

TITLE STUDIES ON THE CHARACTERS OF PARENTAL PURE LINES OF SILKWORM PFI-1 & PFI-2 AND THEIR F1 HYBRID (PFI-1 x PFI-2)

BY

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SUMMARY Two pure silkworm breeds PFI-1 and PFI-2 were supplied by the Pakistan Forest Institute, Peshawar. The eggs of these races and their F1 hybrids, obtained during spring 1989 and used for these studies during spring, 1990 resulted in 91.66 % cocooning ratio, 21.15 % cocoon shell ratio and 1.818 gm cocoon weight in F1 hybrid, as against 19.92 % cocoon shell ratio and 1.716 gm cocoon weight in parent breeds. The hybrid vigour in respect of cocoon weight (5.945 %), cocoon shell weight (10.020%) and cocoon shell ratio (6.175 %) was, in case of improved parents, considered to be satisfactory.

1. PRODUCTION: The silkworm seed required for rearing is the basic need of Sericulture Industry. The success of the rearing programme mainly depends on the quality of seed. It is therefore necessary to consider the racial characteristics in the production of silkworm eggs required for commercial rearing. The commercial eggs are generally the hybrids of two or more pure lines of different races and are reared by the farmers for their high vigour, easy rearing and high silk production.

Since the introduction of hybridization system the hybrids of highly improved parent races are used for commercial cocoon production in various countries but in Japan, the entire country took to the rearing of hybrids (Krishnaswami et al. 1973). Suitable hybrid combinations amongst improved parents are, therefore, continuously and regularly developed to produce hybrid seed for commercial cocoon production.

AKAPANTHU et al. (1971) conducted research on the characteristics of several hybrids to find out good hybrid combinations. The results of the best F1 hybrids, reared at a temperature of 24.7 to 30.3°C, are given below:-

RACE	Larval duration (days-hours)	Cocooning ratio (%)	Single cocoon weight (gm)	Cocoon shell weight (gm)	Cocoon shell ratio (%)
(N 124 x C 124)	22 - 19	95	1.16	0.348	21.8
(N 115 x C 108)	23 - 20	99	1.48	0.263	17.8
(MAYU x KAN)	26 - 08	97	1.47	0.221	15.1

The results of similar works on the economic characteristics of parents Mayu and Kan and their F1 hybrid reported by Higashi (1971) were used as reference for this experiment and are reproduced below:-

RACE	Larval duration (days-hours)	Cocooning ratio (%)	Single cocoon weight (gm)	Cocoon shell weight (gm)	Cocoon shell ratio (%)
MAYU	28 - 06	91	1.10	0.166	15.1
KAN	25 - 08	93	0.98	0.11	11.1
(MAYU x KAN)	26 - 08	97	1.47	0.221	15.1

The hybrid vigour rate, hybrid effect and vigour index of the hybrid (Mayu x Kan) derived from the above characters are given below:-

RACE	HYBRID VIGOUR RATE OF:			HYBRID EFFECT OF:			VIGOUR INDEX OF:		
	Cocoon weight (%)	Cocoon shell weight (%)	Cocoon shell ratio (%)	Cocoon weight (gm)	Cocoon shell weight (gm)	Cocoon shell ratio (%)	Cocoon weight (%)	Cocoon shell weight (%)	Cocoon shell ratio (%)
MAYU x KAN)	41.346	60.144	15.267	0.43	0.083	2.00	141.34	160.14	110.20
									98.20

Non availability of pure lines of silkworm races has been one of the major constraints in the development of silk production in Pakistan. The Pakistan Forest Institute, Peshawar and Punjab Forestry Research Institute, Faisalabad are concentrating their research efforts to develop pure lines so as to overcome this problem. Two pure lines PFI-1 and PFI-2 of Japanese and Chinese origin respectively developed at Pakistan Forest Institute, Peshawar were supplied for multiplication and

production of hybrid seed for commercial rearing. This study was undertaken for investigation the characteristics of the pure lines PFI-1 and PFI-2 and their F1 hybrid (PFI-1 x PFI-2).

MATERIALS AND METHODS:

The pure silkworm lines, PFI-1 and PFI-2 of Japanese and Chinese origin respectively supplied by the Pakistan Forest Institute, Peshawar were reared at Sericulture Research Laboratory, Lahore. The eggs of the two lines and their F1 hybrid (PFI-1 x PFI-2) were obtained during spring, 1989. These eggs were subjected to experimental rearing during spring, 1990 for studying the characters of the pure lines and their hybrid.

The eggs were incubated at 25°C and 75 % R.H. The first and second instar larvae were reared at 24°C - 25°C and 70 - 75% R.H. and rest of the stages under laboratory conditions of 20 - 23°C and 65-70 % R.H. The first to third instar larvae were given five feeds per day i.e. at 07, 11, 15, 19 and 22 hours and the fourth and fifth instar were given four feeds per day i.e. 08, 12, 17 and 22 hours. The larval durations of both the parents and their hybrid were also recorded.

For studying the characters of the pure lines and their F1 hybrid, 900 fourth instar larvae of each variety were taken at random and grouped in three batches of three hundred each. The larvae, on maturity, were mounted on cocooning frames. The cocoons were harvested after seven days and the following characters were studied in each variety:-

(a) Larval Marking and Cocoon Shape

The larval marking and cocoon shape were studied visually.

