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RESEARCH ARTICLE

Investigations of Different Host Plants on Nutritional Indices of Eri Silkworm (*Samia ricini)*

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ABSTRACT

An experiment was conducted during 2021-22 at Forest College and Research Institute, Mettupalayam to evaluate the food ingestion, digestion and efficiency of conversion of castor and tapioca cultivars for Eri silkworm, *Samiaricini*. The leaves of castor cultivars *Viz.,* YTP 1, YRCH 1, YRCH 2 and Local variety and tapioca cultivars *Viz.,* YTP 1 and YTP 2 were fed to Eri silkworm. The studies of nutritional indices on different castor and tapioca cultivars revealed that total food consumption was found to be highest on castor variety YTP 1 (1014.92 g) followed by castor hybrid YRCH 2 (1009.14 g) and least on tapioca YTP 1 (910.14 g). Maximum food digestion and Efficiency conversion of ingested food was found on castor variety YTP 1 (546.17 g and 21.70 %) when compared to 427.05 g and 21.99 per cent on tapioca YTP 1.

Keywords: *Castor; Eri silkworm; Nutritional indices; Tapioca*

INTRODUCTION

Eri silkworm is the only domesticated silkworm among other Vanya silkworms with excellent thermal properties and a wide range of blending potential with other natural silks including wool, cotton, jute and synthetic fibers (Nadiger *et al*., 2016). Eri silkworm has its own advantage of being disease resistant hence it is known as "poor man's silk". It is acknowledged as vital in terms of providing revenue and employment, using the silk and byproducts for various purposes, and larvae and pupae as food and feed. This would be a valuable to subsidiary farm enterprises like small ,marginal and landless farmers. Eri silkworm is polyphagous species, which feeds mostly on the leaves of Castor (*Ricinus communis* L.). Tapioca leaves are a good source of protein and are used as a secondary food source for Eri silkworms (Buamuangphia *et al*., 2017; Sirimungkararat *et al*., 2015). The quality of the leaves supplied to the worms is thought to be the most important component in producing a superior quality cocoon (Jyothi, *et al*., 2014; Lalfelpuii *et al*., 2014). It has been observed that growth, development and cocoon yield are influenced by host plants accession and quality of leaves fed to the worms (Chandrashekhar and Govindan, 2010). Therefore, it is important to screen high yielding and good quality of castor and tapioca cultivar for rearing Eri silkworm. This study is planned to investigate the nutritional indices of Eri silkworm for higher production of Eri silk.

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MATERIAL AND METHODS

Disinfection of rearing room and appliances

Prior to the commencement of rearing operation, the rearing room was cleaned and properly disinfected with 5 per cent bleaching powder solution using knapsack sprayer (Subramanianan *et al.* 2013). After 24 hours of disinfection, doors and windows of the rearing room were kept open for fresh air circulation. Rearing appliances were washed and disinfected thoroughly with 2 per cent bleaching powder solution.

Procurement of Eri Disease Free Laying (DFLs)

The DFLs of Eri silkworm C2 Breed were procured from the ESSPC, Hosur, Tamil Nadu. Further, the eggs were surface sterilized with two per cent formalin for five minutes then washed in tap water and dried under shade and later incubated at room temperature (Swathiga *et al.,* 2019).

Brushing

The eggs hatched after 10 to 11 days of incubation, and the hatched larvae were offered tender leaves of different castor and tapioca cultivars with respect to treatments separately and were transferred to rearing trays.

Treatment details:

T1- Eri silkworms fed with leaves of Castor Variety YTP 1.

T2- Eri silkworms fed with leaves of Castor Hybrid YRCH 1.

T3- Eri silkworms fed with leaves of Castor Hybrid YRCH 2.

T4- Eri silkworms fed with Tapioca of YTP 1Variety.

T5- Eri silkworms fed with Tapioca of YTP 2Variety.

T6- Eri silkworms fed with Castor of Local Variety (Control).

Maintenance of larvae

In order to study the influence of the nutritional efficiency of Eri silkworm on host plants, larvae were reared separately on castor and tapioca cultivars under laboratory conditions from I to V instar stages with three replications, and each consisted of fifty larvae with respect cultivars to host plant (Swathiga *et al.,* 2019).

