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UTILIZATION OF CASSAVA FOLIAGE FOR LARGE SCALE PRODUCTION OF ERI SILK

N. Sakthivel* and S.M.H. Qadri
Regional Sericultural Research Station, Central Silk Board, Government of India,
Salem – 636 003, Tamil Nadu, India
Email: drnsakthivelcsb@gmail.com (**Corresponding Author*)

Abstract: A study was undertaken with seven cassava varieties viz. CO2, CO3, CO(TP)4, H165, H226, MVD1 and Kunguma Rose to find out the feasibility of utilizing the foliage available at the time of removal of weak side branches at 6th month after plantation (6MAP) and tuber harvest (10 MAP) for eri silkworm (*Samia cynthia ricini* Boisduval) rearing. The cassava varieties MVD1 and H226 where found superior in total foliage yield (11.269 & 9.921 MT/ha) and rearing capacity of eri silkworm was recorded as 1408 & 1240 dfls respectively per crop while variety CO2 recorded least values with foliage yield of 2.083 MT/ha and rearing capacity of 260 dfls. Among the varieties, highest nutrient contents viz. leaf moisture crude protein, total carbohydrate, nitrogen, phosphorus, potassium and total minerals and low values in anti nutritional contents i.e. tannin and HCN were recorded with MVD1 which was closely followed by H226. The CO2 variety however exhibited least in nutritional levels while recorded higher values of anti-nutrient contents. The economic traits of eri silkworm viz. ERR, cocoon yield, shell yield, SR %, fecundity and hatching % were found superior in MVD1 followed by H226 whereas poorest economic traits were observed in variety CO2. The results obtained from the pooled data of all varieties revealed that the cassava farmer could generate @ 633.556 kg of eri cocoon at an average cocoon yield of 66.56 kg/100 dfls from one hectare of cassava plantation by rearing 952 dfls utilizing the total available foliage of 7.619 MT per crop.

Keywords: Cassava, *Manihot esculenta*, eri silkworm, *Samia cynthia ricini*, rearing capacity, economic traits, eri silk.

Introduction

Northeast India is considered as the original home of *eri* silkworm, *Samia cynthia ricini* Boisduval. Ericulture is an integral part of native tribal of the zone, where they traditionally rear the eri silkworms since time immemorial primarily for the pupae as a delicacy and conventionally weave silk fabric for their family use. However, in recent past eri silk gained commercial importance after introduction of advanced machineries for spinning of eri cocoons facilitating production of finer yarns which paved the way to attractive designs and products. As the eri silk gained the market value, there has been increasing demand in

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production of eri cocoons. This has attracted the non-traditional states where castor, the food plants of eri silkworm is cultivated as agricultural crop to go for ericulture as a source of additional income by using a part of foliage without affecting the main produce and primary income from host plant. However cassava, the secondary host plant is also proved to be highly suitable after castor for large scale production eri cocoons (Devaiah *et al.* 1985, Sakthivel, 2012).

Globally cassava is cultivated in an area of about 20 million hectares. Nigeria (20%), Thailand (11%), Indonesia (9%) and Brazil (8%) are the world's largest producer with respect to area under cassava. In India, cassava is cultivated over 0.23 million ha, stands first in tuber productivity and the crop is largely cultivated in Tamil Nadu (64%), Kerala (32%), Andhra Pradesh (1.5%), Nagaland (1.2%) and Assam (0.5%). The farmers remove weak side branches of tapioca 5-6 months after plantation allowing only two healthy shoots on opposite side to grow further in order to get uniformly sized roots all around the base of the plant which has been found to increase tuber yield (Mandal *et al.* 1973). The huge foliage obtained by this practice is generally wasted or a part of foliage is diverted for feeding small ruminants and cattle (Sudaryanto, 1992, Phuc *et al.* 2001, Ospina *et al.* 2002, Preston, 2002). Further, the bulk of the foliage available at the time of tuber harvest is also wasted. Thus, the countries cultivating cassava have a lot of potential to introduce ericulture and produce large quantity of eri silk if the available foliage could be successfully diverted for eri silkworm rearing which could also help the cassava growers to get additional income. In this context, the present study was undertaken to find out the feasibility of utilizing the available cassava foliage for eri silkworm rearing and cocoon production.

