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Short Communication

Analysis of genetic variability and character association in bivoltine Silkworm (*Bombyx mori* L.) and their hybrids

A. M. Sofi, G. N. Malik, H. U. Dar, M. A. Malik and Malik Farooq

Division of Sericulture, S.K.U.A.S.&T., Post Box # 868, G.P.O., Srinagar 190 001

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The present work was taken up, with the view, to study the direct and indirect effect of yield and their components and correlation coefficient of six metric trails of bivoltine silkworm (*Bombyx mori* L.) Six newly evolved breeds *viz.*, SK-27, SK-28, SK-29 and SK-30 along with two commercial races NB4D2 and SH6 were utilized as the parental stock in the present study. Each of the six breeds were crossed in all possible combinations, to get fifteen hybrids The parents and hybrids were reared as suggested by Dar and Singh [1] in two environments E1 and E2 i.e. spring and summer season. After third moult, three replications of 250 worms each were retained. Observations were recorded for weight of 10 grown larvae (g) cocoon yield (no.)/10,000 larvae, cocoon yield (kg.)/10,000 larvae, single cocoon weight (g), single shell weight (cg) and shell ratio (%). The methodology was adopted by using formula in which the direct contribution of each of different components as well as indirect effect through the other yield components were analysed. The phenotypic and genotypic correlation coefficient were calculated for six quantitative traits, using the formula suggested by Al-Jibouri *et al.* [2].. Heritability (broad sense) was computed from the components of genetic variance. Expected genetic gain based on full sib family selection was calculated at 5% selection intensity (k = 2.06).

In the present set of material five traits *viz.*, no. of cocoons/10,000 larvae brushed single cocoon weight, single shell weight, shell ratio and weight of mature larvae were taken as independent variables, in order to access their relative association to cocoon yield by weight. Single cocoon weight with the values of 1.501 and 1.895 in both the environments has a maximum direct positive effect towards cocoon yield (Table 1). Single shell weight has a direct positive association towards cocoon yield 0 859 and 0.132 in E1 and E2 environments. This was followed by shell ratio which has a direct contribution towards yield in both environments E1 and E2 with the values of 0.646 and 1.397. Weight of mature larvae has a negative effect towards the cocoon yield with the values of 0.333 and –0.857 in both the environments E1 and E2. This was also followed by no. of cocoons/10,000 larvae brushed –0.415 and –0.170 in E1 and E2. Similarly single cocoon weight has a indirect effect towards cocoon yield *viz.*, no. of cocoons/10,000 larvae, brushed with the values of 4.120 and 0.318 and single shell weight with the values of 1.165 and 0.925 in both the environments E1 and E2. The above results revealed that most of the characters appeared to be direct components of yield. However, except for single cocoon weight, single shell weight and shell ratio, no other character figured important as direct components of cocoon yield. Therefore, it proves that these characters are component ones that need main stress during selection program. Similar observations were also recorded by Kamili *et al.* [3] and Siddiqui *et al.*, [4]. Weight of mature larvae exhibited negative effect with no. of cocoons/10,000 larvae, cocoon yield/10,000 larvae, single cocoon weight, single shell weight and shell ratio in both the environments. No of cocoons/10,000 larvae brushed shows positive and significant association with cocoon yield/10,000 brushed, single cocoon weight, single shell weight and shell ratio in both the environments E1 and E2. Cocoon yield/10,000 larvae brushed exhibited positive and significant contribution with single cocoon weight, single shell weight in E1 and E2 environments. These observations were supported by the findings of Kamili *et al.*, [3]. Single cocoon weight contributes positive association with single shell weight in both the environments; whereas, single shell weight has negative correlation with shell ratio in E1 and E2 environments. It is obvious in the present investigation, that cocoon yield, single cocoon weight, single shell weight has strong inherent relationship with one another. Hence simultaneous selection of these traits would not only add in minimizing the retarding effect of the character, that are negatively correlated, but also helps in increasing the efficiency of selection while evolving high yielding

Table 1. Coefficient analysis for five economic traits towards Cocoon yield of Silkworm *B. mori* in two environments E1 and E2

Characters	Environ-ments	Weight of mature larvea (g)	No. of Cocoons/10,000 larvae brushed (by No.)	Single Cocoon weight (g)	Single shell weight (c.g.)	Shell ratio %	Genotypic correlation with Cocoon yield by weight
Weight of mature larvae (g)	E1	–0.3330	–.2315	–.0139	–.0126	–.0018	–.0156 NS
	E2	–0.8572	–.3830	–.3907	–1.1347	.1215	–.0925 NS
No. of Cocoons yield (No.)/10,000 larvae	E1	.2886	–.0415	–.1139	–.2988	–.2101	–.9317**
	E2	–.0762	–.1705	–.0286	–.0586	–.0753	–.4271**
Single cocoon weight (g)	E1	–.6279	4.1205	1.5010	1.1648	–.0484	–.6855**
	E2	.8639	.3184	1.8953	.9251	–1.203.9	–.6629**
Single shell weight (cg)	E1	.3263	–6.1857	–.6667	.8592	–.5151	.3814**
	E2	.1750	.0454	.0645	.1322	.0911	.8272**
Shell ratio %	E1	–.0358	3.2699	–.0208	.3872	.6458	.1297 NS
	E2	–.1980	.6168	–.8876	.9631	1.3973	.3308**

Significance at 5% level, Residual effect (X): E1 = 0.6493, E2 = 1.8156

Table 2. Path - estimation of heritability, phenotypic, genotypic coefficient of variation and genetic advance in percent of mean of six metric traits

Characters	Environments	Heritability (Broad sence) (%)	Phenotypic coefficient of variation (%)	Genotypic coefficient of variation (%)	Genetic advance in percent of mean (%)
Weight of mature larvae (g)	E1	59.33	9.98	7.70	15.64
	E2	64.07	4.13	3.31	7.00
Cocoons yield (No.)/10,000 larvae	E1	–0.023	4.10	0.19	–0.02
	E2	75.84	15.94	13.88	31.91
Cocoons yield (kg)/10,000 larvae	E1	69.76	8.65	7.23	15.93
	E2	53.36	14.87	10.86	20.94
Single cocoon weight (g)	E1	90.74	6.48	6.16	15.45
	E2	76.42	5.88	5.14	11.88
Single shell weight (cg)	E1	94.45	7.85	7.63	19.60
	E2	40.65	3.74	2.38	4.02
Shell ratio %	E1	85.10	4.60	4.25	10.35
	E2	49.38	7.98	5.61	10.41

desirable genotypes. Estimates of heritability (Broad sense) was very high (above 60%) in most of the characters studied, depicting less influence of environment (Table 2). Ashoka and Govindan [5] and Sofi [6] also reported the similar findings in weight of mature larvae, cocoon yield and cocoon shell weight. Besides the phenotypic and genotypic coefficient of variation were higher for the characters *viz.*, no of cocoons/10,000 larvae brushed and cocoon yield/10,000 larvae brushed. It was followed by weight of mature larvae, single cocoon weight, single shell weight and shell ratio in both the environments E1 and E2. The genetic advance revealed the highest genetic advance for characters *viz.*, cocoon yield/10,000 larvae brushed followed by single cocoon weight, single shell weight and shell ratio in both the environments E1 and E2 (Table 2). Those characters, showing high heritability and genetic advance having positive and significant relationship with cocoon yield provide good scope for further improvement when well-designed selection schemes are followed.

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