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**ANALYSIS OF CORRELATION BETWEEN COMMERCIAL CHARACTERS
OF SILKWORM *BOMBYX MORI* L.**

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ABSTRACT

Six pure silkworm breeds viz., Pure Mysore, Nistari, C. nichii, NB₄D₂, KA & CSR₂ and three hybrid (Pure Mysore x CSR₂, Nistari x NB₄D₂ and KA x NB₄D₂) silkworms were used for the present study. The silkworm rearing was conducted during pre monsoon, monsoon and post monsoon seasons to get the mean values of selected commercial characters. The mean values of commercial characters viz., fecundity, larval weight, larval duration, cocoon weight, shell weight, shell ratio, filament length, denier and renditta were subjected to regression analysis with each other individually to know the level of correlation coefficient between them. Of the 36 analysis, 21 traits clearly showed the positive correlation.

Keywords: Silkworm *Bombyx mori*, Commercial Characters, Correlation Analysis

INTRODUCTION

Ever since its inception, more than four thousand years ago, Sericulture is playing an important role in the economic life of man [1]. To improve the quantity and quality of silk, many attempts are being made to improve the silkworm stocks through genetic manipulation. The silkworm breeding programmes have contributed substantially by

the introduction of improved silkworm breeds and more than 2000 races of silkworm are maintained in the germplasm banks of several countries [2]. In conventional breeding, the parental selection and performance prediction is on the basis of either their performance [3] or performance of the progeny [4, 5]. The correlation between yield and biochemical

parameters [6], genetic variability for egg characters [7]; pupal size to fecundity and silk yield [8]; larval silk gland and shell weight [9]; commercial characters with protein [10], amylase [11], esterase [12], alkaline phosphatase [13] succinate dehydrogenase [14] were reported. However, correlation studies between commercial characters are rather scarce. Hence, the present investigation was undertaken.

MATERIALS AND METHODS

Six pure silkworm breeds *viz.*, Pure Mysore, Nistari, C. nichii, KA, NB₄D₂ & CSR₂ and three hybrid (Pure Mysore x CSR₂, Nistari x NB₄D₂ and KA x NB₄D₂) silkworms were selected for the present investigation. The silkworm rearing was conducted during pre monsoon, monsoon and post monsoon seasons in the laboratory following the method described by Krishnaswamy [15, 16]. All experimental batches were maintained in triplicate. In each replication 500 larvae were kept after third moult. The commercial characters selected for present study included fecundity, larval weight, larval duration, cocoon weight, shell weight, shell ratio, filament length, denier and renditta. For evaluation of selected traits standard protocols were followed.

The experimental data were statistically analyzed through SPSS by one way ANOVA

[17], Scheffe's post hoc test [18] and linear regression analysis using the formula $Y = bx + a$ [19] wherever they were applicable.

RESULTS AND DISCUSSIONS

The summary of the commercial characters studied during pre monsoon, monsoon and post monsoon seasons of the year are presented in the **Table 1**. From the table it is very clear that the bivoltine breeds are superior and multivoltine silkworms are inferior when compared to productivity traits. Whereas the hybrid silkworms exhibited mid parental value for the selected commercial characters. The results of statistical analysis revealed that the variation in fecundity of the selected silkworm breeds is significant at 0.1% ($P < 0.001$). The same trend was observed in all the selected commercial characters of the experimental sets. The results of regression analysis between commercial characters are presented in the **Figures 1 to 36**. From the results of regression analysis it is very clear that the fecundity exhibited highly positive correlation with larval weight ($R^2 = 0.680$), cocoon weight ($R^2 = 0.643$), shell weight ($R^2 = 0.564$), shell ratio ($R^2 = 0.506$) and filament length ($R^2 = 0.557$). Whereas denier ($R^2 = 0.223$) exhibited moderately positive correlation. However, the larval duration exhibited almost neutral status ($R^2 = 0.001$) with fecundity. The

renditta exhibited strong negative correlation with fecundity. The larval weight revealed strong positive correlation with cocoon weight ($R^2=0.771$), shell weight ($R^2=0.817$), shell ratio ($R^2=0.801$), filament length ($R^2=0.772$) and denier ($R^2=0.385$). However, the larval weight exhibited negative correlation with larval duration ($y = -17.65x + 635.4$) and renditta ($y = -2.389x + 17.45$). The larval duration exhibited negative correlation with all the characters. The cocoon weight showed highly strong correlation coefficient with shell weight ($R^2=0.929$), shell ratio ($R^2=0.857$), filament length ($R^2=0.970$) and denier ($R^2=0.712$). But, cocoon weight showed strong negative correlation with renditta ($y = -7.10x + 20.12$). The shell weight exhibited highly strong positive relationship with shell ratio ($R^2=0.982$), filament length ($R^2=0.911$) and denier ($R^2=0.774$) only. The shell weight exhibited highly negative correlation with renditta ($y = -21.52x + 15.36$). The shell ratio also, revealed highly strong correlation with filament length ($R^2=0.855$) and denier ($R^2=0.771$) only. The filament length showed strong correlation with denier ($R^2=0.701$) only.

