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## TRIALS ON AUTUMN SILKWORM REARING IN PAKISTAN

by

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**Summary.** Autumn silkworm rearing of F-1 hybrid of Korean varieties: Jam 103 × Jam 104 was conducted under local conditions during the months of August-September, 1975. The cocooning percentage (86) and cocoon shell ratio (20%) were found to be satisfactory.

**Introduction.** Silkworm rearing is a forest based cottage industry in Pakistan and at present only a single crop is obtained in the spring season. In countries like Japan, Korea and China the rearing has been developed to obtain two or more annual crops, i.e., spring, summer and autumn crops; during one growing season of mulberry. In Japan, the autumn crop is the major crop and about 57 percent of the total annual egg produce is reared in this season (1).

This study was initiated to investigate the possibilities of silkworm rearing during autumn under local conditions so as to have an understanding about the feasibility of this practice.

**Review of Literature.** Normally the rearing of univoltine and bivoltine races could be conducted only in spring but the development of techniques for artificial hatching (1) has made the rearing possible during the whole of summer or autumn. In Japan, the summer-autumn rearing has taken more share than the spring rearing as stated by the Japan Silk Association, 1967 (1). In Korea, the spring and autumn rearing are about 50 : 50 (Year Book of Raw Silk Statistics, 1972). The conditions in China are almost of the same order in this respect (Personal communication).

**Material and Methods.** Commercial silkworm eggs, specifically treated for autumn rearing were procured from Korea in the month of August, 1975. These were F-1 hybrid of Korean varieties: Jam 103 × Jam 104. The characteristics of this variety as prescribed by the producers (Korea Silkworm Eggs Association, 1975) were used as reference for this experiment and are reproduced below:

(a) Name of variety	..	Jam 103 × Jam 104
(b) Larval duration:		
(i) Fifth instar	..	7.10 days
(ii) Whole life	..	24.05 days

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(c) Survival rate	..	96.2%
(d) Double cocoon	..	2.8%
(e) Single cocoon weight	..	2.3 gm
(f) Cocoon shell weight	..	0.5 gm
(g) Cocoon shell ratio	..	22%

The eggs were allowed to hatch at room temperature and the larvae were brushed on August 18, 1975 and feeding was conducted on the same day at 11 a.m. The young larvae were administered six to eight feeds per day and the grown up ones at five to six. The moulting data during larval period was recorded (see Appendix I). Besides, the temperature and relative humidity of the rearing room was also recorded daily at 8 a.m., 12 noon and 4 p.m. during rearing (see Appendix II).

Nine hundred larvae were taken at random out of about 40,000 larval-population on the second day of the fourth-instar and grouped in three batches of three hundred each and reared under the same conditions. After 25 days from the day of hatching, the larvae got ripened and were mounted on wheat straw on September 12-13, 1975 for spinning cocoons. The cocoons were harvested after five days and the survival percentage of the larvae was expressed on the basis of cocooning ratio by the following formula:

$$\text{Cocooning ratio} = \frac{\text{Number of cocoons}}{\text{Number of sampled larvae}} \times 100$$

The cocoons were sorted out to assess their quality and were graded as: (1) best cocoon; (2) medium cocoon; (3) double cocoon and (4) low cocoon (thin, spotted, deformed, dead and others) and their respective percentage was determined.

In order to establish the quantitative characters of the cocoons the following methods were employed.

- Single cocoon weight:* 25 male and 25 female cocoons were taken at random from the produce of each group on the harvest day and their weight determined and averaged.
- Cocoon shell ratio:* 25 male and 25 female cocoons were taken as described above (a) and the average weight of the shell determined after removing the pupae from the cocoons. Cocoon shell ratio expressed in percentage was calculated by the following formula.

$$\text{Cocoon shell ratio} = \frac{\text{Cocoon shell weight}}{\text{Cocoon weight}} \times 100$$

**Results.** The results obtained are given below:

*Survival:* The survival rate of the larvae is given in Table 1.

Table 1

*Survival rate of the larvae—from fourth instar to cocooning stage.*

Number of	Group-1	Group-2	Group-3	Average
sampled larvae	300	300	300	300
mounted larvae	272	271	267	270
cocoon spun	261	261	256	259
Survival percentage:	87	87	85	86

*Cocoon characteristics:*

(a) Cocoon grade: The graded cocoons are tabulated in Table 2.

