EFFECT OF FEED ON NUTRIENT COMPOSITION OF ERI-SILKWORM (*Philosamia ricicnii*) PRE-PUPAE

Rakesh Bhardwaj, K Mamocha Singh, Nabum Yadi, Sanjay Upadhyay, M Chandrakumar Singh

[1] College of Horticulture & Forestry, Central Agricultural University, Pasighat – 791 102, Arunachal Pradesh, India

Background

- Pre-pupae of eri-silkworm is an delicacy in North-east India.
- Consumed mostly as boiled, boiled-shallow fried and roasted form.
- Market price ranges about 4-5 US $ per Kg of pre-pupae
- Eri-silkworm are reared on castor tree (*Ricinus communis*). Kasseru (*Heteropamax pragrans*) and tapioca (*Manihot esculenta*) leaves are the alternate feed used for rearing larvae.

Eri-silk worm Pre-pupae for sale in local vegetable market

Study objective 1

- Study the effect of feeds and season on larval growth

Findings

Maximum growth rate was observed for castor group in summer (4 weeks)

Tapioca & Kasseru group required 5-6 weeks in summer.

In winters only kaseru leaves are available and it requires 7-8 weaks of rearing.

Castor leaves are the most preferred feed by eri-silkworm larvae.

Method of rearing & preparation of study material

- Eri-silkworm were collected locally and reared until pupation on castor leaves in the laboratory
- Eggs from reared adults were collected and hatched on leaves of castor, tapioca and kasseru making three different feed groups
- Larvae were reared upto fifth instar stage and two days after pupation, cocoons were opened to collect pre-pupae.

Eri-silk worm larvae reared on castor leaves in lab

Castor, Tapioca and Kasseru leaves used as feed for larve of eri-silk worm

Recipes

- 250 g pre-pupae boiled in 200 ml water for 5 min. water is drained, pre-pupae cut in to pieces and shallow fried.
- 250 g pre pupae boiled in 400 ml water for 5-10 min. Fermented bamboo shoot (10 g) is added in last 2 min of boiling.
- Pre-pupae wrapped in leaf of *Phyrnum pubnerve, covered with ash and roasted bellow the fire 20 – 30 min.*
- *Pre-pupae roasted directly on fire till golden brown colour.*

Study objective 2

Study the effect of feed and season on nutrient composition

Experimental design & Methods

- Three parallel batches were reared, one on each feed.
- Castor, tapioca and kasseru plants were grown on college farm to avoid variability due to location and ensure continuous availability of feed.
- Batches were replicated every third week; in all three replicates were done and study was repeated for two years.
- For winter season study was done only on Kasseru leaves reared silkworm.
- Standard methods of analysis as per AOAC 2006 manual were used.
- Total Dietary Fiber was estimated by TDF assay Kit from Megazyme.

- Fatty acid methyl esters were identified using reference standard based on retention time and peak overlay.
- PerkinElmer GC - model Clarus 500 having Elite -5 column was used with injector temp 250^0C, FID detector temp 300^0C, Column temp programme 90^0C for 2 min, 6^0C increase per min upto 280^0C hold for 5 min at final temp.
- Na & K were estimated by atomic emission spectroscopy using Systronics flame photometer.
- Other minerals were analysed on PerkinElmer A Analyst 200 atomic absorption spectrophotometer.

Statistical Analysis of data

- Data were analysed for significant differences at 5% error level using one way ANOVA and DMRT was performed to distinguish distinct groups using SPSS v.13.

Proximate composition and sugars expressed as g per 100g fresh weight

	Moisture	Ash	Fat	Protein	Dietary fiber	CHODF	Total Sugar
Castor Leaves (CL)	77.9 ^{b} ±0.9	1.3^{a} ±0.08	1.5^{a} ±0.07	4.3^{a} ±0.1	8.0^{b} ±0.7	6.9^{d} ±0.2	1.61^{d} ±0.4
Tapioca Leaves (TL)	72.9^{a} ±1.1	1.8^{b} ±0.03	2.0^{b} ±0.1	5.9^{b} ±0.4	12.5^{c} ±0.7	4.8^{c} ±0.7	0.40^{c} ±0.1
Kasseru Leaves (KL)	73.3 ^{a} ±1.1	2.3^{c} ±0.01	1.7^{ab} ±0.07	3.9^{a} ±0.2	16.4^{d} ±1.0	2.4^{b} ±0.3	0.44^{c} ±0.07
Eri pre-pupae (CL)	77.4 ^{b} ±0.7	1.5^{a} ±0.04	5.4^{d} ±0.11	9.7^{c} ±0.5	3.5^{a} ±0.5	2.5^{b} ±0.7	0.22^{b} ±0.06
Eri pre-pupae (TL)	77.1 ^{b} ±1.0	1.5^{a} ±0.06	6.4^{e} ±0.09	10.6^{d} ±0.8	3.1^{a} ±0.3	1.3^{a} ±0.3	0.13^{a} ±0.05
Eri pre-pupae (KL)	76.8 ^{b} ±0.7	1.8^{b} ±0.08	4.7^{c} ±0.54	11.9^{e} ±0.3	3.3^{a} ±0.7	1.5^{a} ±0.3	0.26^{b} ±0.06