The results of regression analysis clearly indicated three types of correlations viz., positive, neutral or negative correlation

among the selected commercial characters. From the present study, it could be said that these characters had inherent association with each other i.e., of the 36 analysis, 20 traits exhibited highly strong positive correlation coefficient ($R^2 = >0.5$) and remaining traits maintained either moderately positive, negative or neutral status. As the success of breeding work is largely depends on the selection of parents, the information gathered from this work will helps to know the kind and degree of correlation between the commercial characters as well as their effective selection. Also, the knowledge of correlation among various commercial characters is one of the important parameters in breeding programmes. Therefore, the information generated from this study may be used during the selection process in the breeding programmes for new breeds of silkworm *Bombyx mori* with better economic characters.

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Table 1: Mean Values \pm SD of Nine Commercial Characters in Nine Breeds of Silkworm, *Bombyx mori*

| Commercial Traits Silkworm Breeds | Fecundity | Larval Weight (g) | Larval Duration (h) | Cocoon Weight (g) | Shell Weight (g) | Shell Ratio (%) | Filament Length (m) | Denier | Renditta |
|------------------------------------------|--------------------|-------------------|---------------------|-------------------|------------------|------------------|---------------------|-----------------|------------------|
| Pure Mysore | 467.22 \pm 10.96 | 2.01 \pm 0.06 | 660 \pm 10.39 | 1.02 \pm 0.07 | 0.12 \pm 0.01 | 12.57 \pm 0.49 | 426.44 \pm 19.83 | 1.77 \pm 0.09 | 11.77 \pm 0.82 |
| Nistari | 485.11 \pm 5.30 | 2.83 \pm 0.06 | 564.88 \pm 10 | 1.14 \pm 0.07 | 0.15 \pm 0.01 | 13.41 \pm 0.87 | 435.66 \pm 17.21 | 1.78 \pm 0.07 | 13.26 \pm 0.24 |
| C. nichii | 376 \pm 18.06 | 2.14 \pm 0.05 | 537 \pm 28.16 | 0.890 \pm 0.0 | 0.114 \pm 0.02 | 12.8 \pm 0.947 | 390 \pm 18.22 | 1.88 \pm 0.08 | 14.12 \pm 0.23 |
| CSR ₂ | 509.10 \pm 16.58 | 4.07 \pm 0.05 | 578.88 \pm 6.45 | 1.81 \pm 0.05 | 0.43 \pm 0.01 | 24.02 \pm 0.18 | 1011.99 \pm 12.3 | 2.93 \pm 0.22 | 5.78 \pm 0.23 |
| NB ₄ D ₂ | 520.55 \pm 16.65 | 4.16 \pm 0.05 | 576.67 \pm 11.1 | 1.76 \pm 0.03 | 0.35 \pm 0.01 | 20.27 \pm 0.15 | 1020 \pm 29.96 | 2.48 \pm 0.06 | 8.34 \pm 0.47 |
| KA | 518 \pm 14.21 | 4.08 \pm 0.07 | 561 \pm 23.89 | 1.694 \pm 0.04 | 0.343 \pm 0.02 | 20.24 \pm 0.17 | 992 \pm 28.12 | 2.46 \pm 0.08 | 8.22 \pm 0.22 |
| Pure Mysore x CSR ₂ | 466.66 \pm 11.52 | 2.68 \pm 0.07 | 610 \pm 11.10 | 1.67 \pm 0.02 | 0.28 \pm 0.01 | 17.29 \pm 0.21 | 910 \pm 18.74 | 2.75 \pm 0.06 | 7.64 \pm 0.12 |
| Nistari x NB ₄ D ₂ | 490.77 \pm 6.81 | 3.46 \pm 0.04 | 557 \pm 10.21 | 1.47 \pm 0.02 | 0.23 \pm 0.01 | 16.06 \pm 0.85 | 805.99 \pm 12.4 | 1.83 \pm 0.02 | 9.22 \pm 0.85 |
| KA x NB ₄ D ₂ | 528 \pm 15.13 | 4.12 \pm 0.05 | 552 \pm 10.44 | 1.864 \pm 0.03 | 0.390 \pm 0.02 | 20.9 \pm 0.36 | 1015 \pm 14.33 | 2.5 \pm 0.04 | 8.1 \pm 0.36 |

NOTE: Values are the Mean \pm SD of Pre Monsoon, Monsoon and Post Monsoon Observations; The Variation Between the Races is Statistically Significant at 0.1 % (P<0.001)

