The Correlations Between Larval Weight, Cocoon Weight, Shell Weight, Shell Ratio, Pupal Weight in Four Lines of Silkworm, *Bombyx mori* L.

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Introduction

* Silkworm, Bombyx mori, is one of the most significant insects in silk production as well as in biological studies(Neshagaran et al.,2016).
* The purpose of silkworm breeding is the genetic improvement of characters to increase profitability of the sericulture industry (Ghanipoor et al.2006; Talebi & Subramanya 2009; Mubasher et al. 2010, ; Seidavi 2010).
* Various genotypes have shown that there are many differences in quantitative and qualitative traits which have an effective part in silkworm efficiency (Nagaraju & Singh 1997).
* İn silkworm breeding characters correlation has very important. Many researchers have investigated for estimation of correlation among economic characters of silkworm to develop production through selection systems (Seidavi et al. 2004; Seidavi et al. 2008 , Sing et al,2011).

* Kumar et al. (1995) observed that there is a high correlation between cocoon weight characters, cocoon shell weight, and also cocoon weight and cocoon shell ratio.
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* Grekov (1989) observed thatthere is a strong mutual effect between genotype andthe environment which causes a positive correlationbetween cocoon shell weight and cocoon weight(+0.659).

* Mirhosseini et al. (2010) determined that a highand positive genetic correlation exists between cocoonweight and cocoon shell weight. These two important economic characters in which selection was on cocoon weightcaused the increase of cocoon shell weight.

* Sing et al (2011) determined that high significant positive correlations between cocoon weight and pupal weight (r=+0.994), coccon weight and shell weight (r = + 0.614), pupal weight and shell weight (r =+ 0.527) wheras negative values between pupal weight and cocoon shell ratio (- 0.827).

* Sumioka et al. (1982) have observed that the leaf consumption influenced the body weight, which influences the silk output.

* The objective of this research was to investigate the correlations between larval weight, cocoon weight, shell weight, pupal weight and cocoon shell ratio of M, Showa (China), N, Kinshu (Japan) lines of Silkworm, Bombyx mori

Materials And Methods

* Four silkworm genotypes , M, Showa (Chinase), N, Kinshu (Japanese) lines of silkworm were considered for the present investigation. The project was carried out in silkworm rearing and egg production units that belonged to Sericulture Research Institue which was closed down in 2004, then these units were transfered to Bursa Agriculture Provincial Directorate by the Ministry of Food, Agriculture and Livestock and these are used with the union of cocoon producers cooperatives (Kozabirlik).

* Lines were reared in the standart and optimum conditions (Krishnaswami, 1978). Each line had 3 replications and each replication were kept 250 larvae after four instar. The commercial characters selected in this study included fifty instar larval weight, cocoon weight, pupal weight, shell weight, cocoon shell ratio.

* 50 larvae (4 thday of fifty instar) were randomly selected from each replication of each line and they were weighted to determine the weight of the larvae. Similarly 50 cocoons (25 female, 25 male) from each replication were selected and cocoon characters were measured. Data were analysed one- way ANOVA using the general linear model procedure of the Minitab software (Minitap, 1998) of variance and correlation .

Results and Discussion

Table 1. The mean values of larval weight, cocoon weight, pupal weight, shell weight and cocoon shell ratio at different lines.

Characters		Chinese		Japanese	
		M	Showa	N	Kinshu
		$\bar{X} \pm S_{\bar{X}}$	$\bar{X} \pm S_{\bar{X}}$	$\bar{X} \pm S_{\bar{X}}$	$\bar{X} \pm S_{\bar{X}}$
Larvalweight (g)	*	2,58±0,03b	2,72±0,09a	2,85±0,04a	2,57±0,07b
Cocoonweight (g)	NS	1,49±0,01	1,55±0,05	1,56±0,04	1,44±0,04
Pupalweight (g)	NS	1,17±0,01	1,21±0,04	1,21±0,03	1,09±0,05
Shell weight (g)	NS	0,327±0,01	0,340±0,02	0,353±0,01	0,350±0,03
Shell ratio %	NS	21,9±0,50	22,1±0,39	22,8±0,34	22,5±0,63

In the present study, analysis of variance showed that the mean values for cocoon characters of lines were not to be significant, on the contrast larval weight was found to be significant ($P< 0.05$)

Larval weight was ranged between maximum of N and minumum Kinshu.The highest cocoon charecters was observed in N lines. Larval weight is one of the important parameter which determines not only the health of the larvae, but also the quality of the cocoon spun.

