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Rearing Performance of Eri Silkworm, *Samia cynthia ricini* (Boiduval) (Lepidoptera: Saturniidae) on Cultivars of Castor

Gururaj, KP Kumar and Ramakrishna Naika

Abstract
Ericulture is considered as important for generating income and employment, use of silk and byproducts for various purposes and larvae and pupae as food and feed. Eri silk is produced by *Samia cynthia ricini* (Boiduval) (Lepidoptera: Saturniidae) and is multivoltine feeding on a wide range of food plants. Castor (*Ricinus communis* L.) serves as a food plant. The studies on Rearing Performance of eri silkworm on Castor Cultivars showed that the consumption indices of eri silkworm on fresh weight basis revealed highest total food consumption, total food digestion and approximate digestibility with the cultivar JC-12 (31.35 g/larva, 22.65 g/larva and 84.94% respectively), consumption index was highest with GAUCH-1(6.06), GR in case of GAUCH-1 (0.35), mean ECI was highest in the cultivar DCH-177 (18.69%). On a weight basis, GCH-4 cultivar resulted in highest food consumption of 13.97 g/larva, GAUCH-1 in highest food digestion, CI, GR and ECD (4.55 g/larva, 5.17, 0.36 and 20.72%, respectively), however the mean AD was highest in the cultivar JC-12 (84.99%).

Keywords: Rearing Performance, Castor, Consumption Index, Eri Silkworm, *Samia cynthia ricini*

Introduction
The Eri silkworm, *Samia cynthia ricini* (Boiduval) is a domesticated, multivoltine and polyphagous feeding on more than 29 species of host plants *viz.*, Castor, Kesseru, Tapioca, Payam, *etc* [1]. Castor is the primary food plant of eri silkworm. Castor is cultivated in an area of 10.96 lakh ha with castor seed production of 11.43 lakh tons, besides having the potentiality of producing 12-14 MT/ha of total leaf yield. About 25 percent of the total leaf yield can be harvested and used for eri cocoon production without affecting the castor seed yield [1, 2].
Performance of castor genotype is a vital criterion for better growth and development of eri silkworm for higher productivity in terms of cocoon and egg production. The silk ratio varies with the type of host and eri silkworm breed used for rearing [3]. The food quality relevant to all aspects of insect performance including growth, development and reproductive potentiality depends mainly on nutritional composition, which includes both the absolute and relative amount of water, carbohydrate, protein, amino acids, lipids, fatty acids, vitamins, minerals, etc [4]. In India the production of eri silk is 3072 MT accounting for about 13.32 percent of total raw silk production. The North-Eastern parts of India are considered to be the home land for ericulture accounting for 90 percent of total eri silk production (www.csb.gov.in).
The chemical composition of host plants significantly affects survival, growth, and reproduction of phytophagous insects [5]. Food consumption and utilization link plant attributes with insect performance [6]. Growth, development, and reproduction of insects are strongly dependent on the quality and quantity of food consumed [7]. Since, the nutrition has been known to influence the growth as well as cocoon traits, it is necessary that certain care needs to be taken in selection of genotypes of castor to be provided to the worms to put up healthy growth and in turn to obtain a cocoon yield. However, the present study on rearing performance of Eri silk worms was planned.

Material and Methods
Experiment was conducted at the Department of Sericulture, University of Agricultural Sciences (UAS), Gandhi Krishi Vignana Kendra (GKVK), Bangalore, Karnataka, India during 2013-14 under laboratory conditions. The consumption indices of eri silkworms were recorded on eight castor varieties during December- January, 2014 both on fresh weight and dry weight basis and calculated as per [8].