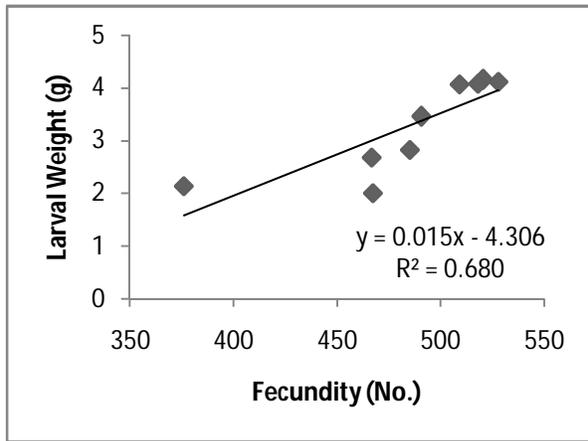


Figure 1: Correlation between fecundity and larval weight

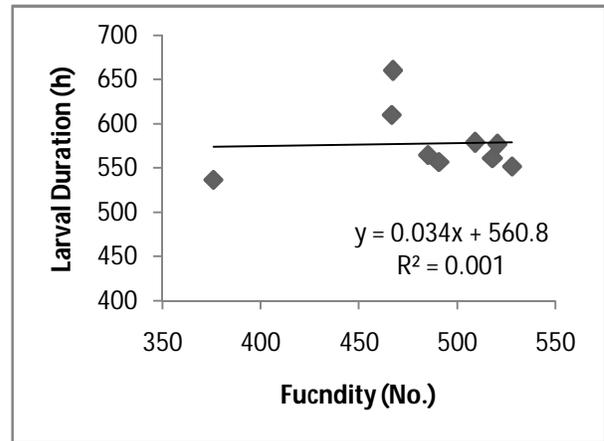


Figure 2: Correlation between fecundity and larval duration

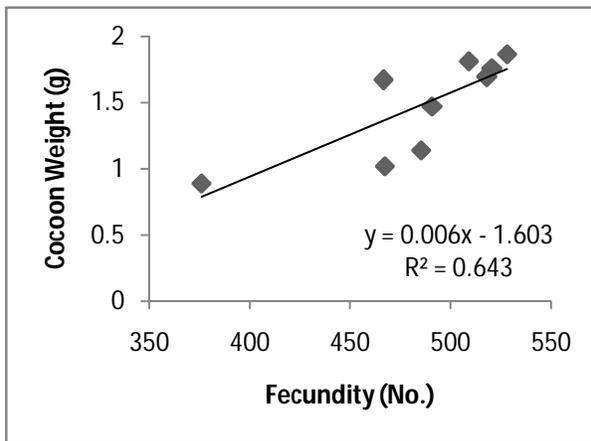


Figure 3: Correlation between fecundity and cocoon weight

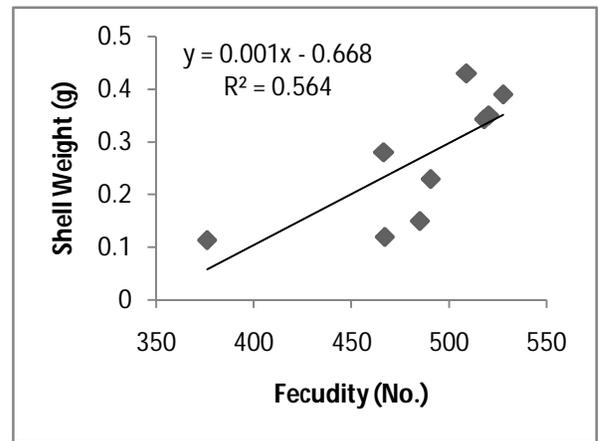


Figure 4: Correlation between fecundity and shell weight

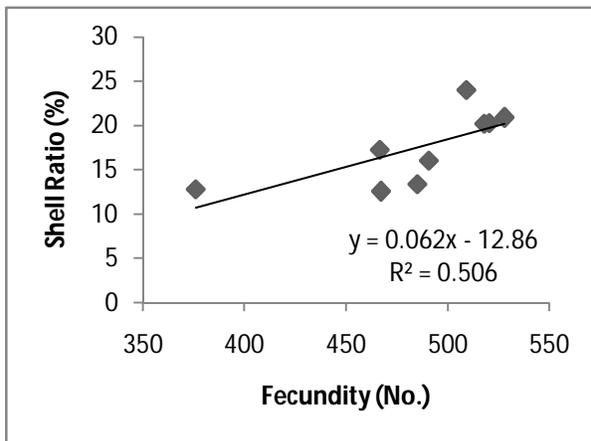


Figure 5: Correlation between fecundity and shell ratio

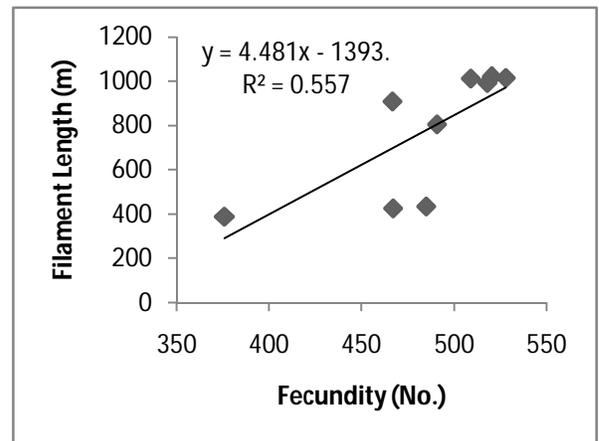


Figure 6: Correlation between fecundity and filament length

