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Evaluation of different castor genotypes based on rearing performance of ERI silkworm, *Samia cynthia ricini* in Telangana State

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Abstract
ERI culture has been proven beneficial and gainful employment to the castor farmers, as 30% of defoliation will not affect the seed yield. Seeds of four high oil yielding castor hybrids / varieties *viz*. DCS-9, 48-1, DCH-519, DCH-177 along with local castor are collected from Directorate of Oil Seeds Research, Hyderabad to study the performance of ERI silkworm. Leaves of the five castor genotypes were fed to the ERI silkworm and studied the performance of ERI silkworm *viz.* larval traits, cocoon traits, grainage traits. The larval, pupa, and adult characteristics were found better in normal temperature and larval development of ERI silkworm during winter was prolonged than rainy season. This study reveals that of the five castors genotypes DCH-519 cultivation would be more beneficial to the castor farmer for ERI culture as it yields more after local castor variety.

Keywords: castor genotypes, ERI silkworm, larval duration, larval traits, cocoon traits, grainage traits, larval breeds

Introduction
Telangana state is located in the Deccan plateau holds immense potential for the development of ERI culture. Castor plants grow as shrubs or small trees in tropical and temperate regions. It is an important crop of dry lands in semiarid zones and small farmers and tribal in this area can generate additional income by switching to ERI culture as a subsidary crop along with castor cultivation. Castor is grown predominantly in drought prone districts like Mahabubnagar, Nalgonda, Rangareddy, and Medak as a rainfed crop. ERI culture has an important role in poverty alleviation and empowerment of woman. Besides vast demand of its good blending and dyeing properties needed impetus is laid on to introduce ERI culture in the state in a big way. (Jayaprakash *et al.* 2003; Saratchandra, 2003; and Rama Rao *et al.* 2005) [6, 17]. Since 30% of the foliage from castor plant was used for rearing of ERI silkworms without affecting the main seed production (Nagalakshmamma, 1987).
More than 11.65 lakh hectares of land in India is covered under castor plantation in different states Gujarat, Andhra Pradesh, Karnataka, Madhya Pradesh, Tamil Nadu, Orissa, and Maharashtra. Andhra Pradesh is leading in 2nd position in the area under castor cultivation next to Gujarat. There are several varieties / hybrids of castor available in India and abroad. Hence there is a need for identification of suitable castor varieties / hybrids that meet the agro climatic needs and yield better for successful rearing of ERI silkworms, to establish ERI culture industry in the state. There are many reports available on the rearing performance of ERI silkworm on various food plants under North Eastern conditions of the country (Saratchandra and Joshi, 1985; Biswas and Das, 2001; Hazarika *et al.* 2003) [18, 3, 5]. Such studies under other agro climatic conditions of the country are scanty (Dayashankar, 1982; Reddy *et al.* 1989). In the present study, an attempt has been made to evaluate the rearing performance of ERI silkworm during rainy season in relation to its primary food plant, castor genotypes. Kedir Shifa *et al.* 2014 [9], reported that silk worm fed with Abaro castor yielded high cocoon weight, pupa weight, shell weight and silk ratio respectively in Ethiopia. The differences in the rearing performances of ERI silk worm regarding larval, cocoon and post cocoon traits when fed with different castor genotypes was comparable with research findings of many workers. (Jayaramaiah and Sannappa, 2000, Sengupta *et al.* 2008; Patil *et al.* 2009, Kedir Shifa *et al.* 2014) [8, 16, 9]. 2. Singh *et al.* (2014) [20]. Realized high cost benefit ratio of 1:1.80, which revealed that ERI culture is a profitable venture for the poor and marginal farmers of North East India. Differential response of castor genotypes in terms of leaf yield, seed yield and ERI cocoon / silk production was observed by Rajasri *et al.* 2015 [15].

