Research Article

STUDIES ON FEASIBILITY OF UTILIZING RAINFED CASSAVA FOR ERICULTURE

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KEY WORDS:
Cassava, leaf harvest, tuber yield, starch content, eri silkworm

ARTICLE INFO
Received on:
19.02.2018
Revised on:
12.06.2018
Accepted on:
18.06.2018

ABSTRACT
A study was undertaken with seven Indian popular cassava varieties *viz.* CO2, CO3, CO(TP)4, H165, H226, MVD1 and Kunguma Rose (KR) cultivated under rainfed condition to find out the feasibility of diverting a part of foliage for rearing of eri silkworm as a source of additional income without affecting the crop produce. The rearing capacity of eri silkworm, was estimated based on the availability of total foliage at the time of removal of week shoots 6 months after plantation (6 MAP) by farmers, forced leaf harvests from 7-9 MAP and finally at the time of tuber harvest (10 MAP). The forced leaf harvests up to 30% once at 8 MAP did not affect the tuber yield and starch content of the tubers in the variety MVD1. The varieties CO3, CO4 and H165 could tolerate leaf plucking up to 20% whereas CO2, H226 and Kunguma Rose were found highly sensitive in which leaf harvest @ 10% only found safe on yield and quality of main produce. Highest foliage yield (6.373 MT/ha)and rearing capacity (797 dfls) of eri silkworm were recorded with H165 without affecting yield and quality of the tuber. The variety MVD1 (4.450 MT/ha & 556 dfls) was found next best suited whereas CO2 was registered lowest foliage yield (1.566 MT/ha) and rearing capacity (196dfls). Based on the overall foliage availability without adverse impact on tuber quality and yield, the order of merit of cassava varieties suitable for ericulture was H165> MVD1> CO3 > Kunguma Rose > CO4 > H226 > CO2 under rainfed conditions.

INTRODUCTION

India is home for a vast variety of silk moths having an amazing diversity in nature. This has enabled the country to acquire an unparallel distinction of being only producer of all five commercially traded varieties of natural silks namely mulberry, tropical tasar, oak tasar, eri and muga. Mulberry silk which contribute to about 90% of the total silk production of the country and rest are collectively termed as non-mulberry or Vanya (wild) silks. Even though their contribution is lesser in production compared to mulberry silk, the Vanya silks have a unique quality which makes them distinct and also most sought after by the consumers. Eri silk, among all non-mulberry silks, is exploited to the maximum extent accounting for 78.4% of total non-mulberry silk production and 7.26% of the total silk production in India. Northeast India is considered as the original home of *eri* silkworm, *Samia cynthia ricini* Boisduval (Lepidoptera: Saturniidae). Ericulture is an age old agro-based small scale industry, which provide livelihood to around 1.3 lakh families in the region. It is an inherited practice since the time immemorial from generation to generation to meet the partial need of their warm clothing woven by their own traditional handlooms and also eri pupae as great delicacy. After fulfilling their family requirements, they sell their surplus products.

In recent past, introduction of advanced machineries for spinning of eri cocoons facilitating production of finer yarns paved the way to commercially attractive designs and products which included blends with other natural silks, cotton, wool, synthetic materials *etc.* As the eri silk gained the market value, there has been increasing demand in production of eri cocoons. This has attracted the non-traditional states, where the food plants of eri silkworm *viz.* castor and cassava are cultivated as agricultural crops to practice ericulture commercially as a source of additional income by using a part of foliage.

Cassava is cultivated over 2.32 lakh hectare in India and the tubers are mainly used for starch production. The southern states *viz.*,Kerala, Tamil Nadu, Andhra Pradesh and Karnataka together are account for 88.65% of total cassava cultivation of the country. In Tamil Nadu it is cultivated over 1, 27,000 hectares mainly under rainfed conditions, leads in tuber production and has great potential for ericulture (Sakthivel *et al*., 2010).However, harvest of leaves from cassava plants could cause adverse effect on the main produce. In this context, a study was undertaken to standardize quantum of leaf harvest without affecting tuber yield and starch content with seven popular varieties and to estimate total foliage availability and rearing capacity of eri silkworm in view of generating additional income to the cassava growers.