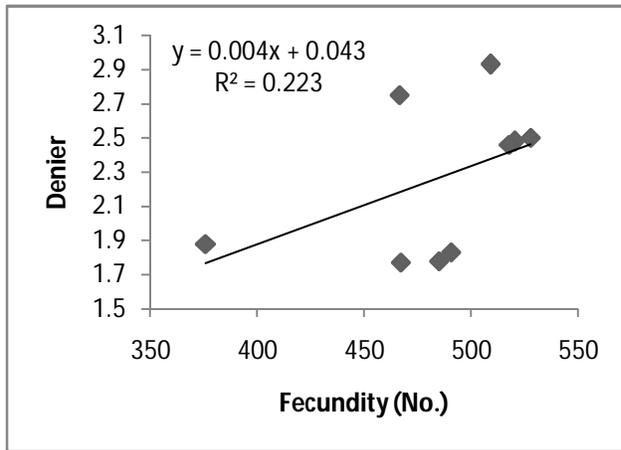


Figure 7: Correlation between fecundity and denier

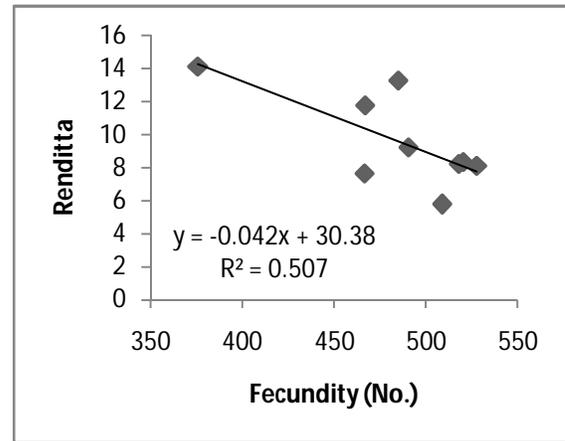


Figure 8: Correlation between fecundity and renditta

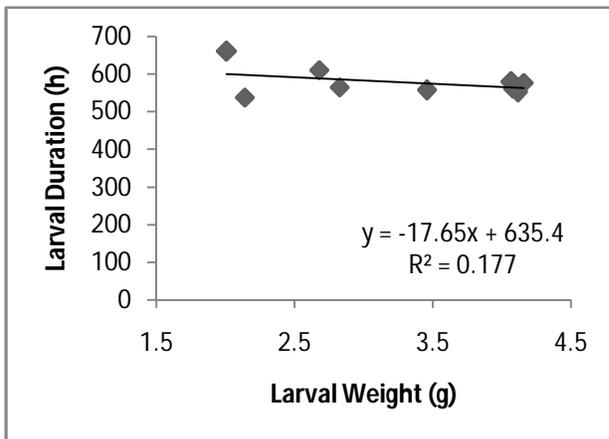


Figure 9: Correlation between larval weight and larval duration

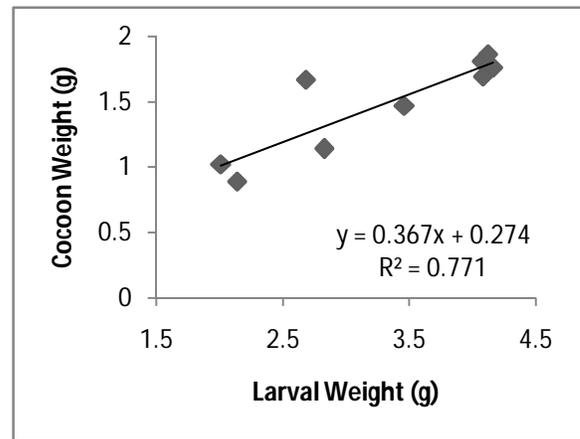


Figure 10: Correlation between larval weight and larval weight

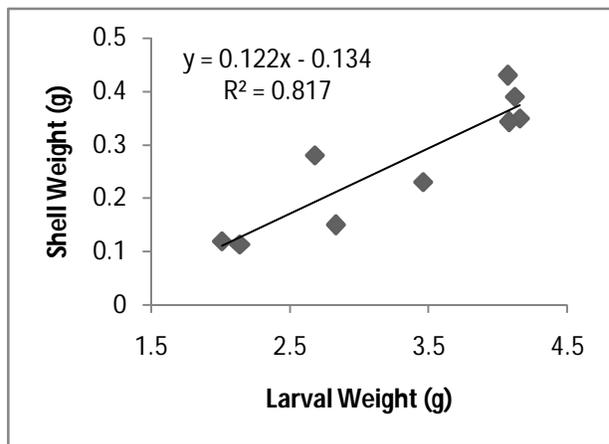


Figure 11: Correlation between larval weight and shell weight

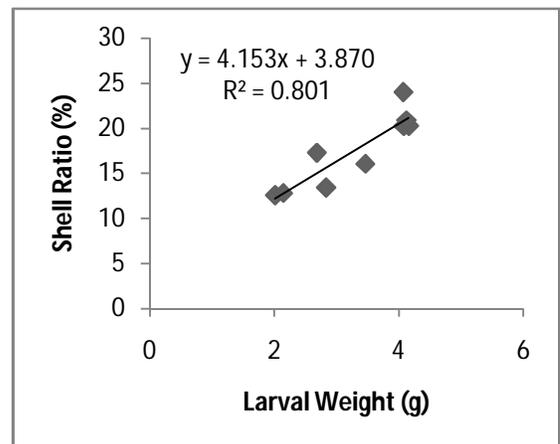


Figure 12: Correlation between larval weight and shell ratio