Fatty acid composition expressed as percentage of total fatty acid

Oil source	Myrsitic	UI	UI	Palmitic	Stearic	Oleic	Linoleic n-6	Linolenic n-3	Ricinolic
Castor Leaves (CL)	0.82^{a}	3.2	6.8	16.8^{b}	1^{a}	56.5^{bc}	13.7^{e}	0.2^{a}	0.9
Tapioca Leaves (TL)	0.8^{a}			10.6^{a}	1.8^{b}	65.5^{de}	7.3^{c}	11.2^{d}	
Kasseru Leaves (KL) Summer	0.74^{c}			24.4^{c}	1.3^{ab}	68.1^{e}	2.3^{a}	1.96^{b}	
Keshru Leaves (KL) Winter	0.83^{d}			20.2^{b}	1.2^{a}	64.6^{d}	6.32^{c}	6.85^{c}	
Eri pre-pupae (CL)	0.5^{a}	3.7	9.1	25.7^{c}	6.2^{e}	43.96^{a}	10.8^{d}	0.26^{a}	0.28
Eri pre-pupae (TL)	0.6^{b}			19.5^{b}	2.9^{c}	51.7^{b}	14.5^{e}	10.6^{d}	
Eri pre-pupae (KL) Summer	0.65^{b}			29.1^{d}	6.3^{e}	59.9^{cd}	3.9^{b}	0.36^{a}	
Eri pre-pupae (KL)Winter	0.65^{b}			27.3^{cd}	4.7^{d}	54.2^{b}	5.6^{c}	7.55^{c}	

8th International Food Data Conference

October 1-3, 2009

Bangkok, Thailand

Mineral composition expressed as mg per 100 g fresh wt. of sample

	K	Na	Ca	Mg	Zn	Mn	Fe	Co
Castor Leaves (CL)	218^{a}	178^{a}	95^{d}	38^{a}	13^{a}	3.3^{a}	0.03^{a}	114^{c}
Tapioca Leaves (TL)	556^{d}	331^{d}	66^{c}	69^{c}	20^{b}	3.8^{b}	0.12^{e}	121^{cd}
Kasseru Leaves (KL)	911^{e}	509^{e}	142^{e}	73^{cd}	12^{a}	7.4^{d}	0.13^{e}	136^{e}
Eri pre-pupae (CL)	331^{b}	273^{c}	35^{a}	69^{c}	16^{b}	4.3^{c}	0.09^{c}	94^{b}
Eri pre-pupae (TL)	484^{c}	253^{c}	31^{a}	58^{b}	24^{c}	3.5^{a}	0.08^{b}	74^{a}
Eri pre-pupae (KL)	511^{cd}	207^{b}	51^{b}	75^{d}	18^{b}	3.4^{a}	0.10^{c}	129^{d}

Summary

- Castor leaves are preferred feed by eri-silkworm larvae and gives faster growth rate probably because of high moisture, high carbohydrate , high sugar and low fiber content.
- Significantly high ash in kasseru leaves and kasseru gp. pre-pupae, high fat in tapioca leaves and tapioca gp. Pre-pupae and high carbohydrate and sugars in castor leaves and castor gp. Pre-pupae is observed.
- Significantly high palmitate and oleate are found in kasseru leaves and kasseru gp. Pre-pupae.
- Castor leaves have very low n-3:n-6 fatty acid ratio (0.014) and so, is pre-pupae reared on them (0.025), while tapioca leaves have n-3:n-6 of 1.35 and pre-pupae of same gp. had ratio of 0.73

- Pre-pupae reared on Kasseru leaves showed n-3:n-6 ratio of 0.09 during summers which inceased to 1.35 in winter with simultaneous increase n-3 and n-6 fatty acids in leaves as well.
- Castor leave and castor gp. pre-pupae have lowest K:Na ratios 1.22 and 1.21 respectively while kasseru leave and kasseru gp. pre-pupae have highest ratios 1.79 and 2.49 respectively.
- High content of Ca, Mg and Co in kasseru leaves has also resulted in increased levels in pre-pupae.
- High Zn in tapioca leaves is also reflected in incresed Zn content in pre-pupae.

Conclusions

- Nutrient composition of eri-silkworm pre-pupae is highly influenced by the feed given to them.
- Kasseru gp and tapioca gp pre-pupae are nutritionally superior over castor gp. pre-pupae considering fatty acid and mineral composition. However faster growth rate on castor leaves makes it a prefered choice as feed.
- Seasonal variations are possible particularly in fatty acids composition; should be accounted while deciding standard values.