REARING PERFORMANCE OF ERI SILKWORM *Samia cynthia ricini* BOISDUVAL ON DIFFERENT SPECIES OF TERMINALIA AND ITS IMPACT ON COCOON QUALITY

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By

MANJUNATH YALIGAR

DEPARTMENT OF AGRICULTURAL ENTOMOLOGY
COLLEGE OF AGRICULTURE, DHARWAD
UNIVERSITY OF AGRICULTURAL SCIENCES,
DHARWAD – 580 005
JUNE, 2014

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CONTENTS

LIST OF TABLES

LIST OF FIGURE

LIST OF PLATES

INTRODUCTION

In India, Sericulture is essentially a village-based industry providing employment to a sizable section of the population. Although Sericulture is considered as a subsidiary occupation, technological innovation has made it possible to take it up on an intensive scale capable of generating adequate income. It is also capable of providing continuous income to farmers.

Sericulture is broadly classified into two distinct sectors *viz*., Mulberry and non-mulberry. Mulberry sericulture is concerned with mulberry silk production. Whereas non-mulberry sericulture includes eri, tasar and muga culture. India holds an unique distinction in producing all the three kinds of non-mulberry silks *viz*., eri, tasar and muga silks, respectively produced by *Antheraea mylitta* Drury, *Samia cynthia ricini* Boisduval and *Antheraea assamensis* Westwood belonging to the family Saturnidae.

Among the non-mulberry silkworm species, only eri silkworm is domesticated and reared indoor for silk production by economically poor sections of the society particularly tribal people mostly in North-Eastern states of India. Among the non-mulbery silks only eri silk production is in increasing trend and is 2760 MT during 2010-11 in India. Eri silkworm is a polyphagus and it is known to feed on more than 30 plant species but only few plant species have been exploited particularly castor, tapioca and payam.

Patil and Savanurmath (1994) reported that there are a number of host plants till left unexploited for eri silkworm rearing due to lack of technology. It is a polyphagous insect and feeds on a wide range of host plants. The eri food plants are abundantly found in natural forests in plains and hilly areas and leaves of these plants are available in one or the other season for eri silk production. Eri host plants can be interchangeable at rearing during scarcity of one host. These plant species are distributed all over India in both natural as well as in cultivated forms and are generally perennial.

Eri culture is believed to have originated in northeastern India especially Assam, which has rich biodiversity of tree species serving as host plants of eri silkworm. Mainly the tribal, landless labours and other socially and economically backward classes of the society are carrying out eri culture. Eri silkworm is referred as poormans friend and eri silk as poor mans silk.Assam is the chief producer of eri silk. Castor being the principle host plant of eri silkworm and is cultivated in many parts of India as a commercial oilseed crop. In addition to castor eri silkworm is reared on other tree species available in forest area. Payam and kesseru trees are exploited for commercial eri silk production in northeastern region. Three eri spun silk mills have been established one at Hindupur (Andhra Pradesh) and another at Kokrajhar (Assam) and at Chaygaon, near Guwahati, Assam, which are spinning the finest Eri spun silk yarn with various blends with Bamboo, Muga silk, Cotton etc. Eri silk products are being promoted as eco-friendly and natural and it will provide more jobs and income for the tribal people.

In India, eri silk is mostly used for the preparation of winter shawl for men and women. The thermal property of eri silk makes it, a suitable fabric for shawls, jackets, blankets, bed spreads and baby dresses materials and baby dresses are of its soft texture and moisture absorbent quality. Now a days very fine (up to Nm 210) eri spun yarns are available, which enables weavers to weave very fine clothing including traditional sari's and dress materials. The unused leaves and branches produced from pruning the host plants are utilized as cattle feed, fuel and manure. The castor stem can be used in paper industry. The castor seeds, which contain about 45% of nitrogen in the oil cake, can be used as manure or antidote to white ants in the field. The litter of eri silkworms can be used as component in production of vermi-compost. The eri pupa contains 60 per cent crude protein, 25 per cent lipid and 5-8 per cent free amino acids and it is a delicacy among many tribes of North East India. The eri pupa oil is used in preparation of emulsion in jute industry to make jute fibre soft for easy spinning.

Ericulture has been introduced in Southern states on castor and tapioca plants respectively in Andrapradesh and Kerala. But in recent years, area under castor and tapioca has come down due to many constraints in their cultivation. Though castor is the main host plant of eri silkworm, castor leaf is not available throughout the year particularly during summer and crop has to be sown every year. Further, several pests and diseases affect the castor crop and for controlling them large quantity of chemicals are frequently used. The chemical sprayed leaves are harmful to eri silkworm. In the event of uncertainty in rainfall and adverse climatic conditions tree based eri culture is the need of hour. In this direction, search for available alternate tree host plants in the region for continuous eri silkworm rearing is essential. Indian forest flora is rich in terminalia species namely *T.tomentosa* and *T.arjuna*

are being commercially exploited for tasar silkworm rearing also. Hence, the present investigation has been undertaken with the following objectives.

1. To study the growth and development of eri silkworm on different species of *Terminalia* and other host plants.
2. Impact of sequential feeding of host plants on growth and development of eri silkworm

REVIEW OF LITERATURE

The literature pertaining to the present investigation on rearing performance of eri silkworm *Samia cynthia ricini* Boisduval on different species of *Terminalia* and its impact on cocoon quality are presented here under.

2.1 The growth and development of eri silkworm on different host plants

Lefroy and Ghosh (1912) reported that castor *Ricinus communis* L. as the main host plant of eri silkworm. Further Arora and Gupta (1979) listed 30 plant species as host plants of Eri silkworm and they are castor (*Ricinus communis* Linn.), Kesseru (*Heteropanax fragrans* Seem), Tapioca (*Manihot utilissima* Phol.), Barkesseru (*Ailanthus excelsa* Roxb.), Physic nut (*Jatropha curcas* L.), Payam (*Evodia flaxinifolia* Hook.), Korha (*Sapium cugeniaefolium* Ham.), Barpat (*Ailanthus grandisprain* Rozb.), Godly tree (*Ailanthus altissima* Miller.), Papaya (*Carica papaya* Linn.), Jaunshar (*Xanthoxylum alatum* Roxb), Masuri (*Coriaria nepalensis*), Thebow-lata (*Hodgsonia heterochita* Hk.) China sumac (*Ailanthus triphysa* Alston.), Gulancha (*Plumeria acutifolia* Poir), Bajramoni (*Zanthoxylum rhesta* Roxb.), Chinese tallow tree (*Sapium sebiferum* Roxb), Timur (*Zanthoxylum armatum* Roxb.), Jhari-udal (*Sterculia villosa* Roxb.) and Catappa (*Terminalia catappa* Linn.). Among different host plants, castor was the principal food plant followed by kesseru, payam and tapioca in order of choice of food plants (Sarkar, 1980).

The eri silkworm*, S. cynthia ricini* is polyphagous and has been reported to feed on a variety of food plants (Kapil, 1967; Sengupta and Kamal Singh, 1974) reported that, when *Philosamia ricini* Hutt. was fed with castor and tapioca leaves to support the growth, no significant difference between them was recorded. However, the larvae fed with tapioca leaves showed considerable reduction in weight of the cocoon.

By considering the effective rate of rearing Roy Choudhury (1974) observed that there was no significant difference between assorted and young castor leaves. However, percent silk production was comparatively higher in larvae fed with young castor leaves than assorted ones. Further, a least effective rate of rearing was recorded on tapioca.

Sengupta and kamal Singh (1974) tried the different hosts. Among the hosts tried, castor was found to be the best host, followed by kesseru and tapioca, while others were considered as secondary food plants.

Shaarawy *et al. (*1976) in an experiment with *Attacus ricini* Hutt. observed a negative correlation between the larval development, period and maximum and minimum temperatures. Also, of the two castor varieties tried as food plants, more number of eggs per female, heavier pupae and adults were obtained from the individuals reared on red variety compared to the green ones.

Anon. (1977) reported that the payam, *Evodia melioefolia* Benth, as a substitute host for *Philosamie cynthia ricini* Dovnovon on which the amount of cocoon obtained was almost comparable to the ones obtained on castor, the main host.

Govindan *et al. (*1978) considering the percentage of larval survival, larval weight, cocoon weight, pupal weight and shell weight opined castor as a better host, for rearing the eri silkworm than tapioca, papaya and their combinations. Tapioca was the next best host. However, papaya cannot be used as a mono host plant.

Muthukrishnan and Radha (1978) observed non significant differences in the larval weight, cocoon weight and shell weight when eri silkworm was reared on castor and tapioca leaves. The life table indicated that castor and tapioca are equally good. The worms reared on papaya did not survive.

Eid *et al. (*1980) opined that both the quality and quantity of silk produced by *S. cynthia ricini* were independent of the quantity of amino acid and nitrogen in the castor leaves on which the larvae were reared. However, the silk production could be affected by the balance of the amino acids in the leaf.

Scriber and Fenny (1980) observed that the saturnid larvae grown on herbaceous plants grow faster and more efficiently compared to those reared on the foliage of shrubs and trees.

Devaiah *et al. (*1985) evaluated the changes in the larval weight, silk production and silk gland weight in relation to four different host plants like castor, tapioca, white plumeria and red plumeria leaves fed to the eri silkworm. They concluded that castor is the best host plant followed by red plumeria, white plumeria and tapioca.

Studies on the rate of development, survival, cocoon yield and reproduction of *Samia cynthia ricini* Boisduval on castor, tapioca, plumeria and Ailanthus were made at temperature ranging from 25^{0C} to 29^{0C} and relative humidity of 51 to 84 per cent in the rearing room. The worms had shorter developmental period, when reared on castor. The order of suitability on other hosts based on these parameters were tapioca > plumeria > ailanthus (Reddy *et al.*, 1989).

Rajaram and Samson (1991) studied the rearing performance of eri silkworm (*Samia cynthia ricini* Boisduval) on different host plants like castor, kesseru and gansarai. The study confirms that castor is the most prefered and ganasarai is the least preferred food plant among the host plants.

Raja Ram and Saratchandra (1998) evaluated the rearing performance of three different host plants like castor, kesseru, phutkoul. It was observed that phutkoul is the least preferred host plant as compared to castor and kesseru.

Neelu Nangia *et al. (*2000) studied the volumetric attributes of the eri silkworm reared on various host plants like castor, tapioca, papaya, barkesseru and gulanch. The host sequence for volumetric assessment were in the merit order of castor > barkesseru > gulanch > tapioca > papaya under caged condition.

Debraj *et al. (*2003) evaluated the four different host plants *viz.,* castor, kesseru, tapioca and payam leaves fed to eri silkworm. The results showed that payam is the potential host of eri silkworm next to castor when reared during November month.

Patil (2004) reported *Michelia champaka* as a potential new host plant of eri silkworm. Further, Patil *et al. (*2008) reported fountain tree *Spathodea campanulata* and *Terminalia paniculata* as the new host plants of eri silkworm.

Patil (2004) evaluated the 25 host plants for ericulture and reported the champaca, fountain tree, and kindal tree and *Ficus bengalensis* as the potential hosts for ericulture.

Philip *et al*. (2008) studied the effect of feeding eri silkworm larvae on cassava mosaic infected tapioca leaves on the larval growth, cocoon production, economic characters of cocoon and the reproductive performance of eri silkworm.

Singh *et al*. (2011) conducted the experiment on the rearing performance of eri silkworm on castor and kesseru during different seasons. The results revealed that rearing performance of eri silkworm *viz*., mature larval weight and ERR were significantly higher on castor as compared to kesseru

Virk *et al*. (2009) studied the performance of eri silkworm, *samia Cynthia ricini* in different seasons of Punjab and recorded that the smallest life cycle was (41 days) recorded during July-August and longest (88 days) during the winter season reported the life cycle as 48-65 days in summer and 91-114 days in winter.

Manjunatha naik *et al*. (2010) evaluated five food plants *viz.,* castor, fountain tree, banyan tree, Indian almond and carrot leaves and observed that among the host plants tried for eri silkworm rearing, high survival rate (99.17%), growth index (4.444), matured larval weight (4.79 g), higher shell percentage (12.95%) and higher adult longevity of male and female (7.40 and 9.83 days) was observed when reared on castor. The order of suitability of new hosts based on these parameters was fountain tree > banyan tree> Indian almond > carrot leaves.

Rajesh Kumar and Gangwar (2010) evaluated four food plants *viz.,* castor, Tapioca, Barera & Papaya for larval growth as well as economic characters. Castor food plants have shown supremacy over the other food plants. The data showed that minimum larval duration (days) in spring season (19.0) ERR % (91) SR % (14.55) and other economic characters showed better in the spring season.

Rajesh Kumar and Elangovan (2010) analyzed different eco-races (Borduar, Titabar, Dhanubhanga and Mendipathar) based on their rearing performances such as hatching (%), larval duration (d), weight of full grown larvae (g), yield (by number and weight), cocoon weight (g), shell weight (g), shell ratio (%), cocoon shape variability, pupal period (d), pupation rate (%) and leaf silk

conversion rate (%).The Mendipathar eco-race of *P. ricini* showed better rearing performance than Titabar, Borduar and Dhanubhanga eco-races.

Sarmah *et al*. (2012) undertaken a study to observe its seasonal variations in commercial characters using a promising eri silkworm, Borduar eco-race feeding with castor. The highest larval weight (7.32 g), average fecundity (580 Nos.) and ERR (94.7%) was recorded during October-November. The highest single cocoon weight (4.01 g) was observed during August-September. Hence, it has been illustrated that autumn is the best season for eri silkworm rearing to improve productivity of eri silk.

2.1.1 Effect of host on larval parameters

2.1.1.1 Larval weight

Devaiah *et al. (*1985) evaluated the five different host plants like castor, tapioca, white plumaria and red plumeria and observed the larval weight of 4.65, 3.49, 2.82 and 1.86 g when reared on castor, tapioca, white plumaria and red plumeria leaves, respectively.

Reddy *et al. (*1989) studied the rate of development, survival, larval yield, and reproduction of *S. cynthia ricini* Boisduval on castor, tapioca, plumeria and Ailanthus and were made at temperature ranging from 25℃ to 29℃ and relative humidity of 51 to 84 per cent in the rearing room and observed the highest larval weight was 6.40, 4.90, 4.39 and 3.63 on castor tapioca, *A. excelsa* and *P. rubra* leaves, respectively.

Rajaram and Samson (1991) studied the rearing performance of eri silkworm on different host plants like castor, kesseru and gansarai. The study confirmed that the highest single larval weight was 5.97 g on castor followed by 5.87 g on gansarai and it was lowest 5.527 g on kesseru.

Kumar *et al*. (1993) evaluated different host plants like castor, kesseru, tapioca and barkesseru and observed the highest mature larval weight of 6.39g on castor followed by 5.33 g on kesseru, 4.11 g on tapioca and it was lowest (3.10 g) on barkesseru.

Raja Ram and Saratchandra (1998) reared eri silkworm with leaves of phutkoul, castor and kesseru under identical conditions at Titabar during January-February and observed the highest larval weight of 5.80 g on castor followed by 5.30 g on kesseru and it was lowest (4.90 g) on phutkoul.

Neelu Nangia *et al*. (2000) evaluated the volumetric attributes of the eri silkworm on various host plants like castor, tapioca, papaya, barkesseru and gulanch under caged condition. They observed the maximum larval weight 0f 52.60g/10 larvae on castor followed by 50.05g/10 larvae on barkesseru, 49.80g/10 larvae on gulancha, 48.50 g/10 larvae on tapioca and was minimum when fed on papaya (45.20 g/10 larvae).

Hazarika *et al. (*2003) studied the effect of different food plants and seasons on the larval development and larval characters of silkworm. Larvae were reared on leaves of castor, kesseru and tapioca during the spring, summer, autumn and winter seasons. Castor was identified as the best host plant for *S. cynthia ricini* based on leaf nutritive value. The larval weight was maximum on castor when compared to other hosts. The autumn season (October-November) was considered as the best time for rearing.

Debaraj *et al. (*2003) evaluated the four different host plants *viz.,* castor, kesseru, tapioca and payam leaves by feeding to eri silkworm and observed the maximum larval weight on castor(5.91g) followed by payam (4.98g) and kesseru (4.73 g).It was minimum tapioca (4.46g) reared during November month.

Patil (2004) reported the highest larval weight on champaca (2.36 g) and lowest on local castor (1.98 g).

Hazarika *et al.* (2003) reared the Eri silkworm (*S. cynthia* ricini) on castor cultivars like DCS-9, DCH- 32, DCH-177 and 48-1 during the spring and autumn. The mature larval weight was maximum in silkworm reared on 48-1.

Sannappa *et al. (*2007) studied the rearing performance of twelve castor genotypes like Local GCH-4, Aruna, RA-8 and SH-41, SHb-145, DCS-9, DCS-72, DCS-73, PCS-121, MHC- 17 and SL-1. Higher mature larval weight were obtained from larvae fed on Aruna (66.98 g/10) and RC-8 (67.53 g/10).

Philip *et al*. (2008) studied the effect of feeding eri silkworm larvae on cassava mosaic infected tapioca leaves and reported the V instar larval weight of 3.69g on infected leaves as against healthy leaves (control) 5.24g.

Virk *et al*. (2009) studied the performance of eri silkworm, *samia Cynthia ricini* in different seasons of Punjab and recorded the maximum larval weight of 46.82g/10 larvae during fourth generation and it was on par with larval weight during second generation (42.36g/10 larvae).

Manjunatha naik *et al*. (2010) evaluated five food plants *viz.,* castor, fountain tree, banyan tree, Indian almond and carrot leaves and observed that among the host plants tried for eri silkworm rearing, castor recorded highest mature larval weight (4.55g) followed by fountain tree (4.45g), banyan tree (4.01g), Indian almond (3.87g).The lowest larval weight was recorded on carrot (3.60g).

Rajesh Kumar and Gangwar (2010) evaluated four food plants *viz.,*castor, Tapioca, Barera & Papaya and observed the larval weight of 7.45g, 6.82g, 6.05g and 5.35g on castor, Tapioca, Barera & Papaya respectively.

Rajesh Kumar and Elangovan (2010) reared the different eco-races of eri silkworm (Borduar, Titabar, Dhanubhanga and Mendipathar) and observed that larval weight of different eco-races ranged from 6.52 g to 6.95 g during 2006 rearing while it was varied from 6.65 g to 7.10 g during 2007 rearing. The highest larval weight was observed in Mendipathar eco-race (6.95 g) during 2006 rearing, while it was observed in Borduar eco race (7.10g) during 2007 monsoon rearing.

Singh *et al.* (2011) conducted the experiment on the rearing performance of eri silkworm on castor and kesseru during different seasons and recorded that mature larval weight was significantly higher on castor with 5.92, 5.67, 6.07 and 5.68 g as against 4.97, 4.90, 4.20 and 4.85g on kesseru during autumn, winter, spring and summer respectively.

Sarmah *et al*. (2012) undertook a study to observe its seasonal variations in commercial characters using a promising eri silkworm, Borduar eco-race feeding with castor. The result indicated that the highest single larval weight was observed during October-November (7.32 g) followed by May –June (7.02 g) and August – September (6.66 g).

2.1.1.2 Larval duration

Devaiah *et al. (*1985) evaluated five different host plants like castor, tapioca, white plumaria, red plumeria and tapioca and observed that the larval duration ranges from 21-28 days under Dharwad condition.

Thangavelu and Phulon (1983) studied the rearing performance of eri silkworm on castor, kesseru, tapioca and barkesseru. They observed the minimum larval duration of 16.00 days on castor followed by 18.50 days on kesseru, 19.25 days on tapioca and it was maximum of 22.75 days on barkesseru.

Reddy *et al. (*1989) studied about the rate of development, survival, larval yield and reproduction of *Samia cynthia ricini* Boisduval on castor, tapioca, plumeria and ailanthus and were made at temperature ranging from 25 to 29° c and relative humidity of 51 to 84 per cent in the rearing room and observed the larval duration of 22.63 days on castor and it was maximum (37.33 days) on *A. excels*, 31.58 days on tapioca and 31.27 days on *P. rubra* leaves, respectively.

Rajaram and Samson (1991) studied about the rearing performance of eri silkworm on different host plants like castor, kesseru and gansarai. The study confirmed that there was a variation in larval duration between new host plants.The lowest larval duration was recorded on castor-516 hr, kesseru-579 hr and Ganasarai-708 hr.

Raja Ram and Saratchandra (1998) reared eri silkworm with leaves of phutkoul, castor and kesseru under identical conditions at Titabar during January-February and observed minimum larval duration of 20 days on castor followed by 24 days on kesseru and it was maximum (29 days) on phutkoul.

Neelu Nangia *et al*. (2000) evaluated the volumetric attributes of the eri silkworm (*S. cynthia ricini* Boisduval) on various host plants like castor, tapioca, papaya, barkesseru and gulanch under caged condition. They found that the larval duration was shortest (26.0 days) on castor followed by (27.0 days) on barkesseru, (29.0 days) on gulancha, (29.05 days) on tapioca and it was maximum when fed on papaya (30.50 days) leaves.

Hazarika *et al. (*2003) studied the effect of different food plants and seasons on the larval development and larval characters of eri silkworm (*Samia cynthia ricini* Boisduval). The larval duration was shorter on castor when compared with kesseru and tapioca and further autumn season (October-November) was considered as the best time for rearing *S. cynthia* ricini.

Sannappa *et al. (*2007) evaluated twelve castor genotypes like Local GCH-4, Aruna, RA-8 and SH-41, SHb-145, DCS-9, DCS-72, DCS-73, PCS-121, MHC-17 and SL-1 and observed the longer larval duration of 22.20 days on Aruna.

Philip *et al*. (2008) studied the effect of feeding of eri silkworm larvae on cassava mosaic infected tapioca leaves and reported larval duration of 31.21 days on CMV infected tapioca 29.11 days as against the healthy leaves.

Virk *et al*. (2009) studied the performance of eri silkworm, *samia Cynthia ricini* in different seasons of Punjab and recorded the shortest larval period (19.0 days) during July-August and it was significantly lesser than winter season (fourth generation) where it was the longest (37.0 days).

Manjunatha naik *et al*. (2010) evaluated five food plants *viz.,* castor, fountain tree, banyan tree, Indian almond and carrot leaves and observed that among the host plants tried for eri silkworm rearing, castor recorded minimum larval duration (21.50 days) followed by carrt(22.25days), fountain tree (27.05 days), banyan tree (28.25 days) and Indian almond (28.50 days).

Rajesh Kumar and Gangwar (2010) evaluated four food plants *viz.,* castor, Tapioca, Barera & Papaya and observed the minimum larval duration of 20 days on castor followed by Tapioca (21.12 days), Barera (22 days) & Papaya (24 days) respectively. Rajesh Kumar and Elangovan (2010), reared the different eco-races (Borduar, Titabar, Dhanubhanga and Mendipathar) and observed that the minimum larval duration was observed in Borduar eco-race (19.45 d) while maximum was observed in Dhanubhanga eco-race (20.00 d) during 2006 monsoon rearing. In consistence to 2007 monsoon rearing, the minimum larval duration was observed in Borduar eco-race (19.20 d) while Dhanubhanga eco-race (19.62 d) under gone maximum larval duration during 2007 monsoon rearing.

2.1.1.3 Larval survivability

Thangavelu and Phulon (1983) studied the rearing performance of eri silkworm on castor, kesseru, tapioca and barkesseru. They observed the larval survivability of 68.65, 36.60 and 19.60 per cent when reared on leaves of castor, Kesseru and Tapioca and Barkesseru hosts, respectively.

Reddy *et al. (*1989) studied the rate of development, survival, larval yield, and reproduction of *Samia cynthia ricini* Boisduval on castor, tapioca, plumeria and ailanthus and were made at temperature ranging from 25 to 29° c and relative humidity of 51 to 84 per cent in the rearing room and observed that the larval survivability was 96, 84, 72 and 56% per cent when reared on castor, tapioca, *P. rubra* and *A. excelsa*, respectively. The larval survivability can be improved by feeding with artificial diet containing castor leaf powder (Hosny *et al.,* 1986). Sannappa *et al. (*2007) evaluated twelve castor genotypes and observed that survival was 98.93, 99.20, 99.73, 99.73, 99.20, 99.47, 98.67, 99.47, 98.93, 98.40, 98.93 and 98.67 per cent on castor genotypes such as local, GCH-4, Aruna, RC-8, SCH-41, SHB-145, DCS-9, DCS-73, PCS-121, MHC-17 and SL-1, respectively.

Manjunatha naik *et al*. (2010) evaluated five food plants *viz.,* castor, fountain tree, banyan tree, Indian almond and carrot leaves and observed that among the host plants tried for eri silkworm rearing, castor recorded highest larval survivability (99.17%) followed by fountain tree (98.84%), banyan tree (97.99%), Indian almond (96.67%).The lowest larval survivability was recorded on carrot (82.50%).

2.1.1.4 Effective rate of rearing (ERR)

Devaiah *et al. (*1985) evaluated the five different host plants like castor, tapioca, white plumaria, red plumeria and tapioca. Devaiah and Dayashankar (1982) reported that the ERR largely depends on type of hosts provided for the worms and observed rearing season significantly influences the ERR. Whereas ERR was considerably more 65.49 per cent on castor 55.95 per cent in tapioca when reared during summer months. Thangavelu and Phulon (1983) studied the rearing performance of eri silkworm on castor, kesseru, tapioca and barkesseru and observed that the ERR was 77.5, 79.5, 74.5 and 65.0 per cent on castor, kesseru, tapioca and barkesseru hosts, respectively.

The ERR was 75.60, 81.00, 75.00, 79.70, 95.30, 97.33 and 86.20 per cent in tray method of feeding with castor as host. In bunch method of feeding the ERR was 80.00, 60.60, 54.00, 90.70, 96.00, 98.33 and 81.27 per cent during April-May, June-July, July-August, September, October-

Novembers and December-January months, respectively (Saratchandra and Joshi, 1984). Rajaram and Samson (1991) studied about the rearing performance of eri silkworm on different host plants like castor, kesseru and gansarai. The study confirmed that highest ERR was recorded on castor (84.87%) followed by kesseru (77.25%) and gansarai (32.82%)

Neelu Nangia *et al. (*2000) evaluated on the volumetric attributes of the eri silkworm (*Samia cynthia ricini* Boisduval) on various host plants like castor, tapioca, papaya, barkesseru and gulanch under caged condition. The maximum ERR on castor (94.65) followed by tapioca (77.25), barkesseru (77.2), gulanch (64.8) and it was minimum when fed on papaya (61.49).

Virk *et al*. (2009) studied the performance of eri silkworm, *samia Cynthia ricini* in different seasons of Punjab and recorded the highest effective rate of rearing (97.5%) during September-October, followed by first generation (95.6%).The effective rate of rearing in these two generations was significantly higher than third and fourth generations completed during October to march.

Manjunatha naik *et al*. (2010) evaluated five food plants *viz.,* castor, fountain tree, banyan tree, Indian almond and carrot leaves and observed that among the host plants tried for eri silkworm rearing, castor recorded highest ERR (96.50%) followed by fountain tree (96.25%), banyan tree (94.90%), Indian almond (94.65%).The lowest ERR was recorded on carrot (82.67%).

Rajesh Kumar and Gangwar (2010) evaluated four food plants *viz.,* castor, Tapioca, Barera & Papaya and observed the highest ERR on castor (86%) followed by tapioca (80%) and Barera (78.0%).The lowest ERR was observed on Papaya (75.0%).

Singh *et al,* 2011 conducted the experiment on the rearing performance of eri silkworm on castor and kesseru during different seasons. The results revealed that the effective rate of rearing (ERR) was also significantly higher on castor with 90.77, 88.46, 90.67 and 88.46 per cent as compared to 76.05, 78.92, 76.64 and 78.92 per cent on kesseru during autumn, winter, spring and summer respectively.

Sarmah *et al*. (2012) had undertaken a study to observe the seasonal variations in commercial characters using a promising eri silkworm, Borduar eco-race feeding with castor. The highest ERR (%) was recorded during October-November (94.7%) whereas July-August, August-September and November-January showed insignificant variations. The lowest ERR (%) was observed during April-May (74.0%).

2.1.1.5 Growth Index

Manjunatha naik *et al*. (2010) evaluated five food plants *viz.,* castor, fountain tree, banyan tree, Indian almond and carrot leaves and observed that among the host plants tried for eri silkworm rearing, castor recorded highest growth index (4.44) followed by fountain tree (4.41), banyan tree (4.36), Indian almond (4.35).The lowest growth index was recorded on carrot (3.74).

2.1.2 Cocoon parameters

2.1.2.1 Cocoon weight

Devaiah and Dayashankar (1982) reported that the cocoon weight largely depends on type of hosts provided for the worms. The highest single cocoon weight was recorded 2.272 g on castor followed by 2.076 g on tapioca, 1.442 g on red plumeria and 1.410 g on white plumeria. The statistical analysis revealed that there was no significant difference between red plumeria and white plumeria. Joshi and Misra (1982) observed the single cocoon weight of 1.335, 3.060, 2.139 and 3.106 g when fed with four dietary regimes *viz.,* tapioca throughout the larval period, 1^{st} to 3^{rd} instar on tapioca and 4^{th} and 5th instars on castor, 1^{st} to 3^{rd} instar on castor and 4^{th} and 5^{th} instars on tapioca and castor throughout the larval period, respectively. Single cocoon weight of 2.81, 2.67, 2.52 and 2.18 g was recorded on leaves *viz.,* castor, tapioca, kesseru and barkesseru, respectively (Thangavelu and Phulon, 1983). Devaiah *et al. (*1985) observed the single cocoon weight of 2.116, 1.884, 1.336 and 1.700 g when reared on castor, tapioca, white plumaria and red plumeria, respectively.

Reddy *et al. (*1989) studied about the rate of development, survival, cocoon yield, and reproduction of *Samia cynthia ricini* Boisduval on castor, tapioca, plumeria and ailanthus and were made at temperature ranging from 25 to 29° c and relative humidity of 51 to 84 per cent in the rearing room and observed the highest cocoon weight of 3.14 g on castor followed by 3.05 g on tapioca, 2.17 g on *P. rubra* and 2.98 g on *A. excelsa* leaves.

Rajaram and Samson (1991) studied about the rearing performance of eri silkworm on different host plants like castor, kesseru and gansarai. The study confirmed that the highest single cocoon weight was 2.717 g on castor followed by 2.569 g on kesseru and 2.508 g on gansarai. Kumar *et al*. (1993) evaluated different host plants like castor, kesseru and tapioca and barkesseru and observed that highest single cocoon weight was 3.37 g on castor followed by 3.06 g on kesseru, 2.49 g on tapioca and it was lowest (1.75 g) on barkesseru.

Raja Ram and Saratchandra (1998) reared eri silkworm with leaves of phutkoul, castor and kesseru under identical conditions at Titabar during January-February and observed highest cocoon weight of 2.450 g on castor followed by 2.190 g on kesseru and it was lowest (2.000 g) on phutkoul. Neelu Nangia *et al*. (2000) evaluated the volumetric attributes of the eri silkworm (*Samia cynthia ricini* Boisduval) on various host plants like castor, tapioca, papaya, barkesseru and gulanch under caged condition. They found the cocoon weight of 2.11, 1.99, 1.88, 1.87 and 1.77 g on castor, Barkesseru, tapioca, Gulanch and papaya, respectively.

Hazarika *et al. (*2003) studied about effect of different food plants and seasons on the larval development and cocoon characters of silkworm *Samia cynthia ricini* Boisduval. Larvae of eri silkworm were reared on leaves of castor, kesseru and tapioca during the spring, summer, autumn and winter seasons. Castor was identified as the best host plant for *Samia cynthia ricini* based on leaf nutritive value. The cocoon weight was maximum on castor when compared to other hosts. The autumn season (October-November) was considered as the best time for rearing.

Debaraj *et al. (*2003) evaluated the four different host plants *viz.,* castor, kesseru, tapioca and payam leaves by feeding to eri silkworm and observed the maximum cocoon weight was 3.32 g on castor followed by 2.92 g on tapioca, 2.82 g on payam and 2.74 g on kesseru reared during November month. Patil (2004) reported that the highest cocoon weight on champaka (2.36 g) and lowest was on local castor (1.98 g).

Philip *et al*. (2008) studied the effect of feeding eri silkworm larvae on cassava mosaic infected tapioca leaves and reported the single cocoon weight of 1.99g on CMV infected tapioca leaves and 2.56g as against the healthy leaves.