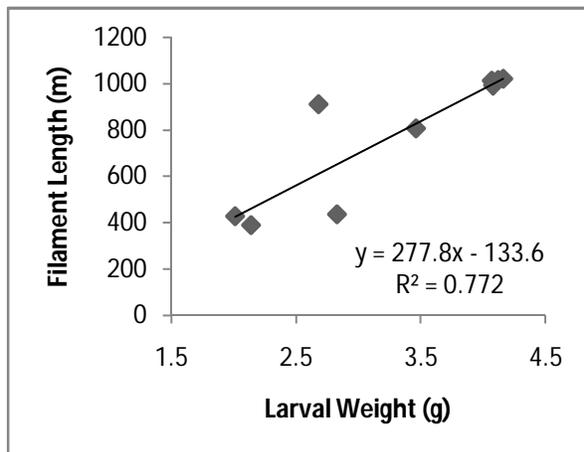


Figure 13: Correlation between larval weight and filament length

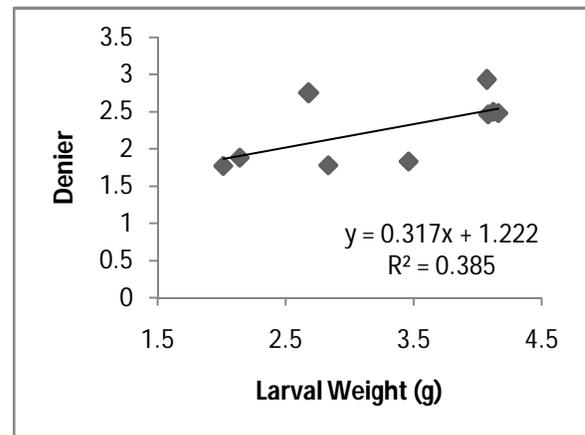


Figure 14: Correlation between larval weight and denier

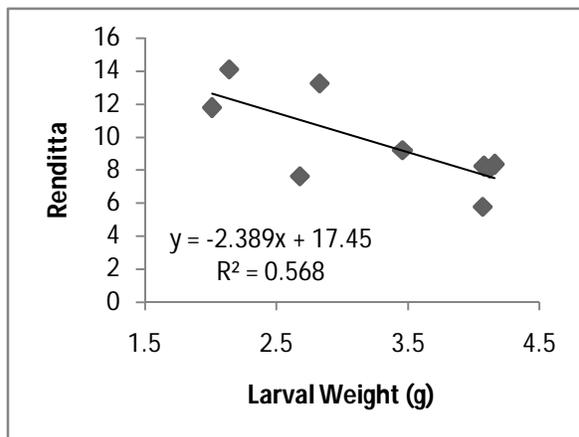


Figure 15: Correlation between larval weight and renditta

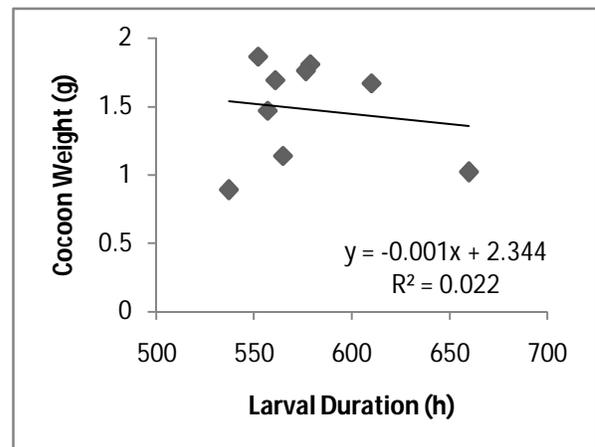


Figure 16: Correlation between larval duration and cocoon weight

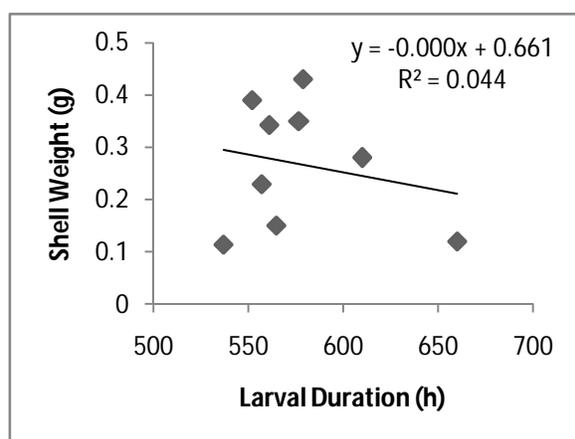


Figure 17: Correlation between larval duration and shell weight

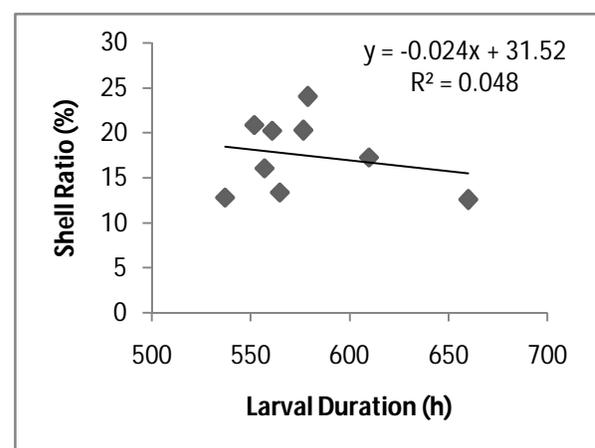


