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Influence of humidity on feed utilization of *Cricula trifenistrata* (Helfer) (Lepidoptera: Saturniidae)

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ABSTRACT: The wild silkworm (*Cricula trifenistrata*) reared under nutritional humidity and environmental stress condition to determine growth and dietary efficiency, compared with a control indicated that consumption of leaves is significantly influenced by humidity.

KEY WORDS: Cricula silk worm, cashew leaf, digestibility, conversion efficiencies

Cricula silk moths *Cricula trifenestrata* (Helfer) (Lepidoptera: Saturniidae) are usually seen on wing around August, with a possible second brood from August to September. However, due to drastic climate changes it is getting harder to predict their appearances. Unlike the domesticated *Bombyx mori* silkworm which feeds solely on mulberry leaves, the Cricula is a polyphagous. It is capable of feeding on a variety of host plants. In Java, Cricula feeds on the leaves of cashew, soursop, avocado and mahogany, with a keen preference towards cashew leaves. The naturally golden cocoons have been successfully utilized into wild silk yarns and other crafts, creating sources of income for local villagers. Cricula are utilized for the production of wild silk yarns. Cricula is a world intangible cultural heritage but the fabrics used to create this textile art such as silk was too expensive for the low income.Educating the villagers on how to turn the cricula cocoon into wild silk yarns and the business partners who purchase the wild silk yarns helped to restore the cricula's natural habitat by planting cashews, avocadoes etc. The village has evolved into a sustainable village, with higher income and creativity in utilizing their local resources. Cocoon composed of bright golden yellow silk united into a network; the female spins larger cocoon than the male to accommodate its larger size. The golden cocoon is completed in about 8 hrs; this incubation phase lasts for 21-26 days. However, during radical climate condition, it may last for 2-3 months on the Island of Java. With technology, collaboration with the golden cocoons has been utilized into wild silk yarns and other crafts, creating a source of income for local villagers. The newly hatched first instar caterpillars moult and transform into II, III, IV and V instars. In general, the female larva is larger and heavier than males. The male and female larvae can be easily distinguished from its sexual marking. On maturity the larva stop feeding and get start to spinning for the protection of pupa in cocoon shell. Moth

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emerges from cocoon by making a hole in anterior end of the cocoon (Pal and Medda, 2006; Reno et al., 2008). The male moth flies actively after emergence and couples naturally with an available female. Oviposition ranges 200-300 whiles the same in natural conditions (Kakati and Chutia, 2009; Tikadar, 2012). The male moth survives 4-5 days and female moth for 4-7 day for oviposition of eggs (Yadavand Kumar, 2003; Sarmah *et al.,* 2010).

In the present study this new productive non-mulberry silkworm suitable for rearing during favorable season (August-February) under the Indian condition was taken up. The rearing was conducted as per the new standard package and recommendation by providing fresh leaves of cashew. About 100 larvae in three replicates were separated and reared in humidity and feeding conditions (treatments at 100% RH and at 80-85% RH as control) in sericatron(under normal environmental condition). Cashew leaf used for each feeding was placed in separate trayas dummy or dry weight determination of ingested. Additional larval batches of each treatment were maintained in parallel to determine the dry weight and for subsequent determination of daily increment in larval weight (Maynard and Loosli, 1962).The based feeding of wild silk larva iscashew followed by mango, black berry, olive, soalu and som (Rono *et al*., 2008; Tikader *et al*., 2010a, 2010b; Tikader, 2011, 2012). The cocoon color varies depending on the host plant, the quality of leaf and its biochemical constituents (Kato *et al.,* 2004).The healthy larvae were counted daily in each replication while the unhealthy and dead larva were removed and replaced from additional batches. The litter was collected carefully on subsequent days of feeding. The excreta and leftover leaf in litter were manually separated and dried in an oven. Observations on III, IV and V instar larval growth were recorded and for dietary efficiency calculation dry weight of left over leaf, excreta, larval weight gain cocoon weight and shell weight and shell weight were recorded for all the replications of each treatment. The experiment was repeated and the data were subjected to statistical analysis to find out the significance.The nitrogen contents of all samples were determined by Micro-Kjeldahl method. The digestibility and conversion efficiencies were calculated by making use of the following formulae -

$$\text{Digestibility (\%)} = \frac{\text{Amount of cashew leaf nitrogen digested}}{\text{Total consumed}} \times 100$$

$$\text{Conversion efficiency based on consumption (\%) (A)} = \frac{\text{Increase in dry weight nitrogen of larva}}{\text{Total consumed during that period}} \times 100$$

$$\text{Conversion efficiency based on digestion (\%) (B)} = \frac{\text{Increase in dry weight nitrogen of larva}}{\text{Total digested during that period}} \times 100$$