Materials and Methods

Seven popular Indian cassava varieties namely CO2, CO3, CO(TP)4, H165, H226, Mulluvadi (MVD1) and Kunguma Rose were selected for the studies. Stems from disease and pest free plants of above varieties after attaining 8-10 months maturity and having a thickness of 2-5 cm were obtained from Tapioca and Castor Research Station, Tamil Nadu Agricultural University, Yethapur, Salem, India. Plantation was raised directly in field after preparing sets of 10 cm length from the stems, in a randomized block design, replicated five times for each variety. Each plot was measuring 5.4 x 5.4 m in size accommodating 49 plants with the spacing of 90 x 90 cm. The crop was raised under irrigated condition as per recommended package of practices (George *et al.* 2000). The studies were conducted with five crops during 2009-2013.

Assessment of leaf yield through removal of weak shoots

The weak shoots were pruned at 6 MAP following farmers traditional practice allowing only two tall shoots in opposite sides. The shoots were harvested manually and the leaves along with petiole from each of the shoot were collected. All the foliages harvested in each subplot were pooled and weighed without petiole to determine the fresh leaf yield. The leaf yield in metric ton (MT)/ha was calculated based on the mean leaf yield in gram (g)/ plant.

Assessment of leaf yield at tuber harvest

Total available foliage was harvested a week before tuber harvest in all the treatments by breaking apical shoot portion bearing the foliage. The leaves were removed from the harvested shoots along with petiole and all the leaves harvested in each subplot were pooled and weighed without petiole to determine the fresh leaf yield. The leaf yield in metric ton (MT) / ha was calculated based on the mean leaf yield in gram (g) / plant.

Estimation of rearing capacity of eri silkworm

The rearing capacity was worked out based on the total foliage availability as above per hectare @ 800 kg of leaves per 100 dfls (Jayaraj *et al.* 2004).

Biochemical analysis

At each harvest, 2 kg of the composite leaf samples were collected, rinsed with distilled water, shade dried after removing the petioles, transferred to hot air oven and maintained at 70^{o}C until constant weight was obtained. The leaf samples were then powdered, sieved and the biochemical contents *viz.* total carbohydrate (Dubois *et al.* 1956), Crude protein, Nitrogen (N) Phosphorus (P) Potassium (K) Total minerals (Jackson, 1973), Total tannins (Anonymous, 1984) Hydrocyanic acid (HCN) (Bradbury *et al.* 1991) were determined as per the standard chemical analytical methods.

Rearing of eri silkworm

In order to study the influence of cassava varieties and age of foliage on growth and economic traits of eri silkworm, rearings were conducted at the time of removal of weak shoot at 6 MAP and tuber harvest at 10 MAP. Each treatment was replicated five times with 100 larvae each. Standard rearing techniques (Anonymous, 2004) were adopted during the experimentation and the economic traits of eri silkworm *viz.* ERR (%), cocoon yield (kg/100 dfls), shell yield (kg/100 dfls), SR (%), fecundity and hatching % were recorded.

The data recorded under the study were analyzed statistically for test of significance using Fisher's method of "Analysis of variance" as outlined by Sundararaj *et al.* (1972). The interpretation of the data was done using critical difference (CD) values calculated at P= 0.05. The correlation co-efficient (Panse and Sukhatme, 1985) of foliar constituents with economic parameters of eri silkworm was also calculated.

Results and Discussion

Foliage yield and rearing capacity of eri silkworm

At the time of removal of weak shoots @ 6 MAP, highest foliage yield (6.035 MT /ha) was recorded with the variety MVD1 with eri silkworm rearing capacity of 754 dfls followed by CO3 (5.218 MT/ha & 652 dfls), H226 (4.925 MT/ha & 652 dfls), CO(TP)4 (4.178 MT/ha & 522 dfls) and Kunguma Rose (3.491 MT/ha & 436 dfls). At the time of tuber harvest, highest foliage yield of 5.234 MT / ha and rearing capacity of 654 dfls was recorded with MVD1 which was followed by H226 (4.996 MT/ha & 625 dfls) and Kunguma Rose (4.091 MT/ha & 511 dfls). Considering the total production of cassava foliage MVD1 and H226 where found superior (11.269 & 9.921 MT/ha) and rearing capacity (1408 & 1240 dfls per crop) while CO(TP)4, CO3 and Kunguma Rose exhibited on par results with the yield of 7.878, 7.718 & 7.582 MT/ha and rearing capacity of 985, 965 &948 dfls respectively. The variety CO2 recorded least values with foliage yield of 2.083 MT/ha and rearing capacity of 260 dfls (Table 1).