Figure 18: Correlation between larval duration and shell ratio

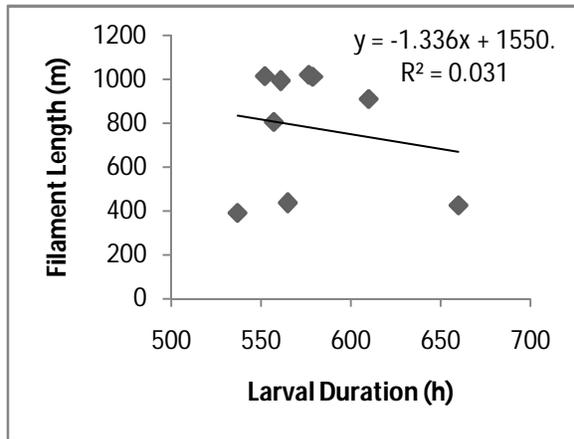


Figure 19: Correlation between larval duration and filament length

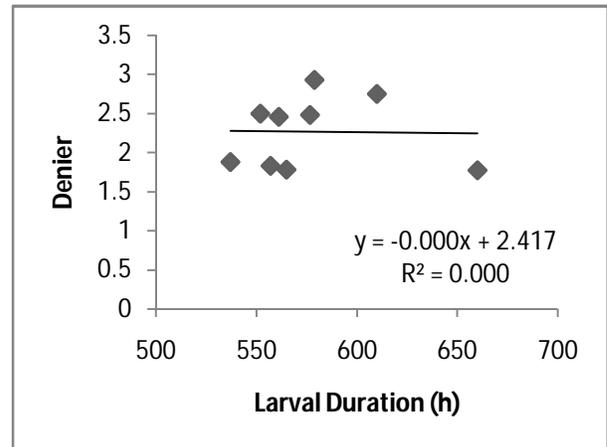


Figure 20: Correlation between larval duration and denier

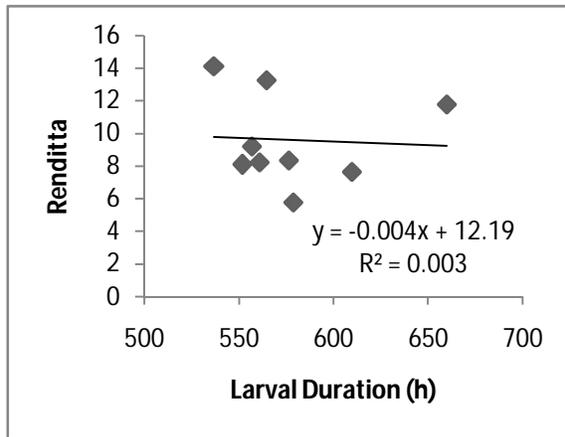


Figure 21: Correlation between larval duration and Renditta

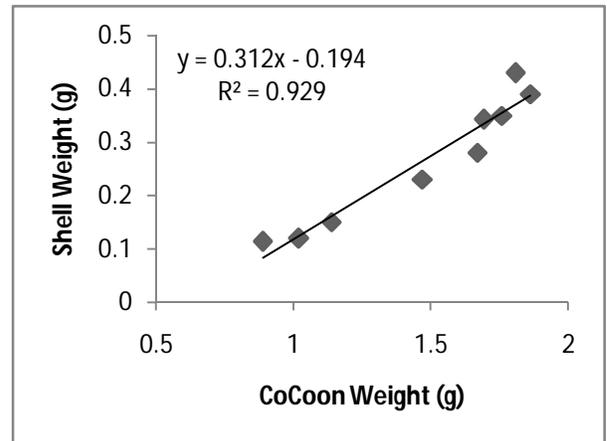


Figure 22: Correlation between cocoon weight and shell weight

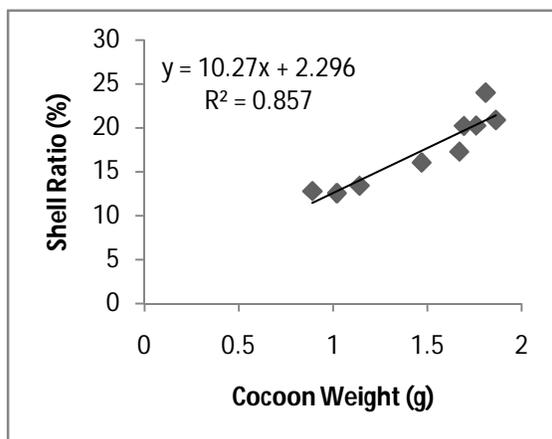


Figure 23: Correlation between cocoon weight and shell ratio

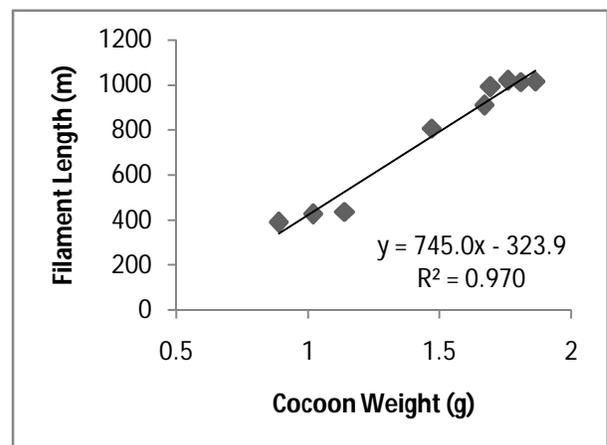