Effect of castor varieties on quantitative nutrition of Eri silkworm

In order to study the nutritional efficiency of eri silkworm on eight castor varieties *viz.*, DCH-519, 48-1, DCS-9, GCH-4, DCH-177, GAUCH-1, JC-12 and Bangalore local, and the silkworms were reared on each variety separately under laboratory conditions from first to fifth instar following the rearing technique of [9] with three replications; each consisting twenty larvae for each variety were maintained in each instar. The newly hatched larvae were selected randomly and transferred separately with the help of feather to the rearing tray of each replication of each variety under study. The initial weight of the larvae of each replicate was recorded before providing of food to observe the growth rate. The first and second instar larvae were fed with tender leaves, medium age leaves were fed to the third instar and mature leaves to the fourth and fifth instar larvae. The larvae were fed at a frequency of two times in first and second instar and four times in later instars per day except during moulting periods. The quantity of food was increased with the advancement of larval age to fulfill their nutritional requirements. Separate batches of 100 larvae for each castor variety under identical conditions were also maintained to replace the dead/ unhealthy larvae, if any during the period and to study other economic larval and cocoon parameters. Equal weighed amount of food was supplied in each feeding to each replication every day. After every instar of feeding the left-over food and faces were collected and weighed. The weight of the larvae was recorded after every instar that is before moult and after moult. The difference between the weight before and after feeding gave the fresh weight gain of the larva during the period. An equal quantity (equal in weight offered as food) of respective castor leaf was kept in a separate tray as blank under the same experimental condition to know the evaporation loss from the leaves offered as food.

The various nutritional indices of consumption and utilization of food were calculated on fresh weight basis by adopting the equations [8].

Treatment details: T1- Eri silkworms fed with leaves of DCH-177 Hybrid; T2- Eri silkworms fed with leaves of DCH-519 Hybrid; T3- Eri silkworms fed with leaves of GAUCH-1 Hybrid; T4- Eri silkworms fed with leaves of GCH-4 Hybrid; T5- Eri silkworms fed with leaves of DCS-9 Variety; T6- Eri silkworms fed with leaves of JC-12 Variety; T7 - Eri silkworms fed with leaves of 48-1 Variety; T8- Eri silkworms fed with leaves of Bangalore local Variety.

Observation Recorded: The instar wise total consumption indices were worked out by following the standard procedure.

1. Food consumption (g)= Weight of fresh food offered to larvae – Weight of fresh remnants

Where,

Weight of remnants = Weight of oven dry remnants × Blank

$$\text{Blank} = \frac{\text{Weight of fresh leaves in control}}{\text{Oven dry weight of control}}$$

2. Food digestion (g) = weight of fresh food offered to larvae - Weight of fresh excreta voided

3. Growth rate (GR)

$$GR = \frac{G}{TA}$$

Where,

G = Increase in the weight of larva over the feeding period

T = Duration of feeding

A = Mean weight of larva during the feeding period

4. Efficiency of conversion of ingested food (ECI) (%):

$$\text{ECI}(\%) = \frac{\text{Increase in weight of larva}}{\text{Weight of food ingested}} \times 100$$

5. Efficiency of conversion of digested food (ECD)(%): It was calculated by using the formula:

$$\text{ECD}\ (\%) = \frac{\text{Increase in weight of larva}}{\text{Weight of food digested}} \times 100$$

Results and Discussion

Food consumption and digestion: On fresh weight basis eri silkworm consumed significantly more leaf when reared on leaves of GAUCH-1 during first, second, third and fourth instars (0.15, 0.27, 1.16 and 3.95 g/larva); whereas, cultivar JC-12 recorded the highest food consumption during the instar as well as total food consumption of 26.97 and 31.35 g/larva respectively. However it was lower in DCH-177 in first and second instars (0.05 and 017 g/larva). Bangalore local recorded the lowest consumption during third, fourth, fifth and total food consumption (0.81, 2.69, 22.30 and 26.33 g/larva) (Table 1).On a weight basis, significant differences were evident among the castor cultivars with respect to food consumption on dry weight basis when leaf was used for feeding eri silkworm except in case of total food consumption.