MATERIALS AND METHODS

Seven popular cassava (*Manihot esculenta* Crantz) varieties of Tamil Nadu, India 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 2-3 cm were obtained from Tapioca and Castor Research Station, Tamil Nadu Agricultural University, Yethapur, Salem. Plantation was raised directly in the field at Karumapuram village, Namakkal district of Tamil Nadu, India after preparing sets of 10 cm length from the stems in the plots measuring 3.6 x 3.6 m^2 with spacing of 60 x 60 cm^2 accommodating 49 plants in each plot, in a randomized block design, replicated five times for each variety. The crops were raised under rainfed condition as per recommended package of practices (George *et al*., 2000) and the studies were conducted in five successive crops during 2009-2013.

In order to assess the quantum of cassava foliage that could be utilized for rearing of eri silkworms without affecting tuber yield and starch content, different types of harvesting schedules were effected *i.e.* recording the foliage yield by forced leaf harvest in different percentage of total leaves available at the time of harvest per plant in monthly intervals from 7-9 months after plantations and once at 8 MAP. The details of forced leaf harvest are given below:

T_1 Harvest of 10% of leaves in monthly intervals at 7, 8&9 MAP

T_2Harvest of 20% of leaves in monthly intervals at 7, 8&9 MAP

T_3 Harvest of 30% of leaves in monthly intervals at 7, 8 &9 MAP

T_4 Harvest of 40% of leaves in monthly intervals at 7, 8 &9 MAP

T_5 Harvest of 50% of leaves in monthly intervals at 7, 8 &9 MAP

T_6 Harvest of 10% of leaves in bimonthly interval *i.e.* once at 8 MAP

T_7 Harvest of 20% of leaves in bimonthly interval *i.e.* once at 8 MAP

T_8 Harvest of 30% of leaves in bimonthly interval *i.e.* once at 8 MAP

T_9 Harvest of 40% of leaves in bimonthly interval *i.e.*once at 8 MAP

T_{10} Harvest of 50% of leaves in bimonthly interval *i.e.*once at 8 MAP

T_{11} Control (Removal of weak shoot only at 6MAP and no forced leaf harvest)

T_{12} Standard check (No removal of weak shoots @ 6 MAP and no forced leaf harvest)

The quantity of foliage available at the time of removing weak shoots at 6 MAP allowing only two healthy shoots on opposite side, as per the traditional practice of the farmers as well as during tuber harvest at 10 MAP were also recorded in all the treatments.

Leaf yield through removal of week 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 biomass yield. The leaf yield in metric ton (MT)/ha was calculated based on the mean leaf yield in gram (g)/ plant.

Leaf yield under different level and interval of forced harvest

The bottom leaves were harvested at the rate of 10, 20, 30, 40 & 50% of total leaves available per plant. Leaf harvest was made by hand plucking along with petiole. At the time of leaf harvest, total numbers of leaves per stem were counted from 5 randomly selected plants per variety for respective level of defoliation in each treatment i.e. @ 10, 20, 30, 40 & 50% and number of leaves to be harvested was fixed following the formula given below.

$$\text{Number of leaves to be harvested} = \frac{\text{Percentage of leaves to be harvested}}{100} \times \text{Total number of leaves}$$

All the leaves harvested in each subplot were pooled and weighed without petiole to determine the fresh biomass yield. The leaf yield in metric ton (MT)/ha was calculated based on the mean leaf yield in gram (g)/ plant.

Leaf yield at the time of 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 biomass 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

The rearing capacity of eri silkworm was worked out based on the availability of foliage from different treatments @ 800 kg /100 dfls (Jayaraj *et al*., 2004).