Figure 24: Correlation between cocoon weight and filament length

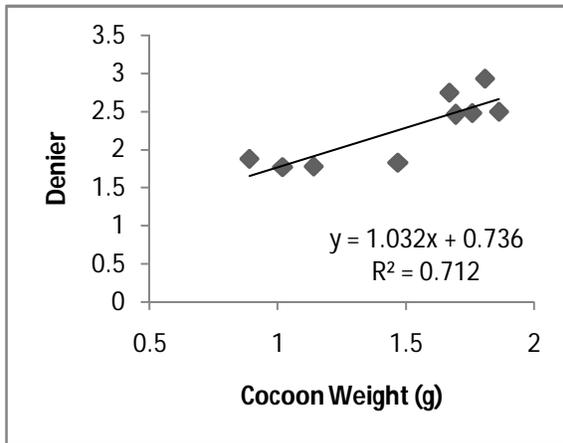


Figure 25: Correlation between cocoon weight and denier

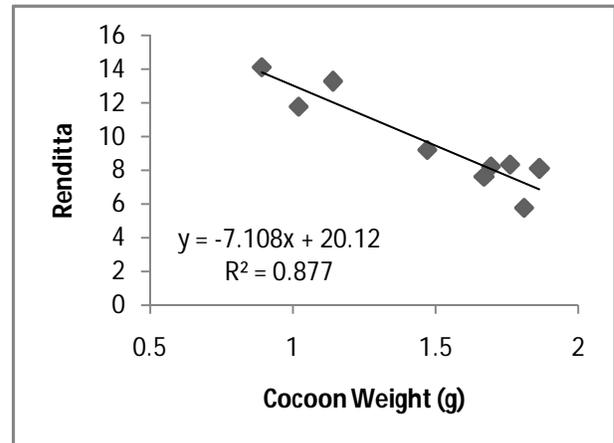


Figure 26: Correlation between cocoon weight and renditta

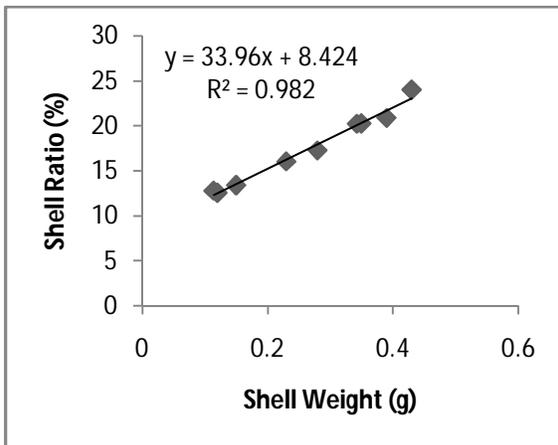


Figure 27: Correlation between shell weight and shell ratio

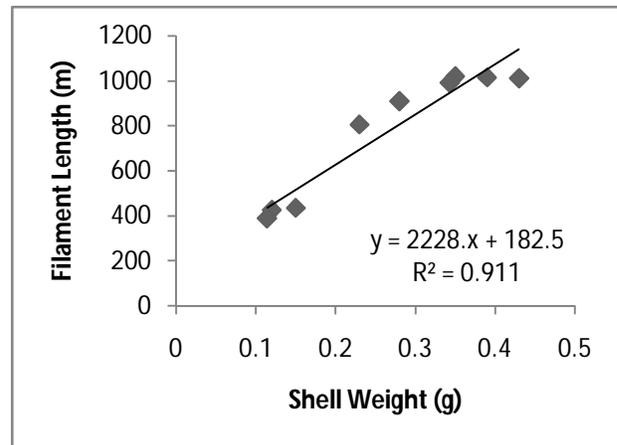


Figure 28: Correlation between shell weight and filament length

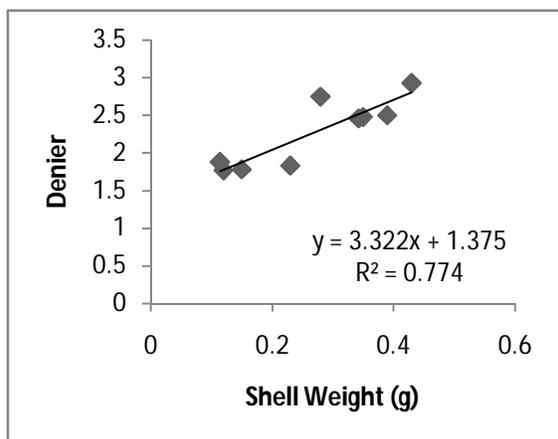


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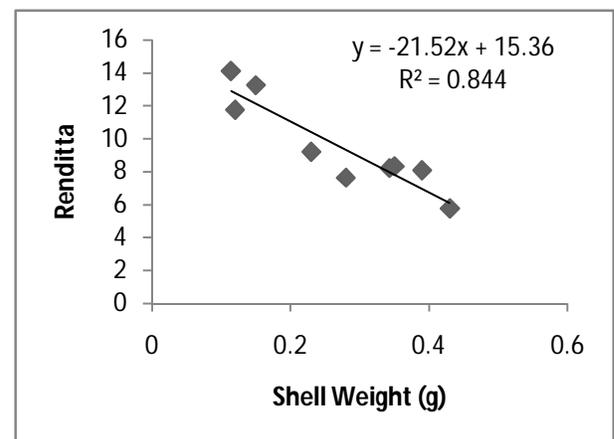


