Evaluation of different bivoltine pure silkworm breed for cocoon and associated parameters under Uttar Dinajpur agro climatic conditions west Bengal, India

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Abstract

Four pure bivoltine silkworm breeds SK6, SK7, BCon1 and BCon4 were evaluated under Uttar Dinajpur agro climatic (Raiganj) conditions West Bengal in two different crop seasons along with their mean performance. The cocoon and associated parameters of the breeds were documented and utilized for analysis of and multiple trait evaluation indexes were valued. The present study revealed that there are considerable variations in the cocoon and associated traits among the studied breeds. However, the breed SK7 found to be the best among studied breed and scored average EI values >50 for the maximum of four individual traits viz., fecundity, single cocoon weight, shell weight, shell ratio, particularly with respect to overall performance irrespective of seasons.

Keywords: BCon1, BCon4, SK6, SK7, Raiganj, Uttar Dinajpur.

Introduction

Sericulture, the agro industrial avocation stands for livelihood opportunity for millions of people in the country India. Fortunately our country enjoys the unique distinction of being the producers of all five kinds of silk namely Mulberry, Tropical and Temperate Tasar, Eri and Muga. However mulberry alone contributes majority of the share. West Bengal is one of the traditional silk producing states among the several silk producing states of the country. Unfortunately, majority of the production comes from cross breed varieties which are of inferior in quality and not fit for power loom. Therefore focus has been shifted in the production of import substitute bivoltine silk in the country to make the occupation more profitable and sustainable one. Robust and productive bivoltine breeds are the pre requisite for production of import suitable bivoltine silk. Many research efforts on silkworm breeding programmes in different countries have resulted development of several robust and productive bivoltine hybrids (Mano et al., 1991; Hong et al., 1992; Thiagarajan et al., 1993; Kumar et al., 2002; Kumar et al., 2014). However, it was observed that many a time's breeds performing well in the laboratory are not

yielding in field because of varied climatic conditions and wider adaptability to the local environment. Hence situation demands evaluation of breeds under diverse agro climatic conditions for their wider adaptability and phenotypic expression to the given environment. Therefore efforts may be put forth for Continuous evaluation and renewal of the existing breeds/hybrids with new or superior breeds or variety with reference to diverse climatic factors for qualitative and quantitative improvement in silk production. The state West Bengal experiences wide variation in temperature, humidity and rainfall but efforts are in place to promote bivoltine sericulture in the state, unfortunately there is no specific breed or hybrids for the state that have gained popularity in the practical field. Keeping the above aspects in view, the seasonal performance of four pure breeds were assessed by using Multiple trait evaluation index (E.I.) to identify promising ones so as to use as future breeding materials for better cocoon yield and productivity.

Materials and Methods

Present study deals with four pure bivoltine breeds *viz*., SK6, SK7, BCon1 and BCon4, were collected from the silkworm seed production centre, Raiganj and studied under Uttar Dinajpur agro climatic (Raiganj) conditions West Bengal in 2015. The collected layings were incubated properly maintaining 80-85% humidity and 25°C temperature for uniform hatching. The rearing of all the breeds were undertaken in a completely randomized design (CRD) with three replications each consists of 300 larvae maintained after third instars by following the standard rearing techniques (Krishnaswami, 1978). Larvae were provided with three feeding during rearing till the onset of the spinning. Mature larvae were mounted in plastic collapsible mountages following all the standard protocol of mounting. Finally harvesting of the cocoons was carried out on 6th / 7th day of spinning. The data pertaining to different phonotypical traits of silkworm *viz*. Fecundity, hatching %, effective rate of rearing (ERR) by number and weight, single cocoon weight (SCW), single shell weight (SSW) and shell ratio (SR %) were measured and analysed. The data generated in respect of different traits was pooled, analyzed statistically and subjected further to multiple trait evaluation index using the following formula (Mano et al., 1993).

Evaluation Index (E. I.) = A-B/C x 10 + 50

Where,

A = Value of a particular breed for particular trait,

B = Mean value for a particular trait of all the breeds,

C = Standard Deviation of a particular trait for all the breeds,

10 = Standard unit,

50 = Fixed value.

Minimum / average E.I. value fixed for selection of a breed is >50.

Results and Discussions

Perusal of the data on the performances of the breeds evaluated under the study revealed that during May-June crop, the breed (Table 1) SK6 recorded highest values for Single cocoon weight, single shell weight and SR% (1.337g, 0.259g and 19.39). Whereas BCon4 for ERR by number and weight (8766.67, 10.67 kg). The breed BCon1 and SK7 scored highest values for fecundity and hatching% (410.67, 96.24). However with respect to the evaluation index values (Table 2) the breed SK6 performed better (53.61) followed by BCon4, SK7 and BCon1 (51.88, 48.83 and 45.68) respectively.

Table 1. Performance of the breeds during May-June.

Name of the Breeds	Fecundity	Hatching	ERR by No.	ERR by wt. (kg)	SCW (g)	SSW (g)	SR%
SK6	437.00	87.32	7266.67	8.22	1.337	0.259	19.39
SK7	407.00	96.24	7100.00	7.89	1.334	0.244	18.26
Bcon1	410.67	88.32	8233.33	9.22	1.177	0.215	18.24
Bcon4	402.67	95.12	8766.67	10.67	1.183	0.223	18.83
CD@5%	**8.40**	**1.33**	**606.87**	**0.83**	**0.13**	**0.03**	**NS**
SEm±	**2.57**	**0.4**	**186.09**	**0.25**	0.03	0.01	0.46
CV%	**1.07**	**0.77**	**4.11**	**4.89**	**5.50**	**7.25**	**4.35**

Table 2. Evaluation index for May-June.

