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EFFECT OF INTERCHANGE OF CASSAVA AND CASTOR LEAVES ON ECONOMIC TRAITS OF ERI SILKWORM, *SAMIA CYNTHIA RICINI* BOISDUVAL (LEPIDOPTERA: SATURNIIDAE)

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

Abstract: The effect of rearing eri silkworms entirely with sole diet of cultivated cassava leaves, natural grown green non-bloom castor leaves and rearing younger instars on castor leaves and shifting later stages to cassava leaves and vice versa on its economic traits were studied when the age of the cassava garden was 6, 8 & 10 months old. Feeding first four instars on castor leaves and fifth instar on cassava @ 6 & 8 months after plantation (MAP) and first two instars on cassava @ 10 MAP and third to fifth on castor were found suitable than other dietary regimens. The results thus indicated that farmers could substitute the castor leaves when met shortage of cassava leaves. Further the farmers can also grow castor as border crop and rear chawki (I & II instars) eri silkworms on castor leaves and then switch over to cassava to enhance the cocoon yield and silk percentage.

Keywords: Castor, cassava, dietary regimens, eri silkworm, economic traits.

Introduction

Eri silkworm, *Samia cynthia ricini* Boisduval (Lepidoptera: Saturniidae) is polyphagous in nature having wide range of food plants and over 29 species have been reported as its host plants (Reddy *et al*., 2002). However, castor (*Ricinus communis*) and kesseru (*Heteropanax fragrans*) are considered to be the major food plants while cassava (*Manihot esculenta*) is one of the well known secondary food plants which can be used for its commercial rearing (Hazarika *et al*., 2003). However, the ericulture confined to north east states of India is introduced to southern zones where cassava, the secondary food plants of eri silkworm is cultivated in large scale. A part of cassava leaves is exploited for producing eri silk as an additional remuneration to the farmers without affecting the yield and quality of the main produce. The foliage available at the time of removal of weak shoots 6 months after plantations (6MAP) and during tuber harvest @ 10 MAP can be diverted for ericulture, however forced leaf plugging up to 20-30% once at 8 MAP also possible as it does not affect the tuber yield and starch content (Sakthivel, 2012). Eri silkworm is a voracious feeder and consumes bulk quantity of foliage at fifth instar. Therefore farmers often face leaf shortage at

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the time of rearing and forced to harvest more cassava leaves for feeding the silkworm which could affect the tuber yield and its quality. In this context, a study was carried out to find out the feasibility of substituting naturally grown castor leaves which available plenty in road sides and wastelands.

Materials and Methods

The cassava variety, Mulluvadi (MVD1) cultivated under irrigated conditions and the natural grown green non-bloom castor genotype were selected for the studies. The effect of rearing eri silkworms with sole cassava leaves, sole castor leaves and rearing younger instars on castor leaves and shifting later ones to cassava leaves and vice versa on its economic traits were studied when the age of the cassava garden was 6, 8 & 10 months old. Eri silkworms were reared in six dietary regimens as detailed below following recommended package of practices (Anonymous, 2004).

T1 First to fifth instars on cassava (CA)

T2 First to fifth instars on castor (CR)

T3 First two instars on cassava and third to fifth on castor (CA2-CR3)

T4 First four instars on cassava and fifth instar on castor (CA4-CR1)

T5 First two instars on castor and third to fifth on cassava (CR2-CA3)

T6 First four instars on castor and fifth instar on cassava (CR4-CA1)

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 studies were conducted with five crops during 2010-2014 and the data recorded 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.

Results and Discussion

Tapioca @ 6 MAP

Extended larval duration (25.03 D: H) was recorded on sole application of cassava leaves (CA) compared to castor (CR) (23:16) which was followed by CA4-CR1 (24: 20), CR2-CA3 (24:00) and CA2-CR3 (23:22). The treatment CR4-CA1 was found on par (23: 15) with CC. The economic traits of eri silkworm *viz.* matured larval weight cocoon (g), ERR %, yield (kg/100 dfls), shell yield (kg/100 dfls), SR%, fecundity and hatching % of eggs respectively were recorded significantly lower (5.49, 92.27, 63.207, 9.244, 14.625, 331.83 & 92.19) on sole cassava (CA) and higher on sole castor, CR (6.85, 96.65, 75.513, 12.003, 16.107, 367.67 & 96.83) which was followed by CR4-CA1 (6.66, 97.00, 74.401, 11.709, 15.870, 355.00 & 95.24) whereas CA4-CR1 (68.892, 10.518 & 15.219) exhibited least among the combination treatments but found superior than CA (Table 1).