The newly hatched healthy larvae were selected randomly and transferred separately with the help of feather, to rearing tray of each replication with test cultivars. The first and second instar larvae fed with tender leaves, whereas medium age and mature leaves were offered to third, fourth and fifth instar larvae respectively. The first and second instar larvae were fed two times a day and later instars were fed four times except during moulting periods

Nutritional Indices

Instar wise total consumption indices were computed following standard procedure.

Food consumption(g)

Food consumption (g) = Weight of fresh food offered – Weight of fresh remnants

Where,

Weight of remnants = Weight of oven dry remnants × Blank

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

Food digestion(g)

Food digestion (g) = weight of fresh food offered - Weight of excreta avoided

Efficiency of Conversion of Ingested Food(ECI):

It was calculated by using following formula,

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

RESULTS AND DISCUSSION

The quantum of food consumption, utilization and conversion efficiency into body mater for production of silk is mainly governed by the type of host/variety on which silkworm feeds.

Food consumption

Among the host plants cultivars, Eri silkworm fed with castor variety YTP 1 registered maximum in instar wise and total consumption (2.57g in I instar, 4.98 in II instar, 27.07 in III instar, 125.18 in IV instar, 855.12 in V instar and 1014.92 g/50 larvae) of spring season, which was on par with castor YRCH 2 which recorded a total food consumption of 1009.14 g/50 larvae (Table. 1). The minimum total food consumption was recorded in tapioca YTP 1 (910 g/50 larvae) during the spring season. During the summer month average food consumption was recorded highest in Castor YTP 1 with 1010.89 followed by Castor YRCH 2 (1004.97) and least was observed in tapioca YTP 1 with 904.17. Pallavi *et al*. (2021) revealed that total food consumption of 28.40 g/larvae in castor, which significantly differed among the castor cultivars along with eco-races of Eri silkworm. The rate of consumption of insects may depend on phagostimulants, existing temperature and relative humidity, nature of food, moisture content of leaf etc.,

Food digestion

The present finding in food digestion showed significant variation among the host plants cultivars (Fig. 1, Fig. 2). Significantly higher food digestion in each instar was registered in castor variety YTP 1 (2.40, 4.13, 20.71, 89.11, 429.82 and 546.17 g/ 50 larvae) of spring season and summer season (2.01, 3.64, 19.71, 87.52, 414.68 and 527.56 g/ 50 larvae) followed by castor YRCH 2 (538.25 g, 520.80 g) of total digestion. The digestion of food was greatly influenced by the host plants cultivars on fresh weight basis (Sannappa *et al*., 2016). Digestion may be influenced by the leaf constituents, particularly the fiber content and the associated enzyme activities in Eri silkworms, thus showing variation in the rate of digestion due to castor cultivars. The least food digestion was documented

in tapioca YTP 1 of both reasons (427.05, 413.63). According to Govindan *et al*. (2002) and Shifa *et al*. (2014), variation in food digestion was greatly influenced by different host plants cultivars.

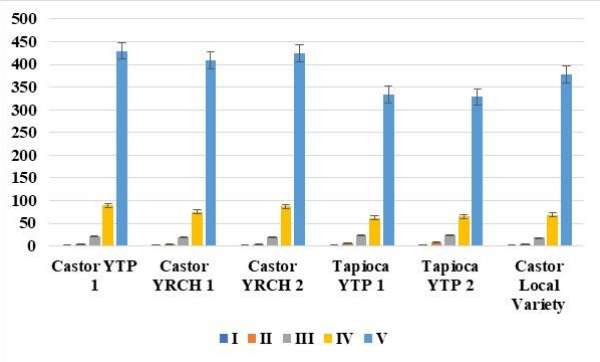

Fig. 1. Food digestion pattern of *Samiaricini*in respect of larval stages during spring season

