BN)5
Body weight(Kg)	Initial ^{NS}	83.16 ± 6.87	84.57 ± 6.95
	Final ^{NS}	96.88 ± 6.70	98.62 ± 6.92
DMI (% body weight)	IInd week ^{NS}	2.37 ± 0.10	2.55 ± 0.04
	IVth week ^{NS}	2.26 ± 0.06	2.27 ± 0.06
	VIthweek ^{NS}	2.17 ± 0.06	2.17 ± 0.04
Cumulative ADG (g) ^{NS}		326.58±10.93	334.52±7.93
ADG(g)	IInd week ^{NS}	346.43±14.25	366.66±8.58
	IVth week ^{NS}	325.00±10.87	332.14±9.36
	VIthweek^{NS}	308.33±12.56	304.76±7.75
Cumulative FCR ^{NS}		6.96±0.05	6.98±0.07
FCR	IInd week ^{NS}	6.85±0.04	6.96±0.10
	IVth week FCR	6.98^{b}±0.08	7.03 ^{a} ±0.09
	VIth week FCR ^{NS}	7.07±0.10	7.15±0.10

Mean of six replicates

Values bearing different superscripts in same row differ significantly (P< 0.05)

NS-No significant variation

It can thus be concluded that to cultivate Co(BN)5 understorey *Cocus nucifera* stem cutting with application of farm yard manure and recommended dose of fertilizer is the best practice.

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