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EFFECT OF DIFFERENT TYPES OF DIET OF CASTOR AND CASSAVA LEAVES ON THE REARING OF ERI-SILK WORM, *SAMIA CYNTHIA RICINI* (BOISD.)

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Ten experimental treatments (Treatments A to J) were conducted to find out the effect of different types of diet of cassava and castor leaves on the growth, development and yield of eri-silkworm, *Samia cynthia ricini* (Boisduval). The treatments A and I showed significantly higher larval and pupal growth, cocoon recovery including shorter larval and pupal period and adult longevity than the other treatments. Lower growth, slower development of larvae, pupae and poor cocoon recovery expressed by longer larval and pupal period and adult longevity were observed in treatment G and J. The present experiment revealed that castor leaves were suitable for better rearing of eri-silkworm. The castor leaves might contain better growth promoting and silk producing nutritive elements.

Key words: Cassava and castor plant, Types of diet, Eri-silkworm.

Introduction

The silk is the most beautiful and valuable textile fibre. Natural silk is produced by the commercial silkworm (*Bombyx mori* L.) as well as by certain other Lepidopterous larvae. Among the other important silk producing worms eri-silkworm, *Samia cynthia ricini* (Boisd.) probably ranks next to the former species in silk production [1]. Now-a-days researchers have drawn their attention to eri-silkworm due to some advantages over mulberry silkworm like large cocoon size, wide host range etc. Eri-silkworm, are extremely hardy and less susceptible to disease [2]. Chowdhury [3] reported that this larvae feeds mainly on the leaves of castor, *Ricinus communis* (L) oil plant. The larvae also survive on cassava (*Manihot utilissima*), Champa (*Plumeria acutifolia*), Gomari (*Gomelina arboria*), Gullar (*Ficus glomerata*), Jatropa (*Jatraps curcus*), Kesseru (*Herpetopanax frograns*), Korah (*Sapium ellgenifolium*), Papaya (*Carica papaya*), Payam (*Evodia flaxinifolia*) and certain other plants.

Eri-culture is practiced on castor leaves in certain areas of Bangladesh, but lack of proper research and absence of extension services, greatly retarded the development of ericulture in our country. The climate of Bangladesh is naturally conducive to a healthy subsistence and development of ericulture. But unfortunately no significant work has been done on ericulture in this country. The varied environmental factors including different types of diet responsible for the larval growth and cocoon yield need to be studied, thoroughly. The present research work was therefore, undertaken to study the effect of different types of diet of castor and cassava leaves on the rearing of eri-silkworm.

Materials and Methods

The experiment was conducted at the Sericulture Research Laboratory, Bangladesh Agricultural University, Mymensingh during April to June 1989 at temperature 26±3° and RH 75±11% to assess the performance of different types of diet of cassava and castor leaves on larval and pupal growth, development and yield of cocoon. There were ten treatments, each having three replications and with 50 larvae per replication. The treatments (types of diet) used in the experiments were as follows:

Treatment (A). Ist instar reared on cassava leaves and remaining instars on castor leaves.

Treatment (B). 2nd instar reared on cassava leaves and remaining instars on castor leaves.

Treatment (C). 3rd instar reared on cassava leaves and remaining instars on castor leaves.

Treatment (D). 4th instar reared on cassava leaves and remaining instars on castor leaves.

Treatment (E). 5th instar reared on cassava leaves and remaining instars on castor leaves.

Treatment (F). 2nd and 4th instars reared on cassava leaves and remaining instars on castor leaves.

Treatment (G). 2nd and 4th instars reared on castor leaves and remaining instars reared on cassava leaves.

Treatment (H). All instars reared on mixed diet of castor and cassava leaves.

Treatment I. All instars reared on castor leaves.

Treatment J. All instars reared on cassava leaves.

The newly hatched larvae were transferred to wooden rearing trays (size 80 cm x 40 cm x 10 cm) and the larvae were supplied with castor and cassava leaves as food from Ist instar to final instar according to the experimental design. The newly hatched larvae were fed on tender chopped leaves. As the larvae grew older, more mature and bigger chopped leaves were supplied to them. Finally, 5th instar larvae were allowed to feed on full, sized mature leaves. The food was offered four times a day at 6 hrs intervals,

collecting from the same plant on the same day to ensure uniformity of feeding.

The observations were made on larval length, breadth and weight, cocoon weight, pupal weight, cocoon shell weight and shell ratio (SR%); effective rate of rearing (ERR%); Larval period, pupal period and adult longevity. The larval length and breadth were measured during its expanded position. The effective rate of rearing and shell ratio were calculated by using the following formulae respectively.

$$ERR\% = \frac{\text{Total number of cocoons obtained}}{\text{Total number of larvae taken}} \times 100$$

$$SR\% = \frac{\text{Weight of single cocoon shell (gm)}}{\text{Weight of single cocoon (gm)}} \times 100$$

The data were analyzed statistically following the principles of completely Randomized Block Design (CRD). Before analysis of variance percentage of cocoon shell ratio (SR%) and effective rate of rearing (ERR%) were transformed to arcsine value to equalize variances. Difference among the means were tested for significance using least significance difference (LSD).