Name of the Breeds	Fecundity	Hatching	ERR by No.	ERR by wt.	SCW	SSW	SR%	Avg. EI
SK6	64.66	40.33	42.76	43.76	58.82	61.96	62.99	53.61
SK7	45.26	59.80	40.66	41.09	58.49	54.23	42.27	48.83
Bcon1	47.63	42.51	54.93	51.78	41.01	39.93	42.00	45.68
Bcon4	42.45	57.36	61.65	63.36	41.68	43.87	52.74	51.88

Table 3. Performance of the breeds during October-November.

Name of the Breeds	Fecundity	Hatching	ERR by No.	ERR by wt. (kg)	SCW (g)	SSW (g)	SR%
SK6	440.67	87.48	7500.00	8.67	1.344	0.262	19.47
SK7	405.33	96.38	7822.22	7.90	1.340	0.260	19.39
Bcon1	409.00	88.05	8666.67	9.44	1.152	0.209	18.11
Bcon4	395.67	95.26	9000.00	10.93	1.163	0.229	19.68
CD@5%	**12.20**	**1.55**	**907.51**	**0.93**	**0.13**	**0.03**	**NS**
SEm±	**3.47**	**0.48**	**278.27**	**0.286**	**0.04**	**0.01**	0.49
CV%	**1.57**	**0.89**	**5.84**	**5.36**	5.62	7.48	**4.45**

Table 4. Evaluation index for October-November.

Name of the Breeds	Fecundity	Hatching	ERR by No.	ERR by wt.	SCW	SSW	SR%	Avg. EI
SK6	64.36	40.78	39.37	45.60	58.85	58.58	54.29	51.69
SK7	46.24	59.80	43.95	39.68	58.45	57.79	53.13	51.29
Bcon1	48.12	42.01	55.97	51.61	40.80	37.84	35.24	44.51
Bcon4	41.28	57.41	60.71	63.10	41.90	45.79	57.33	52.50

Table 5. Mean performance of the breeds.

Name of the Breeds	Fecundity	Hatching	ERR by No.	ERR by wt (Kg)	SCW (g)	SSW (g)	SR%
SK6	438.33	87.40	7383.33	8.44	1.341	0.261	19.43
SK7	407.17	96.31	7461.11	7.89	1.337	0.252	18.82
Bcon1	409.83	88.19	8450.00	9.33	1.164	0.212	18.18
Bcon4	399.17	95.19	8883.33	10.80	1.173	0.226	19.26
CD@5%	**6.18**	**0.98**	**708.38**	**0.84**	**0.13**	**0.03**	**0.34**
SEm±	**1.89**	**0.30**	**217.218**	**0.26**	**0.04**	**0.01**	**NS**
CV%	**0.79**	**0.57**	**4.67**	**0.94**	**5.54**	**6.64**	**3.15**

Table 6. Mean Evaluation index.

Name of the Breeds	Fecundity	Hatching	ERR by No.	ERR by wt.	SCW	SSW	SR%	Avg. EI
SK6	64.46	40.55	41.07	44.69	58.84	60.21	59.11	52.71
SK7	46.22	59.81	42.12	40.35	58.47	56.30	48.20	50.21
Bcon1	47.78	42.25	55.48	51.70	40.90	38.61	36.67	44.77
Bcon4	41.54	57.39	61.33	63.26	41.80	44.88	56.02	52.31

During Oct-Nov crop (Table 3) the breed BCon4 scored highest values for the characters like ERR by number, ERR by weight and SR% (9000, 10.93 kg and 19.68%). The breed SK6 also scored highest values for three characters namely fecundity, single cocoon weight and single shell weight (440.67, 1.344 g and 0.262g) and SK7 for hatching% (96.38). With respect to the evaluation index values (Table 4) BCon4 topped the table (52.50) which was followed by SK6, SK7 and BCon1 (51.69, 51.29 and 44.51).

With respect to the mean performance of the breeds (Table 5) SK7 scored highest values for four characters like fecundity, single cocoon weight, single shell weight and SR% (438.33, 1.341g, 0.261g and 19.43). Whereas the breed BCon4 recorded highest values for the characters like hatching%, ERR by number and ERR by weight respectively (95.19, 8883.33 and 10.80kg). With respect to the evaluation index values (Table 6) SK6 found to be top on the table (52.71) followed by BCon4 (52.31), SK&7 (50.21) and BCon1 (44.77).

In the recent past use of multiple trait evaluation index have become very popular while screening out silkworm breeds as it enables us to single out breed while considering the cumulative effect of all the yield attributing characters. The method have been used extensively by the silkworm breeder in many studies (Naseema Begum 2000; Quadir et al., 2000; Suresh Kumar et al., 2006; Choudhary and Singh 2006; Ganaie et al., 2012; Nisar et al., 2013; Nooruldin et al., 2014). In the present study also variation observed in the cocoon and associated traits among the studied breeds may be attributed to the genetic constitution of the genotype and the degree of expression to which the particular genotype is exposed. Silk yield is known to be contributed by as many as 21 characters (Thiagarajan et al., 1993) any effort to improve silk yield needs to be consider the cumulative efforts of all the characters. In the present study also most of the cocoon and associated traits of the breeds showed considerable degree of variations

were taken into consideration while evaluating their performances.

The result of the present study indicated that the breed SK6 has scored average EI values >50 for the maximum of 4 individual traits viz., fecundity, single cocoon weight, single shell weight, shell ratio, particularly with respect to overall performance irrespective of seasons. The better performance of SK6 in several economic characters may be attributed to its capacity to overcome deleterious environmental effect in varying agro climatic conditions.

Conflict of interest

Author declare that there is no conflict of interest.

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