Cultivar GAUCH-1 recorded the highest food consumption in first, second, third, fourth and fifth instars (0.10, 0.09, 0.23, 0.75 and 6.60 g/larva); GCH-4 recorded highest total food consumption of 13.97 g/larva. Nevertheless, Consumption of food was lower when the worms were fed with Bangalore local during first, second, third, fourth, fifth and also, total consumption of 0.01, 0.05, 0.13, 0.38, 4.93 and 13.84 g/larva respectively. The food consumption was found to be significantly positive correlated with leaf moisture(r=0.0051*) on fresh weight basis, calcium (r=0.7378* and 0.7970*) both on fresh and dry weight basis and sulphur (r=0.7222*) on dry weight basis. The quantity of castor leaves ingested by eri silkworms gradually increased as the age advances from first to fifth instar [9, 10]. Castor cultivars had marked influence on food consumption by the worms when computed on fresh and dry weight basis [11]. The rate of consumption of insects may depend on phagostimulants, existing temperature and relative humidity, nature of food, moisture content of leaf etc [11].

Significant differences were evident among the castor cultivars with respect to food digestion on fresh weight basis when leaf was used for feeding eri silkworm. GAUCH-1 recorded the highest digestibility during first and second instar (0.24 and 0.23 g/larva); JC-12 recorded the highest in third, fourth instar and total food digestion (1.04, 3.48 and 22.65 g/larva); DCH-519 registered highest in fifth instar (18.62 g/larva) (Table 2). However, the least food digestion was recorded in the cultivar DCH-177 during first and second

instar (0.05 and 0.13 g/larva); during third, fourth, fifth and with respect to total food digestion, it was found to be lowest in the cultivar Bangalore local (0.20, 2.28, 13.97 and 17.18 respectively g/larva). On a weight basis significant differences were noticed among the castor cultivars with respect to food digestion on dry weight basis when leaf was used for feeding eri silkworm.

The cultivar GAUCH-1 recorded highest digestibility during first, second, third, fourth, fifth instar and also in total food digestion of 0.09, 0.06, 0.12, 0.40, 3.88 and 4.55 g/larva. The least food digestion was recorded in DCH-177 during first and second instar (0.01 and 0.01); Bangalore local recorded lowest during third, fourth and total food digestion (0.05, 0.13 and 3.03) and the cultivar GCH-4 recorded least food digestion of 2.65 g/larva during fifth instar. The amount of food digestion increased with age of eri silkworm, more being in fifth instar [12]. The digestion of food was greatly influenced by the castor cultivars both on fresh and dry weight basis [13]. Digestion may be influenced by the leaf constituents particularly the fiber content and the associated enzyme activities in eri worms, thus showing variation in the rate of digestion due to castor cultivars.

Table 1: Consumption of food by eri silkworms reared on leaves of selected castor cultivars

Sl. No.	Cultivars	Young-age (g/larva)						Late-age (g/larva)				Total	
		I Instar		II Instar		III Instar		IV Instar		V Instar			
		FWB	DWB	FWB	DWB	FWB	DWB	FWB	DWB	FWB	DWB	FWB	DWB
1	DCH-177	0.05 (0.19)	0.02 (0.14)	0.17 (0.61)	0.06 (0.42)	0.92 (3.25)	0.14 (1.22)	3.22 (11.37)	0.53 (4.78)	23.28 (82.20)	5.57 (50.18)	28.32	11.10
2	DCH-519	0.08 (0.26)	0.02 (0.20)	0.19 (0.60)	0.06 (0.43)	0.89 (2.85)	0.14 (1.22)	3.26 (10.52)	0.46 (4.13)	26.44 (86.89)	5.67 (51.00)	31.04	11.11
3	GAUCH-1	0.15 (0.86)	0.10 (0.93)	0.27 (0.92)	0.09 (0.86)	1.16 (3.93)	0.23 (2.15)	3.95 (13.23)	0.75 (7.07)	23.75 (80.37)	6.60 (62.32)	29.55	10.59
4	GCH-4	0.10 (0.35)	0.03 (0.21)	0.17 (0.56)	0.06 (0.33)	0.97 (3.32)	0.14 (1.00)	3.88 (13.24)	0.64 (4.56)	24.25 (82.68)	5.05 (36.18)	29.33	13.97
5	DCS-9	0.07 (0.23)	0.02 (0.16)	0.25 (0.89)	0.07 (0.59)	1.01 (3.54)	0.15 (1.23)	3.19 (11.23)	0.47 (3.88)	23.50 (82.72)	5.37 (44.64)	28.41	12.02
6	JC-12	0.11 (0.66)	0.06 (0.61)	0.24 (0.77)	0.06 (0.61)	1.14 (3.64)	0.15 (1.45)	3.91 (12.48)	0.65 (6.27)	26.97 (84.34)	6.30 (60.50)	31.35	10.41
7	48-1	0.08 (0.29)	0.02 (0.20)	0.24 (0.88)	0.07 (0.59)	1.03 (3.72)	0.14 (1.20)	3.70 (13.40)	0.55 (4.66)	22.47 (81.47)	4.85 (40.80)	27.58	11.88
8	B-LOCAL	0.08 (0.30)	0.01 (0.16)	0.20 (0.77)	0.05 (0.35)	0.81 (3.08)	0.13 (0.93)	2.69 (10.21)	0.38 (2.78)	22.30 (84.69)	4.93 (35.61)	26.33	13.84
F-test		*	*	*	*	*	*	*	*	*	*	*	NS
S.Em±		0.02	0.01	0.02	0.01	0.03	0.01	0.03	0.01	0.17	0.06	0.52	4.26
CD at 5%		0.06	0.04	0.06	0.11	0.10	0.03	0.09	0.04	0.53	0.19	1.61	-

