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Seasonal Response of two (Silkworm *Bombyx mori* L.) Bivoltine Hybrids with Comparative Performance Shoot vs. Shelf Rearing in Uttar Pradesh Climatic Conditions

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ABSTRACT
Season and region specific studies of silkworm Bombyx mori L. are of greater importance in identifying and understanding the adaptability of silkworm genotypes, which are largely influenced by climatic factors. The present experiment was made to analyze the seasonal performance with a comparison shelf verses shoot rearing of bivoltine hybrid breeds viz. CSR_2 x CSR_5 and CSR_3 x CSR_6 to check their adaptability and rearing performance in the fluctuating climatic conditions of Uttar Pradesh. The results shows that overall performance in four seasons i.e. spring, summer, monsoon and autumn, CSR_3 x CSR_6 shown better adoption in Uttar Pradesh climatic conditions and in rearing, shoot feeding method shows better result in comparison to shelf method of rearing.
Key Words: *Bombyx mori, bivoltine breeds, climatic conditions.*

INTRODUCTION

Adaptation of silkworm *Bombyx mori* L. under tropical conditions is highly influenced by the robustness of the breed, nutrient quality of mulberry leaf and atmospheric conditions [1-9].The seasonal performance of bivoltine breeds depend upon the technology of rearing of silkworm under tropical conditions[2,10-12]. It is also established fact that, for exploiting maximum benefit from above mentioned rearing technology, use for high yielding varieties of mulberry & superior bivoltine silkworm breeds also plays vital role [13-17].

The success of cocoon crop mainly depends upon three major factors *viz*. quality of laying, quality of leaves used and which type of rearing method is adopted by the former [18-20]. But, work for identification of superior bivoltine silkworm breed and appropriate technology for rearing is still lacking. Keeping these points in view author have taken up this experiment to identify the superior bivoltine silkworm breed and appropriate technology for rearing for benefit of Uttar Pradesh farmers.

MATERIALS AND METHODS

Two bivoltine hybrid breeds of mulberry silkworm *Bombyx mori* L. *viz*. CSR_2 x CSR_5 and CSR_3 x CSR_6 were selected for the present experimental study to check their viability, productivity and study their adaptability in four different climatic conditions of Uttar Pradesh *i.e.* spring, summer, monsoon and autumn with shelf and shoot rearing methods.

Twenty-five disease free laying of each race in triplicate were reared by following rearing techniques as per many scientists [21,10,22]. The data on the seasonal performance of the selected breeds for six economic characters were collected and analyzed for the parameters viz. yield / 10000 larvae; by number, by weight, single cocoon weight, single shell weight and cocoon shell%. The results were analyzed for each race statically.

RESULTS

On the basis of recorded observations during the experiments, the results were compiled and are presented in Table-1. The mean yield observed for two bivoltine breeds for different rearing seasons with two types of rearing methods shoot and shelf of each race CSR_2 x CSR_5 and CSR_3 x CSR_6. In CSR_2 x CSR_5 with regard to yield /10000 larvae by number (8553), weight (14.19), cocoon wt. (1.80 g), shell wt. (41.3) and shell ratio (22.9) are observed in shoot rearing method, whereas in

case of shelves rearing method, the observation was yield /10000 larvae by number (8531), weight (13.75), cocoon wt. (1.78 g), shell wt. (40.5) and shell ratio (22.6). In case of CSR_3 x CSR_6 ,observed economic parameters were yield /10000 larvae by number (8710), weight (15.44), cocoon wt. (1.93 g), shell wt. (45.0) and shell ratio (23.0) are observed in shoot rearing method, whereas in case of shelves rearing method , the observation was yield /10000 larvae by number (8676), weight (14.93), cocoon wt. (1.89 g), shell wt. (43.7) and shell ratio (22.9). Above observations proves that in all seasons *viz*. spring, summer, monsoon and autumn, CSR_3 x CSR_6 shows better results in comparison CSR_2 x CSR_5 bivoltine hybrid breed. As far as rearing method is concerned, it was observed that shoot rearing gives better results in comparison to shelf rearing method.