Nutrient content of the foliage

The cassava varieties exhibited marked differences in their nutritional value which were comparatively higher in foliage harvested at 6MAP than the foliage obtained during tuber harvest at 10 MAP except that of total carbohydrate which was found increased with leaf maturity. Considering the anti-nutrients, tannin content was observed to be increased while there was significant reduction in HCN content with increase in leaf age. Among the varieties, highest nutrient contents *viz.* leaf moisture (79.65 & 70.70%), crude protein (27.33 & 23.50%), total carbohydrate (30.28 & 39.57%), nitrogen (4.69 & 4.08%), phosphorus (0.41 & 0.37%), potassium (1.15 & 0.88%) and total minerals (14.78 & 10.23%) and low values in anti nutritional contents *i.e.* tannin (2.80 & 2.84 %) and HCN (332 & 310 mg/kg) were recorded with MVD1 both at 6 and 10 MAP which was closely followed by H226. The CO2 variety however exhibited least in nutritional levels while recorded higher values of anti-nutrient contents (Table 2 & 3).

Economic traits of eri silkworm

The results of rearing eri silkworm utilizing the foliage obtained at 6 MAP by removal of weak shoots revealed that **t**he larval duration (D: H) did not differ significantly among the cassava varieties (25:20) except variety CO2 where it was a little longer (27:00). The economic traits of eri silkworm *viz.* ERR (%), cocoon yield (kg/100 dfls), shell yield (kg/100 dfls), SR (%), fecundity and hatching % of 95.36, 79.452, 12.962, 16.315, 343.19 & 94% respectively were found superior in MVD1 followed by H226 as 94.12, 78.500, 12.740, 16.229, 340.63 & 93.34 respectively whereas poorest economic traits were observed in variety CO2 (88.33, 62.198, 7.835, 12.597, 300.06 & 82.23) with corresponding value of economic traits respectively (Table 4).

Similarly, MVD1 was found significantly superior over other varieties with the larval duration (D:H), ERR %, cocoon yield (kg/100 dfls), shell yield (kg/100 dfls), SR%, fecundity and hatching % of 28:20, 91.63, 66.395, 9.421, 14.189, 339.66 & 93.10 respectively @ 10 MAP *i.e.* the rearing conducted with the foliage obtained at the time of tuber harvest. The next best variety was H226 (28:22, 91.50, 65.800, 9.223, 14.016, 337.09 & 92.37) which was closely followed by CO(TP)4 (29:18, 91.48, 65.022, 8.984, 13.816, 333.19 @ 91.27) for all corresponding traits. The performance of variety CO2 was poorest among all the varieties (30:03, 86.74, 53.684, 5.945, 11.074, 290.11 & 79.51) with corresponding value of economic traits respectively (Table 5).

Removal of weak shoot is essential for production of large number of uniformly sized roots all around the base of the plant (Mandal *et al.* 1973). However, this practice generates large quantity of foliage. Ahmad (1973) reported that the potential yield of cassava leaves varies considerably depending upon cultivar, age of plants, plant density, soil fertility and climate. In the present investigation, the foliage yield at the time of removal of weak shoots was mainly influenced by branching nature of the variety, shoot length and inter nodal distance, leaf area, moisture content of the leaf, weight of single leaf *etc*. However, the foliage availability at the time of tuber harvest *i.e.* at plants maturity is greatly influenced by the leaf retention capacity of the plants. Besides the varietal characters, the cropping system *i.e.* irrigated and rain fed conditions could also influence on the foliage yield. The rearing capacity of eri silkworm is directly proportionate to foliage yield of cassava plant and approximately 800 kg of leaves are required to rear 100 dfls of eri silkworm (Jayaraj *et al.* 2004). Therefore, the average of total foliage availability (7.619 MT per crop) revealed that the cassava farmers could take up eri silkworm rearing up to 952 dfls per hectare of plantation.