FWB: Fresh weight basis, DWB: Dry weight basis, NS: Non-Significant, * Significant, B Bangalore Local, FC: Food consumption ( ): % food consumption to the total

Table 2: Digestion of food by eri silkworms reared on leaves of selected castor cultivars

Sl. No.	Cultivars	Young-age (g/larva)						Late-age (g/larva)				Total FD	
		I Instar		II Instar		III Instar		IV Instar		V Instar			
		FWB	DWB	FWB	DWB	FWB	DWB	FWB	DWB	FWB	DWB	FWB	DWB
1	DCH-177	0.05 (0.27)	0.01 (0.29)	0.14 (0.76)	0.01 (0.58)	0.81 (4.41)	0.07 (2.03)	2.79 (15.20)	0.27 (7.85)	14.57 (79.40)	3.06 (88.95)	18.35	3.44
2	DCH-519	0.07 (0.31)	0.02 (0.52)	0.16 (0.71)	0.02 (0.52)	0.78 (3.47)	0.08 (2.10)	2.82 (12.56)	0.17 (4.46)	18.62 (82.94)	3.52 (92.39)	22.45	3.81
3	GAUCH-1	0.24 (1.22)	0.09 (1.98)	0.23 (1.17)	0.06 (1.32)	1.01 (5.12)	0.12 (2.64)	3.41 (17.29)	0.40 (8.79)	14.83 (75.20)	3.88 (85.27)	19.72	4.55
4	GCH-4	0.10 (0.50)	0.02 (0.64)	0.14 (0.64)	0.02 (0.64)	0.84 (4.17)	0.06 (1.92)	3.44 (17.06)	0.38 (12.14)	15.65 (77.63)	2.65 (84.66)	20.16	3.13
5	DCS-9	0.06 (0.32)	0.02 (0.29)	0.22 (1.16)	0.04 (1.16)	0.89 (4.69)	0.09 (2.62)	2.76 (14.56)	0.20 (5.81)	15.03 (79.27)	3.10 (90.12)	18.96	3.44
6	JC-12	0.19 (0.84)	0.05 (1.15)	0.21 (0.93)	0.04 (0.92)	1.04 (4.59)	0.10 (2.29)	3.48 (15.36)	0.39 (8.94)	17.73 (78.28)	3.79 (86.93)	22.65	4.36
7	48-1	0.07 (0.38)	0.02 (0.62)	0.21 (1.13)	0.04 (1.24)	0.89 (4.77)	0.06 (1.86)	3.25 (17.42)	0.30 (9.29)	14.23 (76.26)	2.82 (90.12)	18.66	3.23
8	B-LOCAL	0.07 (0.41)	0.02 (0.66)	0.17 (0.99)	0.02 (0.66)	0.70 (4.07)	0.05 (2.31)	2.28 (13.27)	0.13 (4.29)	13.97 (81.32)	2.80 (86.93)	17.18	3.03
F-test		*	*	*	*	*	*	*	*	*	*	*	*
S.EM±		0.02	0.01	0.02	0.01	0.03	0.01	0.03	0.02	0.18	0.08	0.19	0.09
CD at 5%		0.07	0.03	0.07	0.04	0.10	0.03	0.10	0.07	0.58	0.26	0.61	0.29