Estimation of tuber yield

The tubers were harvested at 10 MAP irrespective of varieties. The tubers harvested from each treatment sub plots were weighed separately to determine fresh tuber yield. The tuber yield in MT/ha was calculated based on the mean tuber yield (kg) / plot.

Estimation of starch content

Starch content of the tubers was estimated following the procedure adopted by the sago industries using the Riemann scale balance using specific gravity method (Bainbridge, 1996) to fix the rate to cassava tubers while purchase from the farmers. It is expressed as percentage.

The data recorded were analyzed statistically for test of significance using Fisher's method of "Analysis of variance" adopting two-way factorial analyses as outlined by Sundararaj *et al*. (1972). The interpretation of the data was done using critical difference (CD) values calculated at P= 0.05.

RESULTS AND DISCUSSION

Comparative foliage yield of different varieties of cassava and rearing capacity of eri silkworm at the time of removal of weak shoots @ 6 MAP indicated that CO3 recorded highest foliage yield (2.141 MT/ha) with rearing capacity of 268 dfls followed by H165 (1.679 MT/ha & 210 dfls). The variety CO2 recorded least values with foliage yield of 0.466 MT/ha and rearing capacity of 57 dfls respectively (Fig. 1).The results of the different treatments of forced leaf harvest revealed that the foliage yield increased with increase in percentage of leaf harvest and higher foliage yield was obtained on harvest of leaves at monthly intervals than bimonthly interval in all varieties. Among the varieties, highest foliage yield was recorded in the variety H165 as 1.677, 3.237, 4.434, 5.389, 6.134 MT/ha and 0.600, 1.166, 1.749, 2.332, 2.915 MT/ha followed by MVD1 as 1.130, 2.254, 3.114, 3.795, 4.238 MT/ha and 0.410, 0.770, 1.155, 1.540, 1.925 MT/haon leaf harvest @ 10, 20, 30, 40, 50% at monthly and bimonthly intervals respectively. Least foliage yield was noticed with the variety CO2 as 0.440, 0.894, 1.228, 1.440, 1.682 MT/ha & 0.150, 0.325, 0.450, 0.636, 0.750 MT/ha respectively (Table 1).

Table 1. Comparative foliage yield (MT/ha) of different cassava varieties and estimated rearing capacity (No. of dfls) of eri silkworm through forced leaf harvest @ 7-9 MAP

Treatment	CO2		CO3		CO(TP)4		H165		H226		MVD1		KR	
	FY	RC	FY	RC	FY	RC	FY	RC	FY	RC	FY	RC	FY	RC
T_1	0.440	55	0.750	93	0.867	107	1.677	210	0.805	101	1.130	141	0.854	107
T_2	0.894	112	1.500	188	1.727	216	3.237	404	1.610	201	2.254	282	1.703	213
T_3	1.228	154	2.059	257	2.353	294	4.434	554	2.096	262	3.114	389	2.373	296
T_4	1.440	180	2.490	312	2.845	356	5.389	674	2.796	350	3.795	474	2.878	360
T_5	1.682	210	2.818	353	2.853	232	6.134	767	3.198	400	4.328	541	3.268	408
T_6	0.150	19	0.255	32	0.325	41	0.600	75	0.299	37	0.410	51	0.305	38
T_7	0.325	41	0.560	70	0.604	76	1.166	146	0.580	73	0.770	96	0.574	72
T_8	0.450	56	0.750	94	0.906	113	1.749	219	0.870	109	1.155	144	0.861	108
T_9	0.636	80	1.040	130	1.208	151	2.332	292	1.160	145	1.540	193	1.148	143
T_{10}	0.750	94	1.350	169	1.510	189	2.915	364	1.450	181	1.925	241	1.435	179
T11(C)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
T_{12} (STD)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CD (5%)	0.025	2.67	0.022	3.20	0.038	3.78	0.033	4.12	0.028	2.88	0.048	4.15	0.025	3.17

