OBJECTIVES AND SCOPE OF THE RESEARCH WORK

1. To check the effect of PAs on growth and economic parameters of *B. mori*, CSR2 × CSR4 strain and to validate its effect on other parental and hybrid strains.

2. To check the effect of PAs on silk gland during 5th instar larval developmental period.

3. To check the effect of PA binding to silk gland DNA and to check its effect on gene expression.

4. To check the effect of PAs on silk quality.
SUMMARY OF THESIS

Silk is being exploited as a biomaterial due to its surprising strength and biocompatibility. Polyamines (PAs) are simple aliphatic amines found in all living organisms and important for cell growth and regulation. Based on the diverse roles played by PAs, the present study was carried out to check the effect of PAs (Put, Spd, and Spm) on the growth and quantity of silk produced by feeding the PAs to B. mori larvae. Further, its effect was checked on quality of silk.

Preliminary studies showed enhancement in growth and economic parameters upon Spd feeding in micro molar concentrations to silk worm B. mori. In the present study, the effect of Put, Spd and Spm on growth and economic parameters of B. mori, CSR 2 × CSR 4 strain were checked. Of all the PAs, Spd 50 µM showed best result. Spd 50 µM improved growth and economic parameters. Further, every day treatment of Spd 50 µM was found to be better than one day treatment in improving growth and economic parameters.

The work was extended to different parental and hybrid strains. Five strains- PM, CSR 2, CSR 4, PM × CSR 2 and CSR 2 × CSR 4 were selected. All the strains showed positive response to PA feeding. It was concluded that PA treatment had positive effect on B. mori parental and hybrid strains by increasing growth and economic parameters.

To understand the mechanism behind the increased growth and economic parameters, the metabolic status and antioxidant potential of silk gland during its 5th instar development period was checked. The results showed significant increase in the metabolic activity of silk glands in Spd 50 µM group. Spd was shown to cause longevity due to its antioxidant property by protecting the cells against Reactive Oxygen Species (ROS). To check the status of antioxidant potential, antioxidant assays were done with silk gland homogenates on every alternate day (day 1, 3, 5, 7, and 9) of 5th instar stage. Results showed an increase in the free radical scavenging activity from day 1 to day 7 in both control and treated groups. In both the groups, maximum free radical scavenging activity was observed on day 7. Significant increase in SOD and CAT activity was observed in the Spd 50 µM treated silk gland homogenates on day 7. It was concluded that upon Spd treatment to B. mori, metabolic activity and antioxidant potential of silk glands were increased during 5th instar larval and pre-pupal developmental stages.

PAs are known to bind to nucleic acids and modulate gene expression. We checked the binding nature of PAs to SG DNA taking CT DNA as control. Maximum absorbance was
observed at 260 nm with SG and CT DNA. Hypochromic effect was observed with increasing concentrations of PAs. The gradual decrease in the absorbance after addition of PAs indicated the possible interaction between the negatively charged DNA and the positively charged PAs. PAs increased the melting temperature of SG and CT DNA. Expressional analyses were carried out with the posterior silk gland samples of control and Spd 50 µM treated groups. Compared to control group, treated silk gland showed increased expression of *Fib-H* and *MYC* gene. Thus it is concluded that the increased levels of Fib-H expression could have resulted in increased silk production and increase in *MYC* gene expression could have elevated metabolic activity of silk glands.

The effect of Spd on the quality of silk was checked. The morphological, mechanical and structural properties were studied. From the morphological observations, it was found that the diameter of the single filament and fiber was significantly higher than the control filament. As the market value of silk is dependent more on its quality, step by step analysis was performed to determine the quality of silk produced after Spd treatment. Percentage of fibroin per unit weight was higher in the treated group when compared to control group. Treated fiber showed lower denier value and breaking strength when compared to the control fiber. % Elongation at break and moisture regain capacity was more for treated fiber than the control fiber. Thus, treated silk fiber showed better mechanical properties than control fiber.

To check any difference in the fiber at structural level, FTIR and XRD analysis was performed. The ratio of crystalline to amorphous region in both control and treated silk fiber was calculated. The crystallinity index of amide I in control and treated were 0.94 and 0.97 respectively. Amide III showed crystallinity index of control and treated as 0.97 and 0.98 respectively. It was found that treated fiber has comparatively more crystalline region than control fiber.

Further the crystallinity of both the fibers was confirmed by WAXD. The increase in absorbance intensity of the treated fiber in the X-Ray diffraction analysis confirmed the FTIR results of high crystallinity in Spd fed larval fiber when compared to control fiber. Thus Spd 50 µM treatment increased the β-sheet / crystallinity of fiber.

**MAJOR CONCLUSIONS AND IMPLICATIONS**

Results of the study showed that PA feeding has positive effect on silkworm growth and economic parameters. Among all the PAs, Spd treatment showed best result. This study throws light on Spd treatment of silk worms and its positive effect on increasing silk gland weights, cocoon weights, metabolic activity and antioxidant potential of *B. mori* during 5th instar larval developmental period. The increase in silk yield was shown at the molecular
level due to enhanced Fib-H gene expression. PA treatment also showed positive effect on the structural and mechanical properties of fiber. Moreover, this work also opens up the idea of feeding antioxidants to silkworms which would be beneficial to the sericulture farmers.