Manjunatha naik *et al*. (2010) evaluated five food plants *viz.,* castor, fountain tree, banyan tree, Indian almond and carrot leaves and observed that among the host plants tried for eri silkworm rearing, castor recorded highest cocoon weight (2.74g) followed by fountain tree (2.72g), banyan tree (2.38g), Indian almond (2.34g).The lowest cocoon was recorded on carrot (1.96g).

Rajesh Kumar and Gangwar (2010) Evaluated the four different host plants *viz.,* castor, Tapioca, Barera & Papaya and observed the highest cocoon weight of 3.56g on castor followed by Tapioca (3.25g) and Barera (2.95g). The lowest cocoon weight was noticed on papaya (2.80g)

Rajesh Kumar and Elangovan (2010) reared the different eco-races (Borduar, Titabar, Dhanubhanga and Mendipathar) and observed the highest cocoon weight on Mendipathar eco-race during 2006 (3.39 g) and 2007 (3.52 g) monsoon rearing.

Sarmah *et al*. (2012) undertaken a study to observe its seasonal variations in commercial characters using a promising eri silkworm, Borduar eco-race feeding with castor. The highest single cocoon weight was recorded during August-September (4.01 g) followed by October-November (3.89 g) and July- August (3.85 g). Lowest was observed during April-May (3.23 g).

2.1.2.2 Pupal weight

The pupal weight depends on type of hosts provided for the worms. The highest single pupal weight was recorded 2.153 g on castor and lowest 1.403 g on red plumeria (Devaiah and Dayashankar, 1982). Devaiah *et al. (*1985) observed the single pupal weight of 1.634, 1.555 and 1.458 g when reared on castor, tapioca and white plumaria, respectively. Reddy *et al. (*1989) studied about the rate of development, survival, pupal weight, cocoon yield and reproduction of *Samia cynthia ricini* Boisduval on castor, tapioca, plumeria and ailanthus and observed that the highest pupal weight was 2.74 g on castor followed by 2.73 g on tapioca, 1.94 g on *P. rubra* and 2.66 g on *A. excelsa* leaves.

Rajaram and Samson (1991) studied the rearing performance of eri silkworm on different host plants like castor, kesseru and gansarai. The study found that the highest single pupal weight was 2.85 g on castor followed by 1.89 g on gansarai. Eri silkworms were reared on leaves of phutkoul, castor and kesseru under identical conditions at Titabar during January-February and observed

highest pupal weight of 2.100 g on castor followed by 1.920 g on kesseru and it was lowest of 1.750g on phutkoul (Raja Ram and saratchandra, 1998). Neelu Nangia *et al*. (2000) studied about the volumetric attributes of eri silkworm (*Samia cynthia ricini* Boisduval) on various host plants like castor, tapioca, papaya, barkesseru and gulanch under caged condition. Results showed that pupal weight of 1.79, 1.76, 1.68, 1.63 and 1.68 g on castor, barkesseru, tapioca, gulanch and papaya, respectively.

Debaraj *et al. (*2003) evaluated the four different host plants *viz.,* castor, kesseru, tapioca and payam leaves by feeding to eri silkworm and observed the maximum pupal weight of 2.94 g on castor followed by 2.61 g on tapioca, 2.50 g on payam and 2.43 g on kesseru reared during November month. Patil (2004) reported that the highest pupal weight was 2.09 g on champaka and lowest was 1.72 g on local castor. Hazarika *et al. (*2003) studied about the effect of different food plants and seasons on the larval development and pupal characters of silkworm *Samia cynthia ricini* Boisduval. The pupal weight was maximum on castor when compared to other hosts. The autumn season (October-November) was considered as the best time for rearing.

Philip *et al*. (2008) studied the effect of feeding eri silkworm larvae on cassava mosaic infected tapioca leaves and reported the pupal weight of 1.77g on CMV infected tapioca leaves as against 2.23g on the healthy leaves.

Rajesh Kumar and Gangwar (2010) Evaluated the four different host plants *viz.,* Castor, Tapioca, Barera & Papaya and observed the highest pupal weight on castor (3.12 g) followed by tapioca (2.75 g) and barera (2.45g). The lowest shell weight was noticed on papaya (2.43 g).

Manjunatha Naik *et al*. (2010) evaluated five food plants *viz.,* castor, fountain tree, banyan tree, Indian almond and carrot leaves and observed that among the host plants tried for eri silkworm rearing, castor recorded highest pupal weight (2.33g) followed by fountain tree (2.32), banyan tree (2.09g), Indian almond (2.06g).The lowest pupal weight was recorded on carrot (1.96g).

2.1.2.3 Shell weight

Devaiah and Dayashankar (1982) reported that the shell weight largely depends on type of hosts provided for the worms and observed superior shell weight on castor (0.366 g) as compared to red plumaria (0.196 g). Joshi and Misra (1982) observed the single shell weight of 0.020, 0.445, 0.248 and 0.456 g when fed with four dietary regimes *viz.,* tapioca throughout the larval period, 1st to 3rd instar on tapioca and 4th and 5th instars on castor, 1st to 3rd instar on castor and 4th and 5th instars on tapioca and castor throughout the larval period, respectively.

Devaiah *et al. (*1985) observed the single shell weight of 0.182, 0.329 and 0.122 g when reared on castor, tapioca and white plumaria, respectively. Reddy *et al. (*1989) studied about the rate of development, survival, shell yield and reproduction of *Samia cynthia ricini* Boisduval on castor, tapioca, plumeria and ailanthus and were made at temperature ranging from 25 to 29° c and relative humidity of 51 to 84 per cent in the rearing room and observed that the highest shell weight was 0.38 g on castor followed by 0.33 g on tapioca, 0.32 g on *A. excelsa* and 0.26 g on *P. rubra* leaves.

Rajaram and Samson (1991) studied about the rearing performance of eri silkworm on different host plants like castor, kesseru and gansarai. The study confirmed that the highest single shell weight was 0.344 g on gansarai followed by 0.343 g on castor and while lowest 0.326 g on kesseru.

Kumar *et al*. (1993) evaluated different host plants like castor, kesseru and tapioca and barkesseru and observed that highest single shell weight was 0.52 g on castor followed by 0.45 g on kesseru, 0.35 g on tapioca and it was lowest (0.26 g) on barkesseru. Raja Ram and Saratchandra (1998) reared eri silkworm with leaves of phutkoul, castor and kesseru under identical conditions at Titabar and observed highest shell weight of 0.327 g on castor followed by 0.300 g on kesseru and it was lowest (0.213 g) on phutkoul.

Neelu Nangia *et al*. (2000) evaluated the volumetric attributes of the eri silkworm (*Samia cynthia ricini* Boisduval) on various host plants like castor, tapioca, papaya, barkesseru and gulanch under caged condition. They found shell weight of 0.34, 0.26, 0.23, 0.16 and 0.15g on castor gulancha, tapioca, barkesseru and papaya respectively. Debaraj *et al. (*2003) evaluated the four different host plants *viz*., castor, kesseru, tapioca and payam leaves by feeding to eri silkworm and observed the maximum shell weight of 0.38 g on castor followed by 0.32 g on payam, 0.31 g on tapioca and 0.31 g on kesseru reared during November month.

Hazarika *et al. (*2003) studied the effect of different food plants and seasons on the larval development and shell characters of silkworm *Samia cynthia ricini* Boisduval. Larvae of eri silkworm were reared on leaves of castor, kesseru and tapioca during the spring, summer, autumn and winter seasons. Castor was identified as the best host plant for *Samia cynthia ricini* based on leaf nutritive value. The shell weight was maximum on castor when compared to other hosts. The autumn season (October-November) was considered as the best time for rearing. Patil (2004) reported that the highest shell weight was on champaca (0.350 g) and lowest was on local castor (0.246 g).

Philip *et al*. (2008) studied the effect of feeding eri silkworm larvae on cassava mosaic infected tapioca leaves and reported the shell weight of 11.29g on CMV infected tapioca leaves as against 12.90g on the healthy leaves.

Virk *et al*. (2009) studied the performance of eri silkworm, *samia Cynthia ricini* in different seasons of Punjab and recorded the dry shell weight of 3.82 to 4.26g/10 shells and there were non significant differences among different generations.

Manjunatha Naik *et al*. (2010) evaluated five food plants *viz.,* castor, fountain tree, banyan tree, Indian almond and carrot leaves and observed that among the host plants tried for eri silkworm rearing, castor recorded highest shell weight (0.39g) followed by fountain tree (0.34g), banyan tree (0.28g), Indian almond (0.27g).The lowest shell weight was recorded on carrot (0.21g).

Rajesh Kumar and Gangwar (2010) Evaluated the four different host plants *viz.,* castor, Tapioca, Barera & Papaya and observed the highest shell weight of 0.52 g on castor followed by Tapioca (0.46 g) and Barera (0.42 g). The lowest shell weight was noticed on papaya (0.38 g).

Rajesh Kumar and Elangovan (2010) reared the different eco-races (Borduar, Titabar, Dhanubhanga and Mendipathar) and observed the shell weight of different eco-races of eri silkworm was ranged from 0.46 g to 0.53 g during 2006 monsoon rearing, while it was ranged from 0.52 g to 0.59 g during 2007 rearing. In consistent with many other parameters the highest shell weight was also observed in Mendipathar eco-race during 2006 and 2007 rearing.

Sarmah *et al*. (2012) had undertaken a study to observe its seasonal variations in commercial characters using a promising eri silkworm, Borduar eco-race feeding with castor. In respect of single shell weight August –September and October-November showed similar weight of 0.53 g and 0.52 g respectively. The lowest single shell weight was observed during November – January (0.45 g).

2.1.2.4 Shell ratio

The shell ratio depends on type of hosts provided for the worms. The highest shell ratio was recorded 16.11 per cent on castor and lowest 13.90 per cent on red pumeria (Devaiah and Dayashankar, 1982).

Devaiah *et al. (*1985) observed the shell ratio of 13.83%, 12.41%, 13.09% and 11.37 per cent on castor, tapioca, white plumaria and red plumaria, respectively. Reddy *et al. (*1989) studied the rate of development, survival, pupal weight, cocoon yield, shell ratio and reproduction of *Samia cynthia ricini* Boisduval on castor, tapioca, plumeria and ailanthus and observed the highest shell ratio of 12.10 per cent on castor followed by 11.98% on *P. rubra* 10.82% on tapioca and 10.74% on *A. excels* leaves.

Rajaram and Samson (1991) studied about the rearing performance of eri silkworm on different host plants like castor, kesseru and gansarai. The study found that the highest single shell ratio was13.67 per cent on gansarai followed by 12.63 per cent on castor.

Eri silkworms were reared with leaves of phutkoul, castor and kesseru under identical conditions at Titabar during january-february and observed highest shell ratio of 14.29% on castor followed by 14.28% on kesseru and it was lowest of 12.51% on phutkoul (Raja Ram and saratchandra, 1998).

Debaraj *et al. (*2003) evaluated the four different host plants *viz.,* castor, kesseru, tapioca and payam leaves by feeding to eri silkworm and observed the maximum shell ratio was 11.44 per cent on castor followed by 11.34 per cent on payam, 11.31 per cent on kesseru and 10.61 per cent on tapioca, reared during November month.

Hazarika *et al. (*2003) studied about effect of different food plants and seasons on the larval development shell ratio and pupal characters of silkworm *Samia cynthia ricini* Boisduval. The shell

ratio was maximum on castor when compared to other hosts. Patil (2004) reported the non-significant results on shell ratio between champaca and local castor.

Rajesh Kumar and Gangwar (2010) evaluated four food plants *viz.,* castor, Tapioca, Barera & Papaya and observed the highest shell ratio on Castor (14.58 %) followed by Tapioca (14.15%), Barera (13.55 %).The lowest shell ratio was observed on Papaya (13.54 %).

Rajesh Kumar and Elangovan (2010) reared the different eco-races (Borduar, Titabar, Dhanubhanga and Mendipathar) and observed highest shell ratio on Mendipathar eco-race during 2006 (15.70 %) and 2007 (16.82 %) monsoon rearing. The least shell ratio was observed in Dhanubhanga eco-race both during 2006 (15.15 %) and 2007 (15.88 %) monsoon rearing.

Manjunatha naik *et al*. (2010) evaluated five food plants *viz.,* castor, fountain tree, banyan tree, Indian almond and carrot leaves and observed that among the host plants tried for eri silkworm rearing, castor recorded highest shell ratio (12.95%) followed by fountain tree (12.64%), banyan tree (11.97%), Indian almond (11.75%).The lowest shell ratio was recorded on carrot (10.98%).

Singh *et al.* (2011) conducted the experiment on the rearing performance of eri silkworm on castor and kesseru during different seasons. The results revealed that The shell ratio on castor was recorded highest during spring (14.34%) followed by autumn (14.11%), summer (13.76%) and winter (13.62%); while on kesseru, the highest SR was recorded during summer (13.99%) followed by winter (13.97%), spring (13.92%) and autumn (13.37%). However, there was no significant difference between shell ratio of castor and kesseru.

2.1.2.5 Percent pupation

Rajesh Kumar and Gangwar (2010) evaluated four food plants *viz.,* castor, Tapioca, Barera & Papaya and observed the highest percent pupation on Castor (88%) followed by Tapioca (77%), Barera (74%).The lowest percent pupation was observed on Papaya (68%).

Rajesh Kumar and Elangovan (2010) reared the different eco-races (Borduar, Titabar, Dhanubhanga and Mendipathar) and observed the rate of pupation of four different eco-races ranged from 82.30 % to 87.28 % during 2006 monsoon rearing while it was ranged from 84.47 % to 88.83 % during 2007 rearing. However, the Mendipathar eco-race showed highest pupation rate during both 2006 and 2007 monsoon rearing.

2.1.3 Grainage parameters

2.1.3.1 Moth emergence

Saratchandra and Joshi (1984) reported that the moth emergence of 75.15 per cent from six rearing on castor in tray feeding method and it was 81.98 per cent in bunch feeding method. It was 80.07 per cent in tray method of feeding 82.59 per cent in bunch feeding method when reared on kesseru (*Heteropanax fragrans*).

Basaiah (1988) opined that adult emergence did not vary when the worms were reared on different hosts. However, marginally higher rate of emergence was noticed on RC-8 (100.0%), Aruna (100.0%) and local (100.0%) castor varieties and it was comparatively less in tapioca (98.33%).

Sannappa (1997) observed that the moth emergence was 99.90, 99.90, 98.41, 96.70 and 94.39 per cent when reared on Aruna, RC-8, DCS-72 local SL-1 and PCS-121 castor genotypes respectively. According to Ravishankar (2000) methods of feeding has a significant effect on moth emergence, which ranged from 97.23 to 99.94 per cent. Maximum moth emergence was noticed during November-December (98.70%) which may be due to favorable temperature. Interaction of methods and season had significant effect on the moth emergence.

Philip *et al*. (2008) studied the effect of feeding eri silkworm larvae on cassava mosaic infected tapioca leaves and reported the percent moth emergence of 70.79% on CMV infected tapioca leaves as against 87.75% on the healthy leaves.

Manjunatha Naik *et al*. (2010) evaluated five food plants *viz.,* castor, fountain tree, banyan tree, Indian almond and carrot leaves and observed that among the host plants tried for eri silkworm rearing, castor recorded highest moth emergence (99.42%) followed by fountain tree (99.40%), banyan tree (99.35%), Indian almond (99.30%).The lowest moth emergence was recorded on carrot (99%).

2.1.3.2 Fecundity

Jolly *et al. (*1979) observed that the number of eggs laid by the moths varied considerably with highest being under Assam condition where 400 to 500 eggs were laid by each gravid female.

Saratchandra and Joshi (1984) reported fecundity of 265 eggs in tray method of feeding, maximum number of eggs were laid during April-May (332) and minimum (207) were noticed during October-November. It was 274.67 eggs in bunch method of feeding. Maximum number of eggs (355) were laid during September and minimum (241) during June-July.

Considerable variation in fecundity of the moths was recorded depending on the season, with maximum oviposition during autumn (500.0) and minimum in summer (300.0) (Mishra, 1986) while the number reduced under Raichur conditions (173.80) (Patil *et al.,* 1986). The fecundity ranged from 319.17 to 340.08 eggs on castor (Rao, 1986).

Nagalakshmamma (1987) observed that the weight of pupae also influenced the fecundity. Moths emerged from lighter pupae (0.9780 g) deposited less eggs (193.33) whereas heavier pupae (1.4490 g) laid more eggs (284.00). The fecundity on different hosts such as castor, *M. puniculata*, *P. granatum*, blood red castor and *L. polyantha* were 345 ± 22.8, 216 ± 22.9, 212 ± 12, 182 ± 18.5 and 156 ± 16.8, respectively (Rajendra Singh and Prasad, 1987).

Reddy *et al. (*1989) recorded maximum fecundity to be on castor (503.52) and minimum on *A. excelsa (*222.92). It was 260.29 on tapioca and 201.60 on *P. rubra*, respectively. The maximum fecundity was noticed on Aruna (361.89) and RC-8 (352.22) castor genotypes (Sannappa, 1997). Popescu (1998) observed that the comparative study of five races of the silkworm *Philosamlia ricini* fecundity 297-445 eggs with different values were observed in different generations. It was higher during January-February rearing season (323.00) on castor (Ravishankar *et al.,* 2000).

Ramakrishna naika *et al. (*2003) reported that white-plain breed reared on local cultivar recorded the fecundity of 361.7 eggs per laying. Whereas it was 460, 311, 294 and 246 on castor, payam, tapioca and kesseru (Debraj *et al.,* 2003). Chandrappa *et al (*2005) fecundity was not significant among all 10 caster bean genotypes, whereas (3243 eggs/laying) on Aruna (Sannappa *et al.,* 2007).

Philip *et al*. (2008) studied the effect of feeding eri silkworm larvae on cassava mosaic infected tapioca leaves and reported the fecundity of 308 on CMV infected tapioca leaves as against 396 on the healthy leaves.

Manjunatha naik *et al*. (2010) evaluated five food plants *viz.,* castor, fountain tree, banyan tree, Indian almond and carrot leaves and observed that among the host plants tried for eri silkworm rearing, castor recorded highest fecundity (339.50) followed by fountain tree (329.50), banyan tree (307.50), Indian almond (291).The lowest fecundity was recorded on carrot (272.50).

Sarmah *et al*. (2012) undertook a study to observe its seasonal variations in commercial characters using a promising eri silkworm, Borduar eco-race feeding with castor. The highest average fecundity was recorded during October- November (580 nos.) and lowest during November- January (332).

2.1.3.3 Hatchability

Hatching percentage ranged from 54.69 to 97.00 under Dharwad conditions (Devaiah *et al.,* 1978) and 70.60 to 78.30 under Raichur conditions (Patil *et al.,* 1986).

Nagalakshmamma (1987) recorded the highest hatching percentage (90.60%) among the first day deposited eggs. According to Raja Ram and Samson (1991), highest hatching percentage (90.25%) on castor followed by 86.13 on kesseru and while lowest on ganasarai (84.88%). Maximum hatching percentage in Aruna (98.94) and RC-8 (99.94) on castor genotypes (Sannappa, 1997).

According to Ravishankar *et al. (*2000) notable differences were seen in the hatchability as influenced by the method of leaf feeding, rearing season and their interactions. The per cent hatchability in eri silk worm eggs ranged from 96.15 to 99.12 per cent. The hatchability was maximum (98.40%) during September-October. higher with the local x white plain (99.31%) and local x white semi-zebra breeds (99.31%) (Ramakrishna *et al.,* 2003).

Philip *et al*. (2008) studied the effect of feeding eri silkworm larvae on cassava mosaic infected tapioca leaves and reported the hatching percent of 84.75 on CMV infected tapioca leaves as against 90.75 on the healthy leaves.

Rajesh Kumar and Elangovan (2010) reared the different eco-races (Borduar, Titabar, Dhanubhanga and Mendipathar) and observed that after 48 h of incubation the larvae of all the eco-races were hatched out uniformly. The maximum hatching was recorded in Borduar eco-race (94.33%) followed by Mendipathar (94.15%), Titabar (93.36%) and Dhanubhanga (92.65%) eco races during 2006 monsoon rearing, while the highest hatching percentage was observed in Borduar eco-race (94.35%) followed by Mendipathar (94.03%), Titabar (93.15%) and Dhanubhanga (93.15%) eco-races during 2007 monsoon rearing.

Manjunatha naik *et al*. (2010) evaluated five food plants *viz.,* castor, fountain tree, banyan tree, Indian almond and carrot leaves and observed that among the host plants tried for eri silkworm rearing, castor recorded highest hatchability (95.18%) followed by fountain tree (93.72%), banyan tree (92.89%), Indian almond (91.49%).The lowest hatchability was recorded on carrot (87.19%).

2.1.4 Duration of life stage

2.1.4.1Pupal duration

Ahmed (1972) observed the pupal duration of 18.67 days in male and 19.51 days in female. Similarly, seasonal influence was also noticed with 11 days during Feb-March and 20 days during July-August under Dharwad condition (Deviah *et al.,* 1978).

The pupal duration was 15 to 18 days during summer and 35 to 40 days during winter (Anon., 1977). Chowdhary (1982) opined the pupal duration to be 13.0 to 18.0 days under Assam condition. The pupal weight also has influence over the papal duration which ranged from 17.0 to 19.5 days (Nagalakshmamma, 1987).

Basaiah (1988) noticed pupal duration of 13.0 days on Aruna and RC-8 variety and 15.0 days on local castor variety. Reddy *et al. (*1989) reported that, the pupal duration to be 14.60, 21.13, and 19.80 and 23.33 days when reared on castor, tapioca, *P. rubra* and *A. excels* hosts. The pupal duration was significantly shorter both the castor genotypes *viz*., Aruna (13.00 days) and RC-8 (13.00 days) and was higher on PCS-121 (16.00 days) (Sannappa, 1997).

According to Ravishankar *et al. (*2000) the pupal duration was 17.70 days during September, 18 days during November-December and 18.80 days during January-February.

Philip *et al*. (2008) studied the effect of feeding eri silkworm larvae on cassava mosaic infected tapioca leaves and reported the pupal period of 24.21 days on CMV infected tapioca leaves as against 20.03 days on the healthy leaves.

Virk *et al*. (2009) studied the performance of eri silkworm, *samia Cynthia ricini* in different seasons of Punjab and recorded the longest pupal period during the winter season (28.5 days) during 4th generation and minimum pupal period (16 days) was recorded during July-August.

Rajesh Kumar and Elangovan (2010) reared the different eco-races (Borduar, Titabar, Dhanubhanga and Mendipathar) and observed the minimum length of pupal period in monsoon season was recorded in Titabar eco-race (10.24 d) followed by Borduar (10.50 d), Mendipathar (10.62 d) while maximum pupal period was observed in Dhanubhanga eco-race (10.75 d) during 2006 rearing. However, during 2007 rearing the minimum pupal period was observed in Mendipathar (10.24 d) eco-race followed by Titabar (10.33 d), Borduar (10.42 d) and Dhanubhanga (10.66 d) eco-races.

Manjunatha naik *et al*. (2010) evaluated five food plants *viz.,* castor, fountain tree, banyan tree, Indian almond and carrot leaves and observed that all the five hosts recorded the on par pupal period of 18 days.

2.1.4.2 Incubation period

The incubation period is known to be 9.0 to 10.0 days and 14.0 to 15.0 (Jolly *et al.,* 1979), 8.0 and 10.0 days (Sarkar, 1980) and 7.0 and 10.0 days (Vishalkumar, 1983) during summer and winter, respectively. Misra (1986) reported an incubation period of 6.0 days during summer and 7.0 days during winter. Patil *et al. (*1986) recorded an incubation period of 8.90 days under Raichur conditions.

The incubation period was longer on tapioca (12 days) followed by local Aruna (9.0 days) and RC-8 (8.0 days) castor varieties (Basaiah, 1988). Reddy *et al. (*1989) reported that the incubation period was 9.27 days on castor, 10.40 days on tapioca 10.67 days on red plumeria and 11.40 days on *A. excelsa*, respectively. Incubation period of 9-10 days (Patil and Savanurmath, 1994). The shortest incubation period was recorded in case of Aruna and RC-8 (8.00 days) (Sannappa, 1997).

Ravishankar *et al. (*2000) shorter incubation period (9.77 days) was noticed in M-S method of castor leaf as food, highest period (10.98 days) was observed in M-8 and November-December rearing period (11.35 days). Favorable climate during September-October seems to have influence in reducing the incubation period (9.25 days).

Philip *et al*. (2008) studied the effect of feeding eri silkworm larvae on cassava mosaic infected tapioca leaves and reported the incubation period of 11.06 days on CMV infected tapioca leaves as against 10 days on the healthy leaves.

Virk *et al*. (2009) studied the performance of eri silkworm, *samia Cynthia ricini* in different seasons of Punjab and recorded that the egg period varied from 3 to 17.5 days,being the shortest (3 days) during July-August and the longest (17.5 days) during December-march (winter season).

Manjunatha naik *et al*. (2010) evaluated five food plants *viz.,* castor, fountain tree, banyan tree, Indian almond and carrot leaves and observed that all the five hosts recorded the on par incubation period of 8 days.

2.1.4.3 Total duration of life cycle

According to Nanavaty (1965) the eri silkworm completes life cycle in six weeks during summer and 12 weeks during winter. According to Sarkar (1980) it was 44.0 days and 85.0 days respectively.

Thangavelu and Barah (1986) reported that the total duration of life cycle was 45.0 and 50.0 days during summer and winter, respectively. It was 49.0 days and 72.0 days (Misra, 1986). Basaiah (1988) observed the life cycle to occupy 52.65 and 56.10; 52.15 and 55.80; 51.55 and 56.15 and 61.80 and 66.00 days for male and female on local Aruna and RC-8 castor lines and on tapioca respectively.

The insect completes life cycle in 46.49, 63.18, 61.73 and 72.06 days when larvae were fed on castor, tapioca *P. rubra* and *A. excelsa*, respectively (Reddy *et al.,* 1989). Sannappa (1997) reported that the total life cycle was highest on PCS-121 (55.45 days) and it was minimum (56.63 days) on Aruna castor genotypes.

Virk *et al*. (2009) studied the performance of eri silkworm, *samia Cynthia ricini* in different seasons of Punjab and recorded that the smallest life cycle was (41 days) was recorded during July-August and longest (88 days) during the winter season reported the life cycle as 48-65 days in summer and 91-114 days in winter.

Manjunatha naik *et al*. (2010) evaluated five food plants *viz.,* castor, fountain tree, banyan tree, Indian almond and carrot leaves and observed that among the host plants tried for eri silkworm rearing, castor recorded minimum larval duration (47.50 days) followed by carrot (48.25 days), fountain tree (53.05 days), banyan tree (54.25 days), Indian almond (54.50 days).

2.2 Impact of sequential feeding of host plants on growth, development and cocoon parameters eri silkworm

Joshi (2010) reported that the larvae of eri silkmoth, *P. ricini* were reared on four dietary regiments *Viz.,* TT (first to fifth instar on tapioca (*M. utilissima*), TC (first to third instar on tapioca and fourth to fifth instar on castor (*R.communis*), CT (first to third instar on castor and fourth to fifth instar on tapioca) and CC (first to fifth instar on castor). The results showed that castor can be substituted by tapioca for the rearing of eri silkworm up to the third instar for growth almost similar to that with castor feeding throughout.

Khan and Hoque (1986) studied the oviposition and fertility of the eri silkworm, *p. ricini* was studied on various castor-papaya leaf combinations. The lowest oviposition was for females reared on papaya leaf followed by castor (15 days) + papaya, papaya + castor and castor + papaya leaves. All the foods except papaya (15 days) + castor leaves reduced the fertility of females significantly ($p<.001$).

Deka *et al*. (2011) conducted studies on larval growth and spinning parameters of eri silkworm *S. cynthia ricini* on castor (red variety), kesseru (*H. fragrans Roxb)* and tapioca (*Manihot esculenta*). The evaluation of data revealed that castor (red variety) shown supremacy over the other food plants i.e., kesseru and tapioca for larval growth as well as spinning characters. The data showed that the minimum larval duration (days), fecundity, effective rate of rearing (ERR %) and other spinning characters e.g., silk ratio percentage (SR %) showed better in spring season followed by autumn, winter and summer season.

Venu and Munirajappa (2013) undertaken a study to evaluate the morpho-economic traits of eri silkworm, *Philosamia ricini* Hutt by feeding leaves of Castor (*Ricinus communis* L), Tapioca (*Manihot esculenta* Crantz), Wild Castor (*Jatropha curcas* L), Barkesseru (*Ailanthus excelsa* Roxb). It is observed that, despite the fact that the castor leaves serve as chief feed for rearing of eri silkworms, the combination of castor and tapioca leaves could also be beneficially used for commercial rearing of eri silkworm.

Subramanianan *et al.* (2013) evaluated 10 plant species, viz., *Calotropis gigantean, Nerium odourm, Leucaena leucocephla, Parthenium hysterophororum, Annona squamosa, Pongamia pinnata*, Coconut leaf, banana leaf, *Sesbania grandiflora*, and *Terminalia catapa* for feeding the 5th instar larvae of eri silk worm after pre-starvation period of 30 min. It took 26 days to complete the larval development and a maximum of 28 days on the tapioca (TV 1&2) host plant.

2.2.1 Effect of interchanging of host plants on larval parameters

2.2.1.1 Larval weight

Deka *et al*. (2011) evaluated the effect of combinations of 3 host plants like castor, kesseru and tapioca during spring, summer, autumn and winter on larval weight. During spring season, the highest larval weight was recorded on castor + tapioca (7.23 gm.), followed by kesseru + castor (6.77 gm.), kesseru + tapioca (6.68 gm.), tapioca + castor (6.56 gm.), and tapioca + castor (6.49 gm.). During summer season, the highest larval weight was recorded in kesseru + castor (6.61 gm.). The lowest larval weight was recorded in tapioca + castor (5.75 gm.). In autumn season, the highest larval weight was recorded in tapioca + castor (6.23 gm.), followed by castor + tapioca (6.15 gm.), tapioca + castor (6.12gm.), kesseru + castor (5.93 gm.), and kesseru + tapioca (5.75 gm.). During winter season, the highest larval weight was recorded in kesseru + castor (5.57 gm.) followed by castor + tapioca (5.47gm.), kesseru + tapioca (5.32 gm.), castor + tapioca (5.20 gm.) and tapioca + castor (5.08 gm.). The lowest larval weight was obtained in tapioca + kesseru (4.90 gm.)

Venu and munirajappa (2013) reported that the eri larvae which were given castor leaves from 1st instar to 3rd instar and tapioca, ailanthus and jatropha leaves during 4th instar and 5th instar recorded mean larva weight of 6.48g, 6.00g and 5.78g respectively.

2.2.1.2 Larval duration

Deka *et al*. (2011) reported that during spring (Feb-March), the lowest larval duration was recorded in kesseru + castor & kesseru + tapioca (21.00 days) followed by castor + tapioca, tapioca + castor & tapioca + kesseru (21.33 days). During summer season, the lowest larval duration was recorded in castor + kesseru & kesseru + tapioca (20.33 days) followed by castor + tapioca, kesseru + castor, tapioca + castor and tapioca + kesseru (20.78 days). Among the combinations, the lowest duration was recorded in castor + tapioca (21.66) followed by kesseru + tapioca , tapioca + castor and tapioca + kesseru (22 days) and the highest was recorded in Kesseru + Castor (22.33 days) where kesseru was fed from first to third instar larvae then replaced by castor from fourth to fifth instar. Among the combinations, the lowest larval duration was recorded in castor + kesseru & Kesseru + tapioca (27.33 days) followed by castor + tapioca & tapioca + castor (27.76 days), tapioca + kesseru (28.23 days).The highest larval duration was recorded in kesseru + castor (28.33 days).

Venu and munirajappa (2013) reported that eri larvae which were fed with castor leaves during 1st instar to 3rd instar and feeding with tapioca, ailanthus and jatropha leaves from 4th instar to spinning recorded a mean larval duration of 20.67 days, 23.33 days and 24.67 days respectively.

Subramanianan *et al.* (2013) reared the eri silkworm in castor – tapioca combinations and reported the larval duration of 23-24 days.