FWB: Fresh weight basis, DWB: Dry weight basis, NS: Non-Significant, * Significant, B- Bangalore Local, FD: Food Digestion ( ): food consumption to the total

Growth Rate: Significant differences were obvious with regard to GR on castor cultivar in all the instars and mean of the five instar. It was higher in cultivar GAUCH-1 during first, second, third, fourth and fifth instar including mean GR (0.38, 0.54, 0.32, 0.27, 0.23 and 0.35, respectively). However, eri worms fed on cultivar DCH-177 recorded the lowest GR during first, third instar and mean GR (0.23, 0.25 and 0.27, respectively). During second instar the GR was found to be

lowest in the cultivar DCH-519 and 48-1 (0.40) (Table 3).
The eri silkworms fed with cultivar 48-1 during fourth instar recorded the lowest GR of 0.18. Significant differences were evident with regard to GR on castor cultivar except during first and third instar. It was highest in the cultivar DCH-177 during second instar (0.42). During fourth, fifth instar and even mean GR also highest values were recorded when eri worms were fed with the cultivar GAUCH-1 (0.40, 0.29 and 0.36) respectively. However, the lowest GR recorded was in cultivar JC-12 during second and third instar (0.30 and 0.34). during fifth instar the GR was recorded lowest in the cultivar Bangalore local (0.23) and the lowest mean GR recorded the same results in three cultivar i.e., DCH-519, JC-12 and Bangalore local (0.31). Leaf moisture content found to have a significant positive relationship with GR (0.8230* and 0.7423*) both on fresh and dry weight basis. Magnesium also to had a positive relationship with GR (r= 0.7100*).Similar trend was observed by [12], who recorded variation in GR on castor varieties. The eri silkworms fed on different castor cultivars showed marked variation in GR [13-15].

Table 3: Growth rate in eri silkworms reared on leaves of selected castor cultivars

Sl. No.	Cultivars	Young age (g/larva)						Late age (g/larva)				Mean GR	
		I Instar		II Instar		III Instar		IV Instar		V Instar			
		FWB	DWB	FWB	DWB	FWB	DWB	FWB	DWB	FWB	DWB	FWB	DWB
1	DCH-177	0.23	0.29	0.45	0.42	0.25	0.26	0.22	0.35	0.21	0.26	0.27	0.32
2	DCH-519	0.27	0.35	0.40	0.31	0.29	0.28	0.24	0.38	0.20	0.24	0.28	0.31
3	GAUCH-1	0.38	0.46	0.54	0.33	0.32	0.32	0.27	0.40	0.23	0.29	0.35	0.36
4	GCH-4	0.30	0.45	0.45	0.35	0.30	0.26	0.26	0.37	0.20	0.24	0.30	0.33
5	DCS-9	0.26	0.38	0.43	0.36	0.30	0.32	0.25	0.35	0.20	0.24	0.29	0.33
6	JC-12	0.32	0.40	0.45	0.30	0.27	0.27	0.20	0.34	0.20	0.25	0.29	0.31
7	48-1	0.28	0.38	0.40	0.31	0.28	0.25	0.18	0.37	0.21	0.24	0.27	0.31
8	B-LOCAL	0.25	0.36	0.46	0.40	0.33	0.33	0.21	0.34	0.19	0.23	0.29	0.33
F-test		*	NS	*	*	*	NS	*	*	*	*	*	*
S.EM±		0.01	0.03	0.01	0.02	0.01	0.02	0.02	0.01	0.02	0.01	0.02	0.01
CD at 5%		0.04	-	0.03	0.07	0.04	-	0.06	0.04	0.06	0.04	0.06	0.03