The variation in the chemical composition of cassava leaves at different stages of defoliation is in line with the reports of earlier workers that the chemical composition of forages changes with age and stage of development (Ravindran, 1990, Eggum, 1970, Fasae *et al.* 2009). The nutrient and anti-nutrient levels in leaves are influenced by genetic, physiological, edaphic and climatic differences with the stage of maturity being perhaps the major source of variation (Gomez and Valdivieso, 1985, Ravindran, 1995). Cassava leaves contain an average of 21% crude protein, but values ranging from 16.7 to 39.9% have been reported (Ravindran, 1995).

In the present investigation, the nutrient contents except that of total carbohydrates as well as the value of HCN were decreased while tannins were slightly increased with increase in plant age. Gomez and Valdivieso (1985) reported increase in polyphenolic contents in cassava leaves with the maturity of the plant. As in other cyanogenic plants, the glucoside concentration in cassava leaves decreases with age. Cyanide levels in the leaves are also influenced by the nutritional status of the plant. The presence of tannins in cassava leaves is capable of forming indigestible complexes with protein (Reed *et al.* 1982).

Dada and Oworu (2010) reported highest nutrient values including mineral contents *viz.* Na, K. Ca, P, Mn, Fe, and Cu in cassava leaves in young stages than that of physiological maturity phase. They also reported increase in crude protein and hydrogen cyanide content of the crop increase with age of the crop up to vegetative phase and decreased with physiological maturity of the plants. The cassava varieties MVD1 and H226 showed maximum protein content and may be suitable for eri silkworm feeding. According to Fukuda *et al.* (1959) and Takeuchi (1960), who emphasized the role of soluble and crude protein contents in silkworm nutrition. With older plants, the protein content gets reduced and the fiber and dry matter contents are increased. The protein content therefore is higher at early stage of the cassava foliage rendering it more suitable to eri silkworm for feeding.

Generally, the nutritional status in the leaves of food plants which influences the economic characters of silkworm crop depends upon the level of moisture, total protein, total carbohydrates and total minerals (Bongale *et al.* 1991). Eri silkworm rearings when conducted @ 6 MAP on removal of weak shoots and 10 MAP at the time tuber harvest of cassava respectively in the present study, the economic traits of eri silkworm including cocoon and shell yield and silk percentage differed significantly among the varieties and with the age of cassava plants. The leaf nutrients directly influence the larval growth and in turn cocoon quality in silkworms. In the present study the cassava variety MVD1 was found superior in all economic traits with highest matured larval weight, ERR, cocoon yield, shell yield, silk percentage, fecundity and hatchability of eggs both @ 6 & 10 MAP followed by H226 while the variety CO2 was noted as poor performer in all rearings.

The relationship between quality parameters of cassava varieties *viz.* crude protein, total carbohydrates, Nitrogen, Phosphorus, potassium, total minerals exhibited positive correlation with all economic traits except that of larval period which decreased with increase in nutritional content of leaves. The anti nutrients *viz.* total tannins and hydrocyanic acid were had negative impact on the economic traits of eri silkworm irrespective of variety and age of the plants (Tables 6 & 7). The highest nutritional values and lower values of anti-nutrient contents in MVD1 and H226 could be attributed to the superior economic traits including cocoon yield and silk percentage and found most suitable for ericulture compared to the other varieties whereas in CO2 the economic traits and cocoon yield were recorded as lowest which could be due to poor nutrient contents in the leaf. Further, the increased level of tannin and HCN in this variety could have caused reduced intake of leaves and digestibility as reported by earlier workers (Reed *et al.* 1982, Onwuka, 1992) in silkworm. The main limiting factor for the usage of cassava leaves as animal feed is the presence of cyanogenic glucoside, which gives rise to hydrocyanic acid (HCN) when the plant tissues are broken down during various metabolic processes in the body of animals (Ravindran, 1995).