Results and Discussion

The effects of different types of diet of castor and cassava leaves on eri-silkworm are shown in Table 1-4.

(i) Effects of different types of diet on the larval growth and development. The length (cm) and weight (gm) (Table 1) of full grown larvae differ significantly (P<0.01) among the treatments. Maximum length and weight (7.41± 0.17 and 5.92 ± 0.06) were recorded from treatment-A and minimum (6.76 ± 0.08 and 4.76 ± 0.00) from treatment-J showing that castor leaf diet had positive effects in these treatments. Regarding larval length and weight the LSD value at 1% probability level showed that treatment-A was superior for eri-silkworm rearing and this treatment differed from rest of the treatments. The larval breadth differed insignificantly among the treatments. The maximum larval breadth (1.21 ± 0.06 cm) was recorded from treatment-I and minimum (1.08 ± 0.02 cm) from treatment G (Table 1).

(ii) Effect of different types of diet on cocoon and pupal weight. The cocoon and pupal weight (male and female) have been shown in Table 2. These differ significantly (P<0.01) among the treatments. Maximum weight of cocoon (2.490 ± 0.026 gm for male and 2.890 ± 0.096 gm for female) and pupa (2.082± 0.031) gm for male and 2.455 ± 0.086 gm for female) were recorded from treatment-A. Minimum cocoon weights for male (2.12±0.02 gm) and female (2.426±0.002 gm) were recorded from treatment H and J respectively. Minimum pupal weights for both male and female (1.768± 0.007 gm and 2.102± 0.009 gm) were recorded from treatment G and J respectively. The LSD value at 1% probability level showed that heavier cocoons and pupae (male and female) were found from treatment A which differ from other treatments. Female cocoon and pupal weight were always heavier than those of male and these differed significantly (P<0.01) among the male and female.

(iii) Effect of different types of diet on shell weight and shell ratio. The shell weight and shell ratio (male and female) have been shown in Table 3. These differ significantly (P<0.01) among the treatments. It was observed that the maximum shell weight of male (0.408±0.015 gm) were found from treatment A and maximum shell weight and shell ratio of both male and female (0.440±0.022 gm, 17.57±0.72%, 16.10±0.76% respectively) were found from treatment-I and minimum (0.303±0.049gm, 0.316±0.025 gm and 14.30±0.21%, 12.11±0.83% respectively) from treatment-H. The LSD value at 1% probability level showed that highest shell weight and shell ratio were recorded from treatment-A and I which differed significantly (P<0.01) among the treatments.

(iv) Effect of different types of diet on larval and pupal period, adult longevity and ERR% . The larval and pupal period (male and female), adult longevity (male and female) and ERR% have been shown in Table 4. The LSD value at 1% probability level showed that the larval and pupal period (male and female) and adult longevity (female) differed significantly (P<0.01) among the treatments. Adult longevity (male) and ERR% differed insignificantly among the treatments. Longest larval period (19.41±0.16 days), pupal period (11.27±0.14 days for male and 12.36±0.07 days for female) and adult longevity (7.29±0.15 days for male and 7.98±0.13 days for female) were recorded from treatment-G, and shortest larval period (18.12± 0.38 days), pupal period

TABLE 1. EFFECT OF DIFFERENT TREATMENTS ON THE LARVAL LENGTH, BREADTH AND WEIGHT OF ERI-SILKWORM.

Treatment	Mean larval length ± SD(cm)	Mean larval bredth ± SD(cm)	Mean larval weight ± SD(cm)
A	7.41±0.17	1.19±0.12	5.92±0.06
B	7.22±0.06	1.15±0.03	5.79±0.03
C	7.14±0.05	1.13±0.01	5.71±0.06
D	7.09±0.03	1.12±0.01	5.68±0.06
E	7.04±0.02	1.11±0.03	5.63±0.03
F	7.01±0.08	1.10±0.02	5.58±0.07
G	6.97±0.04	1.08±0.02	5.50±0.02
H	7.18±0.02	1.14±0.03	5.74±0.04
I	7.02±0.07	1.21±0.06	5.05±0.01
J	6.76±0.08	1.12±0.03	4.76±0.00
LSD at 1% level	0.17	NS	0.10

TABLE 2. EFFECT OF DIFFERENT TREATMENTS ON THE COCOON AND PUPAL WEIGHT OF ERI-SILKWORM.