FWB: Fresh weight basis, DWB: Dry weight basis, NS: Non-Significant, * Significant, B- Bangalore Local, GR: Growth Rate

Efficiency of Conversion of Ingested Food (ECI): Eri silkworms fed with leaves of different castor cultivars were significantly influenced with respect to ECI during all five instars including mean ECI except during third instar. Significantly higher ECI was recorded when worms were reared on leaves of DCS-9 during first instar (10.11%). The leaves of GCH-4 recorded highest ECI of 15.95 percent. During fourth instar the ECI was highest in the leaves of DCH-517 (33.48%). The worms fed with leaves of GAUCH-1 recorded highest ECI of 22.07 percent during fifth instarand the mean ECI were highest in the cultivar DCH-177 (18.69%) (Table 4). However, the least was recorded in the cultivar JC-12 during first instar (4.37%). During second and fourth instar the lowest ECI was recorded in GAUCH-1 (7.31 and 20.78%, respectively). And finally the mean ECI was least in the cultivar 48-1 (11.36%) (Table 4).
Eri silkworm fed with leaves of different castor cultivars were significantly influenced with respect to ECI during all the instar including mean ECI. Significantly higher ECI was recorded when worms were reared on leaves of DCH-177 during first instar (4.20%). During second and fifth instar the ECI recorded was highest in the leaves of GAUCH-1 (21.56 and 22.07%). The ECI was highest in the leaves of Bangalore local during third instar (28.78%). During fourth instar it was highest in the cultivar DCS-9 (17.01%). However, the least ECI was recorded during first instar when larvae were fed with leaves of JC-12 (1.84%). During second and fourth instars, the mean ECI recorded was least in the leaves of 48-1 (13.65, 7.78 and 11.36%, respectively). The cultivar GAUCH-1 recorded least ECI during third instar (20.78%) and during fifth instar the least ECI was recorded in the cultivar DCH-519 (13.08%) during fifth instar. Total sugar content in leaves of castor cultivars exerted significant positive relationship with ECI (r=0.7089*) on fresh weight basis. These results are comparable with the finding of [9] who observed decreased trend in ECI with advancement in the age of worms. The ECI varied between castor cultivars [13-15].

Table 4: Efficiency of conversion of ingested food (ECI) in eri silkworms reared on leaves of selected castor cultivars

Sl. No.	Cultivars	Young age (g/larva)						Late age (g/larva)				Mean ECI	
		I Instar		II Instar		III Instar		IV Instar		V Instar			
		FWB	DWB	FWB	DWB	FWB	DWB	FWB	DWB	FWB	DWB	FWB	DWB
1	DCH-177	8.01	4.20	15.49	15.43	12.03	25.92	25.92	13.80	32.01	19.92	18.69	14.42
2	DCH-519	6.93	3.26	12.25	15.39	9.95	33.48	33.48	14.06	17.59	13.08	16.04	11.87
3	GAUCH-1	6.11	1.62	7.31	21.56	9.55	20.78	20.78	15.24	34.51	22.07	15.05	13.20
4	GCH-4	8.00	3.08	15.95	17.82	10.10	22.40	22.40	13.73	23.62	15.35	16.01	15.06
5	DCS-9	10.11	3.96	9.17	16.75	12.25	26.99	26.99	17.01	30.08	17.09	17.72	13.11
6	JC-12	4.37	1.84	9.32	17.00	12.25	21.85	21.85	12.66	27.78	16.85	15.11	13.41
7	48-1	9.25	3.75	8.37	13.65	9.19	23.41	23.41	7.78	24.80	20.86	15.00	11.36
8	B-LOCAL	6.12	3.01	14.29	19.38	18.02	28.78	28.78	15.73	19.25	15.03	17.29	13.94
F-test		*	*	*	*	NS	*	*	*	*	*	*	*
S.EM±		1.18	0.34	1.39	0.88	1.48	1.23	1.23	0.72	0.58	0.46	0.51	0.57
CD at 5%		3.77	1.08	4.43	2.85	-	3.98	3.94	2.33	1.87	1.49	1.65	1.86