2.2.1.3Effective rate of rearing (ERR)

Deka *et al*. (2011) reported among the treatments where food plants were fed in combinations, the highest ERR percentage was recorded in castor + kesseru (90.53%) followed by tapioca + castor (90.43%), castor + tapioca (89.46%), and kesseru + tapioca (87.20%), respectively. The lowest ERR percentage was recorded in Kesseru + castor (83.23%). During summer season, the highest ERR percentage was recorded in Castor + kesseru (79.50%) followed by castor + tapioca (78.73%), tapioca + castor (78.73), tapioca + kesseru (77.30%). The lowest ERR was recorded in kesseru + castor (76.57%). autumn season, the highest ERR% was recorded in Castor + kesseru (86.87%) followed by castor + tapioca (85.06%), tapioca + castor (83.76%), kesseru + tapioca (81.70%) and tapioca + kesseru (75.56%) respectively. The lowest ERR% was recorded in kesseru +

castor (74.56%). In winter season the highest ERR% was observed in castor + kesseru (86.10%) followed by kesseru + tapioca (83.80%), kesseru + castor (81.30%) castor + tapioca (78.80%) and tapioca + castor (75.40%) and. The lowest ERR% was recorded in tapioca + kesseru (71.30%).

Venu and munirajappa (2013) reared the Eri silkworms on castor leaves during 1st instar to 3rd instar periods and then feeding with leaves of tapioca, ailanthus and jatropha from 4th instar to spinning recorded the mean ERR of 80.00, 76.00 and 71.33 per cent, respectively.

2.2.2 Cocoon parameters

2.2.2 .1Cocoon weight

Deka *et al*. (2011) reported that among the treatments where food plants were fed in combinations. During spring season, the highest cocoon weight was recorded in castor (3.57g) followed by tapioca (3.53g) and kesseru (3.49g).Among the combinations, the highest cocoon weight was recorded in castor + kesseru (3.89g) followed by Castor + tapioca (3.51g), kesseru + tapioca (3.50g), tapioca + castor (3.49g) and Kesseru + castor (3.48g).During Summer season the highest cocoon weight was recorded on castor + tapioca (2.76gm.) followed by castor + kesseru (2.68 gm) kesseru + tapioca (2.57gm.), tapioca + kesseru (2.61gm.) and tapioca + castor (2.57gm.) The lowest value of cocoon weight was recorded in kesseru + castor (2.53gm.). In autumn season the highest cocoon weight was observed in kesseru + castor (3.52gm.) followed by castor + tapioca (3.50gm.), kesseru + tapioca and tapioca + castor (3.49gm.). The lowest value was recorded in tapioca + kesseru (3.48gm.) winter season. The best result were obtained in castor + kesseru (2.83gm.) followed by castor + tapioca (2.73gm.), tapioca + kesseru (2.61gm.), Tapioca + castor (2.59gm.) and kesseru + tapioca (2.59gm.). The lowest weight was recorded in Kesseru + castor (2.48gm.).

Venu and Munirajappa (2013) reared the eri larvae on castor leaves from 1st instar to 3rd instar and with tapioca, ailanthus and jatropha leaves during 4th instar and 5th instar and recorded the mean cocoon weight of 3.31g, 3.16g and 2.67g, respectively.

2.2.2.2 Pupal weight

Venu and Munirajappa (2013) reared the eri larvae on castor leaves from 1st instar to 3rd instar and with tapioca, ailanthus and jatropha leaves during 4th instar and 5th instar and recorded the mean pupal weight of 2.68g, 2.69g and 2.25g respectively.

2.2.2.3 Shell weight

Deka *et al*. (2011) reported that, during summer season the highest shell weight was recorded in castor + tapioca (0.52gm.), which is followed by castor + kesseru (0.331gm.), kesseru + castor & tapioca + kesseru (0.288), respectively. The lowest shell weight was recorded on Tapioca + castor (0.280gm.). During autumn season the highest shell weight was obtained in castor + tapioca (0.556gm.) followed by tapioca + castor (0.539gm.), kesseru + tapioca (0.536gm.), tapioca + kesseru (0.535gm.). The lowest shell weight was recorded in kesseru + castor (0.488gm.).In winter the best result was obtained in castor + kesseru (0.402gm.) followed by castor + tapioca (0.389gm.), kesseru + castor (0.348gm.), tapioca + kesseru (0.313gm.) and kesseru + tapioca (0.311gm.), respectively. The lowest weight was recorded in Tapioca + castor (0.310gm.).In winter season, the best results were obtained in castor + kesseru (2.83gm.) followed by castor + tapioca (2.73gm.), tapioca + kesseru (2.61gm.), Tapioca + castor (2.59gm.) and Kesseru + tapioca (2.59gm.). The lowest weight was recorded in kesseru + castor (2.48gm.)

Venu and Munirajappa (2013) reared the eri larvae on castor leaves from 1st instar to 3rd instar and with tapioca, ailanthus and jatropha leaves during 4th instar and 5th instar and recorded the mean shell weight of 0.46g, 0.46g and 0.41g, respectively

2.2.2.4 Shell ratio

Deka *et al*. (2011) reported that, during summer season the highest shell ratio was recorded in tapioca + castor (15.73%) followed by castor + tapioca (15.61), kesseru + tapioca (15.54%) and kesseru + castor (15.22%).The lowest shell ratio percentage was obtained in tapioca + kesseru (14.98%). During autumn season the castor + tapioca (12.75%) recorded the highest followed by castor + kesseru (12.35%), Kesseru + castor (11.56%), and kesseru + tapioca (11.24%) respectively. The lowest shell ratio percentage was obtained on tapioca + castor (11.03%). In autumn season castor + kesseru (16.07%) recorded the highest followed by castor + tapioca (15.88%), Tapioca + castor (15.44%), tapioca + kesseru (15.37%) respectively. The lowest shell ratio percentage was obtained in kesseru + tapioca (15.35%). During winter season castor + kesseru and castor + tapioca

(14.20%) recorded the highest followed by Kesseru + castor (14.03%), kesseru + tapioca (12.44%), tapioca + kesseru (11.99%) respectively. The lowest shell ratio percentage was obtained in Tapioca + castor (11.96%).

Venu and Munirajappa (2013) reared the eri larvae on castor leaves from 1st instar to 3rd instar and with tapioca, ailanthus and jatropha leaves during 4th instar and 5th instar and recorded mean shell ratio of 13.89%, 14.55% and 15.35% respectively.

2.2.3 Grainage parameters

2.2.3.1 Fecundity

Deka *et al*. (2011) reported that, during spring season the highest fecundity was recorded in castor + tapioca (462 nos.) followed by kesseru + castor (461 nos.), Kesseru + tapioca (451 nos.), castor + kesseru (374 nos.) and Tapioca + castor (371 nos.), respectively. The lowest fecundity was recorded in tapioca + kesseru (348 nos.). During summer season, the highest fecundity was recorded in castor + tapioca (389 nos.) followed by kesseru + castor (376 nos.), Tapioca + castor (361 nos.), castor + kesseru & tapioca + kesseru (354 nos.) respectively. During autumn season the highest fecundity was recorded in kesseru + castor (461 nos.) followed by castor + tapioca (459 nos.), tapioca + kesseru (446 nos.), kesseru + tapioca (444 nos.) respectively. The lowest fecundity was recorded in castor + kesseru & tapioca + castor (438 nos.). In winter season the highest fecundity was recorded in castor + tapioca & kesseru + tapioca (440 nos.) followed by castor + kesseru & kesseru + castor (439 nos.) and Tapioca + castor (429 nos.), respectively. The lowest fecundity was recorded in tapioca + kesseru (428 nos.).

MATERIAL AND METHODS

Investigations were carried out on the rearing performance of eri silkworm on different species of terminalia during 2011- 12 at Ericulture Laboratory, Department of Agricultural Entomology, College of Agriculture, University of Agricultural Sciences, Dharwad, Karnataka.

Dharwad is a district head quarter in North Karnataka and situated at 15° 26' north latitude, 75°07' east longitude and at an altitude of 731.8 meters above mean sea level. This place lies in the transitional zone receiving an annual rainfall of 1208.5 mm distributed well over the season. This zone is characterized by two peaks of rainfall, one commencing during June-July and another during September-October. The temperature and relative humidity range from 11° to 37°C and 40 to 85 per cent, respectively. The material and methods used in the study are presented below under different headings.

3.1 Establishment of castor and eri silkworm culture

The land was ploughed twice and harrowed to bring it to fine tilth during may 2012. After receipt of the first showers during first week of June, 2012 the castor was sown with a spacing of 3 x 3. The recommended dose of manure and fertilizer were applied and the cultural operations were carried out as per the package of practices published by UAS, Dharwad.Castor leaves were utilized for feeding the eri silkworm 60 days after sowing to maintain eri silkworm culture and the experiment.

3.2 Eri silkworm rearing

3.2.1 Disinfection

The rearing room along with rearing equipments were cleaned, washed thoroughly and disinfected properly with four per cent formalin using a gator rocker sprayer. After spraying, the rearing room was made air tight for 24 hr by closing all the windows and doors properly to make the disinfection process effective. The room was kept open for a minimum of 12 hr to remove the traces of formalin vapour left over in the room before the commencement of the rearing experiment. The eri silkworm rearing practices suggested by Patil and Savanurmath (1994) was followed in rearing eri silkworm for the experiment. The eri silkworm race which produces white cocoon was used for the study.

3.2.2 Incubation

The eri eggs prepared in the ericulture laboratory were surface disinfected by dipping in two per cent formalin solution for five minutes, washed in tap water and dried under shade. Then eggs were incubated in rearing trays covered with paraffin paper surrounded by wet foam rubber stripes to maintain optimum temperature (25±1°C) and relative humidity (80- 85%) till hatching.

3.2.3 Brushing

After two hours of hatching, one layer of tender leaves of different host plants were spread over the eggs in such a way as to just touch the eggs. After 10 to 15 minutes, the worms crawl on the under surface of the leaves.After 30 minutes the leaves along with larvae were then transferred to a separate tray and turned upside down so as to bring the worms above the leaves.

3.2.4 Feeding

Eri silkworm rearing was conducted on castor (GC-3), Fountain tree, Banyan tree, country almond and carrot leaves in shelf method. The eri silkworm larvae were fed twice during first instar, thrice during second and third instar, four times during fourth and fifth instar. The first three instar worms were fed with tender leaves whereas the fourth and fifth instar worms with mature leaves.

3.2.5 Bed cleaning

Bed cleaning was carried out once in first instar (just before entering into the first moult), twice during second instar (once when all the worms came out of first moult and next one just before entering into second moult), thrice in third and fourth instar (first cleaning after all the worms came out of the previous moults, next in the middle of each instar and last just before the worms entering into the next moult) and daily once in the fifth instar. The bed cleaning was done during morning hours, manually.

3.2.6Mounting

The ripe worms were handpicked from the rearing trays and transferred to bamboo mountages for cocoon spinning. The cocoons were harvested on fifth day of mounting.

3.2.7 Eri egg production

The eri silkworm eggs were prepared by following the egg production procedure as suggested by (Nagalakshamma, 1987) Eggs laid in a span of 24 h were collected. They were disinfected with two per cent formalin for five minute and washed in tap water and used for experiments.

Experiment I

3.3 To study the growth and development of eri silkworm on different species of Terminalia and other hosts.

Fountain tree - *Spathodea companulata*

It is a tall tree reaching a height of 22 m, native to tropical Africa, cultivated in gardens and avenues both for shade and for gorgeous display of flowers in the dry areas. The tree is deciduous for a few weeks, but in humid climate it remains evergreen. Leaves are imparipinnately compound, 30 to 45 cm long, leaflets mostly elliptic or oval, flowers bell shaped scarlet-red or orange, in dense pendulous, terminal racemes, capsules oblong –lanceolate, many seeded and seeds are winged. It may also be planted along the river banks to check soil erosion. The tree can easily propagated through root suckers, cuttings and seeds. The trees that are well tended to attain a height of 9 to 12 m. It is suitable for carpentry work and has been suggested as a source for paper pulp. Leaves are used for medicinal Purpose.

Indian almond – *Terminalia catappa*

A widely spread littoral species within the tropics, beach, forests of the Andamans and Malay Peninsula. Cultivated throughout tropical India. It is a beautiful, large and tall tree with stem often buttressed. Branches whorled and vericelled, spreading horizontally like different stages of that kind of compound table, called a dumb-waiter. Leaves clustered at the ends of branch lets, glabrous, petiole and midrib more or less hairy, obviate, from a narrow cordate base of 6 to 10 inches long. The leaf turns deep red in autumn before falling. The kernels/seeds are fully as palatable as the best filberts or even almonds and are eaten being nutritive. The wood is also useful. Leaf fodder, the foliage is suitable for feeding or katkura worms. Tribals have been engaged in time honoured traditions of tasar silk production for centuries in Bihar, MP, Orissa and West Bengal (Gupta, 1992).

Kindal tree-*Terminalia paniculata*

It is a tree native to southwest India (including the Western Ghats and Karnataka). Known in the timber trade as kindal, it has a variety of names in local languages. It is economically important for wood, medicinal uses, and raising silkworm. It is widely grown throughout India.

Asan tree-*Terminalia tomentosa*

It is a species of *Terminalia* native to southern and southeast Asia. in India, Nepal, Bangladesh, Myanmar, Thailand, Laos, Cambodia and Vietnam. It is a tree growing to 30 m tall, with a trunk diameter of 1 m. The fruit is ovoid, 3 cm long; with five wings not extending beyond the fruit apex. The bark is fire-resistant. The wood is coarse, fairly straight grained; dull to somewhat lustrous and without any smell or taste. *Terminalia tomentosa* has a remarkable attribute: some members of the species store water in the dry season. A survey conducted at Bandipur National Park, India showed that a proportion of trees store water and there is a girth dependent increase in the frequency and amount of water storage. The mechanism and ecophysiological significance of this water storage is not known. The wood is used for furniture, cabinetwork, joinery, paneling, specialty items, boat-building, railroad cross-ties (treated), and decorative veneers. The leaves are used as food for *Antheraea paphia* (silkworms) which produces the tassar silk (Tussah), a form of commercially important silk. The bark is used medicinally against diarrhoea. Oxalic acid can be extracted from it. The bark and especially the fruit yield pyrogallol and catechol todye and tan leather. Water stored in the stem is often tapped and used as a source of potable water in the summer by forest folk. It is also thought to have curative value for stomach pain. Outside of its native range, it is cultivated in southern China.

Arjun tree-*Terminalia arjuna*

It is commonly known as arjun tree in English is a tree of the genus Terminalia. The arjun is about 20–25 metres tall; usually has a buttressed trunk, and forms a wide canopy at the crown, from which branches drop downwards. It has oblong, conical leaves which are green on the top and brown below; smooth, grey bark; it has pale yellow flowers which appear between March and June; its glabrous, 2.5 to 5 cm fibrous woody fruit, divided into five wings, appears between September and November. The arjuna is usually found growing on river banks or near dry river beds in West Bengal and south and central India. The arjuna is one of the species whose leaves are used for rear the *Antheraea paphia* silkworm which produces the tassar silk (tussah), a wild silk of commercial importance. In studies in mice, its leaves have been shown to have analgesic and anti-inflammatory properties. The arjuna was introduced into Ayurveda as a treatment for heart disease by Vagbhata (c. 7th century CE).It is traditionally prepared as a milk decoction.In the Ashtānga Hridayam, Vagbhata mentions arjuna in the treatment of wounds, hemorrhages and ulcers, applied topically as a powder.

Champaca tree-*Michelia champaca*

It is a large evergreen tree, native to the Indomalaya ecozone (consisting of South Asia, Southeast Asia and some parts of China). It is best known for its strongly fragrant yellow or white flowers. It is, however, primarily cultivated for its timber, and is also used in urban landscaping. Its aril-covered seeds are highly attractive to birds. This species occurs in varying shades of cream to yellow-orange. In China, *M. champaca* var. *pubinervia* is documented.*Magnolia* × *Alba* is a hybrid cultivar of *M. champaca*. In Thailand, there have been some purported man-made hybrids with other magnolia species including *Magnolia liliifera* and*Magnolia coco*. The flowers are used in Southeast Asia for several purposes. They are primarily used for worship at temples whether at home or out, and more generally worn in hair by girls and women as a means of beauty ornament as well as a natural perfume. Flowers are used to be floated in bowls of water to scent the room, as a fragrant decoration for bridal beds, and for garlands. "*Magnolia champaca* however is more rare and has a strong perfume, and is not that commonly or plentifully used - for example in hair it is worn singly or as a small corsage but rarely as a whole garland, and for bridal beds it is most often jasmine and roses while for bowls of water to be placed around rooms usually other, more colourful for visual decoration and less strongly perfumed flowers are used. The flower is sometimes commonly called the 'Joy perfume tree.

Red Plumeria- *Plumeria rubra*

It is a deciduous plant species belonging to the genus *Plumeria*. Originally native to Mexico, Central America, Colombia and Venezuela, it has been widely cultivated in subtropical and tropical climates worldwide and is a popular garden and park plant, as well as being used in temples and cemeteries. It grows as a spreading tree to 7–8 m (20–25 ft) high and wide, and is flushed with fragrant flowers of shades of pink, white and yellow over the summer and autumn. In Cambodia, as with other Plumeria species, *P. rubra* flowers are used to necklaces as offerings to deities or as decoration for coffins. The leaves of this species are used in the care of sores and made into soothing infusions

Carrot – *Daucus carota*

An annual or binnial herb with an erect, much branched stem, 1 to 4 feet high arising from a thick fleshy tap-root, 2 to 12 inch long, leaves pinnetly compound, flowers white or yellowish borne in branched more or less glabose umbels. Indian carrots are coarser and possess fewer flavours than the exotic types. Carrots with a smooth tender, bright red or orange flesh with minimum core are prized for use as vegetable. Carrots are propagated from seeds and are grown nearly throughout India. Cultivated largely in hilly stations weather condition favourable and in hills they can be grown nearly throughout the year. Carrot leaves are said to be eaten in Java. Carrot leaf meal with spicy flavour, prepared from the tops is used as poultry feed, fodder for cattle and horses.

Experiment I

The experiment was conducted during July-August 2012.The selected host plants leaves were fed separately to the eri silkworm from hatching till cocoon spinning as per the treatments. For each host plants 100 worms per replication were used and replicated three times. Observations on various larval, pupal, cocoonand grainage parameters were recorded.

Treatment details

Treatments	Hosts
T1	Asan tree(*Terminalia tomentosa)*
T2	Arjun tree(*Terminalia arjuna)*
T3	Kindaltree(*Terminalia paniculata)*
T4	Indian almond(*Terminalia catapa)*
T5	Fountain tree *(Spathodea campanulata)*
T6	Champaca tree *(Michelia champaca)*
T7	Castor*(Ricinus communis)*
T8	Carrot*(Daucus carrota)*
T9	Red plumeria*(Plumeria rubra)*

Design : Completely randomized design (CRD)

Treatments : 9

Replication : 3

No. of larvae per replication : 100

Rearing period : July-August

Experiment II: To study the impact of sequential feeding of host plants on growth and development of eri silkworm

Based on the results of the first objective, the top 3 best hosts were selected to study the interchanging the hosts during IV & V instar larvae. The chalki worms were reared on castor upto III instar, during grown up stage the leaves of different hosts were fed as per the treatment.

Treatments	Hosts (I,II &III instars)	Hosts (IV and V instars)
T_1	Castor *(Ricinus communis)*	Fountain tree *(Spathodea campanulata)*
T_2	Castor *(Ricinus communis)*	Champaka tree *(Michelia champaca)*
T_3	Castor *(Ricinus communis)*	Kindal tree *(Terminalia paniculata)*
T_4	Castor *(Ricinus communis)*	castor*(Ricinus communis)*
T_5	Carrot *(Daucus carrota)*	Fountain tree *(Spathodea campanulata)*
T_6	Carrot*(Daucus carrota)*	Champaka tree *(Michelia champaca)*
T_7	Carrot*(Daucus carrota)*	Kindal tree *(Terminalia paniculata)*
T_8	Carrot*(Daucus carrota)*	Carrot *(Daucus carrota)*

Design : Completely randomized design (CRD)

Treatments : 8

Replications : 3

No. of larvae per treatment : 100

Rearing period: September-October

Observations recorded for experiment 1 and 2 are as follows

1. Larval weight (g): Eri larvae from each treatment and replication were weighed in an electronic balance at the end of the instar and just before mounting/spinning.
2. Instar duration: The total instar duration was recorded in days during each instar.
3. Moulting duration: The total moulting duration was recorded in days during each instar.
4. Larval duration (days): The total larval duration was recorded in days from the time of hatching of eggs till 50 per cent larval maturity.

5. Larval survivability (%): It was calculated by the formula and expressed in terms of percentage and the mean survivability will be computed.

6. Effective rate of rearing (%): ERR would be calculated using the formula:

$$\text{ERR (\%)} = \frac{\text{Number of cocoons harvested}}{\text{Number of worms brushed}} \times 100$$

7. Growth index:growth index is calculated by using the formula

$$GI = \frac{N}{AV}$$

N=% pupation

AV=larval duration+pupal duration

8. Disease incidence:Disease incidence is calculated by using the formula

$$\text{Disease incidence} = \frac{\text{No.of diseased worms noticed}}{\text{Total number of worms brushed}} \times 100$$

9. Fecundity: Moths from each treatment and replication were allowed on to plastic trays provided with paper at the bottom and kept in the dark condition for egg laying. The eggs laid by individual females were counted and recorded separately.

10. Pupal duration: Pupal duration was calculated from the time of pupation to the time of emergence of moth.

11. Life cycle: Duration of life cycle was arrived at by adding incubation, larval and pupal periods.

12. Cocoon weight (g): The cocoons weight from each treatment, replication wise was recorded in an electronic balance.

13. Pupal weight (g): After obtaining the cocoon weight they were cut open and pupal weight was recorded from different treatments

14. Shell weights (g): After removing the pupae and larval exuvium from the cocoons the shell weight will be recorded.

15. Shell ratio (%): The shell ratio will be calculated by the formula.

$$\text{Shell ratio (\%)} = \frac{\text{Shell weight (g)}}{\text{Cocoon weight (g)}} \times 100$$

16. Percent pupation: percent pupation was calculated by using formula

$$\text{Percent pupation} = \frac{\text{Number of larvae pupated}}{\text{Number of cocoons spun}} \times 100$$

17. Percent Moth emergence: Moth emergence twenty five cocoons for each replication were preserved for the emergence of moths.The per cent moth emergence as reflected by the different treatments was computed by the formula.

$$\text{Moth emergence (\%)} = \frac{\text{Number of moth emerged}}{\text{Number of cocoons kept for moth emergence}} \times 100$$

The emerged, sexed moths were allowed to mate in bamboo trays. Males were separated from females after ensuring three hours of mating.

18. Percent moth deformity: Percent moth deformity was calculated by using the formula

$$\text{Percent moth deformity} = \frac{\text{No.of deformed moth emerged}}{\text{Total number of cocoons kept for moth emergence}} \times 100$$

19. Hatching percentage: The eggs laid by five females were collected and incubated at room temperature (24-26℃) till they hatched. Hatching percentage was calculated by the formula.

$$\text{Hatchability (\%)} = \frac{\text{Number of eggs hatched}}{\text{Total number of eggs laid by a female}} \times 100$$

20. Incubation period: Incubation period was accounted for period from day of egg deposition until the day of hatching.

21. Adult wing expanse: Wing expansion from each replication, five moths of both sexes were mounted and record the wing expansion in centimeter by using scale.

22. Longevity: Adult longevity from each replication, five moths of both sexes were enclosed separately inperforated plastic containers (20 x 18 cm) to record the longevity of adult. The longevity of adults was calculated by taking the time of emergence and the death of the adults.

Statistical analysis: Data were analysed statistically for test of significance using Fisher's method of "Analysis of variance" as outlined by Sundera Raj *et al.* (1972). The level of significance of 'F'test was tested at 1 per cent. The interpretation of the data was done using critical difference (CD) values calculated at P = 0.01.

EXPERIMENTAL RESULTS

The results of the experiments carried out on the rearing performance of eri silkworm, *Samia cynthia ricini* Biosduval on different species of *terminalia* is presented here under.

4.1 The growth and development of eri silkworm on different species of *Terminalia* and other host plants

Larval weight (g)

The data on the larval weight of eri silkworm at different instars on different species of *Terminalia* and other host plants is presented in Table.1

First instar

The larval weight during 1st instar was significantly influenced by host plants. Among the hosts used, larval weight was highest on carrot (0.017g) which was on par with fountain tree (0.016 g) and Champaca (0.016 g). The new host Kindal tree (0.015g) was also recorded on par larval weight with former treatments. Minimum larval weight was recorded on Indian almond (0.013 g) which was on par with the new hosts, Kindal tree (0.013g) and arjun tree (0.013g). Larval weight on red plumeria (0.013g) also on par with other *Terminalia* species. However, the standard check castor (GC-3) recorded highest larval weight (0.019g) and found superior over rest of the hosts. The host carrot was next best host after (standard check) castor.

Second instar

During second instar, significant differences in larval weight were noticed with respect to host plants. Among the different hosts maximum larval weight was recorded on carrot leaves (0.47 g) which was on par with Fountain tree (0.46 g), Champaca (0.45g) and Kindal tree (0.45g) and it was minimum on Indian almond (0.42g) which was on par with the new hosts arjun tree (0.42g), kindal tree (0.41g) and red plumeria (0.39g). However, the standard check castor (GC-3) recorded highest larval weight (0.48 g) and found superior over rest of the host plants. The host carrot was next best host after standard check castor.

Third instar

Among the hosts, higher larval weight was recorded on carrot leaves (1.54 g) which was on par with Fountain tree (1.49 g) followed by Champaca (1.48g) and Kindal tree (1.45g), significantly lower larval weight was noticed on Indian almond (1.34 g) which was followed by new hosts *viz*., arjun tree (1.19g),kindal tree (1.17g) and red plumeria (1.15g). However, the standard check castor (GC-3) recorded highest larval weight (1.59 g) and found superior over rest of the hosts. The host carrot was next best host after standard check, castor.

Fourth instar

During fourth instar, larval weight was highest on fountain tree (2.61g) followed by Champaca (2.60 g) and Kindal tree (2.54g). The Indian almond (2.38g) recorded the comparatively lower larval weight than other hosts which was on par with the new hosts *viz*., arjun tree (2.36g) and asan tree (2.35g). Lower larval weight was recorded on carrot (2.06 g) followed by red plumeria (2.31g). However, the standard check castor (GC-3) recorded highest larval weight (2.66 g) and found superior over rest of the hosts. The host Fountain tree was next best host after standard check.

Fifth instar

During fifth instar, larval weight was higher on fountain tree (6.15 g) which was on par with Indian almond (5.93 g). Among the new hosts, Champaca (6.14g) recorded the highest larval weight followed by Kindal tree (5.94g), arjun tree (5.77g) and asan tree (5.63g). However, it was lowest on red plumeria (4.51g) followed by carrot leaves (5.49 g). However, the standard check castor (GC-3) recorded highest larval weight (6.31g) and found superior from remaining hosts. The host, Fountain tree was next best host after standard check castor (Plate 1).

Mature larval weight

Significant differences were recorded in mature larval weight on different host plants.

The larval weight was maximum on Fountain tree (4.48g) followed by Champaca (4.47g). Among the *Terminalia* species Kindal tree (3.89g) recorded the highest mature larval weight followed

by Indian almond (3.88g), Arjun tree (3.87g) and Asan tree (3.86g). Lowest larval weight was recorded in case of red plumeria (3.12g) followed by carrot (3.62 g). However, the standard check castor (GC-3) recorded highest mature larval weight (4.62 g) and found superior from rest of the hosts. The fountain tree was next best host after standard check castor.

Instar duration (days)

The results of the instar duration on different hosts are presented in the Table 2.

First instar

The first instar duration was found minimum on carrot (2.05 days) followed by Fountain tree (3.15 days). Among the Terminalia species Kindal tree (4.08 days) recorded the minimum larval duration followed by Indian almond (4.18 days), Arjun tree (4.25 days) and Asan tree (4.33 days). But comparatively longer instar duration was recorded on Red plumeria (4.51 days). However, the standard check castor (GC-3) recorded minimum instar duration (1.93 days) and found superior from rest of the hosts. The carrot was next best host after standard check castor.

Second instar

The second instar duration was minimum on carrot (2.85 days) followed by Fountain tree (3.43) and maximum on Asan tree (4.37), arjuna tree (4.33),Indian almond (4.23 days) and Kindal tree (4.16 days) which were on par with each other. But Red plumeria (4.50 days) recorded the maximum instar duration compared to all the hosts. However, the standard check castor (GC-3) recorded the minimum instar duration (2.72 days) and found superior among rest of the hosts. The new host carrot was next best host after standard check castor.

Third instar

The instar duration was significantly minimum on carrot leaves (2.75 days) whereas, it was maximum on red plumeria (5.71 days) followed by arjun tree (3.89 days), asan tree (3.89 days), indian almond (3.77 days) and Kindal tree (3.63 days) which were on par with each other. The Fountain tree (3.46 days) and Champaca (3.54 days) recorded minimum instar duration compared to other hosts and were on par with each other. However, the standard check castor (GC-3) recorded the minimum instar duration (2.50 days) and found superior over rest of the hosts. The carrot was recorded next best host after standard check castor.

Fourth instar

The instar duration was significantly minimum on carrot leaves (3.71 days) followed by fountain tree (3.69 days), Kindal tree (3.73 days), Indian almond (3.90 days) and Champaca (3.90 days) which were on par with each other whereas, it was maximum on Red plumeria (4.27 days) followed by Asan tree (4.33 days) and Arjun tree (4.17 days). However, the standard check castor (GC-3) recorded the minimum instar duration (3.62 days) and found superior over remaining hosts. The carrot was recorded next best host after standard check castor.

Fifth instar

The instar duration was significantly minimum on carrot leaves (5.73 days) which was on par with the Fountain tree (5.76 days), Champaca (5.79 days) Kindal tree (5.80 days), Indian almond (5.87 days) whereas, it was maximum on red plumeria (7.21 days) followed by asan tree (6.84 days) and Arjun tree (6.46 days). However, the standard check castor (GC-3) recorded the minimum instar duration (5.70 days) and found superior over rest of the hosts. The carrot was recorded next best host after standard check castor.

Total instar duration

Host plants had significant influence on instar duration. The total instar duration was significantly minimum on carrot leaves (17.09 days) followed by Fountain tree (19.59 days), Champaca (21.39 days) Kindal tree (21.41 days) and Indian almond (21.94 days).Whereas maximum instar duration was noticed on Red plumeria (26.21 days) followed by Asan tree (23.09 days) and Arjun tree (23.77 days). However, the standard check castor (GC-3) recorded the significantly minimum instar duration (16.47 days) and found superior over rest of the hosts. The carrot was next best host after standard check castor.

Table 1: Weight of eri silkworm at different instars on different host plants during July-August-2012

Treatment	1st Instar (wt) (g)	2nd instar (wt)(g)	3rd instar (wt)(g)	4th instar (wt)(g)	5th instar (wt)(g)	Mature larval weight (g)
Asan tree	0.013	0.41	1.17	2.35	5.63	3.86
Arjun tree	0.013	0.42	1.19	2.36	5.77	3.87
Kindal tree	0.015	0.45	1.45	2.54	5.94	3.89
Indian almond	0.013	0.42	1.34	2.38	5.93	3.88
Fountain tree	0.016	0.46	1.49	2.61	6.15	4.48
Champaca tree	0.016	0.45	1.48	2.60	6.14	4.47
Castor	0.019	0.48	1.59	2.66	6.31	4.62
Carrot	0.017	0.47	1.54	2.06	5.49	3.62
Red plumeria	0.013	0.39	1.15	2.31	4.51	3.12
S. Em±	0.01	0.01	0.01	0.01	0.01	0.01
CD at 1%	0.03	0.04	0.03	0.03	0.03	0.04

Carrot leaves

Champaca leaves

Plumeria leaves

Arjuna leaves

Asan tree leaves

Kindal tree leaves

Plate 1: Fifth instar in silk worm *Samia cynthia ricini* (Boisduval) larvae feeding on different host plant leaves

Fountain tree leaves

Indian almond leaves

Castor leaves

Plate 1: Contd…

Moulting duration (days)

Influence of different host plants on the moulting duration at different instars of eri silkworm are presented in the Table 3.