Treatment	Mean cocoon weight ±SD (gm)		Mean pupal weight ± SD (gm)	
	Male	Femal	Male	Female
A	2.490±0.026	2.890±0.096	2.082±0.031	2.455±0.086
B	2.380±0.118	2.823±0.038	2.043±0.125	2.400±0.032
C	2.276±0.055	2.600±0.030	1.936±0.080	2.213±0.035
D	2.240±0.056	2.563±0.144	1.883±0.064	2.180±0.139
E	2.236±0.014	2.556±0.032	1.896±0.006	2.174±0.005
F	2.146±0.030	2.623±0.080	1.796±0.047	2.138±0.009
G	2.198±0.032	2.623±0.139	1.768±0.007	2.105±0.005
H	2.120±0.020	2.613±0.050	1.996±0.008	2.296±0.038
I	2.276±0.013	2.733±0.012	1.876±0.015	2.293±0.011
J	2.140±0.140	2.426±0.002	1.832±0.004	2.102±0.009
LSD at 1% level	0.12	0.18	0.14	0.13

TABLE 3. EFFECT OF DIFFERENT TREATMENTS ON THE SHELL WEIGHT AND SHELL RATIO OF ERI-SILK WORM.

Treatment	Mean shell weight ±SD (gm)		Mean shell ratio ± SD (%)	
	Male	Femal	Male	Female
A	0.408±0.015	0.435±0.018	16.39±0.57	15.05±0.50
B	0.343±0.011	0.423±0.006	14.42±1.08	14.99±0.03
C	0.341±0.026	0.386±0.006	14.95±1.58	14.88±0.38
D	0.356±0.015	0.376±0.006	15.93±0.95	14.73±0.96
E	0.340±0.010	0.360±0.020	16.38±0.53	14.09±0.93
F	0.336±0.021	0.360±0.017	15.69±0.99	13.73±0.82
G	0.320±0.010	0.350±0.026	14.56±0.51	13.35±0.94
H	0.303±0.049	0.316±0.025	14.30±2.21	12.11±0.83
I	0.400±0.017	0.440±0.022	17.57±0.72	16.10±0.76
J	0.308±0.008	0.324±0.010	14.39±0.35	13.36±0.43
LSD at 1% level	0.05	0.04	0.05	0.02

TABLE 4. EFFECT OF DIFFERENT TREATMENTS ON LARVAL AND PUPAL PERIOD, ADULT LONGEVITY AND ERR% OF ERI-SILKWORM.

Treatment	Larval period (days)± SD	Pupal period (days)± SD		Adult longevity (days)± SD		ERR%
		Male	Female	Male	Female	
A	18.24±0.21	10.57±0.16	11.32±0.06	6.92±0.18	7.29±0.04	90.67±2.31
B	18.37±0.10	10.79±0.18	11.56±0.14	6.99±0.15	7.36±0.08	90.00±3.46
C	18.62±0.18	10.98±0.12	11.83±0.08	7.09±0.07	7.56±0.09	88.67±1.15
D	18.82±0.17	11.06±0.09	12.06±0.09	7.11±0.17	7.69±0.12	87.33±6.43
E	19.05±0.11	11.10±0.07	12.16±0.10	7.16±0.17	7.78±0.08	86.00±3.46
F	19.24±0.10	11.22±0.15	12.21±0.09	7.23±0.12	7.87±0.10	88.67±2.31
G	19.41±0.16	11.27±0.14	12.36±0.07	7.29±0.15	7.98±0.13	86.67±1.15
H	18.43±0.14	10.88±0.15	11.64±0.21	7.05±0.18	7.47±0.12	83.33±4.62
I	18.12±0.38	10.52±0.10	11.23±0.07	6.87±0.14	7.24±0.11	92.67±1.15
J	18.97±0.12	10.94±0.05	11.68±0.07	6.99±0.12	7.35±0.13	84.67±4.62
LSD at 1% level	0.43	0.29	0.27	NS	0.24	NS

(10.52±0.10 days for male and 11.23±0.07 days for female) and adult longevity (6.87±0.14 days for male and 7.24± 0.11 days for female) were recorded from treatment-I. Pupal period and adult longevity of female were always longer than male and these differed significantly (P<0.01) among the treatments. The highest ERR% (92.67±1.15) was recorded from treatment-I and the lowest (83.33 ± 4.62%) from treatment-H.

The results of the present experiment revealed that better rearing performances of eri-silkworm were observed when larvae fed mainly on castor leaves and poorest performances were seen when larvae fed mainly on cassava leaves. The better larval and pupal growth and development on castor leaves might be due to intake of sufficient amount of foods by the larvae during their entire larval period. Consequently, healthy larval growth and development were obtained resulting in higher cocoon and shell weight. It may therefore be possibly that different treatments contain nutritive elements affecting differently in larval characters and silk productivity. Leaves containing more of the amino-acids of silk might be best for its production by larvae. The length, weight, cocoon and pupal weight, shell weight and ratio (female), larval and pupal period, adult longevity (female) differed significantly (P<0.01) among the treatments in the present experiment. The results of the present experiment agreed with the findings of Chowdhury [4], Dookia [5], Kapil [6], Khalequzzaman [7], Krishnaswami *et.al* [8], Haque *et. al* [9], and Shahjahan *et. al* [10]. From the present study it is evident that the castor leaf might be used as the best food for the rearing of eri-silkworm as castor leaf contributed to the maximum larval and pupal growth, development and finally offered maximum cocoon yield.

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