FWB: Fresh weight basis, DWB: Dry weight basis, NS: Non-Significant, *:Significant, B- Bangalore Local, ECI: Efficiency of conversion of ingested food

Efficiency of Conversion of Digested Food (ECD): The eri silkworm nourished with leaves of different castor cultivars exhibited significant difference in ECD except during first instar. It was being highest during second instar when eri worms were fed with leaves of GCH-4 (31.97%). During third instar ECD was recorded highest in the cultivar Bangalore local (33.83%). The cultivar DCH-519 recorded high ECD in fourth instar (70.58%) and fifth instar worms and the mean ECD recorded was highest in the cultivar DCH-177 (58.27 and 37.39%). However, the least ECD was recorded during second instar when worms were fed with leaves of DCS-9 (12.48%). During third instar it was lowest in the cultivar GAUCH-1 (17.67%).When eri worms were fed with leaves of JC-12 the lowest ECD recorded during fourth instar and also in mean ECD (36.93 and 24.89% respectively). During fifth instar the ECD recorded was lowest in the cultivar DCH-519 (28.30%) (Table 5).

Significant differences were evident among the different castor cultivars with respect to ECD when the leaves were used for feeding eri silkworm. It was highest in the cultivar DCH-177 during first and second instar (5.09 and 26.84%). During third, fifth and with respect to mean ECD, the highest values were in the cultivar GAUCH-1 (24.87, 35.36 and 20.72%, respectively). During fourth instar it was recorded highest in the cultivar DCS-9 (19.65%). However, the ECD was recorded least during first instar when eri worms fed with leaves GAUCH-1 (1.71%). The eri worms fed with leaves of cultivar 48-1 recorded the least ECD during second, third and fourth instar (9.50, 15.71 and 8.83%) respectively. and during fifth instar and mean ECD recorded was lowest in the cultivar DCH-519 (18.94 and 14.53%). Moisture content in the leaves of castor found to have positive relationship with ECD (r=0.7142*) on dry weight basis. Reverse trend in ECD both for fresh and dry weight basis was observed and reported to vary among castor cultivars, which may be due to the role played by the leaf moisture and its utilization [12-15].

Table 5: Efficiency of conversion of digested food (ECD) in eri silkworms reared on leaves of selected castor cultivars

Sl. No.	Cultivars	Young age (g/larva)						Late age (g/larva)				Mean ECD	
		I Instar		II Instar		III Instar		IV Instar		V Instar			
		FWB	DWB	FWB	DWB	FWB	DWB	FWB	DWB	FWB	DWB	FWB	DWB
1	DCH-177	17.01	5.09	23.27	26.84	22.35	17.58	50.13	15.95	58.27	31.85	37.39	18.75
2	DCH-519	9.22	3.55	16.44	12.53	19.48	16.48	70.58	16.29	28.30	18.94	34.72	14.53
3	GAUCH-1	3.44	1.71	24.22	21.94	17.67	24.87	40.02	17.46	58.63	35.36	26.37	20.72
4	GCH-4	10.54	3.34	31.97	25.56	25.25	20.65	37.18	15.49	45.15	23.81	32.50	19.05
5	DCS-9	20.46	4.85	12.48	10.08	21.29	18.86	65.56	19.65	52.23	26.72	35.08	16.51
6	JC-12	5.15	1.98	22.06	18.58	19.33	18.74	36.93	14.23	46.14	25.12	24.89	16.42
7	48-1	13.83	4.26	12.54	9.50	22.37	15.71	43.13	8.83	42.70	32.93	27.23	14.85
8	B-LOCAL	8.61	3.30	19.86	17.30	33.83	22.46	68.45	18.57	33.98	24.01	39.03	17.64
F-test		NS	*`	*	*	*	*	*	*	*	*	*	*
S.EM±		3.56	0.47	3.09	0.57	2.41	1.05	4.05	0.84	1.07	0.80	1.88	0.78
CD at 5%		-	1.55	10.20	1.88	7.95	3.47	13.37	2.77	3.53	2.64	6.20	2.57