Table 2

*Different grades of cocoons and their percentages*

Grade	Group-1	Group-2	Group-3	Total	%
Best cocoon	160	159	150	469	60
Middle cocoon	61	57	61	179	23
Double cocoon	2	2	3	7	1
Low cocoon	38	43	42	123	16
Total:	261	261	256	778	100

(b) *Quantitative characters:* Single cocoon weight, cocoon shell weight and cocoon shell ratio are given in Table 3.

Table 3

*Quantitative characters of the cocoon*

	Group-1	Group-2	Group-3	Average weight
<i>(i) Single cocoon weight: ..... Grams .....</i>				
Male	1.756	1.639	1.650	1.682
Female	2.019	1.990	2.007	2.005
Average:	1.887	1.814	1.828	1.843
<i>(ii) Cocoon shell weight:</i>				
Male	0.370	0.349	0.343	0.354
Female	0.399	0.379	0.370	0.383
Average:	0.384	0.364	0.356	0.368
<i>(iii) Cocoon shell ratio: ..... Percent .....</i>				
Male	21.0	21.3	20.8	21.0
Female	20.0	19.0	18.4	19.0
Average:	20.5	20.1	19.6	20.0

**Discussion.** The results of this experiment are compared with the specified data regarding this variety in Table 4.

Table 4

*Comparison of the results of autumn rearing of F-1 hybrid of Korean varieties Jam 103 × Jam 104 with the prescribed data for this variety.*

Characters	Rearing data of F-1 hybrid (Jam 103 × Jam 104)	
	Prescribed	Achieved
Larval duration (5th-instar)	7.10 days	8 days
Whole life	24.05 days	25 days
Survival rate	96.2%	86%
Double cocoon	2.8%	1%
Single cocoon weight	2.30 gm	1.84 gm
Cocoon shell weight	0.50 gm	0.37 gm
Cocoon shell ratio	22.0%	20.0%

It is evident from the above comparison that results of this experiment go almost well in agreement with those of the prescribed ones for this variety when reared in autumn under local conditions.

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#### References

1. The Japan Silk Association, Ino. Tokyo (1967)  
Introduction to Silkworm rearing.
2. Year Book of raw silk statistics. (1972) Edited by Ministry of Agriculture and Forestry. Published by Korea Raw Silk Exporter's Association, Republic of Korea.
3. Silkworm varietal characteristics. (1975) Published by Korea Silkworm Eggs Association, Republic of Korea.

Moulting data of the larvae.	
(i) Date of hatching	.. August 18, 1975.
(ii) Date of first moulting	.. August 22.
(iii) Date of second moulting	.. August 25.
(iv) Date of third moulting	.. August 29.
(v) Date of fourth moulting	.. September 4.
(vi) Date of mounting	.. September 12-13.

## Appendix II.

Temperature and relative humidity of the rearing room, recorded at 8 a.m., 12 noon and 4 p.m. daily.

Date	Time of the day						
	8 a.m.		12 noon		4 p.m.		
	Temp.* °C	R.H.** %	Temp. °C	R.H. %	Temp. °C	R.H. %	
August	18	33	65	33	65	33	65
	19	33	65	29	66	29	67
	20	29	73	30	72	29	75
	21	29	75	29	75	30	78
	22	29	77	29	78	29	78
	23	25	73	25	74	26	75
	24	26	76	28	75	29	75
	25	29	74	30	74	30	72
	26	30	74	31	74	31	73
	27	30	73	31	73	31	72
	28	28	72	29	74	30	73
	29	25	78	25	79	25	79
	30	24	78	25	79	25	80
	31	28	82	29	82	28	82
September	1	28	82	29	81	30	82
	2	28	81	30	81	29	81
	3	28	81	29	81	29	81
	4	29	82	30	81	31	81
	5	28	82	29	82	29	82
	6	27	82	28	82	28	82
	7	26	82	28	82	28	82
	8	28	82	29	82	29	82
	9	28	82	29	81	29	81
	10	25	85	26	86	27	87
	11	26	90	27	90	27	90
	12	27	90	28	90	28	90
	13	28	90	29	90	29	90
	14	27	82	29	85	29	85
	15	26	84	28	84	28	84
	16	26	81	28	81	28	82
	17	27	80	28	80	29	80
	18	27	78	28	78	29	78

\* Temperature.

\*\* Relative humidity.