Tapioca @ 8 MAP

Larval duration was higher (26.22 D: H) on sole application of cassava leaves (CA) compared to castor (CR) (24:20) which was followed by CR2-CA3 (26.02), CR4-CA1 (25:19), CA4-CR1 (25:18) and CA2-CR3 (25:06). The economic traits of eri silkworm *viz.* matured larval weight cocoon (g), ERR %, yield (kg/100 dfls), shell yield (kg/100 dfls), SR%, fecundity and hatching % of eggs were significantly lower (6.38, 96.56, 73.013, 11.584, 15.190, 359.98 & 96.83) on sole cassava (CA) whereas corresponding values on sole castor (CR) with 6.73, 97.26, 81.633, 13.227, 16.203, 369.86 and 97.28 and CR4-CA1 with 6.57, 97.13, 81.618, 13.166, 16.131, 360.83 & 97.80 exhibited on par results and remarkably superior than all other dietary regimens. The next best treatment was CR2-CA3 when compared with cocoon yield (80.954 kg/100 dfls), shell yield (13.024 kg/100 dfls) and SR (16.088 %) followed by CA2-CR3 (78.969, 12.465 & 15.785) and CA4-CR1 (76.488, 11.730 & 15.336), (Table 2).

Tapioca @ 10 MAP

The regimen, sole application of cassava (CA) registered extended larval duration (30.15 D: H) compared to castor (CR) (27:19). Larval duration in CA2-CR3 (27:22) & CR4-CA1 (27: 20) was found on par with CR whereas CA4-CA1 & CR2-CA3 recorded as 28:15 & 28:20 respectively. The economic traits of eri silkworm *viz.* matured larval weight cocoon (g), ERR %, yield (kg/100 dfls), shell yield (kg/100 dfls), SR%, fecundity and hatching % of eggs were significantly lower (5.73, 95.37, 67.319, 9.786, 14.537, 329.83 & 96.63) on sole cassava (CA) and significantly higher on sole castor (CR) (6.92, 98.09, 83.973, 13.716, 16.334, 372.85 & 98.13) which was followed by CA2-CR3 (6.61, 98.00, 81.945, 13.227, 16.141, 366.97 & 98.00). Among the regimens of castor and cassava CR4-CA1 exhibited poor traits (6.23, 95.95, 74.222, 10.859, 14.631, 327.28 & 97.00) respectively but superior than CA (Table 3).

Feeding eri silkworm with sole castor leaves under the study recorded relatively higher economic traits whereas the sole cassava registered least among all the treatments. Feeding castor leaves up to fourth instar and cassava leaves with fifth instar was found best after sole castor which was closely followed by the treatment of feeding castor leaves up to 2nd instar and then with cassava leaves when the cassava leaves of 6 and 8 month old garden were used whereas feeding cassava leaves up to 2nd instar and rest of the instars with castor leaves was found superior when the cassava leaves in age of 10 MAP were fed. The inter change of host plants from castor to cassava and vice versa in rearing of eri silkworm have reported to perform better when the chawki stages are reared on castor and the later ages on cassava (Deka et al. 2011). Govindan et al. (1992) observed superiority in larval, cocoon and seed technological traits of eri silkworm when reared exclusively on castor leaves which was followed by the worms reared up to the end of the fourth instar on castor and then during fifth instar on cassava leaves. Feeding of eri silkworm with cassava up to end of the third instar and subsequently with castor was found to be superior over feeding castor followed by cassava (Joshi, 1985). But feeding throughout with cassava was inferior. Joshi (1992) reported lowest food consumption index, growth rate and efficiency of conversion of digested food into body matter on sole cassava and highest on sole castor and an intermediately performance of eri silkworm was observed when the young stages reared on cassava were substituted with castor in later stages than vice versa feeding sequence. However, in the present study, the economic traits of eri silkworm were improved when castor leaves were substituted to cassava at any stage of eri silkworm compared to the feeding with sole cassava leaves. Castor is the primary food plant of eri silkworm and most preferred than cassava, the secondary food plant (Sengupta and Singh, 1974). Therefore feeding the worms in younger stages with castor could help in better ingestion and assimilation of food which caused better growth and development of the larvae in growing stages which resulted ultimately into improved larval traits. Further, high protein content in cassava leaves when fed at maturity stages as reported by Eggum, (1970), could have contributed to more silk production with improved cocoon traits. But when the cassava leaves used @ 10 MAP *i.e.* at the time of crop maturity, feeding tender cassava leaves in younger stages followed by castor in later stages recorded best cocoon traits than the worms fed with castor in young stages and cassava in later stages. The poor economic traits of eri cocoons could be attributed to reduced nutritional values especially the protein content in tapioca leaves at the time of crop maturity @ 10 MAP when fed during later stages of eri silkworm.