FWB: Fresh weight basis, DWB: Dry weight basis, NS: Non-Significant, *: Significant, B- Bangalore Local, ECD: Efficiency of conversion of digested food

Conclusion

The castor cultivar GAUCH-1 is best suited for chawki eri silkworm as well as subsequent rearing. However, the castor cultivars suitable for different agro- climatic conditions need to be evolved for higher leaf and seed yield. Economics of chawki eri silkworm rearing on different castor cultivars needs further study to establish chawki eri silkworm rearing centers.

References

1. Devaiah MC, Rajashekargouda R, Suhas Y, Govindan R. Growth and silk production in *Samia cynthia ricini* Boisd. fed on four different host plants. Indian Journal of Sericulture. 1985; 27(1):33-55.
2. Siddiqui AA, Rajaram, Senagupta AK. Eri- Common man's silk. Indian Silk. 1993; 32(4):34-36.
3. Dookia BR. Varied silk ratio in cocoons of eri silkworm *Philosamia ricini* Hutt. reared on different castor varieties in Rajasthan. Indian Journal of Sericulture. 1980; 19:38-40.
4. Slanky F, Scriber JM. Food consumption and utilization. In: Comprehensive Insect Physiology, Biochemistry and Pharmacology, Ed. G.A. Kerkut and L.I. Gilbert. 1985; 4:88-151.
5. Bernys EA, Chapman RF. Host-Plant Selection by Phytophagous Insects. Chapman and Hall, 1994.
6. Slansky F. Insect nutritional ecology as a basis for studying host plant resistance. Florida Entomologist. 1990; 73:359-378.
7. Scriber JM, Slansky F. The nutritional ecology of immature insects. Annual Review of Entomology. 1981; 26:183-211.
8. Waldbauer GP. Quantitative relationship between the number of fecal pellets, fecal weight and the weight of food eaten by tobacco hornworm, *Protoparce sexta* (Johan), (Lepidoptera: Sphingidae). Ent. Exp. and appl. 1964; 7(4):310-314.
9. Poonia FS. Consumption and utilization of castor leaves by larvae of eri silkworm, *Philosamia ricini* (Hutt.). (Saturnidae: Lepidoptera). Indian Journal of Entomology. 1985; 47(3):255-267.
10. Devaiah MC, Govindan R, Rangaswamy HR. Performance of eri silkworm, *Philosamia ricini* Hutt. on castor leaves under Karnataka condition. All India Symp. Seric. Sci., Bangalore, Abst. 1978, 48.
11. Sannappa B, Jayaramaiah M, Reddy DNR, Chavan SS, Rangaswamy. Consumption and leaf- cocoon ratio of eri silkworm on castor genotypes. Proc. Natl. Sem. Tropic. Seric. (Eds. K.P. Chinnaswamy, R. Govindan, N.K. Krishnaprasad and D.N.R. Reddy), UAS, Bangalore. 2000; 3:47-49.
12. Basaiah JMM. Consumption and utilization of castor and tapioca by the eri silkworm. M.Sc (Seri.)Thesis, UAS, Bangalore. 1988, 119.
13. Sannappa B, Jayaramaiah M. Foliar cocnstituents of selected genotypes of castor *Ricinus communis* L. Mysore Journal of Agricultural Science. 2002; 36:315-321.

14. Chandrappa D. Performance of eri silkworm on some castor genotypes and economic of ericulture- cum-castor seed production. Ph.D. Thesis, UAS, Bangalore. 2003, 146.
15. Govindan R, Sannappa B, Bharathi VP, Singh MP, Hegde DM. Elemental composition of leaves of different varieties of castor, *Ricinus communis* L. Environment and Ecology. 2002; 20:955-959.