Figure 30: Correlation between shell weight and renditta

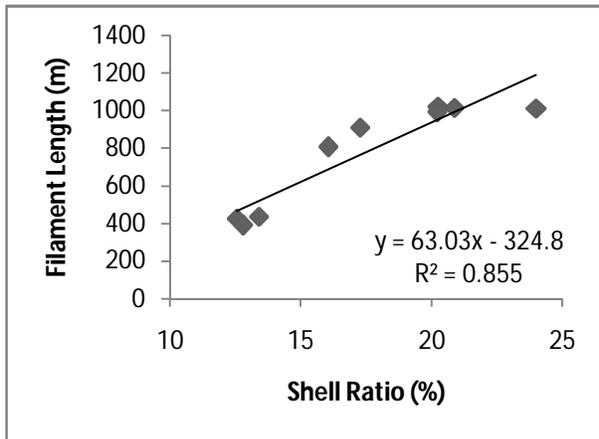


Figure 31: Correlation between shell ratio and filament length

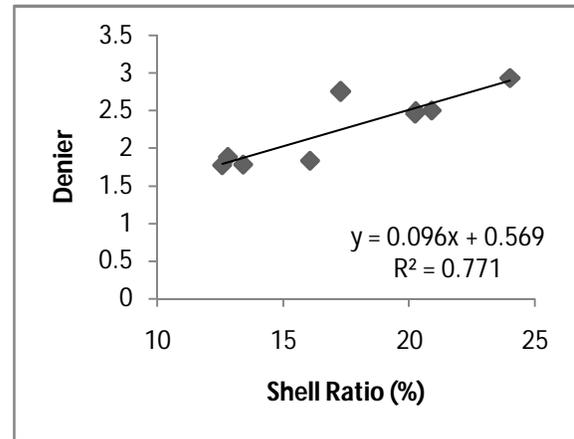


Figure 32: Correlation between shell ratio and denier

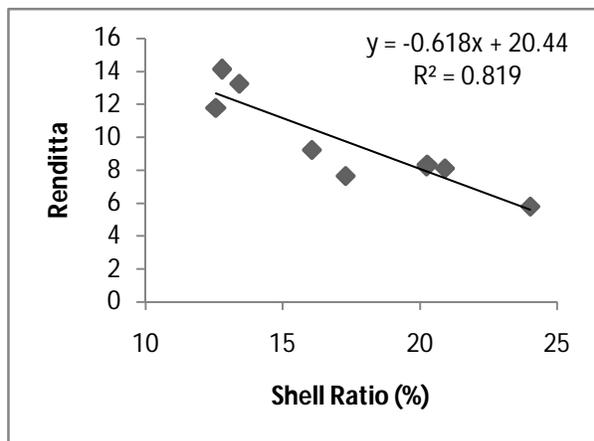


Figure 33: Correlation between shell ratio and renditta

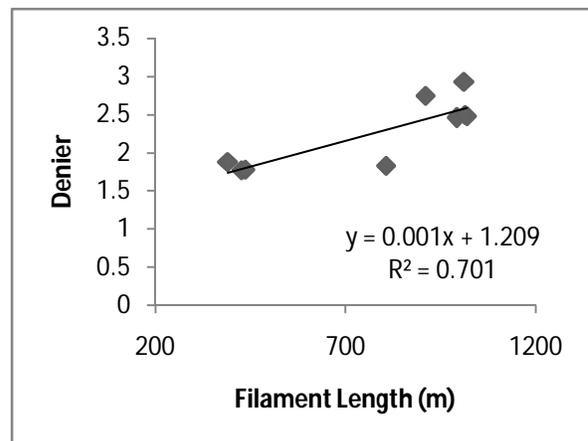


Figure 34: Correlation between filament length and denier

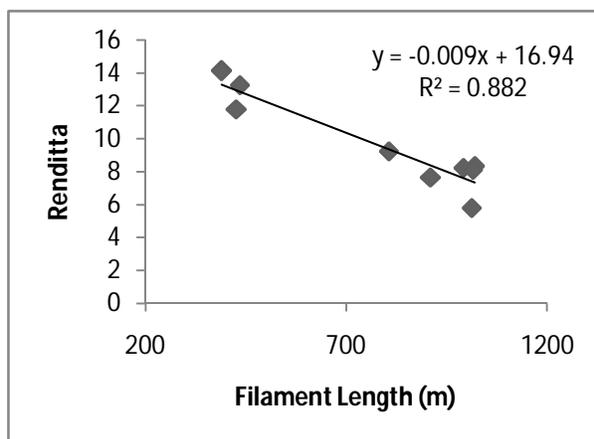


Figure 35: Correlation between filament length and renditta

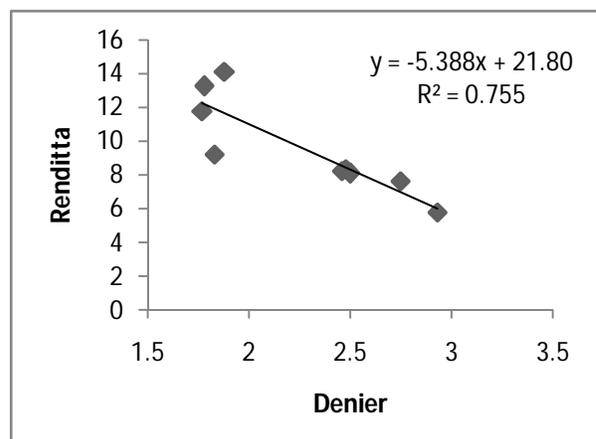


Figure 36: Correlation between denier and renditta