At the time of tuber harvest the foliage yield in all cassava varieties was reduced drastically with increase in percentage of forced leaf harvest at monthly intervals whereas the different percentage of forced leaf harvests at bimonthly intervals did not show significant differences in foliage yield at the time of tuber harvest except that of the treatment of 50% leaf harvest where marginal reduction was recorded. Highest foliage yield was recorded with T12 (standard check) where removal of weak shoots @ 6 MAP and forced leaf harvest was not affected till tuber harvest compared to other treatments in all the varieties. Among the varieties, higher foliage yield was recorded with H165 as 3.529, 3.495, 3.066, 2.213, 1.561 MT/ha and 3.535, 3.528, 3.525, 3.510, 3.493 MT/ha followed by MVD1 as 1.994, 1.940, 1.842, 1.318, 0.924 MT/ha and 2.058, 1.972, 1.910, 1.885, 1.860 MT/ha on leaf harvest @ 10, 20, 30, 40, 50% in monthly and bimonthly intervals respectively. Least foliage yield was noticed with the variety CO2 as 0.892, 1.090, 0.692, 0.540, 0.424 MT/ha & 0.962, 0.970, 0.958, 0.960, 0.954 MT/ha respectively (Table 2).

Fig. 1. Comparative foliage yield (FY) (MT/ha) of different cassava varieties and estimated rearing capacity (ERC) (No. of dfls) of eri silkworm at the time of removal of weak shoots @ 6 MAP

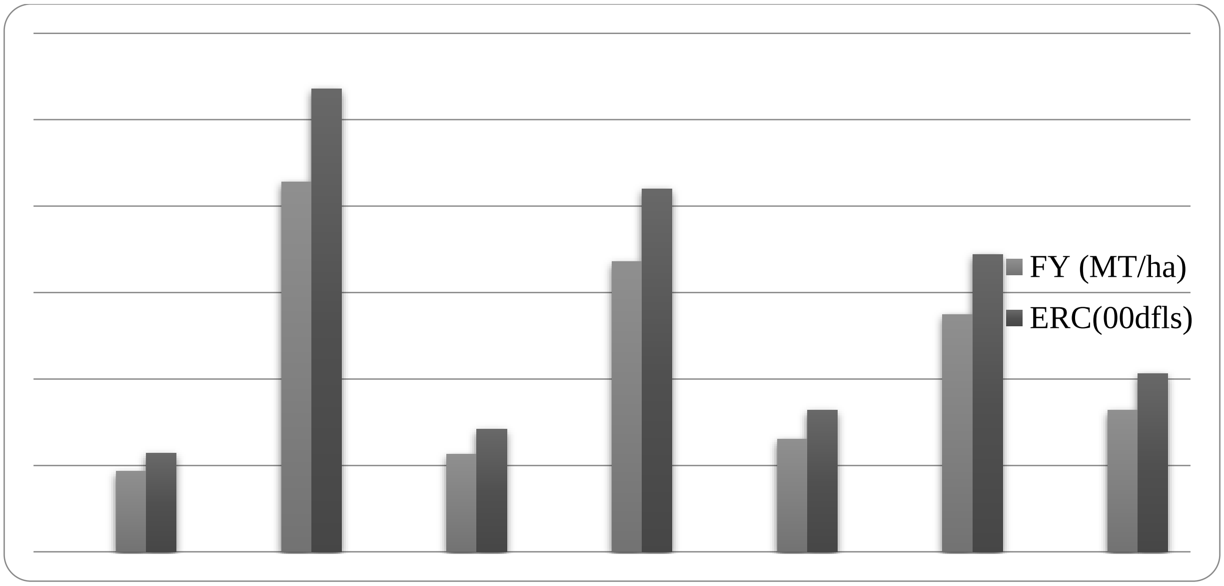

Table 2. Comparative foliage yield (MT/ha) of different cassava varieties and estimated rearing capacity (No. of dfls) of eri silkworm at the time of tuber harvest @ 10 MAP

