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EFFECT OF FEED QUANTUM DURING FIFTH AGE SILKWORM, *BOMBYX MORI* L. ON REELING PARAMETERS

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The effect of different feed quantum (18 to 32 feeds) during 5th instar of PM × NB4D2 and NB4D2 × NB7 was studied. The larvae have been starved after 16 feeds (4th day) during 5th instar are unable to spin cocoons. The larvae starved after 18 feed have spun lighter cocoons. The quality of the cocoons were inferior upto 24 feeding level and the quality of silk was superior in 26 to 28 feeding level. The present study indicates that 26 to 28 feed level yield better reeling characters.

INTRODUCTION

The nutritional quality of mulberry leaf play a major role on the growth and development of the silkworm and also on the economic characters of cocoons. The healthiness, survival and cocoon quality are influenced by the quantum of mulberry leaf fed to the silkworm larvae (Ito, 1967; Okajima, 1981; Krishnaswami, 1978; Takano *et al.*, 1978; Sudo & Horie *et al.*, 1983). However no reports are available on the effect of feed quantum on reeling parameters quality in the tropical breeds. Further, in the field condition farmer will face shortage of leaf in the penultimate stage and to know the critical period of starvation without sacrificing the reeling parameter, the present study has been undertaken to evaluate the different feed quantum during 5th instar on the reeling parameters in popular breeds of silkworm, PM × NB4D2 and NB4D2 × NB7.

MATERIAL AND METHODS

Two popular silkworm hybrids namely PM × NB4D2 and NB4D2 × NB7 were used. The silkworm rearing was conducted upto 4th moult (Krishnaswami, 1978) and different treatments were imposed during the 5th instar as mentioned below :

Treatment	Age of 5th instar larva mounted for spinning	No. of feeding given before allowing for spinning	Quantity of leaf fed for each treatment in kgs in V instar (2250) larvae (Average for 3 seasons)	
			Bi × Bi	Multi × Bi
A	4 1/2 days	18 feeds	32.072	28.957
B	5 days	20 feeds	36.483	32.443
C	5 1/2 days	22 feeds	40.093	35.100
D	6 days	24 feeds	43.470	37.757
E	6 1/2 days	26 feeds	46.117	39.407
F	7 days	28 feeds	48.593	41.057
G	7 1/2 days	30 feeds	50.043	41.893
H	8 days	32 feeds	51.350	42.732

Each treatment had three replications of 750 larvae each. The experiment was conducted in three seasons *viz.* Winter (Nov-Dec: S1), Summer (March-April: S2) and Rainy (June-July: S3). The data was collected on filament length, size of filament (denier), renditta, raw silk (%) reelability, evenness,

neatness, cleanness of the silk fibre. The data has been subjected to statistical analysis to know the effect of feed quantum on the above parameters when compared to normal one. The results are interpreted and presented in Table I-II.

RESULTS AND DISCUSSION

Average filament length

In bivoltine hybrid the minimum filament length was observed in 18 feeds (489.12 mts) and maximum filament length in 32 feeds (920.98 mts) (Table I). In multivoltine hybrid the lowest filament length (366.62 mt) was recorded in 18 feeds and the highest in 30 feeds (658.19 mts) (Table II). The silk filament length increased when the quantum of feed increased in both the breeds. This trend was observed in all the seasons. The present study points out that the mulberry leaves consumed by the silkworm after 4th day of 5th instar were primarily utilised as raw materials for formation of the cocoon fibre and reached the maximum level on the 5th or 6th day, (the most voracious feeding stage). Fukuda (1960) and Fukuda *et al.* (1963) showed the relationship of mulberry leaves consumed by the silkworm on different days and their possible incorporation to the silk filament. He opined that the first 100 mts of the silk filament reeled from one cocoon was linked to the mulberry leaves eaten by the silkworm on the 4th day, the next 200-400 mts was from those consumed on the 6th day and the third from 700-1000 mts from those consumed on 8th day, Therefore, the present results showed that the filament length was maximum at 7 1/2 day (30 feeds) in case of multivoltine hybrid and on 8th day (32 feeds) in case of bivoltine hybrid and our results are in agreement with the earlier reports.