Methodology
Seeds of five castor genotypes four varieties / hybrids along with local castor variety are collected from Directorate of Oil seed Research, Hyderabad and plants are raised in the prepared plot at Sarojini Naidu Vanita Maha Vidyalya at Hyderabad during May 2009. The geographical location of Hyderabad is 17.366 °N Latitude and 78.476 °E Longitude. The leaves collected during 3rd month after plantation removed petiole and fed the caterpillars for two years. Ten DFLs (disease free layings) were collected from RERC (Regional ERI Research Centre) Shadnagar and the eggs were kept for hatching at room temperature. Brushing process was taken up to separate the neonate worms from egg shells and reared them in trays provided with different castor genotypes including the local variety. Three replications were maintained with fifty larvae for each genotype and two rearings were conducted for two years. Tray rearing method was followed, three feedings were given per day and bed cleaning was done once in the morning

for chawki worms. Chawki worms were maintained in special wooden trays with paraffin wax and wet gunny bags were used to maintain proper humidity. Optimum temperature of 28 ± 2°C and 80-90% humidity were maintained constantly during rearing period. Three to four feedings were given to the late age worm's two bed cleanings were given and ten worms were selected randomly for each assessment at every stage. Castor fed to the worms in the early stages was the tender leaves which were very much palatable to the worms and regular spacing was maintained during entire development. It is very important for a healthy, disease free growth. The larval stages were paid more attention as they were important stages of their lifecycle. Ripened worms were collected and placed on bamboo mountages for cocooning and cocoons are collected after six days and twenty cocoons were randomly selected for assessment. There was marked variation in all the parameters and significant difference was observed among the genotypes.

Results and Discussions

Comparative rearing performance of ERI silkworm on castor genotypes during rainy and winter season was analyzed and is presented in the tables 1 to 6. The results indicated that of the five castor genotypes fed to the ERI silkworm DCH-519 yields more after local castor variety. Significant difference was noticed among the five castor genotypes in larval duration, larval weight, silk ratio, ERR, cocoon weight, fecundity, and hatchability. Longer larval duration (27.61 days) was recorded during winter and shorter (20.94 days) during rainy season. Similar observations were reported by Jayaramaiah and Sannappa (2000a) [8]. Shortest larval duration of 20.10, 19.30 days in rainy and 26.50, 27.30 days during winter season was observed in ERI silkworms fed with DCH-519 after local variety. Pupa duration was observed longer (19.41 days) in winter than rainy season (12.60 days). No significant difference was found in Pupa period, in all the silk worms fed on five castor genotypes. Mature larval weight was maximum in silkworms fed with DCH-519 castor hybrid, than all the other castor varieties. Cocoon weight, shell weight, and shell ratio was observed maximum in the silkworms fed with DCH-519, after local variety in winter than rainy season. Moth emergence, fecundity, hatchability and effective rearing ratio in worms fed with DCH-519 and local castor variety was on par with DCS-9, 48-1, and DCH-177, found to be same in rainy and winter seasons. Chaudhury (1979) and Sarkar (1988) [19]. Reported that nutritional value of the feed play a major role in larval and cocoon parameters. Mani *et.al.* (2002) [11]. in a study found that there was slight difference in the qualitative characters of amino acids in castor, kesseru and tapioca in that valine and proline were absent in kesseru and tapioca. Due to the higher leaf quality, higher rate of food ingestion and food assimilation may also have played a role in higher silk ratio in DCH-519 and local castor genotype. Nutritive values of local and DCH-519 castor genotypes may have influenced the larval duration and cocoon weight of the ERI silkworms. Dey (1983) in Antheraea proylei, Maribashetty *et al.* (1999) in Bombyx mori and Srivastava *et al.* (1994) and Virk *et al.* (2009) in ERI silk worm have also reported similar influence of food consumption on larval characters.

The present study reveals that of the five castor genotypes, DCH-519 and local genotype was more yield full than the other genotypes. Temperature and humidity very much influenced the larval growth and among all the ERI worms the white zebra larvae showed active feeding habits. The castor farmer can choose the hybrid DCH-519 genotype for ERI culture as it provides substantial additional income and gainful employment to the poor dry land cultivators. Further investigations are to be done regarding the nutritive value of the castor genotypes. The castor genotypes viz., DCH-519 and local genotype are better suited for both castor seed as well as ERI silk worms rearing under rain fed conditions. These castor genotypes can be grown for dual purpose which gives additional returns due to ERI culture for the resource poor farmers of Southern Telangana region with less fertile lands under rain fed cropping situation. However, there is an enormous scope for ERI culture in castor growing areas without hampering castor seed production and it also provides a supportive economy for the small and marginal farmers. It is remarkable for its low investment, high returns which makes it as a profitable venture and an ideal agro based industry for castor growers of Telangana.