(b) Cocooning Ratio:

The survival percentage of the larvae was expressed on the basis of cocooning ratio by the following formula:

$$\text{Cocooning Ratio} = \frac{\text{Number of cocoon spun}}{\text{Number of sampled larvae}} \times 100$$

(c) Grades of Cocoon: The parental and hybrid cocoons of each group were sorted out and graded as; (1) good cocoons (2) low cocoons (3) defective cocoons and (4) double cocoons. The number of cocoons of each grade were counted, averaged and their respective percentage was determined.

(d) Cocoon Weight: Female and male cocoons, 10 each, were taken at random from good cocoons of each group of each variety on the harvest day and their weight (gm) determined and averaged.

(e) Cocoon Shell Ratio The shell weight (gm) of the cocoons (d) was determined after removing the pupae from the cocoons. Cocoon shell ratio, expressed in percentage, was calculated by the following formula:-

$$\text{Cocoon Shell Ratio} = \frac{\text{Cocoon Shell Weight}}{\text{Cocoon weight}} \times 100$$

(f) Hybrid Vigour Rate (V.R.) The hybrid vigour rate of the F1 hybrid (PFI-1 x PFI-2) in respect of cocoon weight; cocoon shell weight and cocoon shell ratio were determined as under:-

$$(i) \text{ Cocoon weight of F1 hybrid} = \frac{\text{Weight of cocoon of F1 hybrid} - \text{Mean average weight of cocoons of parents}}{\text{Mean Average weight of cocoons of parents}} \times 100$$

(ii) Cocoon shell weight Determined by the above formula replacing cocoon weight by cocoon shell weight.

(iii) Cocoon Shell Ratio Also determined by the above formula replacing cocoon weight by cocoon shell ratio.

(g) Hybrid Effect(s): The hybrid effect(s) in respect of cocoon weight, cocoon weight and cocoon shell ratio was determined by the following formula, where F1 stands for the values of hybrid and MP for the mean values of parents:-

(b) Vigour Index (V.I.)

The vigour index (V.I) in respect of cocoon weight, cocoon shell weight, cocoon shell ratio and larval duration were worked out by the formula given below:-

$$V.I. = \frac{F1}{MP} \times 100$$

RESULTS: The data recorded on different characters of the parents and their F1 hybrids is given in table 1.

TABLE 1

CHARACTERS OF PARENT SILKWORM RACES PFI-1 & PFI-2 AND F1 HYBRID (PFI-1 x PFI-2) DURING SPRING, 1990

Name and origin of parent/hybrid	Larval marking	Colour of larvae	Larval duration whole life (days)	Fifth instar (days)	Single cocoon weight (g)	Cocoon shell weight (g)	Cocoon shell ratio (%)	Shape of cocoon	Colour of cocoon	Cocoon ratio (%)
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
<u>Parents</u>										
PFI-1 Japanese	Normal marking	Brownish white	29.0	8.5	1.578	0.315	19.19	Pea-nut	White	89.66
PFI-2 Japanese	Plain	White	28.0	7.5	1.355	0.383	20.65	Oval	"	90.77
Mean Average of parents (M.P)	-	-	28.5	8.0	1.716	0.349	19.92	-	-	90.21
<u>Hybrid</u>										
(PFI-1 x PFI-2) hybrid	Normal marking	White	29.0	8.0	1.818	0.384	21.15	Slightly constricted	White	91.66

Hybrid Vigour Rate, Hybrid Effect and Vigour Index in respect of cocoon weight, cocoon shell weight, cocoon shell ratio, worked out from the data given in table 1, were found to be 5.945%, 10.028%, 6.175%, 0.102 gm., 0.035 gm, 1.230 % and 105.94%, 110.03%, 106.17 % respectively, vigour index of larval duration was 98.24 percent.

DISCUSSION:

The results achieved in respect of the economic characters of the hybrid (PFI-1 x PFI-2) are compared with those of the hybrid (MAYU x KAN) in table 2.

TABLE 2

COMPARISON OF THE RESULTS OF ECONOMIC CHARACTERS OF THE HYBRID (PFI-1 x PFI-2) WITH THOSE REPORTED FOR THE HYBRID (MAYU x KAN)

CHARACTERS	Data on economic characters of the hybrids of	
	(MAYU x KAN)	(PFI-1 x PFI-2)
Larval duration (days+hours)	26 - 08	28 - 00
Cocooning ratio (%)	97.00	91.66
Single cocoon weight (gm)	1.47	1.818
Cocoon shell weight (gm)	0.221	0.324
Cocoon shell ratio (%)	15.100	21.150
Hybrid Vigour Rate of:		
Cocoon weight (%)	41.364	5.945
Cocoon shell weight (%)	60.114	10.028
Cocoon shell ratio (%)	15.267	6.175
Hybrid Effect of:		
Cocoon weight (gm)	0.430	0.102
Cocoon shell weight (gm)	0.083	0.035
Cocoon shell ratio (%)	2.000	1.230
Vigour Index of:		
Cocoon weight (%)	141.36	105.94
Cocoon shell weight (%)	160.14	110.03
Cocoon shell ratio (%)	115.26	106.17
Larval duration (%)	98.28	98.24

It is evident from the above comparison that the results achieved in respect of the economic characters of single cocoon weight, cocoon shell weight and cocoon shell ratio of the hybrid (PFI-1 x PFI-2) are far more significant as compared to those of the hybrid (MAYU x KAN) reported by Higushi (1971), where as the Hybrid Vigour Rate, Hybrid Effect and Hybrid Index of the former are on low side owing to the much improved parent breeds in quantitative characters of cocoon as compared to those of the later. Other characters like larval duration and cocooning ratio of both the hybrids are almost in well agreement.

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