Filament size (denier)

The average denier of the filament was recorded the minimum (1.96) in case of 18 feeds and the maximum (2.48) was recorded in 28 feeds in bivoltine hybrid (Table I). In case of multivoltine hybrid, the overall average denier was recorded maximum (2.45) in 32 feeds whereas minimum denier (1.75) was recorded in 18 feeds (Table II).

The results of the present study indicates that there is high correlation between the size of the cocoon filament and amount of mulberry leaves supplied. The thinner denier was recorded in 18 feeding level in both the hybrids and thicker denier with the quantum of feeding level increased in 28 and 32 feeding in case of bivoltine and multivoltine hybrids respectively. The increase or decrease in the filament size is due to the quantum of feed given to the silkworm during 5th instar. It is stated that less the quantum of feed, more thinner the size of the filament and vise-versa. Our studies also showed similar results when compared to the observation made by Naito *et al.* (1987).

Renditta

The minimum renditta (9.58) was recorded in 30 feeds and the maximum renditta (15.09) in 18 feeds in case of bivoltine hybrid (Table I). In case of multivoltine hybrid the maximum renditta (19.69) was seen in 18 feeds and minimum (9.85) in 32 feeds (Table II). From the present results it is clear that there exists a correlation between renditta and feed quantum fed to the silkworm. The lowest quantum of 18 feed level yields higher renditta in both the commercial hybrids. The highest and lowest renditta due to more quantum or less quantum of feed consumed by the silkworm and converted into silk protein.

Raw silk (%)

In bivoltine hybrid the lowest raw silk percentage (7.02%) was recorded in 18 feed level and highest was recorded (10.68%) in 30 feed (Table I). In case of multivoltine hybrid, the lowest raw silk percentage (5.01%) was recorded in 18 feed whereas, highest (9.89%) was noticed in 30 feeds (Table II). From the results it seems that the increase or decrease in the amount of leaf supplied affected the raw silk percentage *i.e:* the less the leaf supplied the less raw silk obtained and vice-versa.

Table I. Effect of feed quantum during 5th instar larvae of $NB_4D_2 \times NB_r$ parameters (mean values of 3 seasons).

Treatment	Av. Filament length (m)	Av. size of filament (d)	Renditta (A)	Raw silk (%)	Reelability (%)	Evenness (%)	Neatness (%)	Cleanness (%)
A	489.12	1.96	15.09	7.02	79.80 (63.20)	71.44 (57.76)	80.00 (63.52)	86.78 (68.90)
B	610.69	2.14	13.02	7.89	82.10 (64.84)	76.44 (61.00)	81.44 (64.53)	89.11 (71.30)
C	698.59	2.15	11.95	8.62	85.54 (67.51)	74.89 (59.95)	81.78 (64.79)	88.33 (71.77)
D	782.24	2.25	10.73	9.61	85.99 (67.89)	77.78 (62.05)	82.00 (65.03)	91.67 (73.47)
E	811.38	2.29	10.05	9.91	86.55 (68.56)	77.89 (62.01)	81.89 (64.88)	93.11 (75.03)
F	899.22	2.48	9.74	10.50	86.00 (68.35)	78.22 (62.22)	80.78 (63.50)	91.11 (73.11)
G	918.78	2.47	9.58	10.68	85.22 (67.04)	78.11 (62.12)	79.11 (62.87)	87.78 (69.63)
H	920.98	2.35	9.60	10.37	85.03 (67.20)	78.33 (62.23)	79.89 (63.45)	89.56 (71.19)
S.E. ±	15.231	0.066	0.254	0.225	0.511	0.497	0.460	1.083
C.D. at 5%	43.318	0.187	0.723	0.641	1.453	1.414	1.309	3.080

Figures in parentheses indicate angular transformed value.

Table II. Effect of feed quantum during 5th instar larvae of PM × NB_4 D_2 on reeling parameters (mean values of 3 seconds).