DISCUSSION

The genotypic differences among races due to variable gene frequencies of many loci makes the respective races to respond differently to changing environmental conditions [23], so the response of different breeds were varied in different seasons as shown in Table-1. The adaptability by environment interactions have been well documented [24,25]. Pointed by Barton [26], the performance of a race during certain season of a year shows its better adaptability, the evolved breeds in our study also were subjected in all fluctuating agro-climatic conditions of our state to check the resistance to unfavorable climatic conditions and in this experiment CSR_3 x CSR_6 shows better adaptability in comparison CSR_2 x CSR_5. In spring and autumn season these breeds showed better adaptability in comparison to summer and monsoon season . These variations showed in different seasons by any particular genotype and its range of reaction for the environmental factors [27-29].

On evaluation of the result (mean) for the various rearing parameters as observed in table 1 , CSR_3 x CSR_6 showed better results regarding yield/ 10000 larvae by number, by weight, single cocoon weight, single shell weight and cocoon shell% followed by CSR_2 x CSR_5 bivoltine hybrid silkworm race. The better adaptability of these breeds were seen in spring and autumn season. The performance during unfavorable monsoon and summer seasons was good confirms the view of [30]. This reflects in their consistent behavior not only during favorable seasons but also during unfavorable seasons of Uttar Pradesh. In the view of above findings, the race CSR_3 x CSR_6 of the silkworm *Bombyx mori* are more suitable in for four seasons *i.e*. spring, summer, monsoon and autumn of Uttar Pradesh climatic conditions and should be given positive consideration for commercial exploitation.

In rearing methods; the shoot feeding is effective in comparison toe shelf rearing method, the average cost for the producing one kilogram cocoon was higher in shelf rearing on comparison to shoot feeding [31]. The aim of the study to know the rearing performance of worms under shoot and shelf rearing method of cocoon production. The result shows that the economic characters are appreciable higher and advantage like quality worm due to adequate spacing, higher cocoon yield and high income in shoot feeding method [32]. In the view of above cited facts and results shows that foot feeding is effective for the commercial production of silkworm in Uttar Pradesh.

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Table:1 Seasonal response of two bivoltine hybrids with comparative performance shoot vs. Shelf rearing

Breed	Season	Yield/10000 larvae				Cocoon wt. (g)		Shell wt (g)		Cocoon shell ratio (SR%0)	
		By No.		By wt. (kg)							
		Shoot	shelf	Shoot	shelf	Shoot	shelf	Shoot	shelf	Shoot	shelf
CSR_2 x CSR_5	Spring	8978 ± 1.58	8965 ± 2.23	14.83 ± .010	14.51 ± .014	1.872 ± .003	1.861 ± .008	43.4± .002	42.8± .004	23.2 ± .001	22.9± .007
	Summer	8825 ± 1.98	8790 ± 1.68	13.78 ± .015	13.12 ± .021	1.728 ± .007	1.721 ± .001	39.1± .006	38.5± .009	22.7 ± .003	22.2± .005
	Monsoon	7528 ± 2.34	7501 ± 2.98	13.25 ± .038	13.00 ± .044	1.718 ± .011	1.705 ± .005	38.5± .005	38.0± .008	22.4 ± .002	22.2± .002
	Autumn	8882 ± 1.34	8870 ± 1.99	14.92 ± .012	14.40 ± .016	1.901 ± .014	1.851 ± .001	44.3± .009	42.9± .003	23.4 ± .004	23.2± .008
	Mean	8553	8531	14.19	13.75	1.80	1.78	41.3	40.5	22.9	22.6
CSR_3 x CSR_6	Spring	9118 ± 2.25	9100 ± 1.60	16.87 ± .008	16.00 ± .023	1.951 ± .004	1.921 ± .015	45.9± .002	44.9± .003	23.6± .006	23.2± .003
	Summer	8911 ± 1.56	8898 ± 2.58	14.36 ± .020	14.00 ± .028	1.891 ± .002	1.878 ± .002	43.6± .006	43.0± .004	23.2± .007	22.7± .002
	Monsoon	7758 ± 3.14	7718 ± 2.43	13.74 ± .032	13.50 ± .038	1.871 ± .006	1.856 ± .007	43.0± .004	42.4± .001	23.0± .002	22.9± .004
	Autumn	9053 ± 2.45	8990 ± 2.14	16.80 ± .034	16.24 ± .040	2.009 ± .018	1.931 ± .019	47.7± .005	44.8± .002	23.6± .005	23.1± .006
	Mean	8710	8676	15.44	14.93	1.93	1.89	45.0	43.7	23.3	22.9

(±) Indicates STDEV