ASSESSMENT OF THE PROPERTIES OF SILK FIBRE AND FABRIC PRODUCED BY BIVOLTINE SILKWORM, *Bombyx mori* L. (LEPIDOPTERA: BOMBYCIDAE) IN NAIROBI, KENYA.

Everlyn K. Nguku – Ph.D

Department: *Fashion Design and Marketing*

Supervisors: *Prof. Keren G. Mburugu*
Prof. Olive M. Mugenda
Prof. Suresh K. Rain,

Concern about global warming has led to renewed interest in the more sustainable use of natural fibres. Among the natural fibres, silk indeed commands considerable respect. Silk is a proteinaceous polymer secretion in the form of a cocoon, consisting of a continuous filament. Although it has been in use for centuries worldwide, *Bombyx mori* silk is one of the least researched fibre in Kenya. It has many unique physical advantages and properties which make it the highest priced natural fibre. The purpose of this experimental study therefore, was to evaluate properties of silk fibre, fabric and cocoons produced by the *B. mori* silkworm, through the rearing of six selected silkworm strains. Two locations, the Commercial Insects Programme (CIP) laboratory (S1) and the CIP farm (S2) were set up in order to study the performance of the selected strains during two seasons, the long rains (LR) and short rains (SR). This study revealed that there was a significant difference in the means of cocoon, pupa and shell weight in the two locations and seasons. ICIPE I had the highest cocoon and pupa weight, in the two locations and the highest mean shell weight in location S1. Results established that the longest silk filament length, 1183.35m, was obtained from ICIPE I during the LR season, and weighed 0.355gms. Silk winding breaks varied amongst the different strains, with ICIPE I having the least counts. Average tenacity and elongation for the raw silk analysed was 3.93g/d and 18.5% respectively and differed between the seasons and strains. It was further observed that silkworm strains with high elongation had the least number of winding breaks due to increased elasticity. Cleanliness and neatness percentages differed among the strains, and notably ICIPE I's cleanliness and neatness percentages were higher than the other silkworm strains during the two seasons, 96 and 93% respectively. There was no significant difference in the fabric mass per unit area in the two locations at $P < 0.05$ ($P = 0.0001$) and during the two seasons ($P = 0.0001$). Evaluation of the influence of the various silkworm strains had on the breaking load revealed that there was no significant difference on the warp and weft at $P < 0.05$ ($p=0.0188$) and ($p=0.0006$) respectively amongst the six strains. Auxiliary indications established that the different silkworm strains used in this study were significant in the tearing strengths of both warp and weft ($P < 0.05$) ($p=0.989$) and ($p=0.776$) respectively. ICIPE I recorded the shortest larval development period in S1 during SR and it was significantly shorter ($F = 12.61$; $df = 71$; $P = 0.05$) compared to the other strains. From the research findings, it can be concluded that there is a link between the silkworm strains and ecological conditions during rearing, which determine the larval performance.

Consequently, the larval performance characteristics significantly influence the silk cocoon, fibre and fabric properties. In addition, the cocoon properties, collectively with fibre production processes play a major role in determining the fibre properties, which when combined with fabric production processes influence and determine the fabric properties. A major outcome of the study was the establishment of a silk fibre quality control laboratory. Further ICIPE I silkworm strain was identified as having the most economical traits and most suitable for field rearing in Kenya, compared to the other five strains. This study recommends the Kenya Bureau of Standard (KEBS) together with the relevant textile stakeholders should draft a standard method against which silk fabric in Kenya can be tested and graded. In addition, further research on suitable silkworm strains and training in silk production processes at all levels for production of quality silk products.