The economic traits of eri silkworms including cocoon yield and silk % declined in relation to plant maturity which could be attributed to the corresponding reduction in nutritional values of cassava leaves. Based on the rearing performance of eri silkworm including cocoon and shell yield and silk percentage the order of merit of cassava varieties suitable for ericulture was recorded as MVD1 > H226 > CO(TP)4 > CO3 > Kunguma Rose & H165 > CO2. Chandrashekhar and Govindan (2010) reported average yield of eri cocoon ranging from 60.02 to 75.14 / 100 Dfls on the different varieties of castor screened. However, in the present study the average cocoon yield ranged between 53.68 to 79.45 kg/100 dfls on cassava and the varieties MVD1, H226, CO3 and CO4 exhibited cocoon productivity on par with the primary food plant castor when rearing conducted @ 6MAP. The pooled data of average cocoon yield (66.56 kg/100 dfls) on cassava revealed that the cassava farmer could generate @ 633.556 kgs of eri cocoon from one hectare of plantation by rearing 952 dfls utilizing the available foliage of 7.619 MT (Figure 1 & Table 8).

The results thus confirm that ericulture could be introduced successfully among the farmers who cultivate cassava and can successfully be employed as a tool for poverty alleviation in rural sector. The study also establishes that ericulture provides an additional income to the cassava growers in different countries besides generating a lot of employment opportunities similar to mulberry sericulture and to create new vista in global silk industry with production of eri silks commercially.

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Table 1: Availability of cassava foliage by removal of weak shoots in 6 MAP and at the time of tuber harvest in 10 MAP and estimated rearing capacity of eri silkworm

Treatment	6MAP		10 MAP		Total	
	FY	RC	FY	RC	FY	RC
CO2	0.975	122	1.108	138	2.083	260
CO3	5.218	652	2.500	313	7.718	965
CO4	4.178	522	3.700	463	7.878	985
H165	3.277	410	3.606	450	6.883	860
H226	4.925	615	4.996	625	9.921	1240
MVD1	6.035	754	5.234	654	11.269	1408
KR	3.491	436	4.091	511	7.582	948
Average	4.014	502	3.605	450	7.619	952
CD (5%)	0.082	9.35	0.126	6.67	0.183	15.32

FY = Foliage yield; RC = Rearing capacity

Table 2: Biochemical composition in different varieties of tapioca leaves @ 6 MAP

Treatment	Moisture %	Crude protein (%)	Total Carbo-hydrate (%)	N (%)	P (%)	K (%)	Total Minerals (%)	Total tannins (%)	HCN (mg/kg)
CO2	68.33	20.00	24.17	3.52	0.32	0.83	9.06	3.96	406
CO3	71.85	23.78	27.94	4.12	0.37	0.90	9.90	3.21	392
CO4	73.90	25.48	29.10	4.40	0.38	1.00	11.11	3.22	346
H165	77.65	23.35	28.15	4.05	0.35	0.95	9.84	3.20	348
H226	77.03	26.93	29.77	4.63	0.39	1.08	13.26	3.02	338
MVD1	79.65	27.33	30.28	4.69	0.41	1.15	14.78	2.80	332
KR	75.86	22.21	29.80	3.87	0.36	0.83	10.10	3.23	335
CD (5%)	1.985	0.284	0.316	0.067	0.043	0.050	0.347	0.345	9.637

Table 3: Biochemical composition in different varieties of tapioca leaves @ 10MAP

Treatment	Moisture %	Crude Protein (%)	Total Carbo-hydrate (%)	N (%)	P (%)	K (%)	Total Minerals (%)	Total tannins (%)	HCN (mg/kg)
CO2	64.59	17.34	32.19	3.09	0.32	0.69	6.25	4.23	378
CO3	65.09	20.18	36.12	3.55	0.35	0.76	7.16	3.41	356
CO4	67.15	21.20	36.85	3.71	0.32	0.79	8.25	3.40	336
H165	69.00	21.04	35.21	3.68	0.29	0.82	6.72	3.29	339
H226	68.38	22.98	37.86	4.00	0.37	0.88	9.37	3.18	312
MVD1	70.70	23.50	39.57	4.08	0.37	0.88	10.23	2.84	310
KR	66.65	18.16	34.37	3.22	0.33	0.70	7.67	3.43	316
CD (5%)	1.900	0.240	0.325	0.030	0.045	0.033	0.425	0.336	9.120