First moult

Feeding of different host plants had significant influence on larval duration. The moulting duration was significantly minimum on carrot leaves (1.72 days) followed by Fountain tree (2.30 days), Champaca (2.33 days) and Kindal tree (2.37 days) whereas, maximum moulting duration was noticed on Red plumeria (2.58 days) followed by Asan tree (2.51), Arjun tree (2.45) and Indian almond (2.43 days). However, the standard check castor (GC-3) recorded the significantly lower moulting duration (1.45 days) and found superior over rest of the hosts. The carrot was next best host after standard check castor.

Second moult

The duration was minimum on carrot leaves (1.54 days) followed by Fountain tree (2.29 days), Champaca (2.36 days) and Indian almond (2.39 days). Other new hosts like Kindal tree (2.44 days), Asan tree (2.44 days) and Arjun tree (2.50 days) recorded the slightly higher moulting duration and were on par with each other. The Red plumeria (2.82 days) recorded longer moulting duration compared to all other hosts. However, the standard check castor (GC-3) recorded the significantly minimum moulting (1.50 days) duration and found superior among rest of the hosts. The host carrot leaves was next best host after standard check castor.

Third moult

The moulting duration was minimum on carrot leaves (1.44 days) which was on par with Fountain tree (1.47 days).Whereas, maximum moulting duration was noticed on Red plumeria (2.18) which was on par with the new hosts, Asan tree, Kindal tree, Champaca and Arjun tree recorded 2.07 days, 1.72 days, 1.76 days, 1.87 days.The standard check castor, recorded lowest moulting duration (1.39 days) and found superior over rest of the hosts. The host carrot leaves was next best host after standard check castor.

Fourth moult

During fourth moult, all the host plants recorded similar moulting duration except Red plumeria (2.15 days). The standard check castor (GC-3) recorded lowest moulting duration (1.29 days) and found superior over remaining hosts.

Total moulting duration (days)

Total moulting duration was significantly minimum on carrot leaves (6.07 days) followed by Fountain tree (7.42 days) and Champaca (7.61 days). However, maximum total moulting duration was observed on Red plumeria (9.73 days). Among the *Terminalia* species, Kindal tree (7.84 days) recorded the minimum moulting duration which was on par with Indian almond (7.95 days) followed by Arjun tree (8.15 days) and Asan tree (8.54 days). However, the standard check castor (GC-3) recorded total moulting duration of 5.68 days and found superior over rest of the hosts. The host carrot was next best host after standard check castor.

Larval period (days)

The data pertaining to developmental period of eri silkworm on different host plants is presented in the Table 4 and Plate 2

The larval period was minimum on carrot (22.96 days) followed by fountain tree (27.01 days) and found maximum on red plumeria (35.94 days). Kindal tree (29.25 days) and Champaca (29.06 days) recorded on par larval period. Among other *Terminalia* species, Indian almond (29.90 days) recorded the minimum larval duration followed by asan tree (31.24 days) and Asan tree (32.32 days). However, the standard check castor (GC-3) recorded larval period of 21.67 days and found superior among rest of the hosts. The new host carrot leaves was found next best host after standard check castor.

Table 2: Duration of different instars of eri silkworm on new host plants during July-August-2012

Treatment	1st instar (days)	2nd instar (days)	3rd instar (days)	4th instar (days)	5th instar (days)	Total larval instar duration
Asan tree	4.33	4.37	3.89	4.33	6.84	23.77b
Arjun tree	4.25	4.33	3.89	4.17	6.46	23.09c
Kindal tree	4.08	4.16	3.63	3.73	5.80	21.41e
Indian almond	4.18	4.23	3.77	3.90	5.87	21.94d
Fountain tree	3.15	3.43	3.46	3.69	5.76	19.59f
Champaca tree	4.08	4.08	3.54	3.90	5.79	21.39e
Castor	1.93	2.72	2.50	3.62	5.70	16.47h
Carrot	2.05	2.85	2.75	3.71	5.73	17.09g
Red plumeria	4.51	4.50	5.71	4.27	7.21	26.21a
S. Em±	0.02	0.02	0.02	0.02	0.02	0.06
CD at 1%	0.08	0.07	0.07	0.08	0.08	0.25

Figures in the same column with similar alphabets do not differ significantly at P = 0.01 by DMRT

Table 3: Moulting duration of eri silkworm on new host at different instars of Eri silkworm during July-August-2012

Treatment	1st moult (days)	2nd moult (days)	3rdmoult (days)	4th moult (days)	Total moulting duration
Asan tree	2.51	2.44	2.07	1.39	8.54b
Arjun tree	2.45	2.50	1.87	1.36	8.15c
Kindal tree	2.37	2.44	1.72	1.35	7.84c
Indian almond	2.43	2.39	1.79	1.35	7.95c
Fountain tree	2.30	2.29	1.47	1.33	7.42d
Champaca tree	2.33	2.36	1.76	1.34	7.61d
Castor	1.45	1.50	1.39	1.29	5.68f
Carrot	1.72	1.54	1.44	1.35	6.07e
Red plumeria	2.58	2.82	2.18	2.15	9.73a
S. Em±	0.01	0.02	0.01	0.01	0.07
CD at 1%	0.03	0.08	0.04	0.03	0.28

Figures in the same column with similar alphabets do not differ significantly at P = 0.01 by DMRT

Pupal period (days)

There is no significant differences were noticed between the host plants (Plate 2).

Egg period (days)

There is no significant differences were noticed between the host plants (Plate 2)

Total life cycle (days)

The host plants had significant effect on the total life cycle. The shortest life cycle was recorded on carrot (48.96 days) followed by fountain tree (53.01 days) and Indian almond (55.90 days). Among the hosts Champaca (55.06 days) recorded the on par life cycle with Kindal tree (55.25 days) followed by Arjun tree (59.24 days) and asan tree (58.32 days). The longest life cycle was noticed on Red plumeria (63.94 days). However, the standard check, castor (GC-3) recorded the total life cycle of 47.67 days and found superior from rest of the hosts. The new host carrot leaves was next best host after standard check.

Pupation rate (%)

Different host plants showed significant variations with respect to percent pupation. Highest pupation was recorded on fountain tree (96.26%) followed by Champaca (95.58%), Kindal tree (96.22%) and Indian almond (95.44%). Other *Terminalia* hosts, *viz*., arjun tree and Asan tree recorded 90.38 and 90.91 per cent respectively. However, minimum pupation rate was found on carrot (86.67%) which was on par with red plumeria (87.02%) followed by carrot leaves (11.37%). The data on larval survivability, effective rate of rearing, growth index and disease incidence is presented in the Table 5.

Larval survivability (%)

Significant differences were observed in larval survivability influenced by different host plants. It was significantly maximum on Fountain tree (96.67%) followed by Kindal tree (96%), Indian almond (96%) and Champaca (96%).Other *Terminalia* species like arjun tree (92.67 days) and Asan tree (92.67%) recorded the relatively lower survival rate as compared to other hosts. However, it was significantly minimum on carrot leaves (83%) which were followed by Red plumeria (88%). The standard check castor (GC-3) recorded larval survivability (99.33%) and found superior from rest of the host. The host fountain tree was next best host after standard check castor.

Effective rate of rearing (%)

Significant differences were observed in the effective rate of rearing (ERR). Significantly maximum ERR was recorded on fountain tree (95.33%) which was on par with Champaca (95.33%) followed by Kindal tree (93.33%) and Indian almond (92.33%). However, it was minimum on carrot leaves (82.33%) followed by Red plumeria (82.67%), whereas the standard check castor (GC-3) recorded the highest effective rate of rearing (96.67 %) and found superior among all other host plants. The new host fountain tree and Champaca were next best host after standard check, castor.

Growth index

Significant differences in growth index were noticed among the host plants. Significantly higher growth index was observed on carrot (3.56) followed by fountain tree (3.53) Champaca (3.28 Kindal tree (3.19) and Indian almond (3.09) respectively. However, lower growth index was noticed on Red plumeria (2.30) leaves followed by Asan tree (2.68) and arjun tree (2.81). The standard check castor (GC-3) recorded growth index of 4.36 and was found superior over rest of the host plants. The host carrot was next best host after standard check.

Disease incidence (%)

Disease incidence was noticed only on carrot (9.33%) and Red plumeria (3.67%).

Cocoon characteristics of eri silkworm on different host plants.

The data on cocoon weight, pupal weight and shell weight and shell ratio is presented in the Table.6

Cocoon weight (g)

Among hosts fed to eri silkworms cocoon weight was found higher on fountain tree (2.68 g) followed by Champaca (2.61g).Among *Terminalia* species Kindal tree (2.37g) was recorded the

highest cocoon weight which was on par with Indian almond (2.35g) followed by Arjun tree (2.14g) and Asan tree (2.13g). Lower cocoon weight was recorded on red plumeria (1.62g) followed by carrot (1.96 g). However, the standard check, castor (GC-3) recorded highest cocoon weight (2.71 g) and found superior from rest of the hosts. The new host, fountain tree was next best host after standard check castor (Plate 3).

Pupal weight (g)

Host plants markedly influenced the pupal weight. Highest pupal weight was recorded when worms fed on fountain tree (2.29g) followed by Champaca (1.98 g), Kindal tree (1.95g) and Indian almond (1.94g). The other new hosts *viz*., Arjun tree (1.56g) and Asan tree (1.53g) recorded the relatively lower pupal weight compared to other hosts. Lowest pupal weight was recorded worms fed on Red plumeria (1.33g) followed by carrot (1.67 g). However, the standard check castor (GC-3) recorded pupal weight of 2.34 g and found superior from rest of the hosts. The fountain tree was next best host after standard check, castor.

Shell weight (g)

Significant differences were found in respect of shell weight among the treatments. Highest shell weight was recorded on fountain tree (0.33g) followed by Champaca (0.29 g), Kindal tree (0.28g) and Indian almond (0.27 g). Minimum shell weight was recorded on Red plumeria (0.21g) followed by carrot leaves (0.22 g), Asan tree (0.23g) and Arjun tree (0.24). Whereas, the standard check castor (GC-3) recorded shell weight of 0.35 g and found superior over rest of the hosts. The new host fountain tree was next best host, after standard check.

Shell ratio (%)

Different host plants showed marked variations in respect to shell ratio. Highest shell ratio was recorded on fountain tree (12.17%) followed by Champaca (12.09%), Kindal tree (11.81%) and Indian almond (11.62%), Arjun tree (11.54%) and Asan tree (11.51%) respectively. However, minimum shell ratio was found on Red plumeria (11.11%) followed by carrot leaves (11.37%). The standard check, castor (GC-3) recorded shell ratio (12.81 %) and found superior among rest of the host plants. The new host fountain tree was next best host after standard check, castor.

Effect of host plants on grainage parameters

The data pertaining to moth emergence, normal, deformed moth is presented in the Table 7.

Moth emergence (%)

Host plants had a profound influence on the moth emergence. Among new hosts highest percent of moth emergence was recorded on fountain tree (96.49%) which was on par with Champaca (94.89%), Kindal tree (94.80%) and Indian almond (94.70%), Arjun tree (94.42%) and Asan tree (94.42%). However, red plumeria (92%) had significantly lower moth emergence which was followed by carrot (96.31%) The standard check castor (GC-3) recorded highest moth emergence (98.07 %) and found superior over other hosts. The host fountain tree was next best host after standard check, castor.

Normal moth (%)

Significant differences were noticed in respect of different host plants. Among new hosts highest normal moth was recorded on fountain tree (97.98%) followed by Champaca (96.68%).Among the *Terminalia* species *viz*., kindal tree (95.79%),indian almond (95.69%), arjun tree (95.36%) and asan tree (95.36%) recorded the on par normal moth emergence. Lowest normal moth was recorded on carrot (90.13%) which was on par with red plumeria (91%). However, the standard check castor (GC-3) recorded normal moth of 98.03% and found superior over rest of the hosts. The host fountain tree was next best host after standard check, castor.

Deformed moth (%)

Significant difference was observed in host plants. Minimum deformed moth was noticed on fountain tree (2.02%) followed by carrot (2.87%) and Champaca (3.32%).Among the *Terminalia viz.,* species species Kindal tree (4.21%) recorded lowest deformed moth percent followed by Indian almond (4.28%), arjun tree (4.64%) and asan tree (4.64%) and red plumeria (4.48%) and were on par with each other. Maximum deformed moth was observed on carrot leaves (2.87%). The standard check

Table 4: Duration of different stages of Eri silkworm on new host plants during July-August-2012

Treatment	Larval period (days)	Pupal period (days)	Egg period (days)	Total life cycle (days)	% pupation
Asan tree	32.32b	18	8	58.32b	90.91c (72.46)
Arjun tree	31.24c	18	8	57.24c	90.38c (71.93)
Kindal tree	29.25e	18	8	55.25e	96.22b (78.81)
Indian almond	29.90d	18	8	55.90d	95.44b (77.69)
Fountain tree	27.01f	18	8	53.01f	96.26b (78.87)
Champaca tree	29.06e	18	8	55.06e	95.58b (77.88)
Castor	21.67h	18	8	47.67h	98.97a (85.30)
Carrot	22.96g	18	8	48.96g	86.67d (68.61)
Red plumeria	35.94a	19	9	63.94a	87.02d (68.88)
S. Em±	0.11	0.00	0.00	0.11	0.94
CD at 1%	0.44	NS	NS	0.44	3.82

Figures in the same column with similar alphabets do not differ significantly at P = 0.01 by DMRT

Eggs

Larva

Cocoon

Adult

Plate 2: Different life stages of eri silk worm *Samia cynthia ricini* (Boisduval)

castor (GC-3) recorded deformed moth of 0.13 % and found superior among rest of the host. The new host fountain tree was next best host after standard check, castor.

Fecundity (No.) and hatching percentage

The data on the first, second, third day laid eggs, total eggs, fertile egg, unfertile egg, and hatching (%) were presented in Table 8.

First day laid egg

Significant differences were found in respect of 1st day laid eggs. Among the new host plants used in the experimentation, highest 1st day laid egg was recorded on fountain tree (169.33) followed by Champaca (165.00). Among the *Terminalia* species, kindal tree (147.33) and Indian almond (145.67) recorded highest first day laid eggs and were on par with arjun tree (142) and asan tree (141.67) .Lowest first day laid eggs was recorded on carrot leaves (138.33) which were on par with red plumeria (139.67).However, the standard check castor (GC-3) recorded first days laid egg of 171 and found superior over rest of the hosts. The host fountain tree was next best host after standard check, castor and on par with castor.

Second day laid egg

Significant differences were found in respect of second day laid eggs among the new host plants, highest second day laid eggs was recorded on fountain tree (127) followed by Champaca (123.67) which was on par with kindal tree (123.67) .The indian almond (121.67) recorded the relatively lower second day laid eggs followed by asan tree (119.33) and arjun tree (118.67) which are on par with each other. Lowest second day laid eggs were recorded on carrot leaves (109) followed by red plumeria (112.67).However, the standard check castor (GC-3) recorded second highest second day laid eggs (131.67) and found superior over other host plants. The new host fountain tree was next best host after standard check.

Third day laid egg

Significant differences were found in respect of third day laid eggs among the host plants. Highest third day laid eggs were recorded on fountain tree (29.67).The Champaca (26.33) was next to fountain tree and was on par with Kindal tree (26.33) and Indian almond (25.67). Other *Terminalia* species, arjun tree (22.33) and asan tree (22) recorded the on par third day laid eggs. Lowest third day laid eggs were recorded on Red plumeria (18.67) followed by carrot leaves (25.75). However, the standard check, castor (GC-3) recorded highest third day laid eggs (30.33) and found superior among rest of the hosts. The new host fountain tree was next best host after standard check, castor.

Fecundity (No/moth)

Significant differences were found in respect of fecundity among the host plants. Highest fecundity was observed on fountain tree (326.00) followed by champaca (315.00), Kindal tree (297.33) and Indian almond (293). Other *Terminalia* species viz., arjun tree (283) and asan tree (283) recorded the relatively lower fecundity and were on par with each other. Lowest fecundity were recorded on carrot leaves (268) which were followed by red plumeria (271.01). However, the standard check, castor (GC-3) recorded fecundity of 339.50 and found superior over rest of the hosts. The new host fountain tree was next best host after standard check, castor.

Fertile egg

New host plants showed marked variations in respect of fertile eggs. Highest fertile eggs were recorded on fountain tree (306.33) followed by champaca (293.33). Among the *Terminalia* species, Kindal tree (274.67) recorded the highest number of fertile eggs followed by Indian almond (272), arjun tree (260.67) and asan tree (258.33).Lowest number of fertile eggs were observed on carrot leaves (231) followed by red plumeria (240.34) However, the standard check, castor (GC-3) recorded the highest number of fertile eggs (323.67) and found superior over rest of the hosts. The host, fountain tree was next best host after standard check, castor.

Unfertile egg

Minimum unfertile eggs were observed on fountain tree (9.67) followed by Indian almond (21), champaca (21.67), kindal tree (21.67), arjun tree (22.33) and asan tree (24.67). Maximum unfertile eggs were noticed on carrot leaves (37) which were followed by red plumeria (30.67). However, the standard check, castor (GC-3) recorded unfertile egg (19.33) and found superior among rest of the hosts. The new host fountain tree was next best host after standard check, castor

Table 5: Influence of host plants on ERR, survivability, Disease incidence and Growth index of Eri silkworm during July-August-2012

Treatment	Survivability (%)	ERR (%)	Disease incidence (%)	Growth index(E/A)
Asan tree	92.67^{e} (74.30)	86.67^{c} (68.59)	0.00^{c} (0.00)	2.68
Arjun tree	92.67^{e} (74.30)	87.67^{c} (69.44)	0.00^{c} (0.00)	2.81
Kindal tree	96.00^{c} (78.52)	93.33^{b} (75.05)	0.00^{c} (0.00)	3.19
Indian almond	96.00c (78.52)	92.33b (73.93)	0.00c (0.00)	3.09
Fountain tree	96.67b (79.50)	95.33a (77.54)	0.00c (0.00)	3.53
Champaca tree	96.00c (78.52)	95.33a (77.54)	0.00c (0.00)	3.28
Castor	99.33a (87.29)	96.67a (79.50)	0.00c (0.00)	4.36
Carrot	83.00g (65.69)	82.33d (65.16)	9.33a (17.69)	3.56
Red plumeria	88.00f (69.74)	82.67d (65.40)	3.67b (11.02)	2.30
S. Em±	0.24	0.34	0.11	0.02
CD at 1%	0.96	1.54	0.45	0.10

Figures in the paranthesis are arc sine transformation ERR – Effective rate of rearing

Figures in the same column with similar alphabets do not differ significantly at P = 0.01 by DMRT

Table 6: Cocoon parameters of eri silkworm on different host plants during July-August-2012

Treatment	Cocoon weight (g)	Pupal weight (g)	Shell weight (g)	Shell ratio (%)
Asan tree	2.13	1.53	0.23	11.51cde (19.83)
Arjun tree	2.14	1.56	0.24	11.54bcde (19.86)
Kindal tree	2.37	1.95	0.28	11.81bcd (20.10)
Indian almond	2.35	1.94	0.27	11.62bcde (19.93)
Fountain tree	2.68	2.29	0.33	12.17b (20.42)
Champaca tree	2.61	1.98	0.29	12.09bc (20.34)
Castor	2.71	2.34	0.35	12.81a (20.97)
Carrot	1.96	1.67	0.22	11.37de (19.70)
Red plumeria	1.62	1.33	0.21	11.11e (19.47)
S. Em±	0.01	0.01	0.01	0.12
CD at 1%	0.04	0.03	0.03	0.50

Figures in the paranthesis are arc sine transformation
Figures in the same column with similar alphabets do not differ significantly at P = 0.01 by DMRT

Cocoons obtained from Asan tree leaves

Cocoons obtained from Arjun tree leaves

Cocoons obtained from carrot leaves

Plate 3: Cocoons of eri silk worm *Samia cynthia ricini* (Boisduval) obtained from different host plant leaves

Cocoons obtained from castor leaves

Cocoons obtained from Indian almond leaves

Cocoons obtained from Champaca leaves

Plate 3: Contd…

Cocoons obtained from Fountain tree leaves

Cocoons obtained from Plumaria tree leaves

Cocoons obtained from kindle tree leaves

Plate 3: Contd…

Table 7: Effect of host Plants on moth emergence, deformity of eri silkworm during July-August-2012

Treatments	Moth emergence (%)	Normal moth (%)	Deformed moth (%)
Asan tree	94.42cd (75.73)	95.36d (77.60)	4.64a (12.40)
Arjun tree	94.42cd (75.73)	95.36d (77.60)	4.64a (12.40)
Kindal tree	94.80c (76.84)	95.79cd (78.18)	4.21ab (11.82)
Indian almond	94.70de (74.80)	95.69d (77.40)	4.28a (12.18)
Fountain tree	96.49b (79.30)	97.98a (81.91)	2.02d (8.09)
Champaca tree	94.89c (77.01)	96.68bc (79.55)	3.32bc (10.45)
Castor	98.07a (82.11)	98.03a (82.02)	1.97d (7.98)
Carrot	96.31b (78.98)	90.13b (80.24)	2.87c (9.76)
Red plumeria	92.20e (73.80)	91.00d (77.78)	4.48a (12.22)
S. Em±	0.40	0.36	0.35
CD at 1%	1.63	1.47	1.42

Figures in the paranthesis are arc sine transformation
Figures in the same column with similar alphabets do not differ significantly at P = 0.01 by DMRT

Table 8: Influence of host plants on number of eggs laid and hatchability of eri eggs during July-August-2012

Treatment	1st day laid egg	2nd day laid egg	3rd day laid egg	Total number of eggs	Fertile egg	Unfertile egg	% hatching
Asan tree	141.67d	119.33e	22.00c	283.00f	258.33g	24.67c	90.70de (72.24)
Arjun tree	142.00d	118.67e	22.33c	283.00f	260.67f	22.33d	90.11e (71.69)
Kindal tree	147.33c	123.67c	26.33b	297.33d	274.67d	21.67de	92.49cd (73.27)
Indian almond	145.67c	121.67d	25.67b	293.00e	272.00e	21.00e	91.70bc (74.12)
Fountain tree	169.33a	127.00b	29.67a	326.00b	306.33b	19.67f	93.35b (75.07)
Champaca tree	165.00b	123.67c	26.33b	315.00c	293.33c	21.67g	92.91b (74.57)
Castor	171.00a	131.67a	30.33a	333.00a	323.67a	9.33h	96.10a (78.61)
Carrot	138.33e	109.00g	20.67d	268.00g	231.00i	37.00a	89.48e (71.14)
Red plumeria	139.67e	112.67f	18.67e	271.01h	240.34h	30.67b	89.44e (71.04)
S. Em±	0.43	0.40	0.31	0.16	0.40	0.29	0.59
CD at 1%	1.75	1.63	1.28	0.64	1.63	1.20	2.39

Figures in the paranthesis are arc sine transformation
Figures in the same column with similar alphabets do not differ significantly at P = 0.01 by DMRT

Hatchability (%)

Notable differences were observed with regard to the hatchability of eggs. Highest hatching per cent was noticed on fountain tree (93.35%) followed by champaca (92.91%), indian almond (91.70%), kindal tree (92.49%), arjun tree (90.11%) and asan tree (90.70%). Lowest hatching per cent was noticed on red plumeria (89.44%) which was on par with carrot leaves (89.48%). However, the standard check, castor (GC-3) recorded highest hatchability (96.10 %) and found superior among rest of the hosts. The host fountain tree was next best host after standard check, castor.

Effect of host plants on size of eri silkworm

The data on adult wing expanse and adult longevity of male and female are presented in the Table 9.

Adult wing expanse male moth (cm)

There were significant differences in respect of adult wing expanse of male on different host plants. Among the new hosts, maximum adult wing expanse of male was noticed on fountain tree (10.80 cm) followed by Kindal tree (10.57 cm) and champaca (10.50 cm). Among the other hosts, Indian almond (10.47cm) recorded the highest adult male wing expanse followed by asan tree (10.40cm) and arjun tree (10.37cm) on carrot leaves (10.13 cm). However, the standard check castor (GC-3) recorded adult wing expanse of male (10.83 cm) and found superior among rest of the hosts. The host, fountain tree was next best host after standard check castor.

Adult wing expanse of female moth (cm)

There were significant differences with respect of adult wing expanse of female on new host plants. Among the hosts, fountain tree (11.77 cm) recorded maximum adult wing expanse followed by Kindal tree (11.57cm), champaca (11.47cm), Indian almond (11.43) asan tree (11.33cm) and arjun tree (11cm). The minimum adult wing expanse of female recorded on carrot leaves (10.77 cm) followed by red plumeria (10.80cm). However, the standard check, castor (GC-3) recorded adult female wing expanse of 11.83 cm and found superior among rest of the hosts. The new host fountain tree was next best host after standard check, castor.

Longevity of male (Days)

The differences with regard to longevity of male were significant among the host plants. Among different hosts, longest longevity of male was noticed on fountain tree (7.33 days) followed by champaca (7.17 days).Among the *Terminalia* species Kindal tree (6.83) and Indian almond (6.67 days) recorded on par adult male longevity whereas, the arjun tree (6.61 days), asan tree (6.58 days) and red plumeria (6.55) were on par with each other. Shortest longevity of male was noticed on carrot leaves (6.50 days). However, the standard check castor (GC-3) recorded the highest longevity of male (7.67 days) and found superior among rest of the host. The new host fountain tree was next best host after standard check.

Longevity of female (Days)

The differences with regard to longevity of female were significant among the host plants. Among the new hosts longest longevity of female was noticed on fountain tree (9.67 days) followed by champaca (9.50 days). Among the *Terminalia* species, Indian almond (9.33 days) and kindal tree (9.33 days) recorded the highest female adult longevity which was on par with arjun tree (8.95 days) and asan tree (8.90 days) respectively. Shortest longevity of female was recorded on carrot leaves (8.83 days) and red plumeria (8.83 days).However, the standard check, castor (GC-3) recorded highest longevity of female (9.83 days) and found superior over rest of the hosts. The new host fountain tree was next best host after standard check, castor.

4.2 The impact of sequential feeding of host plants on growth, development and cocoon parameters of eri silkworm

Based on the results of the first objective, the top three host plants were selected to study the interchanging of hosts during IV & V instar larvae.

Hosts selected for interchanging.

1. Fountain tree
2. Champaca tree
3. Kindal tree

Table 9: Effect of host plants on longevity and size of eri silk moth during July-August-2012

Treatment	Adult wing expanse (cm)		Adult longevity in days	
	Male	Female	Male	Female
Asan tree	10.40	11.33abc	6.58a	8.90b
Arjun tree	10.37	11.00bcd	6.61a	8.95b
Kindal tree	10.57	11.57a	6.83a	9.33ab
Indian almond	10.47	11.43ab	6.67a	9.33ab
Fountain tree	10.80	11.77a	7.33a	9.67ab
Champaca tree	10.50	11.47ab	7.17a	9.50ab
Castor	10.83	11.83a	7.67a	9.83a
Carrot	10.13	10.77d	6.50a	8.83b
Red plumeria	10.23	10.80cd	6.55a	8.83b
S. Em±	0.17	0.12	0.27	0.19
CD at 1%	0.70	0.49	1.08	0.78

Figures in the same column with similar alphabets do not differ significantly at P = 0.01 by DMRT

The chalki wormrs were reared on castor and carrot upto III instar. During grown up stage the leaves of different hosts were fed to eri silkworm.

The results of the experiments are presented below

Larval weight

The data on the larval weight of eri silkworm at different instars on different combinations of host plants is presented in Table.10

First instar

During first instar, first 4 treatments, castor + fountain tree, castor + champaca tree, castor + kindal tree and castor were reared on castor and other treatments, Carrot + fountain tree, carrot + champaca tree, carrot + Kindal tree and on carrot. Among the 2 hosts castor treatments, castor + fountain tree (0.018), castor + champaca tree (0.019), castor + kindal (0.019) and castor (0.019) recorded the highest first instar weight and were on par with each other whereas, the carrot treatments Carrot + fountain tree (0.016), carrot + champaca tree (0.017g), carrot + Kindal tree (0.016g) and carrot (0.017g) recorded the lower larval weight. However, the standard check, castor (GC-3) was found superior over carrot.

Second instar

During second instar, castor + fountain tree , castor + champaca tree, castor + kindal tree and castor were reared on castor and observed the larval weight of 0.49g, 0.48g, 0.48g and 0.49g, respectively whereas, Carrot + fountain tree, carrot + champaca tree, carrot + Kindal tree and carrot reared on carrot and recorded a mean larval weight of 0.46g,0.47g,0.47g and 0.47g, respectively. However, the standard check, castor (GC-3) was found superior over carrot.

Third instar

During third instar, castor + fountain tree, castor + champaca tree, castor + kindal tree and castor were reared on castor and observed the mean larval weight of 1.58g, 1.58g, 1.59g and 1.59g, respectively whereas, Carrot + fountain tree, carrot + champaca tree, carrot + Kindal tree and carrot reared on carrot and recorded a mean larval weight of 1.54g,1.54g,1.53g and 1.54g respectively. However, the standard check, castor (GC-3) was found superior over carrot.

Fourth instar

The highest mean larval weight was recorded on castor (2.66g) whereas; the lowest mean larval weight was recorded on carrot (2.06g). Among the combinations castor + fountain tree (2.60g) recorded the highest mean larval weight followed by castor + Champaca (2.54g) and castor + Kindal tree (2.51g). Among the another combinations red Carrot + fountain tree (2.32g) recorded the highest mean larval weight followed by carrot + Champaca (2.27g) and carrot + Kindal tree (2.22g). However, the standard check, castor maintained superiority among all the hosts and combinations followed by castor + fountain tree.

Fifth instar

The highest mean larval weight was recorded on castor (6.31g) whereas the lowest mean larval weight was recorded on carrot (5.50g). Among the combinations castor + fountain tree) (6.26g) recorded the highest mean larval weight followed by castor + Champaca) (6.18g) and castor + Kindal tree) (6.12g). Among the another combinations Carrot + fountain tree (6.12g) recorded the highest mean larval weight followed by carrot + Champaca (6.08g) and carrot + Kindal tree (6.05g). However the standard check, castor maintained superiority among all the hosts and combinations followed by castor + fountain tree.

Mature larval weight

The highest mature larval weight was recorded on castor (4.62g) whereas the lowest mature larval weight was recorded on carrot (3.62g). Among the combinations castor + fountain tree (4.55g) recorded the highest matured larval weight followed by castor + champaca (4.52g) and castor + kindal tree (4.10g). Among another combinations carrot + fountain tree (3.93g) recorded the highest matured larval weight followed by carrot + champaca (3.89g) and carrot + kindal tree (3.80g). However the standard check castor maintained superiority among all the hosts and combinations followed by castor + fountain tree.

Table 10: Influence of sequential feeding of host plants on weight of eri silkworm at different instars during September-October-2012

Treatment	1st Instar (wt) (g)	2nd instar (wt)(g)	3rd instar (wt)(g)	4th instar (wt)(g)	5th instar (wt)(g)	Mature larval weight (g)
Castor + Fountain tree	0.018	0.49	1.58	2.60	6.26	4.55
Castor + Champaca tree	0.019	0.48	1.58	2.54	6.18	4.52
Castor + Kindal tree	0.019	0.48	1.59	2.51	6.12	4.10
Castor	0.019	0.49	1.59	2.66	6.31	4.62
Carrot + fountain tree	0.016	0.46	1.54	2.32	6.12	3.93
Carrot + champaca tree	0.017	0.47	1.54	2.27	6.08	3.89
Carrot + Kindal tree	0.016	0.47	1.53	2.22	6.05	3.80
Carrot	0.017	0.47	1.54	2.06	5.50	3.62
S. Em±	0.00	0.01	0.01	0.01	0.01	0.01
CD at 1%	NS	0.02	0.02	0.02	0.03	0.03

Table 11: Influence of sequential feeding of host plants on duration of different instars of eri silkworm during September-October-2012

Treatment	1^{st} instar (days)	2^{nd} instar (days)	3^{rd} instar (days)	4^{th} instar (days)	5^{th} instar (days)	Total instar duration
Castor + Fountain tree	1.93	2.72	2.53	3.64	5.72	16.54
Castor + Champaca tree	1.93	2.71	2.52	3.68	5.73	16.56
Castor + Kindal tree	1.92	2.70	2.51	3.68	5.74	16.62
Castor	1.94	2.72	2.53	3.62	5.62	16.43
Carrot + fountain tree	2.04	2.84	2.75	3.73	5.77	17.10
Carrot + champaca tree	2.05	2.84	2.73	3.75	5.79	17.13
Carrot + Kindal tree	2.04	2.84	2.73	3.77	5.81	17.12
Carrot	2.05	2.85	2.74	3.71	5.76	17.10
S. Em±	0.01	0.01	0.01	0.01	0.01	0.02
CD at 1%	0.04	0.04	0.03	0.03	0.03	0.08

Instar duration (days)

The results of the instar duration on different hosts and their combinations are presented in the Table 11.