Treatment	CO2		CO3		CO(TP)4		H165		H226		MVD1		KR	
	FY	RC	FY	RC	FY	RC	FY	RC	FY	RC	FY	RC	FY	RC
T_1	0.892	112	1.481	185	1.365	171	3.529	441	1.419	177	1.994	249	1.505	188
T_2	1.090	136	1.480	185	1.348	169	3.495	437	1.410	176	1.940	242	1.489	186
T_3	0.692	87	1.399	175	1.325	166	3.066	383	1.346	168	1.842	230	1.475	184
T_4	0.540	68	0.999	125	1.028	129	2.213	276	1.107	138	1.318	165	1.072	134
T_5	0.424	53	0.698	87	0.717	90	1.561	195	0.800	100	0.924	116	0.757	95
T_6	0.962	120	1.530	191	1.440	180	3.535	442	1.500	188	2.058	257	1.620	203
T_7	0.970	121	1.495	187	1.360	170	3.528	441	1.403	175	1.972	247	1.452	181
T_8	0.958	120	1.503	188	1.345	168	3.525	441	1.363	170	1.910	239	1.397	175
T_9	0.960	120	1.500	188	1.336	167	3.510	167	1.308	164	1.885	235	1.328	166
T_{10}	0.954	119	1.485	186	1.325	166	3.493	437	1.240	155	1.860	233	1.290	161
T_{11} (C)	0.952	119	1.533	192	1.380	173	3.540	443	1.325	165	2.014	252	1.455	182
T_{12} (STD)	0.947	118	2.162	270	1.541	192	4.575	572	1.687	211	2.922	365	1.747	218
CD (5%)	0.036	4.56	0.049	6.15	0.045	4.70	0.045	4.00	0.029	6.10	0.033	4.12	0.030	4.08

The pooled data of foliage yield at the time of removal of weak shoots, forced leaf harvest and at during tuber harvest revealed that higher foliage yields were recorded in all the treatments irrespective of varieties as compared to farmers practice (T11) and control (T12). However, among the varieties highest foliage yield was recorded in variety H165 as 6.885, 8.407, 9.183, 9.282, 9.390 MT/ha and 5.819, 6.373, 6.967, 7.517, 8.088 MT/ha) followed by MVD1 as 4.497, 5.579, 6.337, 6.490, 6.612, MT/ha and 3.848, 4.119, 4.450, 4.785, 5.164 MT/ha on leaf harvest @ 10, 20, 30, 40, 50% in monthly and bimonthly intervals respectively. Least foliage yields of 1.784, 2.456, 2.390, 2.436, 2.572 MT/ha & 1.566, 1.765, 1.864, 2.056, 2.170 MT/ha respectively were recorded in variety CO2(Table3).

Table 3. Comparative overall foliage yield (MT/ha) influenced by different schedules and quantum of harvests and estimated rearing capacity (No. of dfls) of eri silkworm