The results thus indicated that farmers could substitute the naturally grown castor leaves when met shortage of cassava leaves. Further the farmers can also grow castor as border crop of cassava and rear chawki (I & II instars) stages of eri silkworms on castor leaves and then switch over to cassava to enhance the cocoon yield and silk percentage.

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Table 1: Effect of castor and tapioca @ 6 MAP leaf combinations of on economic traits of eri silkworm

Dietary regimens	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 (%)
CA	25.03	5.49	92.27	63.207	9.244	2.482	0.363	14.625	331.83	92.19
CR	23.16	6.85	96.65	75.513	12.003	2.713	0.437	16.107	367.67	96.83
CA2-CR3	23.22	6.57	96.96	72.988	11.303	2.642	0.409	15.480	351.95	95.46
CA4-CR1	24.20	6.29	93.89	68.892	10.518	2.602	0.396	15.219	345.17	94.36
CR2-CA3	24.00	6.44	95.68	73.017	11.400	2.678	0.419	15.646	350.23	95.32
CR4-CA1	23.15	6.66	97.00	74.401	11.709	2.685	0.425	15.870	355.00	95.24
CD (5%)	--	0.130	2.965	2.666	0.352	0.026	0.009	0.269	8.313	1.614

Table 2: Effect of castor and tapioca @ 8 MAP leaf combinations of on economic traits of eri silkworm

Dietary regimens	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 (%)
CA	26.22	6.38	96.56	73.013	11.584	2.653	0.403	15.190	359.98	96.83
CR	24.20	6.73	97.26	81.633	13.227	2.876	0.466	16.203	369.86	97.28
CA2-CR3	25.06	6.52	97.30	78.969	12.465	2.800	0.442	15.785	358.88	96.62
CA4-CR1	25.18	6.48	97.00	76.488	11.730	2.719	0.417	15.336	347.82	96.67
CR2-CA3	26.02	6.50	96.96	80.954	13.024	2.853	0.459	16.088	360.12	97.55
CR4-CA1	25.19	6.57	97.13	81.618	13.166	2.864	0.462	16.131	360.83	97.80
CD (5%)	--	0.141	3.478	3.045	0.456	0.033	0.004	0.321	10.110	4.159

Table 3: Effect of castor and tapioca @ 10 MAP leaf combinations of on economic traits of eri silkworm

Dietary regimens	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 (%)
CA	30.15	5.73	95.37	67.319	9.786	2.435	0.354	14.537	329.83	96.63
CR	27.19	6.92	98.09	83.973	13.716	2.908	0.475	16.334	372.85	98.13
CA2-CR3	27.22	6.61	98.00	81.945	13.227	2.887	0.466	16.141	366.97	98.00
CA4-CR1	28.15	6.00	96.14	78.461	12.263	2.783	0.435	15.630	354.49	97.75
CR2-CA3	28.20	5.85	97.78	75.810	11.361	2.669	0.400	14.986	335.45	96.83
CR4-CA1	27.20	6.23	95.95	74.222	10.859	2.604	0.381	14.631	327.28	97.00
CD (5%)	0.0624	0.124	2.189	2.413	0.331	0.026	0.009	0.257	7.006	3.507