Fig 1: ERI culture Tray rearing method

Fig 2: Poly morphic larvae of ERI silkworm, White plain, White zebra, Green zebra, Green plain

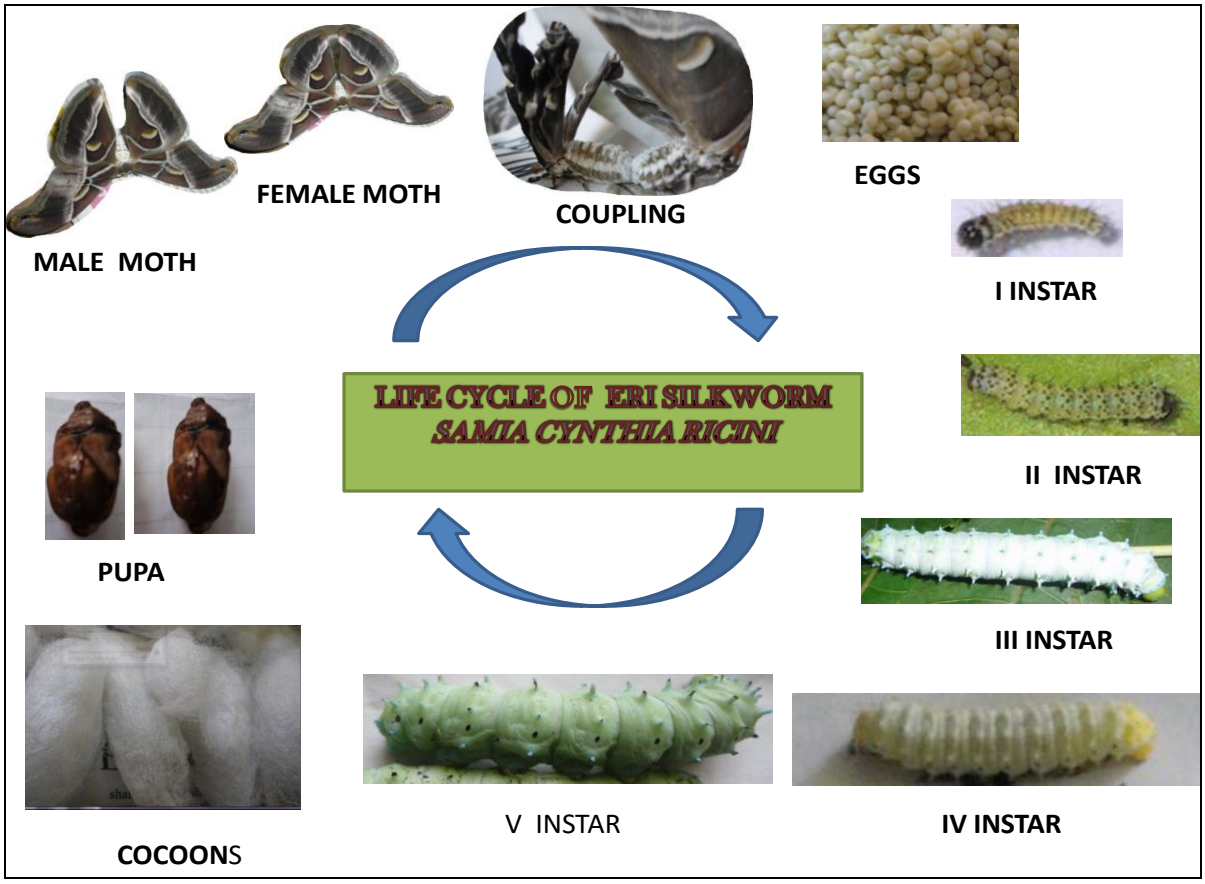

Fig 3: Poly morphic larvae of ERI silkworm, White plain, White zebra, Green zebra, Green plain

Table 1: Larval duration of ERI silkworm at different instars fed on five castor genotypes during rainy season in 2009 (in days)

Treatments	I	II	III	IV	V	Total duration
Local	2.80	2.85	3.85	3.65	6.15	19.30
DCS-9	3.00	3.65	4.80	4.10	6.90	22.45
48-1	2.85	3.70	4.65	4.10	6.35	21.65
DCH 177	2.90	3.10	4.10	4.10	6.85	21.05
DCH 519	2.65	3.10	4.55	4.00	5.45	19.75
Mean	2.84	3.28	4.39	3.99	6.34	20.84
S d±	0.13	0.37	0.40	0.19	0.59	1.31