Treatment	CO2		CO3		CO(TP)4		H165		H226		MVD1		KR	
	FY	ERC	FY	ERC	FY	ERC	FY	ERC	FY	ERC	FY	ERC	FY	ERC
T_1	1.784	223	4.372	547	2.796	350	6.885	861	2.877	360	4.497	562	3.179	397
T_2	2.456	307	5.118	640	3.635	454	8.407	1051	3.670	459	5.579	697	4.025	503
T_3	2.390	299	5.608	701	4.246	531	9.183	1148	4.102	513	6.337	792	4.638	580
T_4	2.436	305	5.637	705	4.433	554	9.282	1160	4.560	570	6.490	811	4.750	594
T_5	2.572	322	5.650	706	4.499	562	9.390	1174	4.656	582	6.612	827	4.833	604
T_6	1.566	196	3.918	490	2.331	291	5.819	727	2.454	307	3.848	481	2.753	344
T_7	1.765	221	4.200	525	2.523	315	6.373	797	2.633	329	4.119	515	2.811	351
T_8	1.864	233	4.385	548	2.819	352	6.967	871	2.891	361	4.450	556	3.051	381
T_9	2.056	257	4.679	585	3.109	389	7.517	940	3.123	390	4.785	598	3.306	413
T_{10}	2.170	271	4.978	622	3.400	425	8.088	1011	3.345	368	5.164	646	3.550	444
T11 (C)	1.408	176	3.678	460	1.941	243	5.227	653	1.984	248	3.400	425	2.275	284
T12 (STD)	0.947	118	2.162	270	1.541	192	4.575	572	1.687	211	2.922	365	1.747	218
CD (5%)	0.068	8.106	0.063	7.150	0.066	9.326	0.096	7.812	0.084	6.120	0.051	6.426	0.048	7.097

Highest tuber yield (26.826 MT/ha) and starch content (23.80%) was recorded with the variety H165 which is closely followed by MVD1 (26. 157 MT/ha and 21.75%) in control plots (T11) where no forced leaf harvest was effected. The varieties CO4 and CO3 were next best with tuber yield of 20.475 & 20.59 MT/ha and starch content of 20.81 & 17.50% whereas CO2 was least (17.339 MT/ha & 16.66%) among the varieties evolved. Further the tuber yield and starch content were adversely affected in relation to increase in percentage and frequency of forced leaf harvest (Table 4). Highest leaf yield and eri silkworm rearing capacity (6.373 MT / ha / crop &

Table 4. Tuber yield (MT/ha) and starch content (%) influenced by different schedules and quantum of leaf harvests

Treatment	CO2		CO3		CO(TP)4		H165		H226		MVD1		K. Rose	
	TY	SC	TY	SC	TY	SC	TY	SC	TY	SC	TY	SC	TY	SC
T_1	16.191	16.00	19.068	16.21	18.450	18.60	25.800	21.69	16.630	18.48	25.036	20.49	18.912	18.75
T_2	16.408	15.04	18.105	15.19	16.390	16.90	23.000	20.86	15.000	17.80	24.973	20.05	18.139	18.16
T_3	13.009	13.55	15.938	14.08	14.900	14.63	21.123	18.63	13.765	15.28	22.530	18.38	16.432	16.89
T_4	10.881	12.00	13.263	13.28	11.105	12.12	18.650	15.00	10.700	13.13	18.345	16.11	12.900	14.07
T_5	07.060	10.88	09.339	12.00	08.360	10.03	14.405	11.38	07.850	10.98	14.600	13.44	09.650	11.18
T_6	17.457	16.53	20.232	17.87	20.461	20.64	26.795	24.00	17.570	19.50	26.162	21.80	20.105	19.15
T_7	16.226	15.15	20.191	17.73	20.340	20.58	26.618	23.62	17.303	19.43	26.123	21.69	19.388	18.26
T_8	15.665	14.83	16.113	15.20	18.832	18.67	26.455	23.35	15.832	17.10	26.089	21.50	18.612	17.87
T_9	12.294	13.19	14.655	14.77	15.455	17.00	24.564	20.43	14.001	15.00	22.103	20.08	17.065	16.32
T_{10}	10.155	12.85	12.560	11.96	11.500	15.80	21.203	18.40	12.109	13.66	19.076	18.27	15.006	13.65
T_{11}(C)	17.339	16.66	20.259	17.50	20.475	20.81	26.826	23.80	17.579	19.55	26.157	21.75	19.831	19.13
T_{12}(STD)	17.456	17.59	20.309	18.23	20.466	21.97	27.313	24.18	17.673	20.70	25.450	21.68	19.650	19.26
CD (5%)	0.617	0.516	0.800	0.501	0.652	0.498	0.701	0.522	0.812	0.617	0.733	0.558	0.685	0.498

797dfls) without adverse effect on crop produce was recorded with the cassava variety H165. The varieties MVD1 and CO3 recorded on par results (4.450 & 4.200 MT / ha / crop and 556 & 525 dfls respectively) and found best after H165. The leaf yield and rearing capacity on Kunguma Rose, CO4 and H226 were recorded as 2.753, 2.523 & 2.454 MT / ha / crop and 344, 315 & 307 dfls respectively whereas CO2 (1.566 MT / ha / crop & 196 dfls) was found inferior (Table 5).