First instar

During first instar, castor + fountain tree, castor + champaca tree, castor + kindal tree and castor were reared on castor and observed the mean larval duration of 1.93 days, 1.93 days, 1.92 days and 1.94 days, respectively whereas Carrot + fountain tree, carrot + champaca tree, carrot + Kindal tree and carrot reared on carrot and recorded a mean larval duration of 2.04 days, 2.05 days, 2.04 days and 2.05 days, respectively. However, the standard check castor (GC-3) was found superior over carrot.

Second instar

During second instar, castor + fountain tree, castor + champaca tree, castor + kindal tree and castor were reared on castor and observed the mean larval duration of 2.72 days, 2.71 days, 2.70 days and 2.72 days, respectively whereas, Carrot + fountain tree, carrot + champaca tree, carrot + Kindal tree and carrot reared on carrot and recorded a mean larval duration of 2.84 days, 2.84 days, 2.84 days and 2.85 days respectively. However, the standard check, castor (GC-3) was found superior over carrot.

Third instar

During second instar, castor + fountain tree, castor + champaca tree, castor + kindal tree and castor were reared on castor and observed the mean larval duration of 2.53 days, 2.52 days, 2.51 days and 2.53 days, respectively whereas Carrot + fountain tree, carrot + champaca tree, carrot + Kindal tree and carrot reared on carrot and recorded a mean larval duration of 2.75 days, 2.73 days, 2.73 days and 2.74 days, respectively. However, the standard check, castor (GC-3) was found superior over carrot.

Fourth instar

The castor (3.62 days) recorded the minimum instar duration followed by carrot (3.71 days). Among the combinations castor + fountain tree (3.64 days) recorded the minimum instar duration followed by castor + Champaca (3.68 days) and castor + kindal tree (3.68 days) which were on par with each other. Among the another combinations, Carrot + fountain tree (3.73 days) recorded the minimum instar duration followed by carrot + Champaca (3.75 days) and carrot + Kindal tree (3.77 days) respectively. However the standard check, castor maintained superiority among all the hosts followed by carrot.

Fifth instar

The castor (5.72 days) recorded the minimum instar duration followed by carrot (5.76 days). Among the combinations castor + fountain tree (5.72 days) recorded the minimum instar duration followed by castor + Champaca (5.73 days) and castor + Kindal tree (5.74 days). Among the another combinations, Carrot + fountain tree (5.77 days) recorded the minimum instar duration followed by carrot + Champaca (5.79 days) and carrot + Kindal tree (5.81 days) respectively. However the standard check, castor maintained superiority among all the hosts followed by castor + fountain tree.

Total instar duration

The castor (16.43 days) recorded the minimum total instar duration followed by carrot (17.10 days) when reared solely. Among the combinations castor + fountain tree (16.54 days) recorded the minimum instar duration followed by castor + champaca (16.56 days) and castor + Kindal tree (16.62 days). Among the combinations carrot + fountain tree (17.10 days) recorded the minimum total instar duration followed by carrot + champaca (17.13 days) and carrot + Kindal tree (17.12 days) respectively. However the standard check castor maintained superiority among all the hosts followed by castor + fountain tree.

Moulting duration (days)

Influence of different host plants and their combinations on the moulting duration at different instars of eri silkworm are presented in the Table 12.

First moult

During first moult, castor + fountain tree, castor + champaca tree, castor + kindal tree and castor recorded the mean moulting duration of 1.47 days,1.46 days, 1.46 days and 1.46 days, respectively whereas, Carrot + fountain tree, carrot + champaca tree, carrot + Kindal tree and carrot recorded a mean first moulting duration of 1.72 days,1.73 days, 1.73 days and 1.72 days, respectively. However, the standard check, castor (GC-3) was found superior over carrot with respect to moulting duration.

Second moult

During second moult castor + fountain tree, castor + champaca tree, castor + kindal tree and castor were recorded the mean moulting duration of 1.54 days,1.55 days, 1.55 days and 1.54 days, respectively whereas Carrot + fountain tree, carrot + champaca tree, carrot + Kindal tree and carrot recorded a mean second moulting duration of 1.55 days,1.56 days, 1.56 days and 1.55 days, respectively. However, the standard check castor (GC-3) was found superior over carrot with respect to moulting duration.

Third moult

During third moult castor + fountain tree, castor + champaca tree, castor + kindal and castor were recorded the mean moulting duration of 1.46 days,1.47 days,1.57 days and 1.40 days, respectively whereas, Carrot + fountain tree, carrot + champaca tree, carrot + Kindal tree and carrot recorded a mean third moulting duration of 1.49 days,1.49 days,1.60 days and 1.44 days, respectively. However, the standard check castor (GC-3) was found superior over carrot with respect to moulting duration.

Fourth moult

Non-significant differences were recorded with regard to moulting duration on both solely reared treatments and combinations. During fourth moult castor + fountain tree, castor + champaca tree, castor + kindal tree and castor were recorded the mean moulting duration of 1.35 days,1.35 days,1.37 days and 1.34 days, respectively whereas, Carrot + fountain tree, carrot + champaca tree, carrot + Kindal tree and carrot recorded a mean moulting duration of 1.35 days,1.36 days,1.37 days and 1.35 days, respectively.

Total moulting duration

Significant differences were recorded with respect to total moulting duration among the hosts and combinations. Castor recorded significantly lower moulting duration of 5.74 days followed by carrot (6.06 days) among the solely reared treatments. Among the combinations castor + fountain tree (5.81 days) recorded the minimum total moulting duration followed by castor + champaca (5.83 days) and castor + Kindal tree (5.96 days). Among the another combinations carrot + fountain tree (6.12 days) recorded the minimum total moulting duration followed by carrot + champaca (6.14 days) and carrot + Kindal tree (6.06 days) respectively. However the standard check, castor maintained superiority among all the hosts followed by castor + fountain tree combination.

The data pertaining to developmental period of eri silkworm on different host plants is presented in the Table 13.

Larval period (days)

When the eri silkworm reared on carrot and castor leaves solely, the lowest larval duration was recorded on castor (21.70 days) followed by carrot (22.94 days).Among the combinations which were fed with castor leaves during 1st instar to 3rd instar and feeding with fountain tree, champaca and Kindal tree leaves from 4th instar to spinning recorded a mean larval duration of 22.35 days, 22.39 days 22.58 days, respectively. Among the second combinations which were fed with carrot leaves during 1st instar to 3rd instar and feeding with fountain tree, Champaca and kindal tree leaves from 4th instar to spinning recorded a mean larval duration of 23.21 days, 23.26 days 23.38 days, respectively. However the standard check, castor (GC-3) recorded the minimum larval duration and found superior among all hosts and combinations followed by castor + fountain tree combination.

Pupal period (days)

Non-significant differences were observed with respect to host plants and their combinations.

Egg period (days)

Non-significant differences were recorded with regard to host plants and their combinations

Total life cycle (days)

When the eri silkworm reared on castor and carrot leaves solely, the duration of life cycle was minimum on castor (47.70 days) followed by carrot (48.94 days).Among the combinations which were fed with castor leaves during 1st instar to 3rd instar and feeding with fountain tree, champaca and Kindal tree leaves from 4th instar to spinning recorded the total life cycle of 48.35 days, 48.39 days and 48.58 days, respectively. Among the second combinations which were fed with carrot leaves from 1st instar to 3rd instar and feeding with fountain tree, champaca and kindal tree leaves from 4th instar to spinning recorded the total life cycle of 49.21 days, 49.26 days 49.38 days respectively. However the standard check castor (GC-3) recorded the lowest life cycle and found superior among all hosts and combinations followed by Castor + fountain tree combination.

Pupation rate (%)

The highest Percent pupation was recorded on castor (97.59%) followed by carrot (89.98%) treatments when the eri silkworm larvae reared solely. Among the combinations, which were fed with castor leaves during 1st instar to 3rd instar and feeding with fountain tree, champaca and kindal tree leaves from 4th instar to spinning recorded the percent pupation of 96.58%, 95.58 and 95.24%, respectively. Among the second combinations, which were fed with carrot leaves during 1st instar to 3rd instar and feeding with fountain tree, champaca and kindal tree leaves from 4th instar to spinning recorded the percent pupation of 93.86, 93.20 and 91.86 per cent, respectively.

Larval survivability (%)

The highest larval survivability was recorded on castor (99.33%) followed by carrot (86%) treatments when the eri silkworm larvae reared solely. Among the combinations which were fed with castor leaves during 1st instar to 3rd instar and feeding with fountain tree, Champaca and Kindal tree leaves from 4th instar to spinning recorded the survivability of 97.67, 96.33 and 96 per cent, respectively. Among the second combinations which were fed with carrot leaves during 1st instar to 3rd instar and feeding with fountain tree, Champaca and Kindal tree leaves from 4th instar to spinning recorded the survivability of 95%, 94.33% and 93%, respectively. However the standard check, castor (GC-3) recorded the highest larval survivability and found superior among all hosts and combinations which was followed by Castor + fountain tree combination.

Effective rate of rearing (%)

The highest effective rate of rearing was recorded on castor (94.67%) followed by carrot (86%) among the solely reared treatments. Among the combinations, which were fed with castor leaves during 1st instar to 3rd instar and feeding with fountain tree, Champaca and Kindal tree leaves from 4th instar to spinning recorded the effective rate of rearing of 94, 93.67 and 93.33 per cent, respectively. Among the second combinations, which were fed with carrot leaves during 1st instar to 3rd instar and feeding with fountain tree, Champaca and Kindal tree leaves from 4th instar to spinning recorded the effective rate of rearing of 91.67, 91.33 and 90.33 per cent respectively. However, the standard check, castor (GC-3) recorded the highest effective rate of rearing and found superior among all hosts and combinations which was followed by Castor + fountain tree combination.

Growth index

The highest growth index was recorded on castor (4.25) followed by carrot (3.61) treatments when the eri silkworm larvae reared solely. Among the combinations, which were fed with castor leaves during 1st instar to 3rd instar and feeding with fountain tree, Champaca and Kindal tree leaves from 4th instar to spinning recorded the growth index of 4.21, 4.18 and 4.14, respectively. Among the second combinations, which were fed with carrot leaves during 1st instar to 3rd instar and feeding with fountain tree, champaca and Kindal tree leaves from 4th instar to spinning recorded growth index of 3.95, 3.93 and 3.86, respectively. However the standard check castor (GC-3) recorded the highest effective rate of rearing and found superior among all hosts and combinations which was followed by Castor + fountain tree combination.

Disease incidence (%)

The disease incidence was noticed only on carrot (10.67%).Other treatments were free from disease incidence.

Table 12: Influence of sequential feeding of host plants on Moulting duration of eri silkworm during September-October-2012

Treatment	1st moult (days)	2nd moult (days)	3rd moult (days)	4th moult (days)	Total moulting duration
Castor + Fountain tree	1.47	1.54	1.46	1.35	5.81
Castor + Champaca tree	1.46	1.55	1.47	1.35	5.83
Castor + Kindal tree	1.46	1.55	1.57	1.37	5.96
Castor	1.46	1.54	1.40	1.34	5.74
Carrot + fountain tree	1.72	1.55	1.49	1.35	6.12
Carrot + champaca tree	1.73	1.56	1.49	1.36	6.14
Carrot + Kindal tree	1.73	1.56	1.60	1.37	6.25
Carrot	1.72	1.55	1.44	1.35	6.06
S. Em±	0.01	0.01	0.01	0.01	0.03
CD at 1%	0.03	0.03	0.03	0.03	0.11

Table 13: Influence of sequential feeding of host plants on different stages of eri silkworm during September-October-2012

Treatment	Larval period (days)	Pupal period (days)	Egg period(days)	Total life cycle (days)	% pupation
Castor + Fountain tree	22.35	18	8	48.35	96.58b (79.36)
Castor + Champaca tree	22.39	18	8	48.39	95.58c (77.88)
Castor + Kindal tree	22.58	18	8	48.58	95.24c (77.41)
Castor	21.70	18	8	47.70	97.59a (81.12)
Carrot + fountain tree	23.21	18	8	49.21	93.86d (75.65)
Carrot + champaca tree	23.26	18	8	49.26	93.20d (74.89)
Carrot + Kindal tree	23.38	18	8	49.38	91.86e (73.43)
Carrot	22.94	18	8	48.94	89.98f (71.58)
S. Em±	0.03	0.00	0.00	0.03	0.48
CD at 1%	0.12	NS	NS	0.12	1.98

Figures in the paranthesis are arc sine transformation
Figures in the same column with similar alphabets do not differ significantly at P = 0.01 by DMRT

Table 14: Influence of sequential feeding of host plants on ERR, survivability, disease incidence and growth index of eri silkworm during September-October-2012

Treatment	Survivability (%)	ERR (%)	Disease incidence (%)	Growth index(E/A)
Castor + fountain tree	97.67b (81.26)	94.00ab (75.82)	0.00 (0.00)	4.21
Castor + champaca tree	96.33c (78.98)	93.67ab (75.43)	0.00 (0.00)	4.18
Castor + kindal tree	96.00cd (78.46)	93.33b (75.05)	0.00 (0.00)	4.14
Castor	99.33a (86.17)	94.67a (76.66)	0.00 (0.00)	4.25
Carrot + fountain tree	95.00de (77.08)	91.67c (73.23)	0.00 (0.00)	3.95
Carrot + champaca tree	94.33e (76.24)	91.33c (72.88)	0.00 (0.00)	3.93
carrot + Kindal tree	93.00f (74.66)	90.33c (71.89)	0.00 (0.00)	3.86
Carrot	86.00g (68.03)	83.67d (66.16)	10.67a (19.06)	3.61
S. Em±	0.36	0.33	0.00	0.01
CD at 1%	1.51	1.37	NS	0.04

Figures in the paranthesis are arc sine transformation
ERR – Effective rate of rearing
Figures in the same column with similar alphabets do not differ significantly at P = 0.01 by DMRT

Cocoon parameters

The data pertaining to Influence of different host plants and their combinations on cocoon parameters is presented in the Table 15.

Cocoon weight (g)

Host plants markedly influenced the cocoon weight. Highest cocoon weight was recorded on castor (2.71g) followed by carrot (1.97g) when reared solely on castor and carrot starting from first instar to spinning. Among the combinations, which were fed with castor leaves during 1st instar to 3rd instar and feeding with fountain tree, champaca and kindal tree leaves from 4th instar to spinning recorded the cocoon weight of 2.66g, 2.63g and 2.60g, respectively. Among the second combinations, which were fed with carrot leaves during 1st instar to 3rd instar and feeding with fountain tree, champaca and kindal tree leaves from 4th instar to spinning recorded the cocoon weight of 2.32g, 2.21g and 2.05g, respectively. However, standard check, castor (GC-3) recorded the highest cocoon weight and found superior among all hosts and combinations which was followed by castor + fountain tree combination.

Pupal weight (g)

Highest pupal weight was recorded on castor (2.34g) followed by carrot (1.70g) when reared solely on castor and carrot starting from first instar to spinning. Among the combinations, which were fed with castor leaves during 1st instar to 3rd instar and feeding with fountain tree, champaca and kindal tree leaves from 4th instar to spinning recorded the pupal weight of 2.28g, 2.25g and 2.22g, respectively. Among the second combinations, which were fed with carrot leaves during 1st instar to 3rd instar and feeding with fountain tree, champaca and kindal tree leaves from 4th instar to spinning recorded the pupal weight 1.89g, 1.87g and 1.84g, respectively. However standard check castor (GC-3) recorded the highest pupal weight and found superior among all hosts and combinations followed by castor + fountain tree combination.

Shell weight (g)

Highest shell weight was recorded on castor (0.35g) followed by carrot (0.22g) when reared solely on castor and carrot starting from first instar to spinning. Among the combinations, which were fed with castor leaves during 1st instar to 3rd instar and feeding fountain tree, champaca and kindal tree leaves from 4th instar to spinning recorded the shell weight of 0.32g, 0.31g and 0.30g respectively. Among the second combinations, which were fed with carrot leaves during 1st instar to 3rd instar and feeding with fountain tree, champaca and kindal tree leaves from 4th instar to spinning recorded the shell weight 0.27g, 0.25g and 0.23g, respectively. However, standard check, castor (GC-3) recorded the highest shell weight and found superior among all hosts and combinations which was followed by castor + fountain tree combination.

Shell ratio (%)

The highest shell ratio was recorded on castor (12.81%) followed by carrot (11.34%) treatments when the eri silkworm larvae reared solely. Among the combinations, which were fed with castor leaves during 1st instar to 3rd instar and feeding with fountain tree, Champaca and Kindal tree leaves from 4th instar to spinning recorded the shell ratio of 12.05%, 11.79% and 11.55%, respectively. Among the second combinations which were fed with carrot leaves during 1st instar to 3rd instar and feeding with fountain tree, Champaca and Kindal tree leaves from 4th instar to spinning recorded the shell ratio of 11.62, 11.48 and 11.36 per cent, respectively. However the standard check, castor (GC-3) recorded the highest shell ratio and found superior among all hosts and combinations which was followed by Castor + fountain tree combination.

Moth emergence (%)

The highest percent moth emergence was recorded on castor (95.24%) followed by carrot (93.21%) treatments when the eri silkworm larvae reared solely. Among the combinations, which were fed with castor leaves during 1st instar to 3rd instar and feeding with fountain tree, Champaca and Kindal tree leaves from 4th instar to spinning recorded the percent moth emergence of 95.24, 94.02 and 92.40 per cent, respectively. Among the second combinations, which were fed with carrot leaves during 1st instar to 3rd instar and feeding with fountain tree, Champaca and Kindal tree leaves from 4th instar to spinning recorded the percent moth emergence of 93.88%, 93.08% and 92.95%, respectively. However the standard check, castor (GC-3) recorded the highest percent moth

emergence and found superior among all hosts and combinations which was followed by Castor + fountain tree combination.

Normal moth (%)

The maximum and minimum normal moth percent was recorded on castor (99.60%) and carrot (96.88%) respectively. treatments when the eri silkworm larvae reared solely. Among the combinations, which were fed with castor leaves during 1st instar to 3rd instar and feeding with fountain tree, Champaca and Kindal tree leaves from 4th instar to spinning recorded the percent normal moth emergence of 98.33, 98.30 and 98.27 per cent, respectively. Among the second combinations, which were fed with carrot leaves during 1st instar to 3rd instar and feeding with fountain tree, Champaca and Kindal tree leaves from 4th instar to spinning recorded the percent normal moth emergence of 97.39, 97.36 and 96.88 per cent, respectively. However the standard check, castor (GC-3) recorded the highest percent normal moth emergence and found superior among all hosts and combinations which was followed by Castor + fountain tree combination.

Deformed moth (%)

The highest deformed moth percent was recorded on carrot (3.09%) and it was lowest on castor (0.40%) treatments when the eri silkworm larvae reared solely. Among the combinations, which were fed with castor leaves during 1st instar to 3rd instar and feeding with fountain tree, Champaca and Kindal tree leaves from 4th instar to spinning, castor followed by fountain tree (1.67%) recorded the lowest percent of deformed moth which was followed by the respective combinations of Champaca (1.70%) and Kindal tree (1.73%) . Among the second combinations, which were fed with carrot leaves, castor followed by Fountain tree (2.61%) recorded the lowest percent of deformed moth which was followed by the respective combinations of champaca (2.64%) and Kindal tree (2.67%). However the standard check, castor (GC-3) recorded the lowest deformed moth percent and found superior among all hosts and combinations which was followed by Castor + fountain tree combination.

Fecundity and hatching percentage

The data on the first, second, third day laid eggs, total eggs, fertile egg, unfertile egg, and hatching (%) were presented in Table 17.

First day laid egg

Significant differences were found in respect of 1st day laid eggs. The castor (178eggs/moth) recorded the highest first day laid eggs and carrot (136.33eggs/moth) recorded the lowest first day laid eggs. Among the combinations, castor + fountain tree (170.67) recorded the highest first day laid eggs followed by castor + champaca (161) and castor + kindal tree (154). Significant reduction was noticed when the same hosts were reared in combination with carrot. Among the combinations, carrot + fountain tree (154) recorded the highest number of first day laid eggs followed by carrot + champaca (147.67) and carrot + kindal tree (144.67) respectively. However the standard check, castor maintained superiority among all the hosts and combinations followed by castor + fountain tree.

Second day laid egg

Significant differences were found in respect of second day laid eggs. The castor (125) recorded the highest second day laid eggs and carrot (104.67) recorded the lowest second day laid eggs. Among the combinations, castor + fountain tree (119) recorded the highest second day laid eggs followed by castor + champaca (115.33) and castor + kindal tree (113). Significant reductions were not noticed with respect to second laid eggs when the same hosts were reared in combination with carrot. Among the combinations, carrot + fountain tree (112) recorded the highest number of second day laid eggs followed by carrot + champaca (110.33) and carrot + kindal tree (108), respectively. However the standard check castor maintained superiority among all the hosts and combinations followed by castor + fountain tree.

Third day laid egg

Significant differences were found in respect of third day laid eggs. The castor (36) recorded the highest third day laid eggs and carrot (24.33) recorded the lowest third day laid eggs. Among the combinations, castor + fountain tree (31.67) recorded the highest third day laid eggs followed by castor + champaca (28.33) and castor + kindal tree (27.33). Significant reductions were not noticed with respect to third day laid eggs when the same hosts were reared in combination with carrot. Among the combinations, carrot + fountain tree (27.33) recorded the highest number of third day laid eggs followed by carrot + Champaca (26.67) and carrot + kindal tree (24.33) respectively. However the standard check, castor maintained superiority among all the hosts and combinations followed by castor + fountain tree.

Table 15: Influence of sequential feeding of host plants on cocoon parameters during September-October-2012

Treatment	Cocoon weight (g)	Pupal weight (g)	Shell weight (g)	Shell ratio (%)
Castor + Fountain tree	2.66	2.28	0.32	12.05b (20.31)
Castor + Champaca tree	2.63	2.25	0.31	11.79c (20.08)
Castor + Kindal tree	2.60	2.22	0.30	11.55d (19.87)
Castor	2.71	2.34	0.35	12.81a (20.97)
Carrot + fountain tree	2.32	1.89	0.27	11.62bc (19.93)
Carrot + champaca tree	2.21	1.87	0.25	11.48bc (19.80)
Carrot + Kindal tree	2.05	1.84	0.23	11.36bc (19.70)
Carrot	1.97	1.70	0.22	11.34bc (19.67)
S. Em±	0.01	0.01	0.01	0.17
CD at 1%	0.03	0.04	0.03	0.71

Figures in the paranthesis are arc sine transformation
Figures in the same column with similar alphabets do not differ significantly at P = 0.01 by DMRT

Table 16: Effect of sequential feeding of host plants on moth emergence, deformity of eri silkworm during September-October-2012

Treatments	Moth emergence (%)	Normal moth (%)	Deformed moth (%)
Castor + Fountain tree	95.24b (77.40)	98.33b (82.69)	1.67 (7.31)
Castor + Champaca tree	94.02c (75.85)	98.30b (82.62)	1.70 (7.38)
Castor + Kindal tree	92.40d (74.01)	98.27b (82.55)	1.73 (7.45)
Castor	98.03a (82.02)	99.60a (87.91)	0.40 (2.09)
Carrot + fountain tree	93.88c (75.67)	97.39c (80.71)	2.61 (9.29)
Carrot + champaca tree	93.03cd (74.71)	97.36c (80.64)	2.64 (9.36)
Carrot + Kindal tree	93.21cd (74.90)	97.58c (81.14)	2.67 (8.86)
Carrot	92.95cd (74.61)	96.88d (79.87)	3.09 (10.12)
S. Em±	0.32	0.15	0.02
CD at 1%	1.33	0.62	0.09

Figures in the paranthesis are arc sine transformation
Figures in the same column with similar alphabets do not differ significantly at P = 0.01 by DMRT

Fecundity

Significant differences were found with respect to fecundity. The castor (339) recorded the highest fecundity and carrot (267.33) recorded the lowest fecundity. Among the combinations, castor + fountain tree (321.33) recorded the highest fecundity followed by castor + champaca (304.67) and castor + kindal tree (294.33). Significant reductions were not noticed with respect to fecundity when the same hosts were reared in combination with carrot. Among other combinations, Carrot + fountain tree (293.33) recorded the highest number of fecundity followed by carrot + champaca (284.67) and carrot + Kindal tree (278.34) respectively. However the standard check, castor maintained superiority among all the hosts and combinations followed by castor + fountain tree.

Fertile egg

Significant differences were found with respect to fertile eggs. The castor (328.67) recorded the highest number of fertile eggs whereas the number of fertile eggs on carrot (240.33) was low. Among the combinations, castor + fountain tree (309.00) recorded the highest number of fertile eggs followed by castor + Champaca (289.67) and castor + Kindal tree (278). Significant reductions were noticed with respect to fertile eggs when the same hosts were reared in combination with carrot. Among the combinations, Carrot + fountain tree (274.67) recorded the highest number of fertile eggs followed by carrot + Champaca (261.67) and carrot + Kindal tree (253.67), respectively. However the standard check, castor maintained superiority among all the hosts and combinations followed by castor + fountain tree.

Unfertile egg

Significant differences were found with respect to unfertile eggs. The castor (10.33) recorded the lowest number of unfertile eggs whereas the number of unfertile eggs on carrot (27) was highest. Among the combinations, castor + fountain tree (12.33) recorded the lowest number of unfertile eggs followed by castor + Champaca (15.00) and castor + Kindal tree (16.33). Significant reductions were noticed with respect to unfertile eggs when the same hosts were reared in combination with carrot. Among other combinations, carrot + fountain tree (18.67) recorded the lowest number of unfertile eggs followed by carrot + champaca (23.00) and carrot + kindal tree (24.67) respectively. However the standard check castor maintained superiority among all the hosts and combinations followed by castor + fountain tree.

Hatchability (%)

The castor (95.50%) recorded the highest hatchability whereas the lowest hatchability was recorded on carrot (89.90%). Among the combinations, castor + fountain tree (95.23%) recorded the highest hatchability followed by castor + champaca (95.08) and castor + Kindal tree (94.45%). Among other combinations, carrot + fountain tree (93.64%) recorded the highest hatchability followed by carrot + champaca (91.86%) and carrot + kindal tree (91.07%), respectively. However, the standard check, castor maintained superiority among all the hosts and combinations followed by castor + fountain tree.

Effect of host plants on size of eri silkworm

The data on adult wing expanse and adult longevity of male and female are presented in the Table 18.

Wing expanse of male moth (cm)

The castor (10.90) recorded the highest Adult male wing expanse whereas the lowest wing expanse was recorded on carrot (10.13). Among the combinations, (castor + fountain tree) (10.80) recorded the highest wing expanse which was on par with castor + champaca (10.80) and castor + Kindal tree (10.77). Among the another combinations, carrot + fountain tree (10.47) recorded the highest male wing expanse which was on par with carrot + champaca (10.47) and carrot + kindal tree (10.43) respectively. However the standard check, castor maintained superiority among all the hosts and combinations followed by castor + fountain tree.

Wing expanse of female (moth)

The castor (11.87) recorded the highest adult female wing expanse whereas the lowest female wing expanse was recorded on carrot (10.77). Among the combinations, castor + fountain tree (11.57) recorded the highest female wing expanse which was followed by castor + champaca (11.50) and castor + kindal tree (11.47). Among the combinations carrot + fountain tree (11.37) recorded the

highest female wing expanse which was followed by carrot + champaca (11.33) and carrot + Kindal tree (11.23), respectively. However the standard check, castor maintained superiority among all the hosts and combinations followed by castor + fountain tree.

Longevity of male moth (Days)

The castor (8.00days) recorded the highest adult male longevity whereas the lowest adult longevity was recorded on carrot (6.50 days). Among the combinations castor + fountain tree (7.00days) recorded the highest wing expanse followed by castor + champaca (6.83days) which was on par with castor + Kindal tree (6.83days). Among other combinations, carrot + fountain tree (7.33days) recorded the highest longevity of male which was followed by carrot + champaca (7.00days) and carrot + kindal tree (6.67days), respectively. However the standard check, castor maintained superiority among all the hosts and combinations followed by castor + fountain tree.

Longevity of female moth (Days)

The castor (10.00days) recorded the highest adult female longevity whereas the lowest adult longevity was recorded on carrot (8.83days). Among the combinations, castor + fountain tree (9.00 days) recorded the highest wing expanse which was on par with castor + champaca (9.00 days) and castor + kindal tree (9.00 days). Among the another combinations, Carrot + fountain tree (9.00) recorded the on par longevity with carrot + champaca (9.00days) and carrot + kindal tree (9.00days), respectively. However the standard check, castor maintained superiority among all the hosts and combinations followed by castor + fountain tree.

Table 17: Influence of sequential feeding of host plants on number of eggs and hatchability of eri silkworm during September-October-2012

Treatment	1st day laid egg	2nd day laid egg	3rd day laid egg	Total number of eggs	Fertile egg	Unfertile egg	% hatching
Castor + Fountain tree	170.67b	119.00b	31.67b	321.33b	309.00b	12.33g	95.23a (77.38)
Castor + Champaca tree	161.00c	115.33c	28.33c	304.67c	289.67c	15.00f	95.08a (77.18)
Castor + Kindal tree	154.00d	113.00d	27.33cd	294.33d	278.00d	16.33e	94.45ab (76.38)
Castor	178.00a	125.00a	36.00a	339.00a	328.67a	10.33h	95.50a (77.79b)
Carrot + fountain tree	154.00d	112.00d	27.33cd	293.33d	274.67e	18.67d	93.64c (75.39)
Carrot + champaca tree	147.67e	110.33e	26.67de	284.67e	261.67f	23.00c	91.86c (73.43)
Carrot + Kindal tree	144.67f	108.00f	25.67e	278.34f	253.67g	24.67b	91.07cd (72.62)
Carrot	136.33g	104.67g	24.33f	267.33g	240.33h	27.00a	89.90d (71.47)
S. Em±	0.66	0.35	0.31	0.37	0.50	0.26	0.32
CD at 1%	2.71	1.46	1.29	1.54	2.07	1.09	1.34

Figures in the paranthesis are arc sine transformation
Figures in the same column with similar alphabets do not differ significantly at P = 0.01 by DMRT

Table 18: Effect of sequential feeding of host plants on longevity and size of eri silkworm during September-October-2012

Treatment	Adult wing expanse (cm) (Size of moth)		Adult longevity in days	
	Male	Female	Male	Female
Castor + Fountain tree	10.80	11.57	7.00bc	9.00b
Castor + Champaca tree	10.80	11.50	6.83bc	9.00b
Castor + Kindal tree	10.77	11.47	6.83bc	9.00b
Castor	10.90	11.87	8.00a	10.00a
Carrot + fountain tree	10.47	11.37	7.33b	9.00b
Carrot + champaca tree	10.47	11.33	7.00bc	9.00b
Carrot + Kindal tree	10.43	11.23	6.67bc	9.00b
Carrot	10.13	10.77	6.50c	8.83b
S. Em±	0.03	0.03	0.16	0.06
CD at 1%	0.14	0.13	0.64	0.24

Figures in the same column with similar alphabets do not differ significantly at P = 0.01 by DMRT

DISCUSSION

The results of the experiments on rearing performance of eri silkworm *Samia cynthia ricini* boisduval on different species of terminalia and other hosts and its impact on cocoon qualityare discussed here under.