Table 4: Influence of feeding leaves of different tapioca varieties @ 6 MAP on economic traits of eri silkworm

Variety	Larval period D:H	Matured larval weight (g)	ERR %	Cocoon Yield (kg/100 dfls)	Shell yield (kg/100 Dfls	SCW (g)	SSW (g)	Silk (%)	Fecundity (no.)	Hatching (%)
CO2	27.00	6.03	88.33	62.198	7.835	2.445	0.308	12.597	300.06	82.23
CO3	25.20	6.55	92.68	73.055	10.783	2.737	0.404	14.760	323.42	88.63
CO4	25.20	6.58	92.90	72.533	10.996	2.711	0.411	15.160	329.18	90.17
H165	25.20	6.59	92.78	66.801	9.565	2.500	0.358	14.320	314.18	88.17
H226	25.20	6.72	94.12	78.500	12.740	2.896	0.470	16.229	340.63	93.34
MVD1	25.20	6.80	95.36	79.452	12.962	2.893	0.472	16.315	343.19	94.00
KR	25.20	6.62	91.49	67.295	9.327	2.554	0.354	13.860	319.93	88.66
Average	--	6.55	92.52	71.405	10.601	2.676	0.396	14.824	324.37	89.31
CD (5%)	--	0.134	6.123	5.126	0.456	0.177	0.019	0.444	12.356	1.025

Table 5: Influence of feeding leaves of different tapioca varieties @ 10 MAP on economic traits of eri silkworm

Variety	Larval period D:H	Matured Larval weight (g)	ERR %	Cocoon Yield (kg/100 dfls)	Shell yield (kg/100 Dfls	SCW (g)	SSW (g)	Silk (%)	Fecundity (no.)	Hatching (%)
CO2	30.03	5.83	86.74	53.684	5.945	2.149	0.238	11.074	290.11	79.51
CO3	29.18	6.48	90.10	61.083	7.758	2.354	0.299	12.701	319.97	87.69
CO4	29.18	6.56	91.48	65.022	8.984	2.468	0.341	13.816	333.19	91.27
H165	29.18	6.52	90.25	59.781	7.875	2.300	0.303	13.173	310.85	87.24
H226	28.22	6.65	91.50	65.800	9.223	2.497	0.350	14.016	337.09	92.37
MVD1	28.20	6.73	91.63	66.395	9.421	2.516	0.357	14.189	339.66	93.10
KR	29.18	6.50	89.88	60.235	7.610	2.327	0.294	12.634	314.14	87.06
Average	--	6.46	90.22	61.714	8.166	2.373	0.311	13.135	320.607	88.32
CD (5%)	--	0.133	4.900	6.512	0.650	0.215	0.035	0.678	22.105	3.508

Table 6: Correlation co-efficient between biochemical compositions of tapioca varieties @ 6 MAP and economic traits of eri silkworm under irrigated and rain fed conditions

Parameters	Larval period D:H	Matured larval weight (g)	ERR %	Cocoon yield (kg/100 dfls)	Shell yield (kg/100 Dfls	SCW (g)	SSW (g)	Silk (%)	Fecun-dity (no.)	Hatc-hing (%)
Crude protein	-0.698	0.844	0.948	0.960	0.981	0.926	0.976	0.994	0.968	0.961
Total carbohydrate	-0.908	0.971	0.865	0.747	0.765	0.683	0.750	0.803	0.855	0.915
Nitrogen	-0.694	0.841	0.945	0.960	0.980	0.927	0.976	0.993	0.968	0.960
Phosphorus	-0.736	0.883	0.940	0.963	0.965	0.933	0.959	0.962	0.986	0.969
Potassium	-0.480	0.699	0.870	0.882	0.915	0.845	0.907	0.922	0.872	0.863
Total minerals	-0.440	0.713	0.824	0.897	0.913	0.878	0.908	0.891	0.911	0.883
Total tannins	0.897	-0.988	-0.976	-0.852	-0.871	-0.780	-0.852	-0.903	-0.900	-0.958
HCN	0.736	-0.833	-0.705	-0.519	-0.573	-0.439	-0.553	-0.638	-0.680	-0.777