Table 5. Comparative foliage yield (MT/ha) of different cassava varieties over control without affecting tuber yield and starch content and rearing capacity (no. of dfls) of eri silkworm

Variety	Treat ment	6 MAP		8 MAP		10 MAP		Total		Tuber Yield (MT/ha)	Starch content (%)	Control	
		FY	ERC	FY	ERC	FY	ERC	FY	ERC			Tuber Yield (MT/ha)	Starch content (%)
CO2	T6	0.454	57	0.150	19	0.962	120	1.566	196	17.457	16.53	17.339	16.66
CO3	T7	2.145	268	0.560	70	1.495	187	4.200	525	20.191	17.73	20.259	17.50
CO(TP)4	T7	0.559	70	0.604	76	1.360	170	2.523	315	20.340	20.58	20.475	20.81
H165	T7	1.679	210	1.166	146	3.528	441	6.373	797	26.618	23.62	26.826	23.80
H226	T6	0.655	82	0.299	37	1.500	188	2.454	307	17.570	19.50	17.579	19.55
MVD1	T8	1.385	173	1.155	144	1.910	239	4.450	556	26.089	21.50	26.157	21.75
KR	T6	0.828	103	0.305	38	1.620	203	2.753	344	20.105	19.15	19.831	19.13
Average	--	**1.100**	**137**	**0.605**	**75**	**1.767**	**221**	**3.474**	**434**	**21.195**	**19.80**	**21.209**	**19.88**

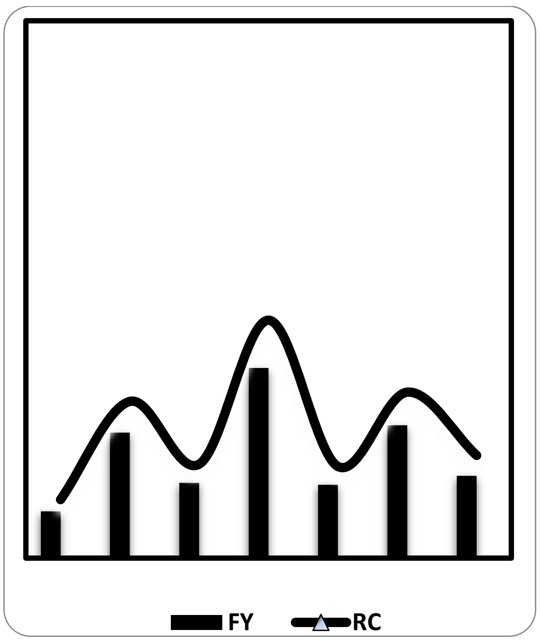

Fig. 2. Comparative foliage yield (MT/ha) of different cassava varieties and rearing capacity (00 dfls) of eri silkworm without affecting main crop productivity (tuber yield & starch content)