5.1 The growth and development of eri silkworm on different species of *Terminalia* and other host plants.

Larval weight

The leaves of different host plants fed to eri silkworm starting from hatching till ripening stage, exhibited considerable differences in respect of mature larval weight. The significantly maximum mature larval weight was recorded on castor (4.62g) followed by fountain tree (4.48g) and Champaca (4.47 g) which were on par with each other. Other hosts recorded the mature larval weight in the range of 3.62-3.89g.The lowest mature larval weight was recorded on red plumeria (3.12g). The present results are comparable with the earlier studies by Manjunath naik (2008),who recorded the maximum mature larval weight on castor (4.55g) followed by fountain tree (4.45),banyan tree (4.01g),Indian almond (3.87g) and lowest mature larval weight was recorded on carrot (3.60g). These results are in line with the Raja Ram and Saratchandra (1998) who observed highest mature larval weight of 5.80 g on castor followed by 5.30 g on kesseru and it was lowest (4.90 g) on phutkoul. The results are also comparable with Neelu Nangia et al. (2000) who reported the mature larval weight (52.60g/10) on castor followed by (50.05g/10) on barkesseru, (49.80g/10) on gulancha, (48.50/10g) on tapioca and was minimum when fed on papaya (45.20/10g). Patil et al. (2008) reported the mature larval weight of 4.5 to 5 g on fountain tree in the present study the larval weight of 4.5 g on fountain tree is in agreement with the variation may be due to palatability and quality character of host leaf (Fig. 1).

Larval period

The new host plants of eri silkworm had significant influence on larval period. It was significantly minimum on castor (21.67 days) which was on par with carrot (22.96 days). However other hosts recorded the average larval period of 27 to 32.32 days. The maximum larval duration was recorded on red plumeria (35.95 days). The present results are comparable with the earlier studies by Manjunath naik (2008),who recorded the minimum larval duration on castor (21.50 days) which was on par with carrot (22.50 days) followed by fountain tree (27.05 days),banyan tree (28.25 days) and Indian almond (28.50 days) . The present results are in close accordance with the Reddy *et al. (*1989) who observed that the larval duration was minimum (22.63 days) on castor and it was maximum (37.33 days) on *A. excels,* 31.58 days on tapioca, 31.27 days on red plumeria leaves. The present results are in close accordance with the report of Rajesh Kumar and Gangavar (2010), who observed that the larval duration was minimum on castor (20 days) followed by, tapioca (21.12 days), barera (22 days) and papaya (24 days). Raja Ram and Saratchandra (1998) observed minimum larval duration of 20 days on castor followed by 24 days on kesseru and it was maximum (29 days) on phutkoul at Titabar region during January-February. Difference of present findings might be due to the host either to differential nutritional constituent of the host leaf or selective preference, conversion efficiency exerted by the insect itself and rearing period. Patil (2004) also reported that larval period was more on champaca compared to castor (Fig. 4).

Total Instar duration

The total instar duration was significantly minimum on castor (16.47 days) followed by carrot leaves (17.09 days),fountain tree (19.59 days), kindal tree (21.41 days), Champaca (21.45 days) and Indian almond (21.94 days),whereas maximum instar duration was noticed on red plumeria (26.21 days) which was followed by kindal tree (23.09 days) and arjun tree (23.77 days). More or less similar results were reported by Manjunath naik (2008), who recorded the lowest total instar duration on castor (15.99 days) which was followed by fountain tree (19.87 days), banyan tree (20.79 days), Indian almond (20.97 days) and carrot (16.64 days) (Fig. 2).

Total moulting duration

Total moulting duration was significantly minimum on castor leaves (5.68 days) followed by carrot (6.07 days), fountain tree (7.42 days) and Champaca (7.61 days), kindal tree (7.84 days),Indian almond (7.95 days), arjun tree (8.15 days) and asan tree (8.54 days). Highest moulting duration was.

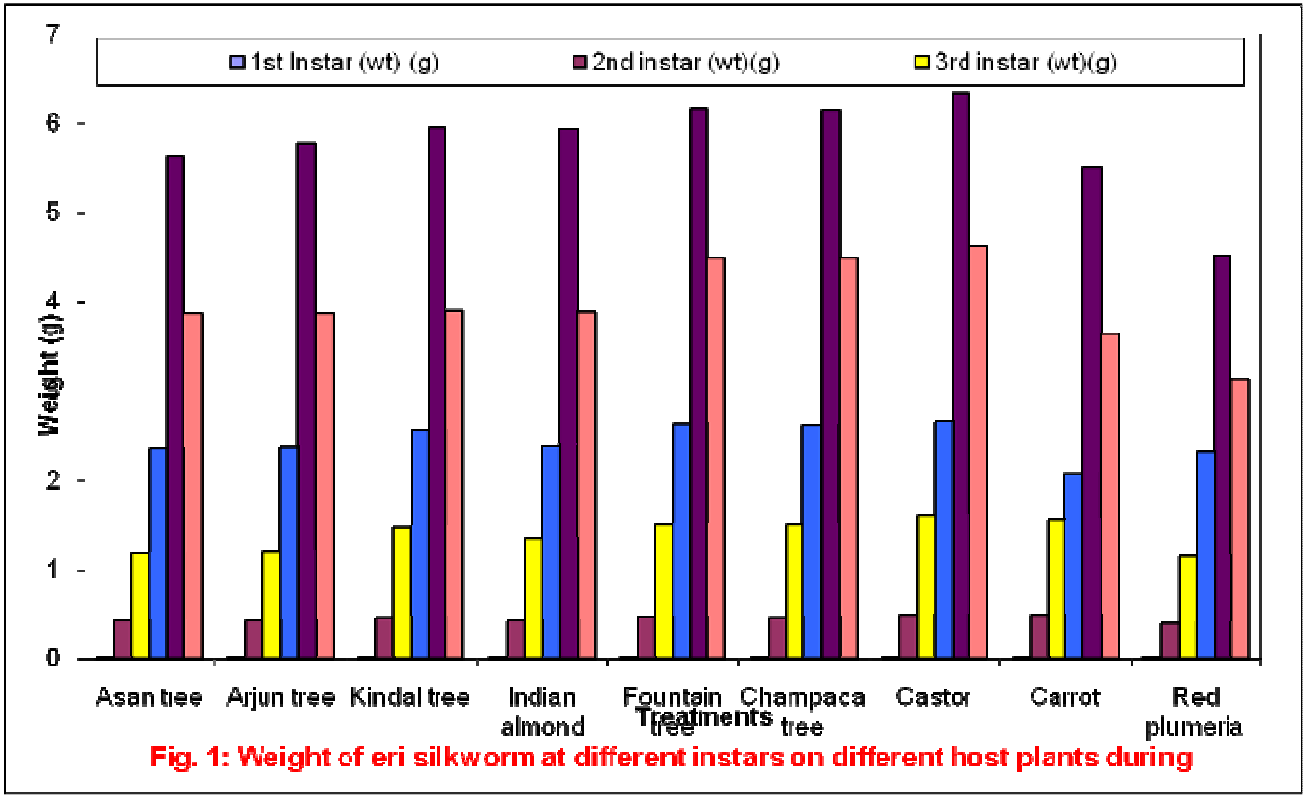

Fig. 1: Weight of eri silkworm at different instars on different host plants during July-August-2012

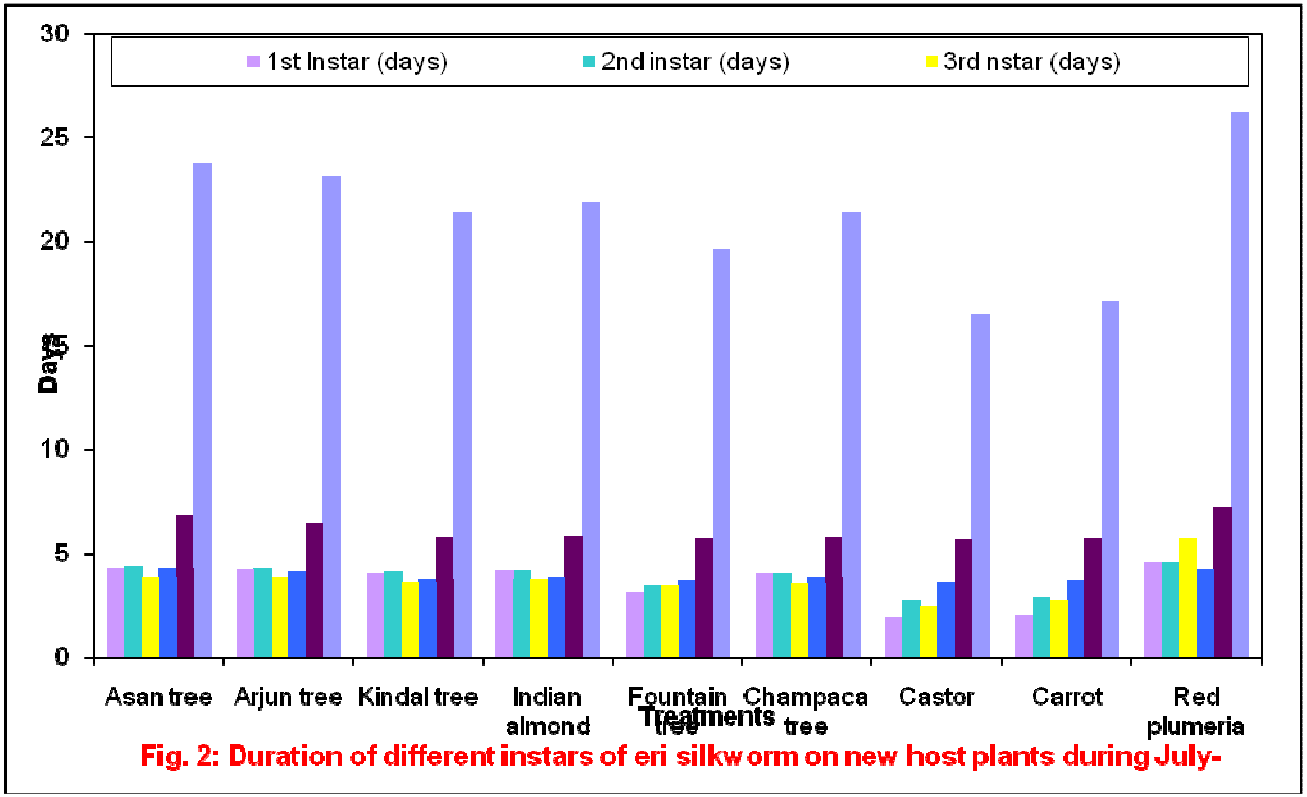

Fig. 2: Duration of different instars of eri silkworm on new host plants during July-August-2012

recorded on red plumeria (9.73 days).The present results are comparable with the Manjunath naik (2008),who recorded the lowest moulting duration on castor (5.50 days) which was followed by fountain tree (7.17 days),banyan tree (7.45 days), Indian almond (7.53 days) and carrot (5.60 days) (Fig. 3).

Pupal period

Significant differences were not observed on the pupal period with respect to host plants. Pupal period was 18 days on all the hosts except red plumeria on which it was 19 days. There was not much influence of host plants on the pupal period. The present results are comparable with Manjunath naik (2008), who recorded the pupal period of 18 days on castor, fountain tree, banyan tree and carrot. Ravishankar *et al*. (2000) reported the pupal period of 17.70, 18.00 and 18.80 days. Choudhary (1982) recorded pupal duration of 13.0 to 18.0 days under Assam condition. The pupal duration of 18 days on new hosts are in agreement with Patil (2004) who recorded pupal duration of 18 days on champaca and castor leaves. The significant differences in pupal duration on different host plants might be due to the different nutritional contents of host plants (Fig. 4).

Egg period (days)

Non-significant differences were observed on the egg period with respect to host plants. Egg period was 8 days on all the hosts except red plumeria on which it was 9 days. The present results are comparable with Manjunath naik (2008), who recorded the egg period of 8 days on castor, fountain tree, banyan tree and carrot. Basaiah (1988) reported the incubation period of 8.00 days on Aruna and RC- 8 castor cultivar. According to Patil and Savanurmath (1994) the incubation period was of 9-10 days. Sannappa (1997) reported the shortest incubation period (8 days) in case of Aruna and RC-8. Patil (2004) recorded egg period of 8 days on Champaca and castor leaves. The difference might be due to differences in weather conditions and influence of method of feeding and optimum temperature and relative humidity maintained in the laboratory (Fig. 4).

Total life cycle (days)

Significant differences were found with respect to total life cycle of eri silkworm. Shortest life cycle was recorded on eri worms fed with castor leaves (47.67 days) which were on par with carrot leaves (48.96 days). Other hosts recorded the life cycle of 55-58.32 days. The maximum larval duration was recorded on red plumeria (35.95 days). The present results are comparable with the earlier studies by Manjunath Naik (2008), who recorded the minimum total life cycle on castor (47.67 days) which was on par with carrot (48.96 days) followed by fountain tree (53.05 days), banyan tree (54.25 days) and Indian almond (54.50 days). The present results are comparable with the earlier report of Thangavelu and Barah (1986) who reported the life cycle of 45.0 and 50.0 days during summer and winter, respectively. The eri silkworm completes life cycle in 46.49, 63.18, 61.73 and 72.06 days when larvae/were fed on castor, tapioca red plumeria and *A. excelsa*, respectively (Reddy *et al*., 1989). The difference might be due to agro climatic condition, quantity and quality of the leaves provided and the different host plants used for rearing (Fig. 4).

Larval survivability

Different host plants leaves fed to eri silkworm had profound effect on larval survivability. The significantly maximum larval survivability was observed on castor (99.33%) which was followed by fountain tree (96.67%), Champaca (96%) and Indian almond (96%). Other hosts like arjun tree (92.33%) and asan tree (92.67%) recorded the lower larval survivability than other hosts. The present results are in line with Manjunath naik (2008),who recorded the maximum larval survivability on castor (99.17%) which was followed by fountain tree (98.84% days),banyan tree (97.99%) and Indian almond (96.67%) and it was lowest on carrot (82.50%).However it was significantly minimum on carrot leaves (82.50%) which was on par with *P.rubra* (82.67%). The results are comparable with the reports placed on record by Thangavelu and Phulon (1983) observed larval survivability of 96, 84, 72 and 56 per cent, on castor. tapioca, red plumeria and *A. excelsa*, respectively. Sannappa (1997) reported 99.20 per cent on GC-3 castor genotype. The variations of the present findings are due to qualitative character of the leaf (Fig. 5).

Effective rate of rearing (ERR)

New host plants had significant effect on the effective rate of rearing. Significantly higher effective rate of rearing (96.67%) was observed on castor followed by fountain tree (95.33%) and champaca (95.33%).Other hosts recorded the effective rate of rearing in the range of 86.67-93.33%. Significantly lower effective rate of rearing was observed on carrot (82.33%) which was on par with

red plumeria (82.67%). The present results are comparable with the earlier studies by Manjunath naik (2008), who recorded the maximum effective rate of rearing on castor (96.50%) which was followed by fountain tree (96.25%), banyan tree (94.40%) and Indian almond (94.65%). According to Thangavelu and Phulon (1983), the ERR varied as different host plants. It was 77.5, 79.5, 74.5 and 65.0 per cent on castor, kesseru, tapioca and barkesseru hosts, respectively. Neelu Nangia *et al*. (2000) reported more ERR on castor (94.65%) followed by tapioca (77.25%), barkesseru (77.20%), and gulancha (64.8%) was minimum when fed on papaya (61.49%). According to Debaraj *et al*. (2003) the ERR on payam was 58 per cent during May-June and 93.33 per cent in November. It may be due to the increase in crude protein, calcium and phosphorus, content as the leaves mature and crude fibre content is highest during the monsoon season (Fig. 5).

Growth index

Significant difference was observed in growth index of eri silkworm with respect to host plants. Significantly maximum growth index was observed with castor (4.36) followed by carrot (3.56), fountain tree (3.53) and champaca (3.28).Other hosts recorded the the growth index in the range of 2.30-3.19. The present results are comparable with the earlier studies by Manjunath naik (2008),who recorded the maximum growth index on castor (4.44) followed by fountain tree (4.41),banyan tree (4.36) and Indian almond (4.35) and it was lowest on carrot (3.74). Present findings are comparable with Dayashankar (1982) who recorded the growth index of 4.630, 2.940, 2.940 and 2.050, on castor, tapioca, white plumeria, red plumeria, respectively. Reddy *et al. (*1989) reported growth index of 2.06, 1.33, 1.17 and 0.77 on castor, tapioca, red plumeria and *A. excelsa*, respectively. The variation in growth index may be due to nutritional content of leaves and seasonal variations (Fig. 5).

Cocoon weight

Notable differences were recorded with respect to cocoon weight due to the influence of the different host plants. Significantly higher cocoon weight was recorded on castor (2.71g) which was on par with fountain tree (2.68g) followed by champaca (2.61g).Other hosts recorded the cocoon weight in the range between 2.13 to 2.35g.

However, Significantly lowest cocoon weight was on red plumeria (1.62g) followed by carrot (1.96 g).The present results are in line with Manjunath naik (2008),who recorded the maximum cocoon weight on castor (2.74g) followed by fountain tree (2.72g),banyan tree (2.38) and Indian almond (2.34). Results are in broad agreement with the observation of Devaiah and Dayashankar (1982) who reported highest cocoon weight (2.421 g) on castor and lowest on red plumaria (1.529 g). Neelu Nangia *et al. (*2000) cocoon weight was 2.11, 1.99, 1.88, 1.87 and 1.77 g, on castor, barkesseru, tapioca, gulancha and papaya, respectively. Kar *et al. (*2000) reported that cocoon weight highest a winter (2.68 g) and lowest (2.56g) was summer. Patil (2004) reported highest cocoon weight on champaca (2.36 g) and lowest was on local castor (1.98 g).Further Patil *et al. (*2008) reported cocoon weight of 2.80 g on fountain tree. The variation may be due to an impact of nutrition as influenced by these host plants (Fig. 6).

Pupal weight

Marked variations were found in respect of pupal weight among different host plants of eri silkworm. Notably highest pupal weight was registered on castor (2.34 g) which was on par with fountain tree (2.29 g) and it was lowest on red plumeria (1.33g). Other hosts recorded the pupal weight between the ranges of 1.67- 1.98g. The present results were in agreement with the earlier studies by Manjunath naik (2008), who recorded the maximum pupal weight on castor (2.33g) followed by fountain tree (2.32g), banyan tree (2.09g) and Indian almond (2.06g) and lowest was on carrot (1.65g).The results are also comparable with the earlier report of Devaiah and Dhayashankar (1982) who observed that the pupal weight depends on type of hosts provided for the worms. The highest single pupal weight (2.153g) was recorded on castor and lowest on red pumeria (1.403g). Neelu Nangia *et al*. (2000) reported the pupal weight of 1.79, 1.76, 1.68, 1.63 and 1.68 g on castor, barkesseru, tapioca, gulanch and papaya, respectively. Debaraj *et al. (*2003) observed that the maximum pupal weight (2.94 g) on castor followed by 2.61 g on tapioca, 2.50 g on payam and 2.43 g on kesseru reared during November month. Patil (2004) reported highest pupal weight on champaca (2.095g) and lowest was on local castor (1.729g).Likewise Patil *et al. (*2008) reported pupal weight of 2.50g on fountain tree. The variation may be due to nutritional content of the host plant (Fig. 6).

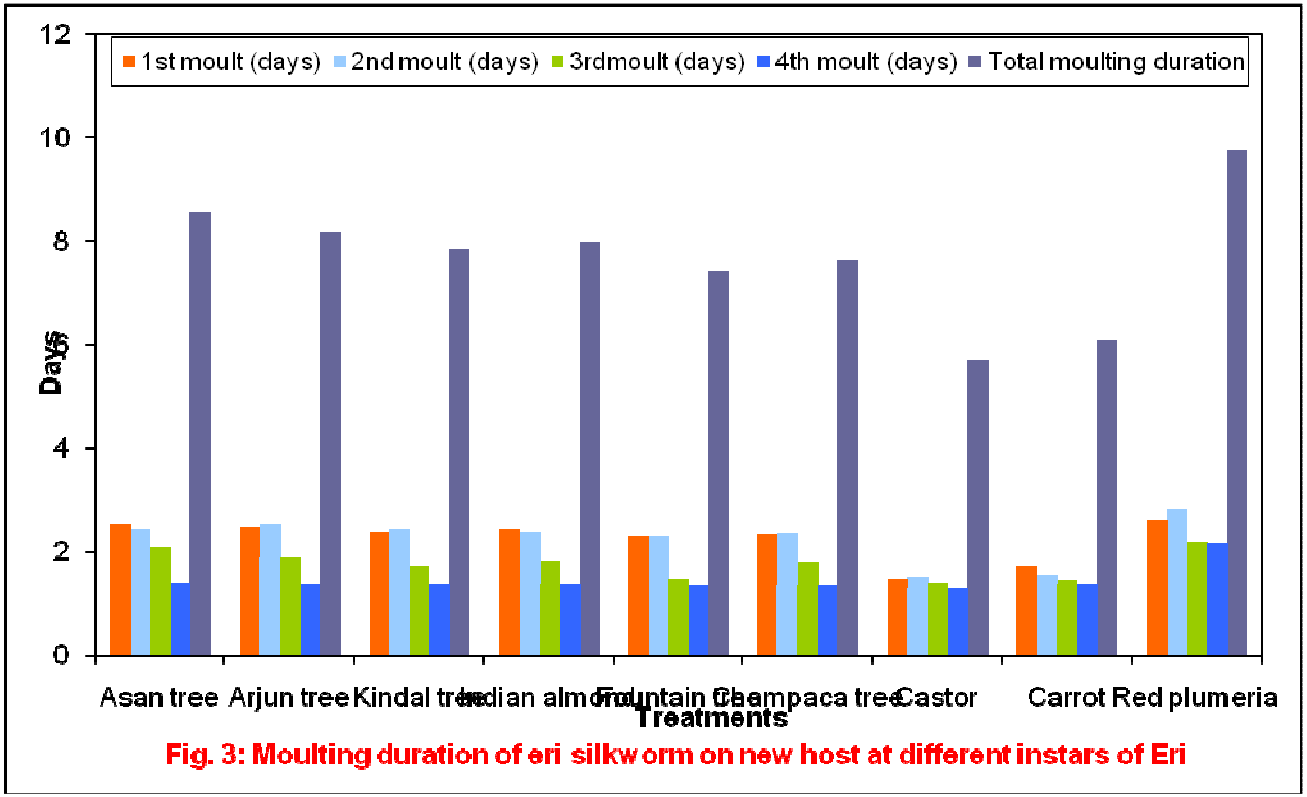

Fig. 3: Moulting duration of eri silkworm on new host at different instars of Eri silkworm during July-August-2012

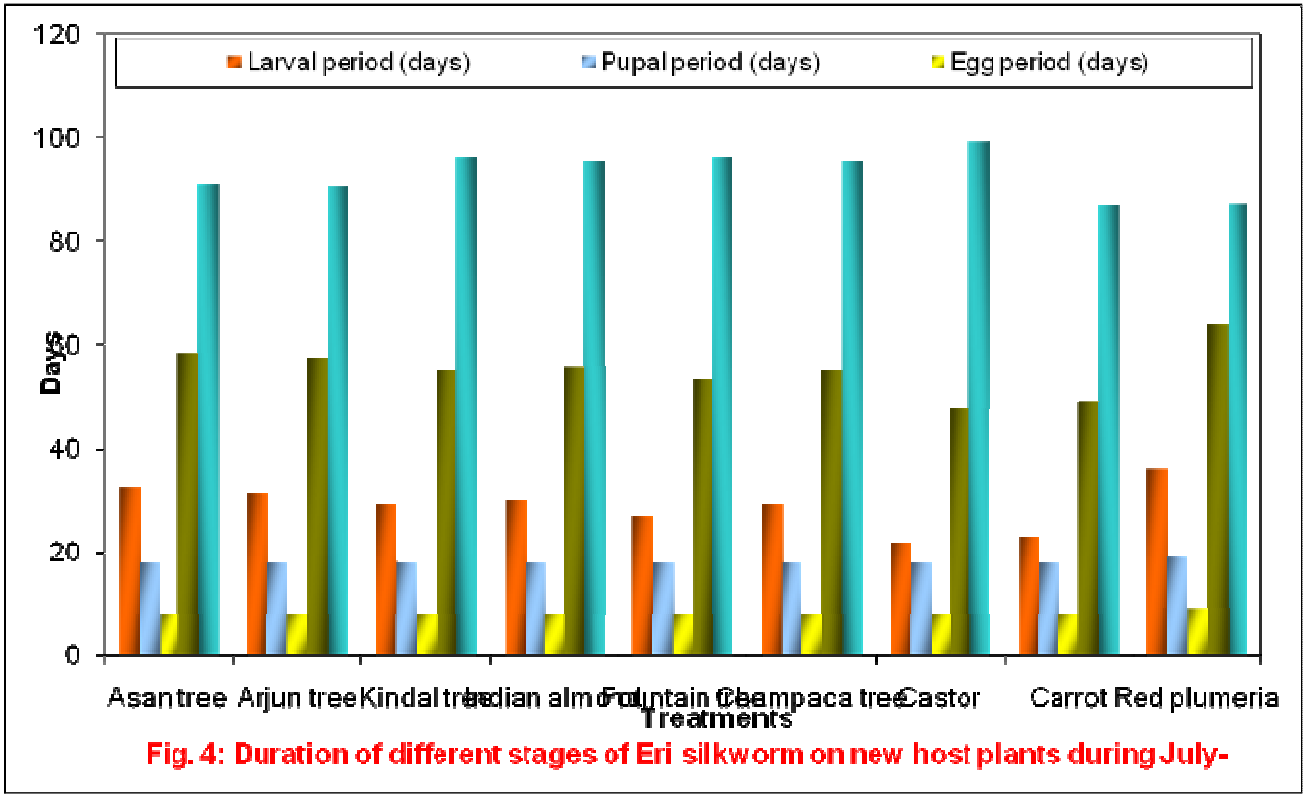

Fig. 4: Duration of different stages of Eri silkworm on new host plants during July-August-2012

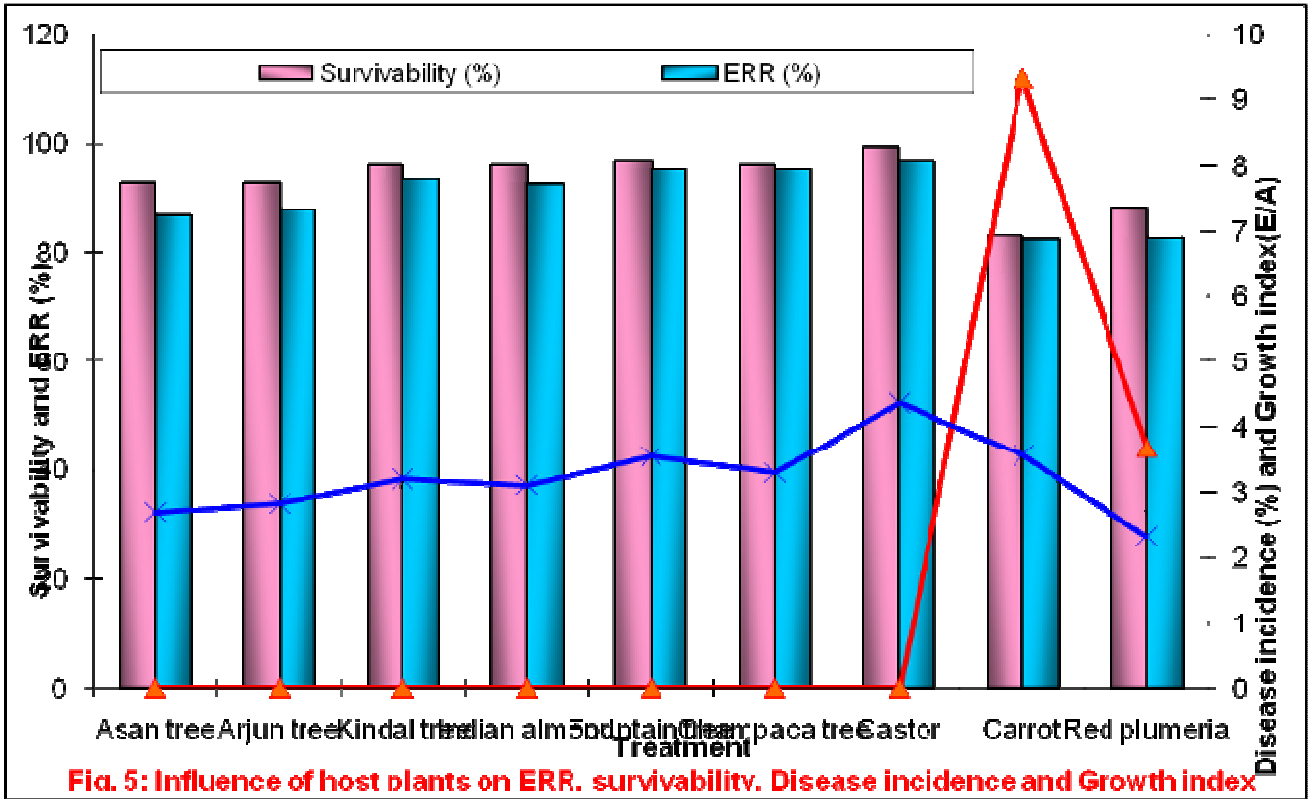

Fig. 5: Influence of host plants on ERR, survivability, Disease incidence and Growth index of Eri silkworm during July-August-2012

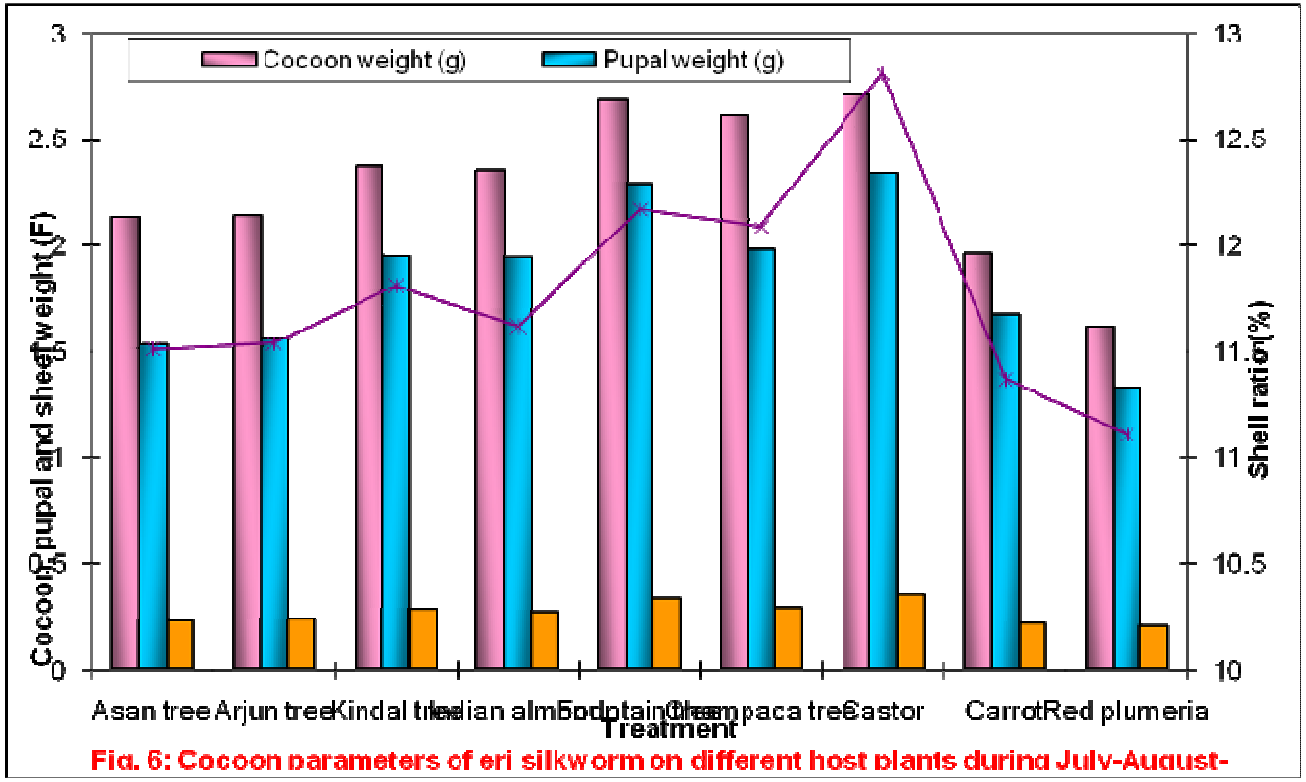

Fig. 6: Cocoon parameters of eri silkworm on different host plants during July-August-2012

Shell weight

Host plants have significant effect on the shell weight. Significantly highest shell weight was recorded on castor (0.35g) which was on par with fountain tree (0.33 g) and it was lowest on red plumeria (0.21g). Other hosts recorded the shell weight between the ranges of 0.22-0.28g. The present results are comparable with the Manjunath naik (2008),who recorded the maximum shell weight on castor (0.35g)which was followed by fountain tree (0.34g),banyan tree (0.28g) and Indian almond (0.27g) and it was lowest on carrot (0.21g).The results are comparable with the report of Reddy *et al*. (1989) who observed the highest shell weight of 0.38 g on castor followed by 0.33 g on tapioca, 0.32 g on *A. excelsa* and 0.26 g on red plumeria leaves. Kumar *et al*. (1993) observed the highest single shell weight of 0.52 g on castor followed by 0.45 g on kesseru, 0.35 g on tapioca and it was lowest (0.26 g) on barkesseru. Patil (2004) reported that the highest shell weight on Champaca (0.305 g) and lowest was on local castor (0.246 g).Neelu Nangia (2000) reported the shell weight 0.34, 0.266, 0.23, 0.116 and 0.15 g on castor gulancha, tapioca, barkesseru and papaya, respectively. According to Kar *et al*. (2000) the shell weight was highest in winter (December-January) (0.59g) and was lowest in summer (July-August) (0.57g). Debaraj *et al*. (2003) reported different shell weight (0.38, 0.32, 0.31 and 0.31) on castor, payam, tapioca and kesseru respectively during November. Patil (2004) reported highest shell weight on champaca (0.305g) and lowest was on local castor (0.246g). Further Patil *et al*. (2008) reported shell weight of 0.20g on fountain tree (Fig. 6).