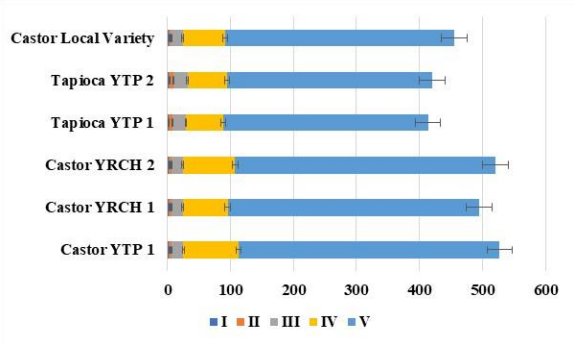

Fig. 2. Food digestion pattern of *Samiaricini*in respect of larval stages during summer season

Efficiency of Conversion of Ingested Food (ECI)

The Eri silkworm nourished with leaves of different cultivars exhibited significant difference in ECI in each instar of two seasons (Fig. 3, Fig. 4). Mean ECI was recorded highest in castor local variety (23.09 %, 21.58%). Castor YTP 1 recorded high ECI in first (19.46%, 20.83%) and second instar (15.06 %, 10.62%). However, the least ECD was recorded during second instar when worms were fed with leaves of tapioca YTP 2(8.65 %, 6.16%). During third instar it was lowest in the cultivar tapioca YTP 1 (9.84%, 7.12%). When Eri worms were fed with leaves of castor YTP 1 the lowest ECI was recorded during fifth instar and also in mean ECI (26.31 and 21.31 % respectively). The present finding is in collaboration with Gururaj *et al.* (2017) who reported that variation of ECI when silkworm fed with different castor cultivars, the highest ECI was observed in GAUCH-1 with 18.69 %.These findings are analogous to those of Govindan *et al.,* (2002), who noted a decreasing trend in ECI as worm ages increased. Across different castor cultivars, the ECI varied.

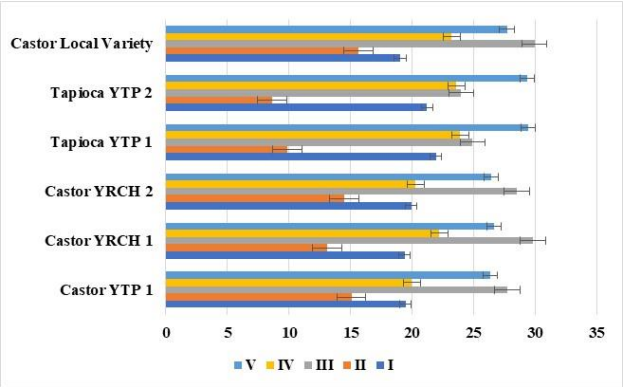

Fig.3. Efficiency conversion of ingested food (%) by *Samia ricini* during different larval stages (Fresh weight basis) in spring season

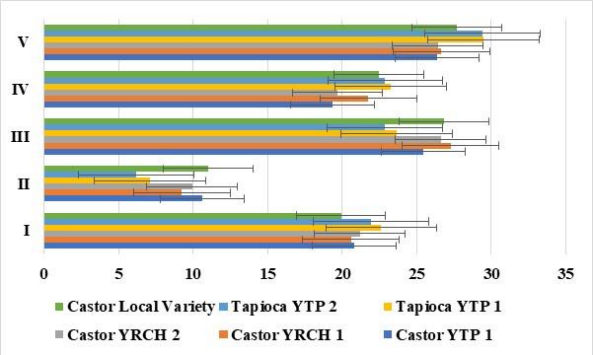

Fig.4. Efficiency conversion of ingested food (%) by *Samia ricini* during different larval stages (Fresh weight basis) in summer season

CONCLUSION

The results revealed that Castor YTP-1 leaves fed to Eri silkworms were superior in terms of nutritional indices when compared with tapioca cultivars in both seasons. The result is due to the variance in food consumption pattern, digestion and efficiency of conversion of biochemical contents in castor leaves by Eri silkworm. Moreover, it affects the choice and suitability of the leaves as a host plant for the Eri silkworm. Since a higher efficiency of food conversion is observed while feeding castor, castor YTP 1 variety might be used as a nutritionally advantageous host plant for Eri silkworms.

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Ethics statement

No specific permits were required for the described field studies because no human or animal subjects were involved in this research.

Consent for publication

All the authors agreed to publish the content.

Competing interests

There were no conflict of interest in the publication of this content

Author contributions

All the authors are equally contributed to research work

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