The potential yield of cassava leaves varies considerably depending upon cultivar, age of plants, plant density, soil fertility and climate (Ahmad, 1973). It is found in the present study that foliage yield is greatly influenced by percentage of leaves harvested. 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). The removal of weak shoots done @ 6 MAP irrespective of varieties helped to improve the foliage yield. Mandal *et al*. (1973) have reported that this method allows for production of large number of uniformly sized roots all around the base of the plant. Lockard *et al.*(1985) and Tung *et al.* (2001) recommended initial harvest of cassava leaves at 105 days after plantation and should not be shorter than 3 months while Jalloh (1998) suggested delaying the first foliage collection until the fourth months allows the plant to pass the most critical stage for its tuberous root yield. Fasae *et al.* (2009) found that cassava leaves defoliated from 6 MAP onwards has little or no influence on tuber yield and they recommended that the cassava foliage could be harvested from 6 MAP onwards to ensure higher leaf harvest, high nutrient content and avoid reduction in tuber yield. Contrary results were, however, reported by Singh and Chaudhury (1985) when cassava was defoliated in the second, fourth and sixth months after planting. They found out that defoliation of cassava at any stage of the crop was observed to be harmful to the plants. It is reasonable to attribute the variation in the above reports to environmental conditions and the defoliation pattern employed which might probably have led to reduction in effective photosynthetic activities of the plants. In the present investigation forced leaf harvest in different percentages (10, 20, 30, 40 & 50%) in monthly and bimonthly intervals was done one month after removal of weak shoots *i.e.* from 7 MAP till tuber harvest. The foliage yield varied significantly among the varieties. The foliage availability at the time of leaf harvest was also greatly influenced by percentage and interval of leaf harvest. Thus, differences in foliage yield could be due to the differences in variety (Gomez and Valdivieso, 1984; Simwambana *et al.*, 1992) and age at first harvest and interval between the harvests (Lockard *et al*., 1985; Simwambana *et al*., 1992; Tung *et al*., 2001; Hong *et al*., 2003).

Increase in percentage of forced leaf harvest in monthly interval yielded increased foliage yield initially @ 7 MAP but there were corresponding reductions in consequent harvests @ 8 & 9 MAP compared to the initial harvest.

The foliage availability at the time of tuber harvest (@ 10 MAP) was reduced drastically with increase in percentage of leaf harvest @ 7, 8 & 9 MAP. However, forced leaf harvest at bimonthly interval *i.e.* only @ 8 MAP did not affect the quantum of foliage yield at the time of tuber harvest @ 10 MAP. This is because of significant growth of plants at bimonthly interval resulting into addition of considerable quantity of new leaves. The results are in agreement with the observations of Phengvilaysouk and Wanapat (2008) who reported significant reduction in cassava foliage yields by subsequent harvest and with the age of the plants.

In the present study, removal of weak shoots allowing only two tall shoots and harvest of total foliage at the time of tuber harvest was practiced irrespective of varieties. The forced leaf harvest in monthly interval @ 3 harvests in 7, 8 & 9 MAP strongly affected tuber yield and starch content of the tubers in all varieties irrespective of percentage of leaves plucked. However, MVD1 was found best in which the tuber yield and starch content of the tuber were not affected on forced leaf harvest up to 30% only at 8 MAP. In the varieties H165, CO(TP)4 and CO3 the yield and quality of tuber were not affected on the leaf harvest up to 20% while it was only 10% for the varieties CO2 and Kunguma Rose. These results showed a consistency were more or less consistent with the work of Phengvichith *et al*. (2006) who reported only 10.7 and 7.4% reduction in tuber yield respectively when the foliage of local and improved varieties were harvested only one time. Ravindran and Rajaguru (1988) reported that when defoliation was done once at 7 months of growth, 86% of the normal yield of root was obtained. Considering over all foliage yield, H165 was found superior followed by MVD1 and CO3 (Fig.2). Based on the foliage yield without affecting tuber yield and starch quality and the rearing capacity of eri silkworm the order of merit of cassava varieties suitable for ericulture was recorded as H165 > MVD1 & CO3 > Kunguma Rose > CO(TP)4 > H226 > CO2 under rainfed conditions.

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How to cite this article?
Sakthivel, N. and S.M.H. Qadri. 2018. Studies on feasibility of utilizing rainfed cassava for ericulture. *Innovative Farming*, **3**(2): 64-71.