Shell ratio

Notable differences were exhibited in respect of shell ratio among different host plants leaves fed to eri silkworm. Significantly higher shell ratio was observed on castor (12.81%) followed by fountain tree (12.17%), Champaca (12.09%) and lowest on red plumeria *(*11.11%). Other hosts recorded the shell ratio between the ranges of 11.37-11.81%. Similar results are also reported by Manjunath naik (2008),who recorded the maximum shell ratio on castor (12.95g)which was followed by fountain tree (12.64%),banyan tree (11.97%) and Indian almond (11.75%) and lowest on carrot (10.98%).The results are comparable with the report of Rajaram and Samson (1991) who found that the highest single shell ratio of 13.66 per cent on gansarai followed by 12.62 per cent on castor. Similarly Debaraj *et al. (*2003) also observed the maximum shell ratio of 11.44 per cent on castor followed by 11.34 per cent on payam, 11.31 per cent on kesseru and 10.61 per cent on tapioca, reared during November month (Fig. 6).

Moth emergence

Host plants had a significant effect on moth emergence. Significantly maximum moth emergence was on castor (98.07%) followed by fountain tree (96.49%) and carrot (96.31%). Other hosts recorded the moth emergence between the ranges of 92.20-94.89 per cent. More or less similar results reported by Manjunath naik (2008),who recorded the maximum moth emergence percentage on castor (99.42%)which was followed by fountain tree (99.40%), banyan tree (99.35%) and Indian almond (99.30%) and carrot (10.98%). Basaiah (1988) opined that moth emergence did not vary when the worm were reared on different hosts. However, marginally higher rate of emergence was noticed on RC-8 (100.00%), Aruna (100.0%) and local (100.0%) castor varieties and it was comparatively less in tapioca (98.33%). According to Sannappa (1997), moth emergence was 99.90, 99.90, 98.41, 96.70 and 94.39 per cent when reared on Aruna, RC-8, DCS-72 local SL-1 and PCS-121 castor genotypes, respectively. Ravishankar (2000) reported the maximum moth emergence during November-December (98.70%). The variation may be due to the nutritional quantity and quality of leaves fed during rearing period (Fig. 7).

Fecundity

Significant differences were recorded in respect of fecundity of moths as influenced by different host plants. Significantly maximum fecundity was observed on castor (333) followed by fountain tree (326) and champaca (315). %). It was lowest on carrot (268).Other hosts recorded the total fecundity between the range of 271-297. The present results are comparable with the earlier studies by Manjunath naik (2008), who recorded the highest fecundity on castor (339.50) which was followed by fountain tree (329.50), banyan tree (307.50) and Indian almond (291) and carrot (272.50). The findings of this experiment broadly compared with the Nagalakshamamma (1987) who reported the moths emerged from higher pupae (0.9780 g) deposited fewer eggs (193.33). According to Ramakrishna naika *et al.* (2003) white-plain bread reared on local cultivar recorded fecundity of 361.7 eggs per laying whereas, 460,311,294and 246 on castor, payam, tapioca and kesseru (Debraj *et al.* 2003). The variation may be due to the nutritional constituent of host like protein, phosphorus etc.

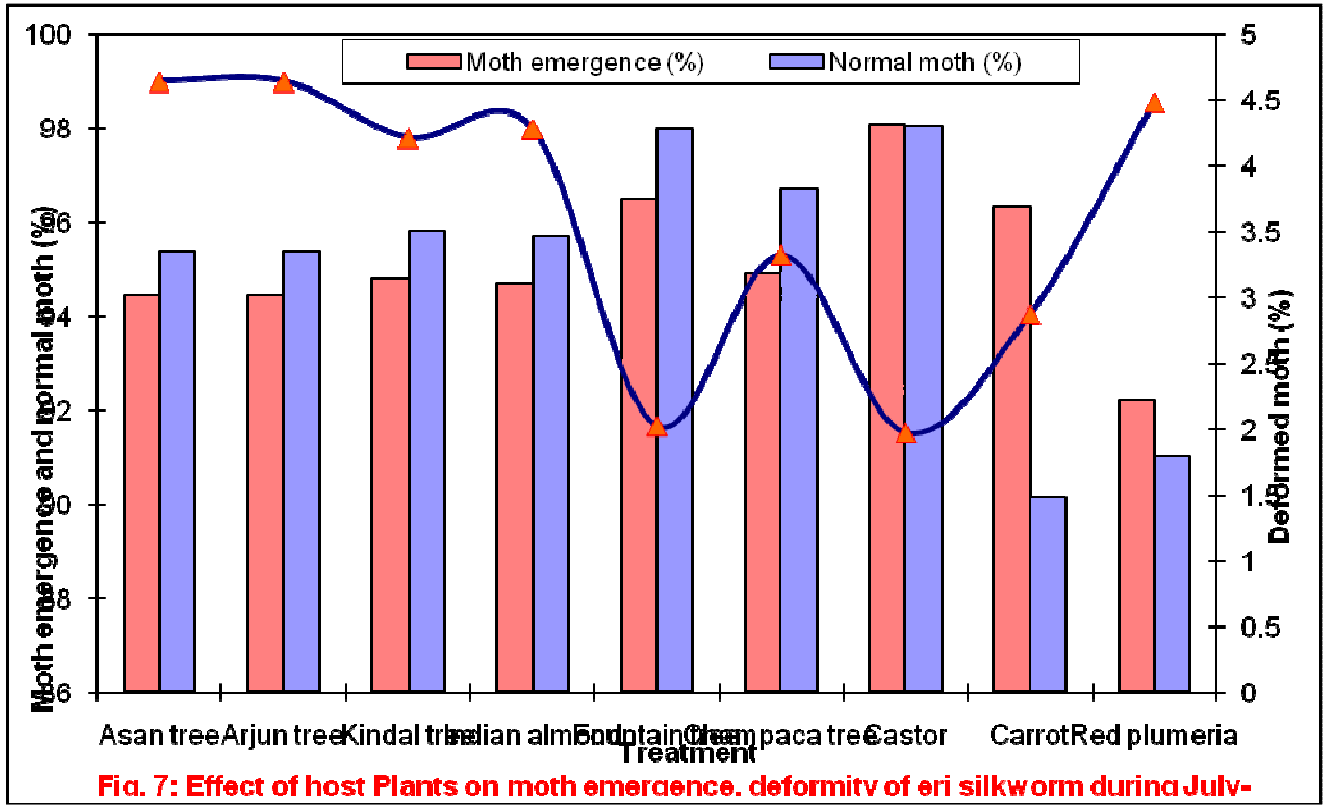

Fig. 7: Effect of host Plants on moth emergence, deformity of eri silkworm during July-August-2012

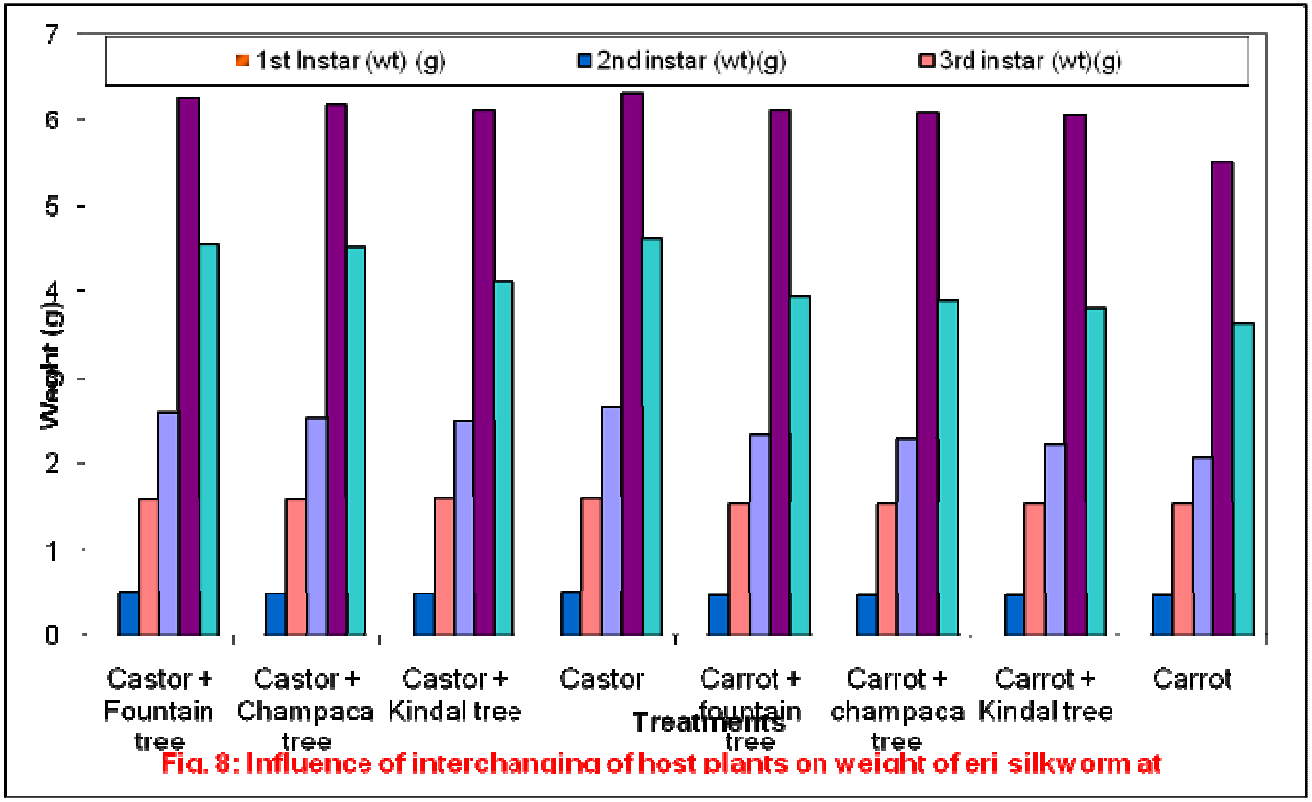

Fig. 8: Influence of interchanging of host plants on weight of eri silkworm at different instars during September-October-2012

Hatchability

Notable differences were seen in respect of hatchability due to different host plants. Significantly maximum hatchability was found on castor (96.10%) followed by on fountain tree (93.35%), Champaca (92.91%).Other hosts recorded the fecundity in the range between 89.44-92.49 percent. similar results are noticed by Manjunath naik (2008), who recorded the highest hatchibility on castor (95.18%) which was followed by fountain tree (93.72%),banyan tree (92.89%), Indian almond (91.49%) and carrot (87.19%). The findings of this experiment broadly compared with the findings of Devaiah *et al. (*1978) who reported that hatching percentage of 54.63 to 97.00 under Dharwad conditions and Patil *et al.* (1986) who recorded 70.60 to 78.30 per cent was under Raichur conditions. Ravishankar *et al.* (2000) 98.40 per cent during September-October. Ramakrishna naika *et al. (*2003) who reported egg hatching percentage was higher with the local x white plain (99.31%) and local x white semi-zebra breed (99.31%). It might be due to changes in the climatic conditions at different regions and quality of the host leaves fed.

Longevity of male and female

The difference with regard to longevity of male and female was significant among the host plants. Significantly longest longevity of male and female was noticed on castor (7.67and 9.83 days) which was on par with fountain tree (7.33 and 9.67 days) followed by Champaca (7.17-9.50 days). Significantly shortest longevity of male and female was noticed on carrot (6.50and 8.83 days). Other hosts recorded the fecundity in the range between 6.55-9.33 days. The present results are comparable with the earlier studies by Manjunath naik (2008),who recorded the highest longevity of male and female on castor (7.40 and 9.83 days)which was followed by fountain tree (7.35 and 9.83 days),banyan tree (6.86 and 9.34 days), Indian almond (6.55 and 9.33 days) and carrot (6.59-8.84%) .The results are comparable with the earlier report of Reddy *et al. (*1989) who reported considerable influence of castor on adult longevity in both sexes. It was (5.98 + 0.13, 3.93 + 0.51, 5.25 + 0.05 and 4.46 + 0.23 days) on male and (7.10 + 1.22, 6.83 + 0.89, 5.72 + 0.79 and 7.27 + 0.85) on female of castor, tapioca, red plumeria and *A. excelsa*, respectively. Ravishankar *et al (*2000) significant differences were observed in the longevity of eri moths, the longevity of male moths ranged from 8.51 to 9.97. Males lived longer (9.60 days) during November-December rearing season. Longevity of female moths was highest in M-S (13.61 days) method of leaf feeding and November-December rearing period (12.60 days). The variation may be due to the chemical composition of leaves varies from season to season and locality.

5.2 The impact of interchanging of host plants on growth development and cocoon parameters of eri silkworm

Larval weight (g)

The castor (4.62g) recorded the highest mature larval weight whereas the lowest mature larval weight was recorded on carrot (3.62g). Among the combinations (castor + fountain tree) (4.55g) recorded the highest matured larval weight followed by (castor + Champaca) (4.52g) and (castor + kindal tree*) (*4.10g). Other combinations recorded the mature larval weight in the range between the 3.80-3.93g. The present results are comparable with the earlier studies by Venu and muniyappa (2013) reared the eri larvae on castor, tapioca, ailanthus and jatropha leaves recorded the mean larval weight of 7.53g, 6.76g, 6.08g and 6.06g respectively. While the eri larvae which were given castor leaves from 1st instar to 3rd instar and tapioca, ailanthus and jatropha leaves during 4th instar and 5th instar recorded mean larva weight of 6.48g, 6.00g and 5.78g respectively. Significant differences were not recorded between independent and sequential treatments. The present study is also comparable with the results of Deka *et al.* (2011), who reported the highest larval weight on castor (6.47 gm) followed by kesseru (5.48 gm.) and Tapioca (5.10 gm.). Among the combinations the highest larval weight was recorded on Kesseru + castor (5.57 gm.) followed by castor + kesseru (5.47) gm.), kesseru + tapioca (5.32 gm.), Castor + tapioca (5.20 gm.) and Tapioca + castor (5.08 gm.). The lowest larval weight was obtained on Tapioca + kesseru (4.90 gm.). Present study, thus, deviates from the earlier reports.This might be due to change in locations, contents of host plants and Climatic factors (Fig. 8).

Larval period

Significant differences were observed with respect to larval duration when the eri silkworm is reared in combinations with the other hosts. It was significantly minimum on castor leaves (21.70 days) followed by carrot (22.94 days).Among the combinations the treatments which were reared on

castor recorded significantly lower larval duration than they reared individually. The hosts reared in combinations with castor from first to third instar and Fountain tree, champaca and kindal tree leaves from 4th instar to spinning recorded a mean larval duration of 22.35 days, 22.39 days 22.58 days, respectively. In other combinations with carrot recorded a mean larval duration of 23.21 days, 23.26 days 23.38 days, respectively. The present results are comparable with the earlier studies by Venu and muniyappa (2013), who reared the eri larvae on castor, tapioca, ailanthus and jatropha leaves recorded the mean larval duration of 19 days, 20 days, 23 days and 24.33 days, respectively. While the eri larvae which were given castor leaves from 1st instar to 3rd instar and tapioca, ailanthus and jatropha leaves during 4th instar and 5th instar recorded the mean larval duration of 20.67 days, 23.33 days and 24.67 days respectively . Significant differences were not recorded between independent and sequential treatments. The present study is also comparable with the results of Deka *et al.* (2011), who reported the lowest larval duration on castor (17 days) followed by kesseru (20.33 days.) and Tapioca (21 days). Among the combinations, the lowest larval duration was recorded in kesseru + castor and kesseru + tapioca, (21.00 days) followed by Castor + tapioca Tapioca + castor & Tapioca + kesseru (21.33 days) (Fig. 11).

Total instar duration

Significant differences were recorded with respect to total instar duration among the hosts and combinations. Castor (16.43 days) recorded significantly lower instar duration followed by castor+fountain tree (16.54days) combination. Among the other combinations castor + Champaca tree (16.54 days) recorded the minimum total instar duration followed by castor + kindal tree (5.83 days) combinations. More or less similar results were reported by Manjunath naik (2008), who recorded the lowest total instar duration on castor (15.99 days) which was followed by fountain tree (19.87 days), banyan tree (20.79 days), Indian almond (20.97 days) and carrot (16.64 days) (Fig .9).

Total moulting duration

Significant differences were recorded with respect to total moulting duration among the hosts and combinations. Castor (5.74 days) recorded significantly lower moulting duration followed by carrot (6.06 days) among the solely reared treatments. Among the combinations (castor + fountain tree) (5.81 days) recorded the minimum total moulting duration followed by castor + champaca (5.83 days) and castor + kindal tree (5.96 days). Among the another combinations carrot + fountain tree (6.12 days) recorded the minimum total moulting duration followed by carrot + champaca (6.14 days) and carrot + kindal tree (6.06 days). The present results are comparable with the earlier studies by Manjunath naik (2008), who recorded the lowest moulting duration on castor (5.50 days) which was followed by fountain tree (7.17 days), banyan tree (7.45 days), Indian almond (7.53 days) and carrot (5.60 days) respectively (Fig. 10).

Pupal period

Significant differences were not observed on the pupal period when the eri silkworm was reared in combinations with castor and carrot. Pupal period was 18 days on castor and carrot on individual treatments and also on their combinations. There was not much influence of host plants on the pupal period. The present results are comparable with the earlier studies by Manjunath naik (2008), who recorded the pupal period of 18 days on castor, fountain tree, banyan tree and carrot. Ravishankar *et al.* (2000) reported the pupal period of 17.70, 18.00 and 18.80 days. Choudhary (1982) recorded pupal duration of 13.0 to 18.0 days under Assam condition. The pupal duration of 18 days on new hosts is in agreement with both Patil (2004) recorded pupal duration of 18 days on champaka and castor leaves. The significant differences in pupal duration on different host plants might be due to the different nutritional contents of host plants (Fig. 11).

Egg period (days)

Non-significant differences were observed on the egg period with respect to host plants. Egg period was 8 days on the individual treatments and their combinations. The present results are comparable the earlier studies by Manjunath naik (2008),who recorded the egg period of 8 days on castor, fountain tree, banyan tree and carrot. Basaiah (1988) reported the incubation period of 8.00 days on Aruna and RC- 8 castor cultivar. According to Patil and Savanurmath (1994) the incubation period was of 9-10 days. Sannappa (1997) reported the shortest incubation period (8 days) in case of Aruna and RC-8. Patil (2004) recorded egg period of 8 days on Champaca and castor leaves. The difference might be due to differences in weather conditions and influence of method of feeding and optimum temperature and relative humidity maintained in the laboratory (Fig. 11).

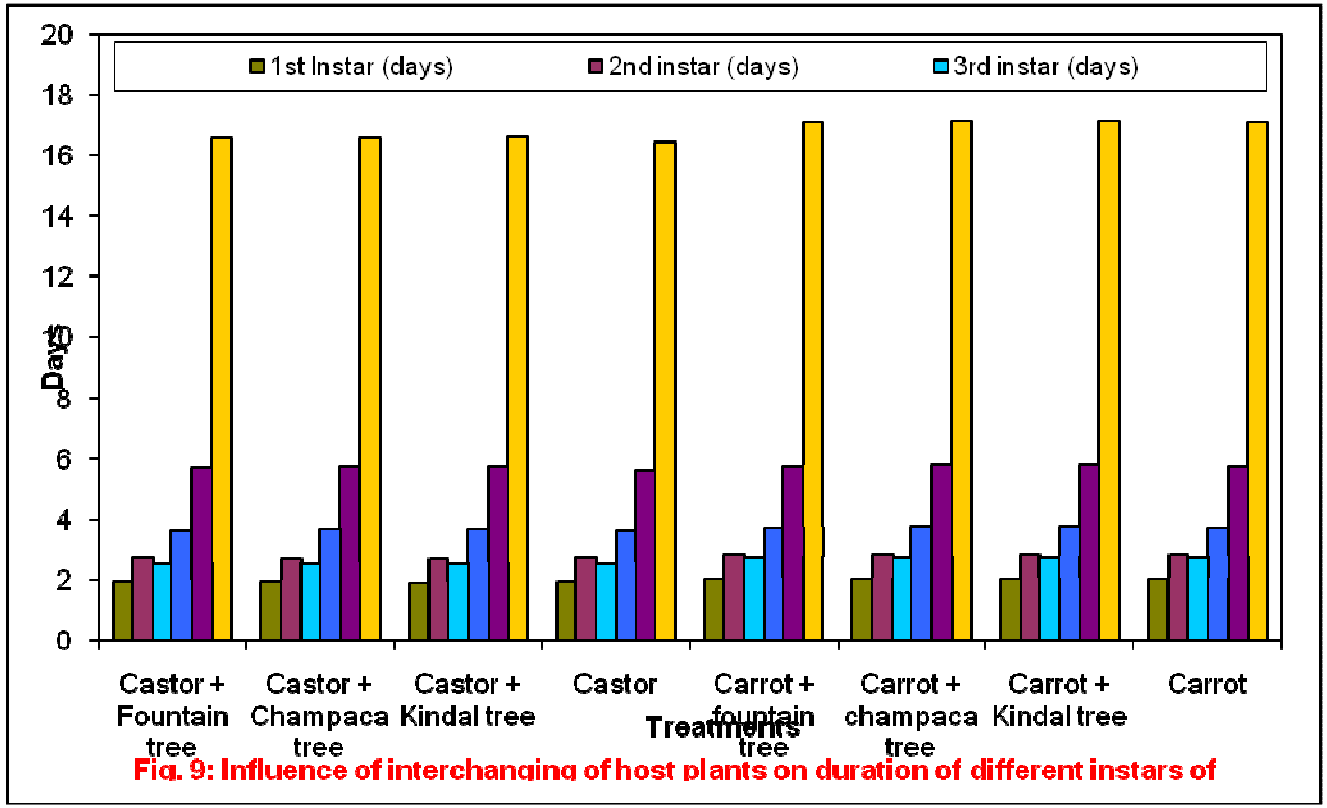

Fig. 9: Influence of interchanging of host plants on duration of different instars of eri silkworm during September-October-2012

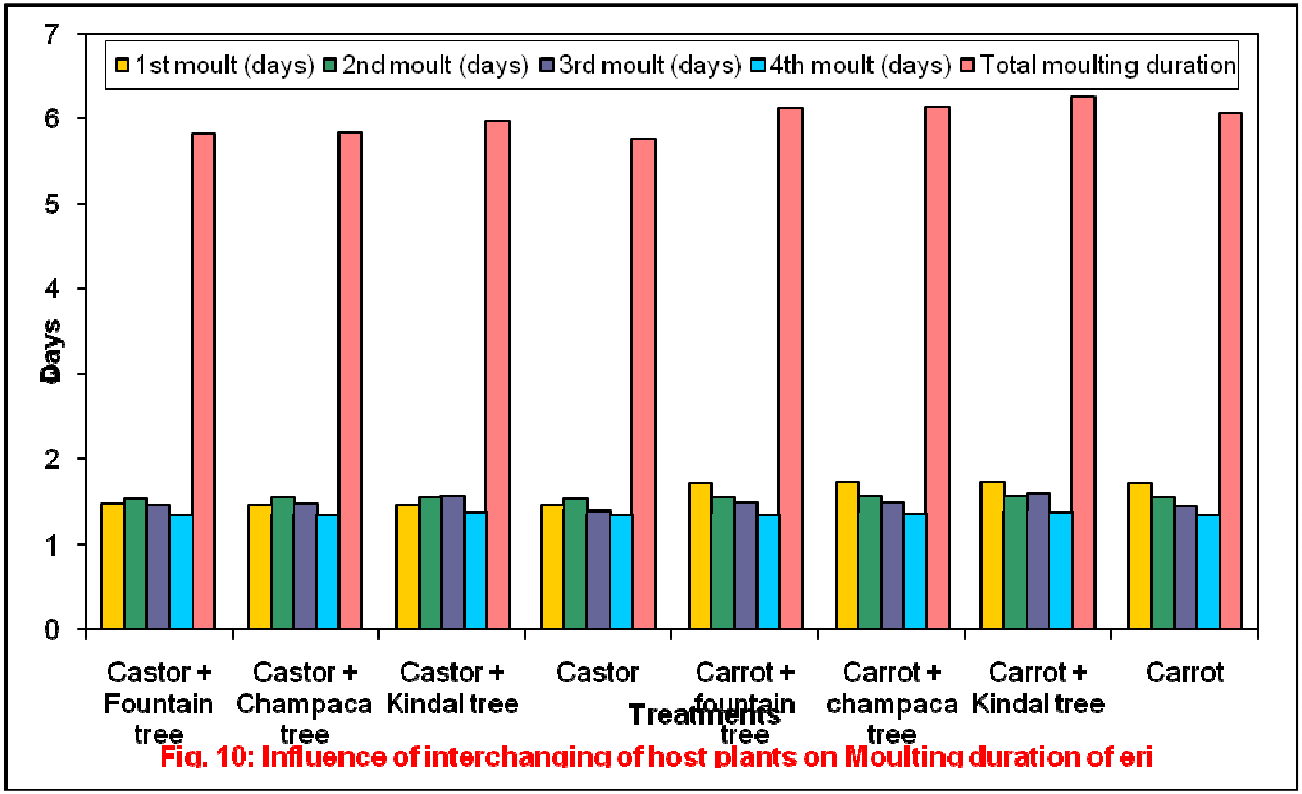

Fig. 10: Influence of interchanging of host plants on Moulting duration of eri silkworm during September-October-2012

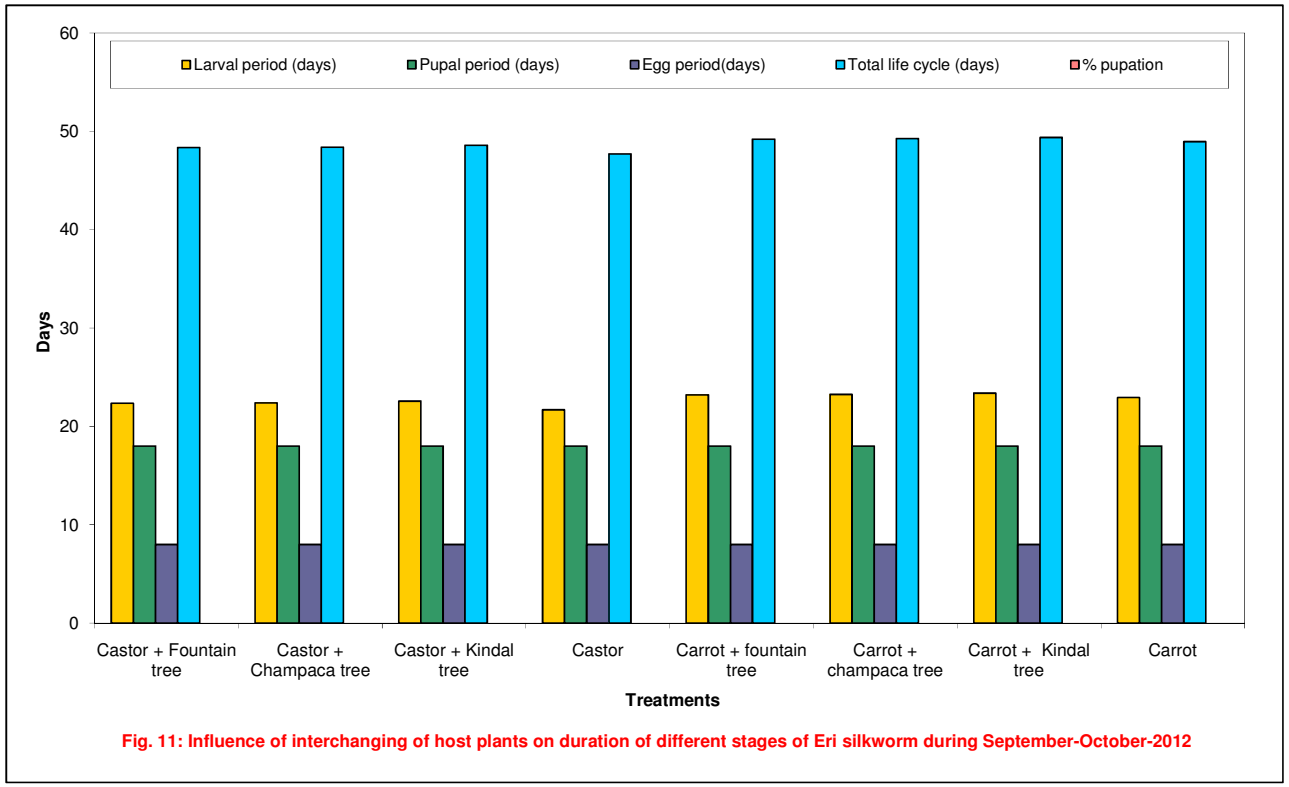

Fig. 11: Influence of interchanging of host plants on duration of different stages of Eri silkworm during September-October-2012

Fig 11: Influence of sequential feeding of host plants on duration of different stages of eri silkworm during September-October-2012

Total life cycle (days)

Significant differences were found with respect to total life cycle of eri silkworm. Shortest life cycle was recorded on eri worms fed with castor leaves (47.70 days) which were on par with carrot leaves (48.94 days). Among the combinations castor followed by fountain tree (48.35 days), Champaca (48.39 days) and kindal tree (48.58 days) recorded the significantly lower life cycle. Among other combinations carrot followed by fountain tree (49.21 days), Champaca (49.26 days)) and kindal tree (49.38 days) recorded the on par total life cycle with castor combinations. The present results are comparable with the earlier studies by Manjunath Naik (2008), who recorded the minimum total life cycle on castor (47.67 days) which was on par with carrot (48.96 days) followed by fountain tree (53.05 days), banyan tree (54.25 days) and Indian almond (54.50 days). The present results are comparable with the earlier report of Thangavelu and Barah (1986) who reported the life cycle of 45.0 and 50.0 days during summer and winter, respectively. The eri silkworm completes life cycle in 46.49, 63.18, 61.73 and 72.06 days when larvae/were fed on castor, tapioca red plumeria and *A. excelsa*, respectively (Reddy *et al.,* 1989). The difference might be due to agro climatic condition, quantity and quality of the leaves provided and the different host plants used for rearing (Fig. 8).

Larval survivability

The highest larval survivability was recorded on castor (99.33%) followed by carrot (86%) treatments when the eri silkworm larvae reared solely. The combinations of castor recorded the highest survivability of 97.67, 96.33 and 96 per cent, respectively. Among other combinations, carrot followed by fountain tree, Champaca and kindal tree recorded the recorded the survivability of 95, 94.33 and 93 per cent, respectively. The present results are comparable with the earlier studies by Manjunath Naik (2008), who recorded the maximum larval survivability on castor (99.17%) which was followed by fountain tree (98.84% days), banyan tree (97.99%) and Indian almond (96.67%) and it was lowest on carrot (82.50%).However it was significantly minimum on carrot leaves (82.50%) which was on par with red plumeria (82.67%) (Fig. 12).