In this study, larval weight was determined on 4^{th}day of fifty instar, therefore this value was lower than some previous studies, which larval larval weight was determined that on the V instar -5^{th} day (Umushankara and Subramanya, 2002, Paland Moorthy, 2011).

Tablo 2. The correlations between larval weight, cocoon weight, pupal weight, shell weight, cocoon shell ratio at different Lines

	Larval weight	Cocoon weight	Pupal weight	Shell weight	Shell ratio
Larval weight, g	-				
Cocoon weight, g	0,787**	-			
Pupal weight,, g	0,742**	0,926**	-		
Shell weight, g	0,202	0,299	-0,083	-	
Shell ratio , %	0,082	0,087	-0,145	0,596*	-

Means in the same line with no common superscript are significantly different at P< 0.05

In the present study, significant and high positive correlation was observed between larval weight and cocoon weight (r = + 0.787), pupal weight (r = +0.742). In other characters, cocoon weight was correlated with pupal weight (r = +0.926) and shell weight with cocoon shell ratio (r = +0.596) for all lines.

Tablo 3. The correlation between larval weight, cocoon weight, pupal weight, shell weight, cocoon shell ratio at Chinese and Japanese Lines.

		Larval weight	Cocoon weight	Pupal weight	Shell weight	Shell ratio
Chinese	Larval weight, g	-				
	Cocoon weight,g	0,84*	-			
	Pupal weight, g	0,839*	0,982**	-		
	Shell weight, g	0,717	0,894*	0,793*	-	
	Shell ratio , %	0,427	0,516	0,345	0,84*	-
Japanese	Larval weight, ,g	-				
	Cocoon weight,g	0,844*	-			
	Pupal weight, g	0,866*	0,928*	-		
	Shell weight, g	-0,091	0,154	-0,226	-	
	Shell ratio %	-0,295	-0,055	-0,204	0,396	-

From obtained results, the correlations coefficient of Chinese lines were found more significant than Japanese lines. The correlation between shell weight and shell ratio were found to be significant for only Chinese lines. Besides both cocoon weight and pupal weight has positive correlation with larval weight and also cocoon weight and pupal weight in Chinese and Japanese lines. Rajanna and Sreeramareddy (1990) reported that increase in body size of the larvae is largely dependent on the rate of growth and development in silkworm during the 5. Instar which contributes to the phenotypic expression of cocoon characters

* The results obtained in this study showed that larval weight plays important role in estimating the total cocoon productivity of the lines. There is importance of larval weight for getting higher cocoon weight thereby more silk yield.

* In addition that, mean of values cocoon characters were founded similar or different previous research results (Mahashaand at al, 2013; Nagalakshmamma and Jyothi, 2010; Anantha and Subramanya, 2010). Because , the most of the genetic characters in silkworm are under polygenic control, under the influence of enviromental factors and nutrition like other system (Yokoyama, 1979).

* These results are supported by many research results. Umashankara and Subramanya (2002) optained that the correlations with cocoon weight and pupal weight in females of all the races undertaken except one Line.

* Similarly, Mahesha et al. (2013), reported that the there were positive correlation between larval weight and cocoon weight, shell weight, shell ratio.

* Singh et al. (2011) found that high significant positive correlation between cocoon weight and pupal weight (r=+0.994), shell weight (r=+0.614) (P <0.01). They found that positive correlation between pupal weight and shell weight (r=+0.527), while significant negative values between pupal weight and cocoon shell ratio (r= - 0.827) (P <0.01).

* Pal and Moorthy (2011), reported that expected cocoon weight had a significant and positive correlation with cocoon shell weight and also cocoon shell weight had a significant and positive correlation with cocoon weight).

* In addition that, mean of values cocoon characters were founded similar or different previous research results (Mahashaand at al, 2013; Nagalakshmamma and Jyothi, 2010).

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* On contrast, negative correlations were determined ; shell ratio and pupal weight (Sing et al, 1992a), cocoon weight and cocoon shell weight (Ghanipoor et al. 2006).

Conclusion

* The knowledge of correlation among various commercial characters is one of the important in breeding programme.

* İnformation generated from this study may be used during the selection process in the breeding programmes for new lines of silkworm with the better cocoon characters.

* Because, the hight cocoon yield is important for producers to earn much money .

* Thank your for your attendition!