Among five types of silkworms found in India, the mulberry silkworm *Bombyx mori* L. has a pride of place in holding major share and producing the best quality of silk.

Concerted efforts of research in the field of breeding have resulted in the development of superior silkworm breeds / hybrids and are being utilized for commercial exploitation. However, little information is available on their systematic evaluation.

Keeping in view, an attempt has been made to evaluate various silkworm breeds. Eighteen multivoltine and twelve bivoltine breeds with well known genetic background were chosen from the working germplasm of Central Sericultural Research and Training Institute, Mysore.

Performance of the breeds was evaluated by rearing in different seasons with three replications as per standard rearing technique.

Observations were made on ten economic characters *viz.*, fecundity, hatching percentage, pupation rate, cocoon weight, cocoon shell weight, cocoon shell percentage, filament length, reelability, raw silk percentage and neatness. Data were compiled and subjected to Multiple Traits Evaluation Index method of Mano *et al.* (1993).
Top ranked six multivoltine breeds namely, BL\textsubscript{67}, BL\textsubscript{68}, 96A, 96E, 96H and PM and six bivoltine breeds \textit{viz.}, CSR\textsubscript{2}, CSR\textsubscript{3}, CSR\textsubscript{4}, CSR\textsubscript{12}, CSR\textsubscript{17} and NB\textsubscript{4}D\textsubscript{2} were short listed as lines and testers respectively.

All the six lines were crossed with all the six testers raising thirty six hybrids.

Rearing of F\textsubscript{1} hybrids along with parents was carried out with three replications during three major seasons of the year i.e., summer, rainy and winter in order to know the their performance in different environmental conditions.

Data were recorded for fourteen characters \textit{viz.}, fecundity, hatching \%, total larval duration, V\textsuperscript{th} instar larval duration, yield / 10,000 larvae by weight, pupation rate, cocoon weight, cocoon shell weight, cocoon shell percentage, filament length, reelability, raw silk \%, denier and neatness. Data were generated and pooled together and subjected to relevant statistical analysis to adjudicate superior hybrid combination.

Line × tester analysis suggested by Kempthorne (1957) was employed to determine general combining ability (GCA) of lines and testers and specific combining ability (SCA) of hybrids and also to understand the magnitude of hybrid vigour in different hybrids.

Among the lines, BL\textsubscript{67} and BL\textsubscript{68} exhibited significant GCA effects for majority of the characters studied and were adjudicated as good general combiners.
Among thirty-six multivoltine × bivoltine hybrids, BL<sub>67</sub> × CSR<sub>2</sub> was found promising that expressed significant SCA value for most of the characters.

Maximum hybrid vigour over MPV was exhibited by BL<sub>67</sub> × CSR<sub>2</sub> whereas PM × CSR<sub>4</sub> manifested high hybrid vigour over BPV for majority of the characters studied.

Genotype × environment interaction showed highly significant variation for all the characters in different hybrids in different seasons indicating variable genetic response of the breeds in different seasons.

Hybrids were also evaluated through multiple traits evaluation index system of Mano <i>et al.</i> (1993) in order to understand overall superiority of hybrids for different characters in different seasons to short list promising hybrids.

Five potential hybrids in each season have been selected based on average evaluation index values.

During summer, BL<sub>68</sub> × CSR<sub>2</sub> recorded maximum average E.I. value (63.66%) followed by BL<sub>67</sub> × CSR<sub>2</sub> (63.18%), BL<sub>68</sub> × CSR<sub>12</sub> (58.12%), BL<sub>67</sub> × CSR<sub>4</sub> (57.05%) and BL<sub>68</sub> × CSR<sub>17</sub> (54.97%).

BL<sub>67</sub> × CSR<sub>2</sub> exhibited maximum average E.I. value (65.25%) followed by BL<sub>68</sub> × CSR<sub>2</sub> (64.48%), BL<sub>68</sub> × CSR<sub>17</sub> (56.16%), BL<sub>67</sub> × CSR<sub>12</sub> (55.32%) and 96A × CSR<sub>17</sub> (54.12%) in rainy season.
In winter, BL_{67} × CSR_{2} showed maximum E.I. value (65.00%) followed by BL_{68} × CSR_{2} (57.61%), BL_{67} × CSR_{12} (57.59%), BL_{68} × CSR_{17} (57.51%) and BL_{67} × CSR_{3} (57.07%).

Overall, two hybrids, BL_{67} × CSR_{2} and BL_{68} × CSR_{2} were found superior in all the three seasons.

Multivoltine × bivoltine hybrids were also assessed based on cocoon size uniformity.

Five hybrids were selected during each season, viz., BL_{67} × CSR_{12}, BL_{67} × CSR_{2}, BL_{68} × CSR_{12}, 96A × CSR_{12} and 96E × CSR_{2} during summer, BL_{67} × CSR_{2}, BL_{67} × CSR_{12}, BL_{68} × CSR_{12}, 96A × CSR_{12} and 96H × NB_{4}D_{2} during rainy and BL_{67} × CSR_{2}, BL_{67} × CSR_{3}, BL_{67} × CSR_{17}, BL_{68} × CSR_{2} and 96A × CSR_{3} showed uniformity in cocoon size in winter season.

It was interesting to note that the cocoons of many hybrids involving BL_{67} were found uniform in all the rearing seasons.

Based on overall results utilizing various statistical methods, BL_{67} × CSR_{2} and BL_{68} × CSR_{2} emerged as promising multivoltine × bivoltine hybrids in all respects and were selected for laboratory evaluation and preliminary field trial at farmers level along with the control PM × CSR_{2}.

Laboratory results showed that the hybrids viz., BL_{67} × CSR_{2} and BL_{68} × CSR_{2} and PM × CSR_{2} are characterized by pupation rate of 93.49, 92.27 and 89.19%, cocoon yield / 10,000 larvae by weight 18.464, 17.715 and 16.580 kg, cocoon weight 1.975, 1.920 and 1.859g
cocoon shell weight 0.399, 0.394 and 0.332 g, cocoon shell percentage 20.20, 20.52 and 17.85%, filament length 980, 964 and 844 m, raw silk percentage 15.79, 15.93 and 13.45% and neatness 91, 90 and 88 p respectively.

- Preliminary field trial of the selected hybrids, BL\textsubscript{67} × CSR\textsubscript{2}, BL\textsubscript{68} × CSR\textsubscript{2} along with control PM × CSR\textsubscript{2} recorded an average cocoon yield of 67.239, 64.384 and 61.143 kg / 100 dfls respectively.

- Based on the performance of three hybrids both in the laboratory as well as in the field, BL\textsubscript{67} × CSR\textsubscript{2} was found promising.

Certain conclusions can be drawn on the basis of findings reported in this thesis:

- Multivoltine breeds like BL\textsubscript{67} and BL\textsubscript{68} being good general combiners, can be used as breeding resource materials in future breeding programmes to develop superior multivoltine silkworm breeds.

- The identified multivoltine × bivoltine hybrid, BL\textsubscript{67} × CSR\textsubscript{2} can be recommended for commercial exploitation in order to get stabilized cocoon crops with better silk quality.