The results are comparable with the reports placed on record by Thangavelu and Phulon (1983) observed larval survivability of 96, 84, 72 and 56%, on castor. Tapioca, red plumeria and *A. excelsa,* respectively. Sannappa (1997) reported 99.20 per cent on GCH-4 castor genotype. The variations of the present findings are due to qualitative character of the leaf.

Effective rate of rearing (%)

The highest effective rate of rearing was recorded on castor (94.67%) followed by carrot (86%) among the solely reared treatments. Among the combinations which were reared in sequence with castor leaves recorded the effective rate of rearing of 94%, 93.67% and 93.33% respectively. It was on par with the combinations which were reared in sequence with carrot leaves recorded the effective rate of rearing of 94%, 93.67% and 93.33% respectively. The present results are comparable with the earlier studies by Venu and Muniyappa (2013), who reared the eri larvae on castor leaves from 1st instar to 3rd instar and tapioca, ailanthus and jatropha leaves during 4th instar and 5th instar recorded effective rate of rearing of 80, 76 and 71.33 per cent respectively. The present study is also comparable with the results of Deka *et al.* (2011), who reported the highest effective rate of rearing on castor + kesseru (86.87%) followed by castor + tapioca, (85.06%), tapioca + castor (83.76%), kesseru + tapioca (81.70%) and tapioca + kesseru (75.56%) respectively. Present study, thus, deviates from the earlier reports. This might be due to change in locations, nutrient contents of host plants and Climatic factors (Fig. 12).

Growth index

The highest growth index was recorded on castor (4.25) followed by carrot (3.61) treatments when the eri silkworm larvae reared solely. Among the combinations which were fed with castor followed by other hosts recorded the growth index of 4.21, 4.18 and 4.14 respectively. In another combination which were fed with carrot followed by other hosts recorded the growth index of spinning recorded growth index of 3.95, 3.93 and 3.86 respectively. The present results are comparable with the earlier studies by Manjunath Naik (2008), who recorded the maximum growth index on castor (4.44) which was followed by fountain tree (4.41),banyan tree (4.36) and Indian almond (4.35) and it was lowest on. Present findings are comparable with Dayashankar (1982) who recorded the growth index of 4.630, 2.940, 2.940 and 2.050, on castor, tapioca, white plumeria, red plumeria, respectively. Reddy *et al. (*1989) reported growth index of 2.06, 1.33, 1.17 and 0.77 on castor, tapioca, red plumeria and *A. excelsa*, respectively. The variation in growth index may be due to nutritional content of leaves and seasonal variations (Fig. 12).

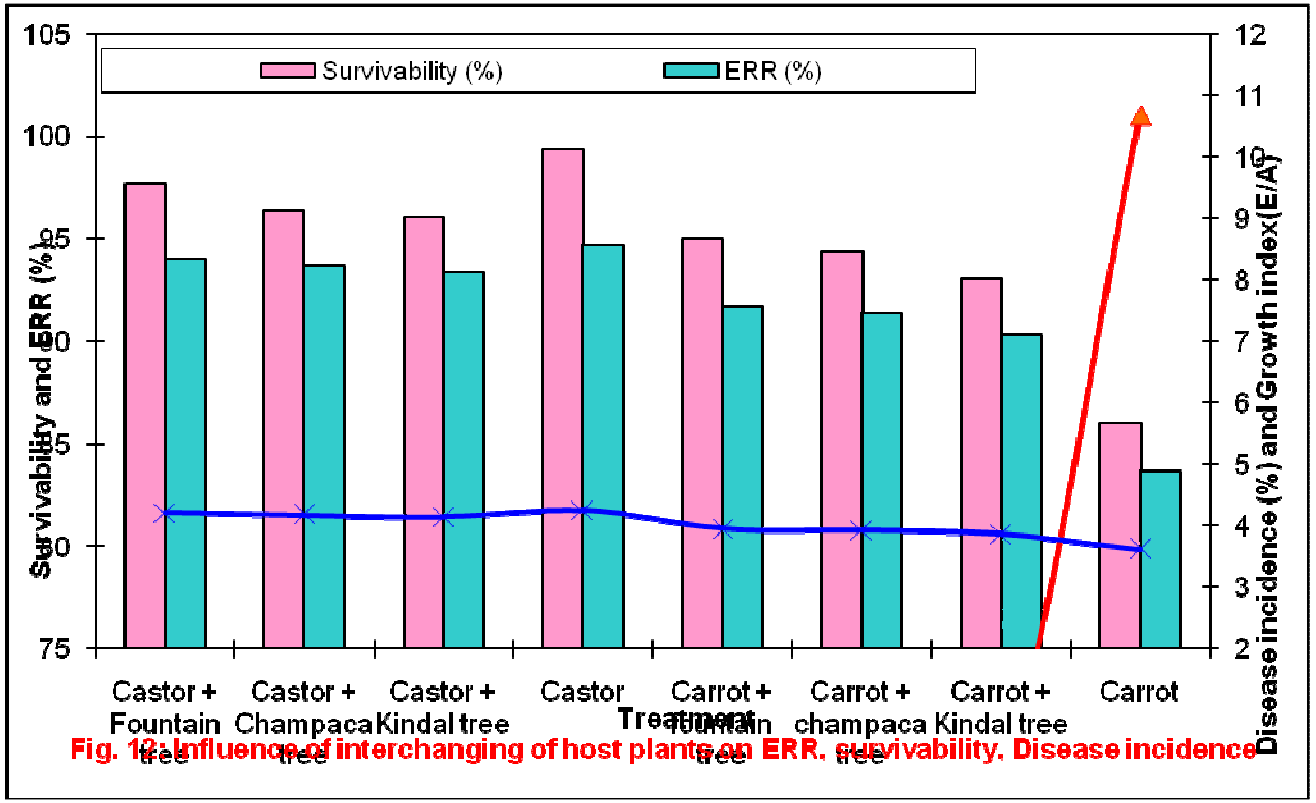

Fig. 12: Influence of interchanging of host plants on ERR, survivability, Disease incidence and Growth index of Eri silkworm during September-October-2012

Cocoon weight

Host plants markedly influenced the cocoon weight. Among the combinations which were fed with castor followed by other hosts recorded spinning recorded the cocoon weight of 2.66g, 2.63g and 2.60g respectively. In other combinations which were fed with carrot followed by other hosts recorded the cocoon weight of 2.32g, 2.21g and 2.05g respectively. The present results are comparable with the earlier studies by Venu and muniyappa (2013), who reared the eri larvae on castor leaves from 1st instar to 3rd instar and tapioca, ailanthus and jatropha leaves during 4th instar and 5th instar recorded mean cocoon weight of 3.31g, 3.16g and 2.67g respectively. The present study is also comparable with the results of Deka *et al.* (2011), who reported the highest cocoon weight on castor + kesseru (3.89 gm.) followed by Castor + tapioca (3.51g), kesseru + tapioca (3.50 gm.), Tapioca + castor (3.49gm.) and carrot + champaca (3.48 gm.) The lowest cocoon weight was observed in tapioca + kesseru (3.41gm). Present study, thus, deviates from the earlier reports. This might be due to change in locations, nutrient contents of host plants and Climatic factors (Fig. 13).

Pupal weight

Highest cocoon weight was recorded on castor (2.34g) followed by carrot (1.70g) when reared solely on castor and carrot starting from first instar to spinning. Among the combinations which were fed with castor upto third instar and followed by other hosts recorded the pupal weight of of 2.28g, 2.25g and 2.22g respectively. In other combinations which were fed with carrot upto third instar followed by other hosts recorded the pupal weight of 1.89g, 1.87g and 1.84g respectively. The present results are comparable with the earlier studies by Venu and muniyappa (2013), who reared the eri larvae on castor leaves from 1st instar to 3rd instar and tapioca, ailanthus and jatropha leaves during 4th instar and 5th instar recorded recorded the mean pupal weight of 2.68g, 2.69g and 2.25g respectively. The present results are comparable with the earlier studies by Manjunath naik *et al.*, (2008), who recorded the maximum pupal weight on castor (2.33g) which was followed by fountain tree (2.32g), banyan tree (2.09g) and Indian almond (2.06g) respectively. And lowest pupal weight was recorded on carrot (1.65g) (Fig. 13).

Shell weight

Highest shell weight was recorded on castor (0.35g) followed by carrot (0.22g) when reared solely on castor and carrot starting from first instar to spinning. Among the combinations which were fed with castor up to third instar and followed by other hosts recorded the shell weight of 0.32g, 0.31g and 0.30g respectively. In other combinations which were fed with carrot up to third instar followed by other hosts recorded the shell weight of 0.27g, 0.25g and 0.23g respectively. The present results are comparable with the earlier studies by Venu and muniyappa (2013), who reared the eri larvae on castor leaves from 1st instar to 3rd instar and tapioca, ailanthus and jatropha leaves during 4th instar and 5th instar recorded recorded the mean shell weight of 0.54g, 0.50g, 0.48g and 0.44g respectively. The present study is also comparable with the results of Deka *et al.* (2011),who reported the highest shell weight on castor + kesseru (0.590gm.), which is followed by Tapioca + castor (0.549gm.), Castor + tapioca (0.548), kesseru + tapioca (0.544) and kesseru + castor (0.530) respectively. The lowest shell weight was recorded in Tapioca + kesseru (0.511gm.). This might be due to change in locations, nutrient contents of host plants and Climatic factors (Fig. 13).

Shell ratio

The highest shell ratio was recorded on castor (12.81%) followed by carrot (11.34%) treatments when the eri silkworm larvae reared solely. Among the combinations which were fed with castor up to third instar and followed by other hosts recorded the shell ratio of 12.05, 11.79 and 11.55 per cent, respectively. In other combinations which were fed with carrot up to third instar followed by other hosts recorded the shell ratio of 11.62, 11.48 and 11.36 per cent, respectively. The present results are comparable with the earlier studies by Venu and Muniyappa (2013), who reared the eri larvae on castor leaves from 1st instar to 3rd instar and tapioca, ailanthus and jatropha leaves during 4th instar and 5th instar recorded recorded the recorded mean shell ratio of 13.89, 14.55 and 15.35 per cent respectively. The present study is also comparable with the results of Deka *et al.* (2011),who reported the highest shell shell ratio on tapioca + castor (15.73%) followed by castor + tapioca (15.61), kesseru + tapioca (15.54%) and kesseru + castor (15.22%).The lowest shell ratio percentage was obtained in tapioca + kesseru (14.98%). The lowest shell weight was recorded in tapioca + kesseru (0.511gm.). This might be due to change in locations, nutrient contents of host plants and Climatic factors (Fig. 13).

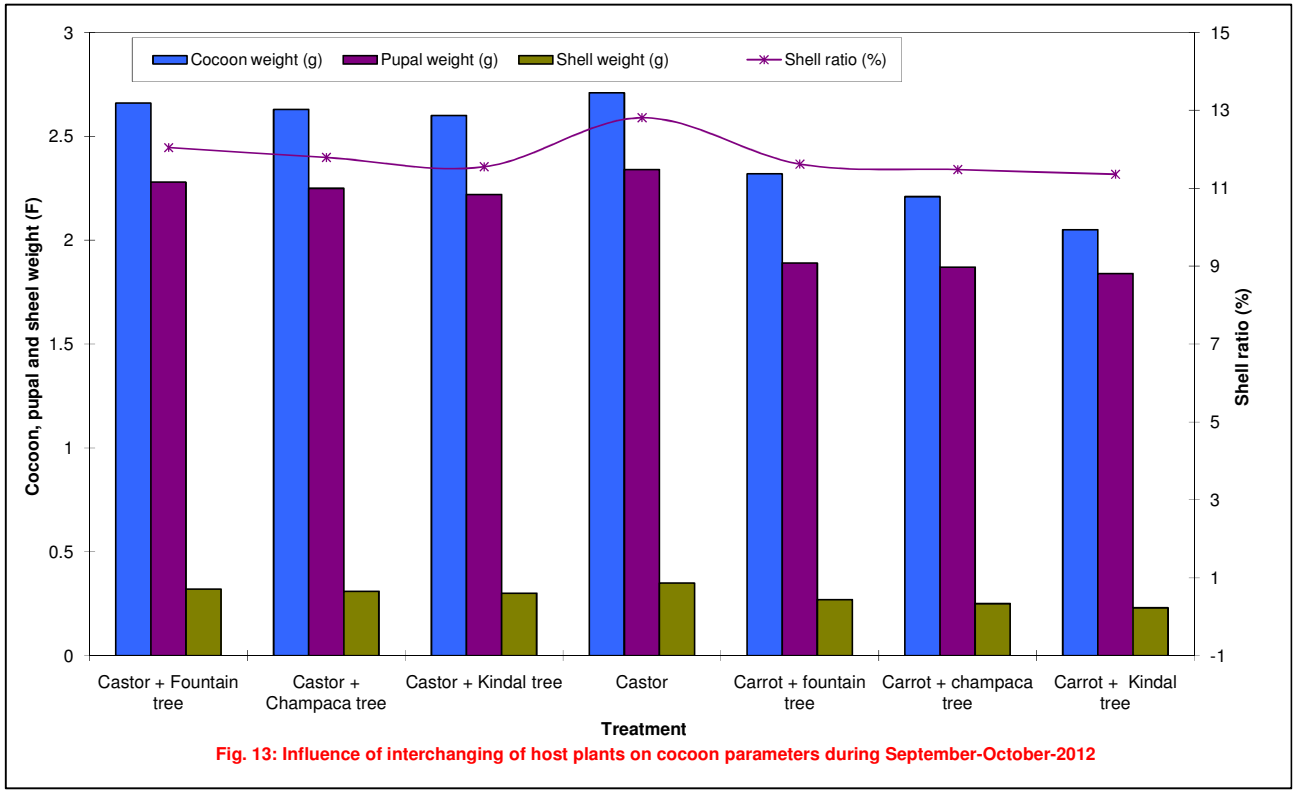

Fig. 13: Influence of interchanging of host plants on cocoon parameters during September-October-2012

Fig 13: Influence of sequential feeding of host plants on cocoon parameters during September-October-2012

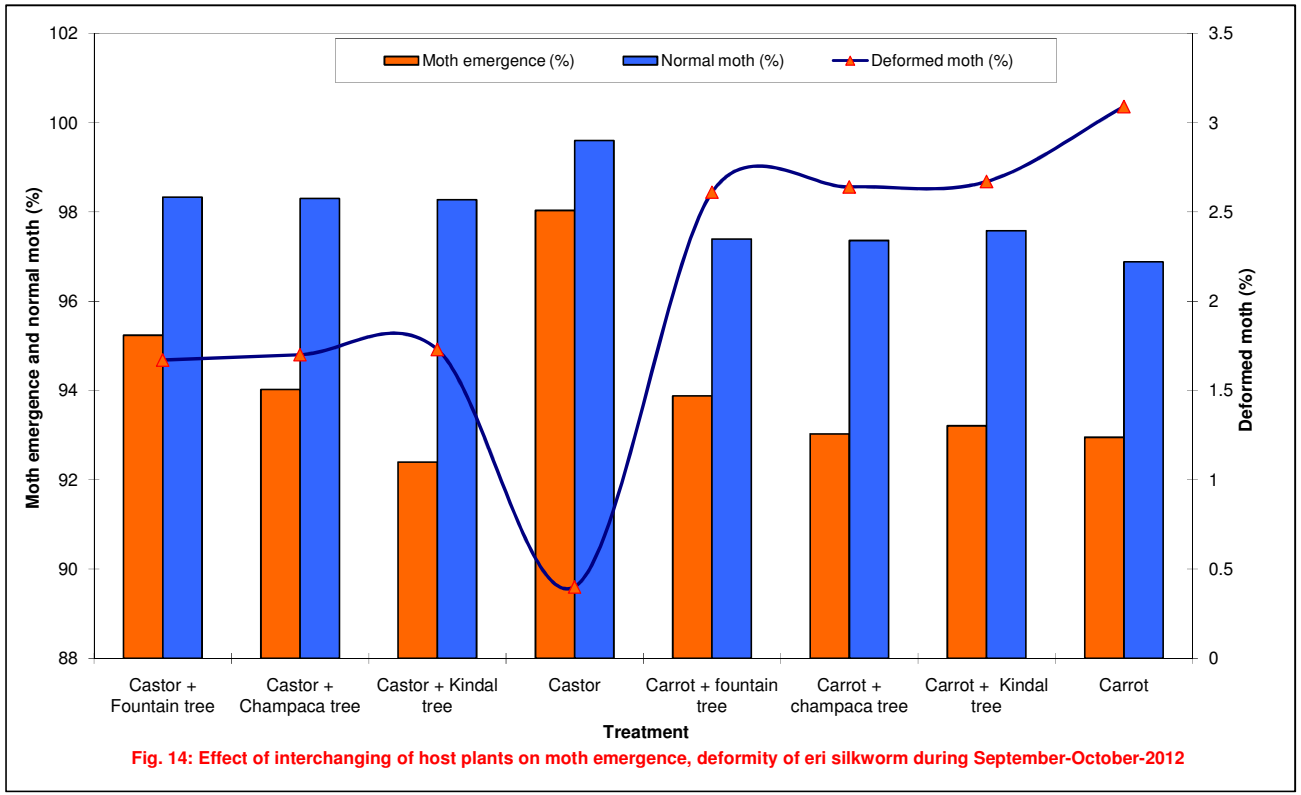

Fig. 14: Effect of interchanging of host plants on moth emergence, deformity of eri silkworm during September-October-2012

Fig 14: Effect of sequential feeding of host plants on moth emergence, deformity of eri silkworm during September-October-2012

Moth emergence

The highest percent moth emergence was recorded on castor (95.24%) followed by carrot (93.21%) treatments when the eri silkworm larvae reared solely. Among the combinations which were fed with castor up to third instar and followed by other hosts recorded the percent moth emergence of 95.24, 94.02 and 92.40 per cent respectively. In other combinations which were fed with carrot up to third instar followed by other hosts recorded the percent moth emergence of 93.88, 93.08 and 92.95 per cent respectively. The present results are comparable with the earlier studies by Manjunath naik *et al*., (2008),who recorded the maximum moth emergence percentage on castor (99.42%)which was followed by fountain tree (99.40%%),banyan tree (99.35%%) and Indian almond (99.30%) and carrot (10.98%) respectively. Basaiah (1988) opined that moth emergence did not vary when the worm were reared on different hosts. However, marginally higher rate of emergence was noticed on RC-8 (100.00%), Aruna (100.0%) and local (100.0%) castor varieties and it was comparatively less in tapioca (98.33%). According to Sannappa (1997), moth emergence was 99.90, 99.90, 98.41, 96.70 and 94.39 per cent when reared on Aruna, RC-8, DCS-72 local SL-1 and PCS-121 castor genotypes respectively. Ravishankar (2000) reported the maximum moth emergence during November-December (98.70%). The variation may be due to the nutritional quantity and quality of leaves fed during rearing period (Fig. 14).

Fecundity

Significant differences were found with respect to fecundity. The castor (339) recorded the highest fecundity and carrot (267.33) recorded the lowest fecundity. Among the combinations which were fed with castor up to third instar and followed by other hosts recorded the fecundity of 321.33, 304.67, and 294.33, respectively. In other combinations which were fed with carrot up to third instar followed by other hosts recorded the 293.33, 284.67 and 278.34 respectively. The present study is also comparable with the results of Deka *et al.* (2011),who reported the highest highest fecundity on treatments where food plants were fed in combinations, the highest fecundity was recorded inCastor + tapioca (462 nos.) followed by kesseru + castor (461 nos.), kesseru + tapioca (451 nos.), castor + kesseru (374 nos.), and Tapioca + castor (371 nos.), respectively. The lowest fecundity was recorded in Tapioca + kesseru (348 nos.). The present results are comparable with the earlier studies by Manjunath Naik *et al*.,2008, who recorded the highest fecundity on castor (339.50) which was followed by fountain tree (329.50), banyan tree (307.50) and indian almond (291) and carrot (272.50) respectively.

Hatchability

The castor (95.50) recorded the highest hatchability whereas the lowest hatchability was recorded on carrot (89.90%). Among the combinations which were fed with castor up to third instar and followed by other hosts recorded hatchability of 95.23, 95.08 and 94.45 per cent. In other combinations which were fed with carrot up to third instar followed by other hosts recorded the hatchability of 93.64, 91.86 and 91.07 per cent respectively. The present results are comparable with the earlier studies by Manjunath Naik *et a.,l* 2008, who recorded the highest hatchibility on castor (95.18%) which was followed by fountain tree (93.72%), banyan tree (92.89%), Indian almond (91.49%) and carrot (87.19%) respectively. The findings of this experiment broadly compared with the findings of Devaiah *et al.* (1978) who reported that hatching percentage of 54.63 to 97.00 under Dharwad conditions and Patil *et al.* (1986) 70.60 to 78.30 per cent under Raichur conditions. Ramakrishna naika *et al.* (2003) egg hatching percentage was higher with the local x white plain (99.31%) and local x white semi-zebra breed (99.31%). It might be due to changes in the climatic conditions at different regions and quality of the host leaves fed.

Longevity of male and female

The castor (8.00) recorded the highest adult male longevity, whereas the lowest adult longevity was recorded on carrot (6.50 days). Among the combinations castor + fountain tree (7.00) recorded the highest wing expanse followed by castor + Champaca (6.83) which was on par with castor + kindal tree (6.83). Among another combinations Carrot + fountain tree (7.33) recorded the highest longevity of male which was followed by (carrot + Champaca (7.00) and carrot + kindal tree (6.67), respectively. The castor (10.00) recorded the highest adult female longevity whereas the lowest adult longivity was recorded on carrot (8.83). Among the combinations, castor + fountain tree (9.00 days) recorded the highest wing expanse which was on par with castor + champaca (9.00) and castor + kindal tree (9.00). Among the combinations, carrot + fountain tree (9.00) recorded the on par longevity with carrot + champaca (9.00) and carrot + kindal tree (9.00) respectively. The difference with regard to longevity of male and female was significant among the host plants. The present results

are comparable with the earlier studies by Manjunath naik *et al*. (2008),who recorded the highest longevity of male and female on castor (7.40 and 9.83 days)which was followed by fountain tree (7.35 and 9.83 days),banyan tree (6.86 and 9.34 days), Indian almond (6.55 and 9.33 days) and carrot (6.59-8.84%) respectively .The results are comparable with the earlier report of Reddy *et al. (*1989) who reported considerable influence of castor on adult longevity in both sexes. It was (5.98 + 0.13, 3.93 + 0.51, 5.25 + 0.05 and 4.46 + 0.23 days) on male and (7.10 + 1.22, 6.83 + 0.89, 5.72 + 0.79 and 7.27 + 0.85) on female of castor, tapioca, *P. rubra* and *A. excelsa*, respectively. Ravishankar *et al (*2000) reported the significant differences in the longevity of eri moths, the longevity of male moths ranged from 8.51 to 9.97. Males lived longer (9.60 days) during November-December rearing season. Longevity of female moths was highest in M-S (13.61 days) method of leaf feeding and November-December rearing period (12.60 days). The variation may be due to the chemical composition of leaves varies from season to season and locality.

Future line of work

1. Analysis of biochemical component of different host plants
2. Further investigation is to be need in search of new host plants in other region of the country
3. Investigation on adaptability of these hosts in different areas is to be a great need

SUMMARY AND CONCLUSIONS

The results of the investigations on rearing performance of eri silkworm *Samia cynthia ricini* Boisduval on different species of terminalia are summarized below.

Kindal tree, Asan tree and arjun tree are the new host plants of eri silkworm.

The host plants significantly influenced the weight of chawki worms. The maximum larval weight of 0.019, 0.48 and 1.59 were recorded on castor during I, II and III instars which was on par with carrot leaves (0.017, 0.47 and 1.54 g) during I, II and III instars, respectively). The highest mature larval weight (4.62 g) was registered on castor which was on par with fountain tree (4.48 g) and Champaca (4.47g). Among the combinations which were fed with castor and carrot leaves during 1st instar to 3rd instar and feeding with Fountain tree, Champaca and Kindal tree leaves from 4th instar to spinning recorded highest mature larval weight on castor + fountain tree (4.55g) followed by castor + Champaca (4.52g) and castor + Kindal tree (4.10g) respectively.

Significantly shortest larval period (21.67 days) was registered on castor which was on par with carrot (22.96 days) leaves fed throughout the larval period. Larval survivability was maximum on castor (99.33%) followed by fountain tree (96.67%). ERR and growth index was maximum on castor 96.67% and 4.36, respectively followed by fountain tree 95.33% and 3.53, respectively). Pupal period and egg period were not influenced by the host plant. Total life cycle was minimum (47.67 days) on castor which was on par with carrot leaves (48.96 days). Among different combinations which were fed with castor and carrot leaves during 1st instar to 3rd instar and feeding with Fountain tree, Champaca and Kindal tree leaves from 4th instar to spinning,the shortest larval period was registered on castor + fountain tree (22.35 days) followed by castor + Champaca (22.39 days) and castor + Kindal tree (22.58 days) respectively. Larval survivability was maximum on castor + fountain tree (97.67%) followed by castor + Champaca (96.33) and castor + Kindal tree (48.58 days). ERR and growth index was maximum on castor + fountain tree (94% and 4.21, respectively) followed by castor + Champaca (93.67% and 4.18) and castor + Kindal tree (93.33% and 4.14) respectively. Pupal period and egg period were not influenced by the host plant. Total life cycle was minimum 48.35 days) on castor + fountain tree which was on par with castor + Champaca 48.39 days) and castor + Kindal tree (48.58 days) respectively.

All economic parameters *viz*., cocoon weight (2.71 g), pupal weight (2.34 g), shell weight (0.35 g) and shell ratio (12.81%) and percent pupation (98.97%)were significantly superior on castor which was on par with fountain tree with corresponding figure of 2.68 g, 2.29 g, 0.33g ,12.17% and 96.26% respectively. Among the combinations of host plants all economic parameters *viz*., cocoon weight (2.66g), pupal weight (2.28g), shell weight (0.32 g) and shell ratio (12.05%) and percent pupation (96.58%) were significantly superior on castor + fountain tree fed throughout the larval period which was on par with castor + Champaca corresponding figure of 2.63g, 2.25 g, 0.31g and 11.79per cent, respectively.

Feeding of castor leaves throughout the larval period had maximum moth emergence (98.07%) followed by fountain tree (96.49%).Normal moth emergence was maximum on castor (98.03%) which is on par with fountain tree (97.98%). Minimum deformed moth was recorded on castor (1.97) followed by fountain tree (2.02).Among the combinations, maximum moth emergence was on castor + fountain tree (95.24%) followed by castor + champaca (94.02%). Normal moth emergence was found maximum on castor + fountain tree (98.33%) which is on par with castor + Champaca (98.30%). Minimum deformed moth was on castor + fountain tree (1.67) followed by fountain tree (1.70%).

Fertile eggs were maximum (323.67) on castor followed by fountain tree (306.33) minimum number of unfertile eggs (9.33) on castor which is on par with fountain tree (19.67). Hatchability was maximum on castor (96.10%) followed by fountain tree (93.35%). Among the combinations maximum number of fertile eggs were recorded on castor + fountain tree (309) followed by castor + champaca (289.67) whereas minimum unfertile eggs were recorded on castor + fountain tree (12.33) followed by castor + champaca (15). Hatchability was maximum on castor + fountain tree (95.23%) which was on par with castor + champaca (95.08%).

The eggs laid in first three days was maximum (171, 131 and 30.33) on castor followed by (169.33, 127 and 29.67) fountain tree. Fecundity was maximum (333) on castor followed by fountain tree (326).Among the combinations the eggs laid in first three days was maximum (170, 119 and 31.67) on castor + fountain tree followed by (161, 115.33 and 28.33) on castor + Champaca

respectively. Fecundity was maximum (321.33) on castor + fountain tree followed by castor + champaca (304.67).

Adult wing expanse of male and female moth was maximum (10.83 cm and 11.83 cm) on castor which was on par with fountain tree (10.80 cm and 11.77 cm).The significantly highest adult longevity of male and female (7.67 and 9.83 days) was on castor which was on par with (7.33 and 9.67 days) fountain tree. Among the combinations adult wing expanse of male and female was maximum (10.80 cm and 11.57 cm) on castor + fountain tree which was on par with castor + Champaca (10.80 cm and 11.50cm).The significantly highest adult longevity of male and female (7 and 9 days) was on castor + fountain tree which was on par with castor + champaca. (6.83 and 9 days).

1. Among new host plants, fountain tree considered as superior host plant. The leaves were dark green, compound and evergreen available throughout the year in forest area. So, one can utilize these hosts.
2. For chawki rearing the carrot tops are more suited than other new host and it was on par with castor leaves. Thus in place of castor leaves carrot tops can be conveniently used for rearing chawki worms. Further, carrot crop is cultivated during both kharif and Rabi season and leaves are available for ericulture in these season.
3. Carrot leaves are not commercially exploited except rarely as animal feed. The present findings helps to utilize carrot tops for commercial chawki rearing of eri silkworm during 4^{th} and 5^{th} instar we can utilize fountain tree leaves.
4. Among the combinations, the rearing of eri larvae by feeding the castor and carrot leaves from first to third instar and interchanging with fountain tree, Champaca and kindal tree leaves during fourth and fifth instars improved the commercial characteristic features such as larval weight, larval duration ,ERR, cocoon weight and shell weight. There was not much difference in sole reared treatments and combinations. Hence during scarcity of castor leaves the rearing can be done by interchanging of hosts. Further carrot leaves are fleshy and tender. Hence, during grown up stage the it will not meet out the nutritional requirements and disease incidence also more because of feeding of tender leaves, it would be appropriate if the eri silkworm is reared on carrot upto third instar and interchanging with other hosts. This avoids the disease incidence and economic parameters are better compared to reared treatments.

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REARING PERFORMANCE OF ERI SILKWORM *Samia Cynthia ricini* BOISDUAL ON DIFFERENT SPECIES OF TERMINALIA AND ITS IMPACT ON COCOON QUALITY

MANJUNATH YALIGAR **2014** **Dr. G. M. PATIL**
Major Advisor

ABSTRACT

Studies on rearing performance of eri silkworm *Samia cynthia ricini* Boisdual on different species of terminalia and its impact on cocoon quality were carried out at Ericulture laboratory, Department of Agricultural Entomology, UAS, Dharwad during, 2012. The host plants significantly influenced the weight of chawki and grown up worms. The maximum larval weight of 0.019, 0.48 and 1.59 g were recorded with castor during I, II and III instars which was on par with carrot (0.017, 0.47 and 1.54 g, respectively). In late age worms the highest mature larval weight (4.62g) was registered with castor followed by fountain tree (4.48g) and champaca tree (4.47). Cocoon weight (2.71g), pupal weight (2.34g), shell weight (0.35g) and shell ratio (12.81%) were significantly superior with castor which were on par with fountain tree (2.68g, 2.29g, 0.33g and 12.17 %) and champaca tree(2.61g,1.98g,0.29g and 12.09%), respectively. Maximum moth emergence (98.07%) was recorded with castor and on par with fountain tree (96.49%) and carrot leaves (96.31%). Adult wing expanse of male and female was maximum (10.83 and 11.83cm) in castor which was on par with fountain tree (10.80 and 11.77cm) and kindle tree (10.57 and 11.57 cm). Significantly longest adult longevity of male and female (7.67 and 9.83 days) was on castor which was followed by fountain tree (7.33 and 9.67 days) and champaca tree (7.17 and 9.50 days).

The maximum mature larval weight (4.55gm) was registered with castor+fountain tree followed by castor+champaca tree (4.52g) and castor+kindle tree (4.47). Cocoon weight (2.66g), pupal weight (2.28g), shell weight (0.32g) and shell ratio (12.05%) were significantly superior with castor+fountain tree leaves followed by castor+champaca (2.63g, 2.25g, 0.31g and 11.79%) and castor+kindle tree (2.60g,2.22g,0.30g and 11.55%) respectively. Maximum moth emergence (95.24%) was recorded with castor+fountain tree leaves followed by castor+champaca tree (94.24%). Adult wing expanse of male and female was maximum (10.80 and 11.57cm) with castor+fountain tree leaves followed by castor+champaca tree (10.80 and 11.50cm). Significantly longest adult longevity of male and female (7 and 9 days) was on castor followed by castor+champaca tree (6.83 and 9 days). The carrot leaves are the best alternate host for chawki worms and fountain tree leaves for grown up eri worms.