Table 7: Correlation co-efficient between biochemical composition of tapioca varieties @ 10 MAP and economic traits of eri silkworm under irrigated and rain fed conditions

Parameters	Larval period D:H	Matured larval weight (g)	ERR %	Cocoon yield (kg/100 dfls)	Shell yield (kg/100 Dfls	SCW (g)	SSW (g)	Silk (%)	Fecun-dity (no.)	Hatc-hing (%)
Crude protein	-0.900	0.808	0.860	0.887	0.919	0.882	0.921	0.924	0.882	0.895
Total carbohydrate	-0.924	0.868	0.904	0.952	0.953	0.955	0.955	0.933	0.959	0.950
Nitrogen	-0.901	0.807	0.860	0.887	0.918	0.883	0.921	0.923	0.883	0.895
Phosphorus	-0.712	0.412	0.419	0.586	0.524	0.629	0.530	0.435	0.636	0.542
Potassium	-0.881	0.744	0.788	0.809	0.856	0.804	0.859	0.872	0.800	0.824
Total minerals	-0.917	0.741	0.780	0.890	0.880	0.911	0.885	0.835	0.900	0.868
Total tannins	0.909	-0.968	-0.922	-0.886	-0.903	-0.867	-0.902	-0.922	0.871	-0.923
HCN	0.865	-0.857	-0.809	-0.805	-0.813	-0.796	-0.813	-0.817	-0.782	-0.830

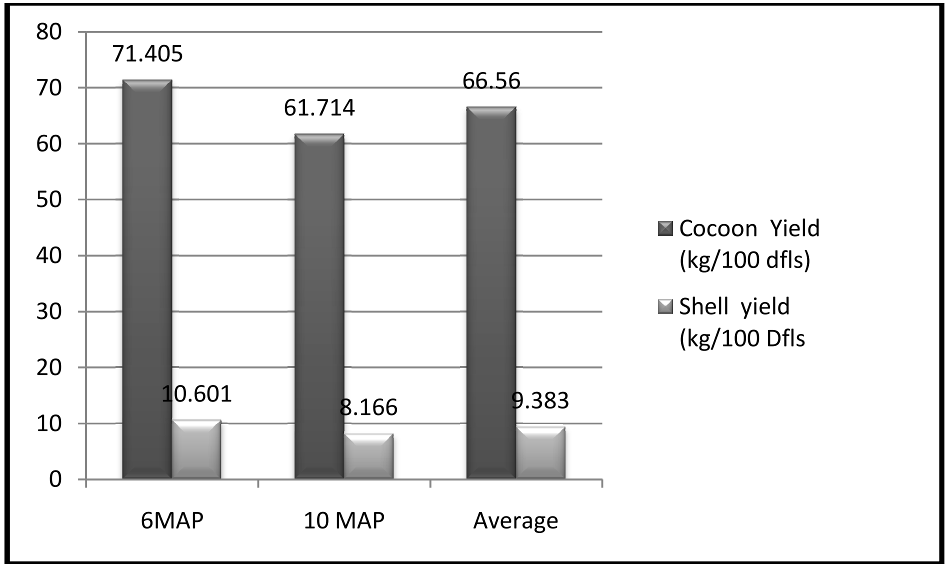

Figure 1: Average eri silk productivity (kg / 100 Dfls) on cassava foliage

Table 8: Estimated foliage yield and eri silk production capacity from one hectare of cassava plantation

Crop period	Average foliage yield (MT / ha)	Rearing capacity (Dfls / ha)	Average cocoon yield (Kg / ha)	Average shell yield (Kg / ha)
6 MAP	4.014	502	334.081	46.977
10 MAP	3.605	450	299.475	42.111
Total	**7.619**	**952**	**633.556**	**89.088**