Table 2: Performance of ERI silkworm fed on five castor genotypes during Rainy season (in days)

Treatments	Incubation period	Larval duration	Pupa period	Adult longevity	Total duration of life cycle
Local	9.00	19.30	13.00	10.00	51.30
DCS-9	9.00	22.45	13.00	10.00	54.45
48-1	10.00	21.80	12.00	10.00	53.80
DCH 177	9.00	21.05	12.00	10.00	52.05
DCH 519	10.00	20.10	13.00	10.00	53.1
Mean	9.40	20.94	12.60	10.00	52.94
S d±	0.54	1.26	0.54	0.00	1.28

Table 3: Larval duration of ERI silkworm at different instars fed on five castor genotypes during winter season (in days)

Treatments	I	II	III	IV	V	Total larval duration
Local	3.30	4.95	4.85	5.75	7.65	26.50
DCS-9	4.45	4.80	5.90	5.90	8.10	29.15
48-1	4.65	4.90	4.90	5.55	8.10	28.10
DCH 177	4.00	5.00	5.00	5.00	8.00	27.00
DCH 519	3.80	4.75	4.90	5.90	7.95	27.30
Mean	4.04	4.88	5.11	5.62	7.96	27.61
Sd±	0.48	0.09	0.40	0.34	0.17	0.93

Table 4: Performance of ERI silkworm fed on five castor genotypes during winter season (in days)

Treatments	Incubation period	Larval duration	Pupa period	Adult longevity	Total duration of life cycle
Local	12.00	26.50	19.00	10.00	67.50
DCS-9	14.00	29.15	20.00	10.00	73.15
48-1	14.00	28.10	20.00	10.00	72.10
DCH 177	13.00	27.00	19.00	10.00	69.00
DCH 519	13.00	27.30	19.00	10.00	69.30
Mean	13.20	27.61	19.40	10.00	70.21
Sd±	0.75	0.93	0.49	0.00	2.09

Table 5: Evaluation of ERI silkworm at different stages fed on five castor genotypes during rainy season in 2009

Genotypes	Mature larval weight (gm/10)	Cocoon traits				Grainage traits			
		Cocoon weight (gm/each)	Shell weight (gm/each)	Shell Ratio (%)	Pupa weight (gm/each)	Moth emergence (%)	Fecundity	Hatchability (%)	ERR (%)
Local	68.15	2.67	0.42	15.65	2.25	98.50	370	98.90	95.00
DCS -9	65.75	2.20	0.31	14.08	1.89	96.30	352	99.20	90.50
48-1	65.45	2.32	0.31	13.48	2.00	97.80	356	98.90	90.00
DCH-177	68.10	2.41	0.36	14.76	2.05	98.60	346	98.60	89.50
DCH 519	69.56	2.54	0.39	15.23	2.15	97.40	340	98.80	94.00
Mean	67.40	2.42	0.36	14.88	2.07	97.72	352.8	98.88	91.8
Sd±	1.740	0.18	0.05	0.87	0.14	0.93	11.36	0.21	2.51

Table 6. Evaluation of ERI silkworm at different stages fed on five castor genotypes during winter season

Genotypes	Mature larval weight (gm/10)	Cocoon traits				Grainage traits			
		Cocoon weight (gm/each)	Shell weight (gm/each)	Shell Ratio (%)	Pupa weight (gm/each)	Moth emergence (%)	Fecundity	Hatchability (%)	ERR (%)
Local	76.52	2.605	0.418	16.05	2.187	97.00	362	99.30	97.00
DCS-9	74.45	2.195	0.309	14.08	1.886	97.00	355	99.20	89.00
48-1	73.10	2.315	0.316	13.65	1.999	96.20	350	98.70	90.00
DCH 177	75.35	2.405	0.355	14.76	2.05	98.20	347	98.60	89.50
DCH 519	76.25	2.495	0.383	15.35	2.112	98.00	341	99.20	94.50
Mean	75.13	2.403	0.356	14.81	2.047	97.28	351	99.00	92.00
Sd±	1.25	0.14	0.04	0.86	0.10	0.73	7.13	0.29	3.18

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