The nutritional indices consumed and dietary consumption of III, IV and V instars are presented in table 1 and 2. The feed consumption is higher for the worms reared under 100% humid atmosphere than for the control for all instars studied (Table 1). It would thus appear that rearing the silkworms under the prevailing conditions of humidity of the atmosphere entails a considerable wastage of the non-mulberry feeds, through the average percentage of consumption for the entire period works out to be the same. Nutritional efficiency in the larval stages significantly influences the resulting pupa, adult and production of silk particularly in an economically important insect like *Bombyx mori* (Takano and Aral, 1978; Aftab Ahmed *et al.*, 1998). The efficiency with which food substances is ingested and converted to larval body matter varied prominently among the hybrids. It was reported that silkworm hybrids were more efficient in converting the food to larval body matter (Trivedi and Nair, 1999; Singh and Das, 1996) reported that less food consumption wild silkworm batches have high efficiency of conversion of ingest and efficiency conversion of digest to cocoon and shell. This may be due to the fact that less choice of feed leads to some physiological adoptions overcomes nutritional stress conditions (Mishra *et al*., 2011; Keto, 2000). It is clear that the digestibility on the basis of dry weight of leaves remains fairly constant in neighborhood of 35% for the worm reared under the saturated atmosphere in contrast to the widely fluctuating values (nitrogen basis) for the control wild silkworm. Similarly results have

Table 1.Consumption of cashew leaf during diffrent instars (dry weight basis)

Treatment	Total Supplied (g)			Consumed (g)			Consumed (%)		
	III	IV	V	III	IV	V	III	IV	V
100% RH	0.94	4.7	51.7	0.37	2.23	19.7	39.4	47.4	38.1
Control 80-85% RH	1.6	4.9	40.6	0.42	1.7	13.7	20.2	34.2	33.6

Table2.Cashew leaves consumed to produce unit body weight of different instars (weight of dry leaves in g)

Treatment	III	IV	V
100% RH	4.8	5.5	4.7
Control 80-85% RH	6.3	4.2	9.4

obtained for the conversion efficiencies based consumption (A) and digestion (B) which lie in the vicinity of 20 and 50 per cent for experimental worms.

The data indicate that the more or less constant values (nitrogen basis) for the digestibility and conversion efficiencies for the worms recorded at100 per cent RH, while it varied in the control (Table 2). These values, it may be observed, are always at a considerably high level due, perhaps to the intense protein metabolism occurring in the silkworms in the humidity chamber (JunliangXu and Xiaoffeng Wu, 1992). Similarly, significant differences of approximate digestibility were observed between all the treatments and controls. Digestibility is affected by nutritional deficiency or imbalanced diet, high content of crude fiber of deficiency of water in food (Waldbauer, 1964; Muniraju *et al*., 1999). The higher assimilation efficiency or approximate digestibility is certainly is certainly a racial character as higher food intake does not necessarily result in higher digestibility (Magdum *et al.*, 1996; Meenaland Ninagi, 1995) references ratio is an indirect expression of absorption and assimilation of food. It is also expressed in ingest required per unit excreta production. Higher reference ration values mean high rate of digestion and absorption of food. It shows that more food is consumed by the larvae at low humidity in order to build up body weight. This is in accordance with the observation of Singh and Ninagi (1995), Das *et al.* (1999) and Nath *et al*. (1990) on silkworm food utilization efficiency. This would lead one to that, a part of wild silkworm diet consumed at low humidity serves the purpose of maintaining the water balance that gets disturbed during rearing conditions under varying atmosphere conditions of humidity. In the present study it was clear that larvae growth and nutritional indices parameters were recorded significantly higher when larvae were reared under optimum environmental temperature and humidity and adequate feed quantum as per the recommendation.Though a sericigenous insect, it is now commercially utilized only in Indonesia where it is used as alternative source of income and has become popular among the farmers. With the wide availability of cricula cocoons, the perception of people has also changed and people have started appreciating and enjoying the beauty of its silk. The silk manufacturers like the cocoon due to its unique gloss and gold color, which makes an attractive material for fabrics. The cloth materials produced from cricula cocoons are special due to its strong characters such as water resistance and golden color, cool to wear, heat resistance, non allergenic and anti-bacterial properties. The silk thread of cricula products is lighter and more water absorptive than the normal silk, and has an elegant luster with soft touch. Thus, rearing and conservation of cricula are worthy to include in the activities of the sericulture industry. The insect is capable of surviving and producing cocoons and functional adults at 40ºC diurnal temperatures. The genes responsible for such high temperature tolerance need to be elucidated for their possible utilization in developing hardy *B. mori* (Tikader *et al*., 2013), especially in light of the predicted global warming. The findings demonstrate environmentally induced quality parameters and humidity of cashew leaf that must not be ignored for the successful wild silkworm crop.

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