Treatment	Av. Filament length (m)	Av. size of filament (d)	Renditta (A)	Raw silk (%)	Reelability (%)	Evenness (%)	Neatness (%)	Cleanness (%)
A	366.62	1.75	19.69	5.01	77.85 (61.95)	71.56 (57.77)	76.89 (61.34)	85.78 (67.93)
B	405.60	2.08	16.71	5.64	81.67 (64.77)	72.89 (58.63)	79.00 (62.92)	88.56 (70.26)
C	466.05	2.07	15.16	6.28	86.05 (68.29)	73.91 (58.77)	78.33 (62.34)	90.00 (71.71)
D	524.83	2.28	12.52	7.67	88.55 (70.26)	75.11 (60.10)	77.78 (61.92)	90.89 (72.54)
E	581.34	2.34	10.83	9.21	91.26 (72.92)	79.44 (63.05)	79.89 (63.47)	91.33 (73.20)
F	619.29	2.36	10.46	9.80	92.06 (73.79)	79.00 (62.75)	80.89 (64.25)	90.00 (71.72)
G	658.19	2.36	9.86	9.89	89.44 (71.09)	79.67 (63.18)	78.89 (62.78)	88.89 (70.76)
H	657.38	2.45	9.85	9.84	89.85 (71.45)	78.67 (62.58)	78.67 (62.65)	87.56 (69.54)
S.E. ±	11.403	0.074	0.365	0.234	0.643	0.438	0.579	0.806
C.D. at 5%	32.429	1.039	1.039	0.667	1.828	1.246	1.646	3.969

Figures in parentheses indicate angular transformed value.

But it is an interesting point to note that 28 feeds onwards there is non significant effect on the raw silk percentage and the present results are similar to the observation made by Naito *et at.* (1987).

Reelability (%)

In bivoltine hybrid, 18 and 20 feeds showed the lowest reelability (79.80% and 82.10%) and 22 to 32 feeds showed highest reelability percentage (85.03 to 86.55%) (Table I). In multivoltine hybrid, the lowest (77.85%) reelability percentage was recorded in 18 feeds and highest (92.06%) in 28 feeds (Table II). The results indicates that there is some effect of feed quantum during 5th instar on reelability of cocoons, It has been observed that reelability increased upto 28 feeding level in multivoltine hybrid and 24 feed level in bivoltine hybrid.

Evenness (%)

In bivoltine hybrid, 18 feed showed lowest (71.44%) and highest (78.33%) evenness percentage in 32 feeds (Table I). In multivoltine hybrid 18 feed level showed lowest (71.56%) and 30 feed level showed highest evenness percentage (79.67%) (Table II). It has been observed that there is linear increase in evenness in silk filament from 18 to 32 feed level. The increase or decrease in quantum of feed in multi and bivoltine hybrids during 5th instar affected the evenness of raw silk. The highest evenness was recorded in the 30 feed level and 32 feed level in case of multi and bivoltine hybrids respectively. It may be possibly explained that the less the feed quantum the larvae could not produce the silk protein in the silk gland. This observation is similar to observation of earlier workers (Fukuda, 1960; Naito *et al.*, 1987).

Neatness (%)

In bivoltine hybrid, the neatness percentage was increasing in order 18 to 24 feeds and decreasing order in 26 to 32 feeds (Table I). In case of multivoltine hybrid, the neatness percentage (76.89%) was lowest in 18 feeds (Table II). It was observed that in both the commercial hybrids neatness was increased upto 28 feeds and decreased upto 32 feed level. Naito *et.al.*, (1987) reported that less the quantum of feed supplied result in thinner filament size and more quantum produces thicker filament size. It may be explained that the filament denier and also racial characters affect the neatness.

Cleanness (%)

The cleanness percentage was increasing in order 18 (86.78%) to 26 feeds (93.11%) and decreasing trend from 28 (89.11%) to 32 feeds (89.56%) in case of bivoltine hybrid (Table I). In multivoltine hybrid the lowest (85.78%) and the highest (91.33%) neatness percentage was observed in 18 and 26 feed, respectively (Table II). The cleanness percentage has affected distinctively by the feed quantum given to the silkworm during 5th instar. The cleanness of the rawsilk may be decrease or increasing order according to the feed quantum. The cleanness of raw silk increases in 26 feeds in both the hybrids and began to decrease. The effect of feed quantum as well as the racial characters of the silkworm affect the cleanness of raw silk.

From the foregoing account it may be concluded that 26 and 28 feed level yield better reeling characters such as reelability, evenness, neatness and cleanness. But the renditta is moreover the 30 and 32 feed levels in both the hybrids. The difference in renditta is not statistically significant. Hence it may be suggested that 26 and 28 feed levels are sufficient to get better reeling characters, whereas 30 and 32 feed level appears to be wastage of leaf and manpower.

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