CHAPTER-V

Studies on some multivoltine × bivoltine mulberry silkworm hybrids for pooled Spring seasons (commercial seasons)

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The promising multi x bi hybrid and bi x bi hybrids/combinations with better survival and economic character to maximize silk production in North Eastern Region. Productive hybrids for commercial rearing will contribute the substantial increase in silk production. By enhancing the quality as well as quantity of raw silk, we can upgrade the economic condition of rural mass because in the NE Region more than 3.0 lakhs families are engaged in sericulture with a total of 55,819 hectares of land. So, to increase the productivity of mulberry silk in this region, we have to identify promising multi x bi hybrid with high qualitative & quantitative characters for rearing as per suitability of the Assam climatic condition.

In the present study, four multi x bi hybrids namely MC1 x BC4 (plate 9, page 80), MC4 x BC4 (plate 10, page 81), N x NB4D2 (plate 8, page 80) and PM x CSR2 (plate7, page 80) were evaluated for some important economic traits form commercial point of view to identify the most promising hybrids. Data on 15 economically important traits were analyzed using evaluation index method of Mano *et al.* (1993)

4.1 Results of Multi x Bi hybrids in pooled Spring seasons (commercial seasons) (From Table 17 to Table 32 and Fig. 16 to Fig. 30)

Results

The performances of **Multi x Bi hybrids** i.e MC1 x BC4, MC4 x BC4 , N x NB4D2, PM x CSR2 during **Spring season** at different temperature levels i.e., 24±3◦C and 25±5◦C with constant humidity of 79±2 % is given below.

Fecundity : The analysed data revealed that fecundity of Multi x Bi hybrids reared at 25±5◦C and 79±2 % ranged from 297.0 (N x NB4D2) to 354.55 (MC4 x B

C4) (Table 32).Among the four hybrids highest evaluation index value was observed in the hybrid MC4 x BC4 (EIV 60.5448) followed by PM X CSR2 (EIV 59.20078) and MC1 x BC4 (EIV 42.06628)

Hatchability : The analysed data revealed that fecundity of Multii x Bi hybrids reared at 25±5◦C and 79±2% ranged from 67.59% (N x NB4D2) to 77.48 % (PM x CSR2) . Hatching percentage was observed highest in PM x CSR2 (EIV 66.04396) followed by MC1 x BC4 (EIV 49.57418)

Effective rate of rearing (ERR/No.) : The economic output of mulberry silkworm rearing as reflected by effective rate of rearing in number (ERR) ranged from 3787.335 (MC1 x BC4) to 6455.33(PM X CSR2) reared at 25±5◦C and 79±2 % . Among the four hybrids highest evaluation index value was observed in the hybrid PM X CSR2 (E IV 63. 00388) followed by N x NB4D2 (EIV 53.04915) and MC4 x BC4 (EIV 48. 77783)

Cocoon yield/10,000 larvae by weight : The cocoon yield by weight ranged from 4.985 kg (MC1 x BC4)to 8.46 kg (PM X CSR2) at 25±5◦C and 79±2%. Significant difference in cocoon yield among the four Multi x Bi hybrids was noticed in PM X CSR2 (EIV 61.09105) followed by N x NB4D2 (EIV 53.63422) and MC4 x BC4 (EIV51.48744)

Single cocoon weight : cocoon weight among hybrids reared at 25±5◦C and 79±2% ranged from 1.198 (MC1 x BC4) to 1.4465 g (PM X CSR2) . Significant difference in single cocoon weight among the four Multi x Bi hybrids was noticed in PM X CSR2 (EIV 52.88542) followed by (MC4 x BC4) (EIV 46.79167) and N x NB4D2 (EIV 45.41667).

Shell weight : The shell weight ranged from 0.1905 (NxNB4D2) to 0.227 g (PM x CSR2) at 25±5◦C and 79±2 % . Significant difference in shell weight for all the hybrids was recorded in PM X CSR2 (EIV 54.63964) followed by (MC1 x BC4) (EIV 50.0), MC4 x BC4 (EIV 49.14414) and N x NB4D2 (N x NB4D2(EIV 48.06306).

Shell percentage : The analyzed data revealed that shell ratio among the four Multi x Bi hybrids reared at 25±5◦C and 79±2 % ranged from 15.78 % (PM X CSR2) to 16.605 % (MC1 x BC4). Significant difference was observed among four Multi x Bi hybrids in MC1 x BC4 (EIV 67.17325) followed by MC4 x BC4 (EIV 45.59271) and N x NB4D4D2 (EIV 45.13678).

Yield : Cocoon yield was calculated per 10,000 larvae brushed and expressed in terms of yield / 100 dfls (kg). The cocoon yield among the four Multi x Bi hybrids reared at 25±5◦C and 79±2% ranged from 7.45 (Nx NB4D2) to 33.84 kg (Table 2). (PM x CSR2). Significant difference was observed among the four Multi x Bi hybrids in PM X CSR2 (EIV 61.26221) followed by MC4 x BC4 (EIV 56. 38285) and MC1 x BC4 (EIV 47.40379).

Filament length : The trait filament length ranged from 456 (PM x CSR2) to 571 m (MC4 x BC4) (Table 3) at 25±5◦C and 79±2% . Significant difference was observed among the four Multi x Bi hybrids in MC4 x BC4 (EIV 61.57974)followed by MC1 x BC4 (EIV 58. 28469) and Nx NB4D2 (EIV 40. 209).

Filament weight : The trait filament weight ranged from 13.285 (MC4 x BC4) to 14.78cg (PM x CSR2) at 25±5◦C and 79±2%. Significant difference was observed among the four Multi x Bi hybrids in PM x CSR2 (EIV 65.99297) followed by Nx NB4D2 (EIV50.87873), MC1 x BC4 (43.84886)and MC4 x BC4 (EIV 39.7188).

Filament size: The trait filament size ranged from 1.925d (PM x CSR2) to 2.825d (N x NB4D2) at 25±5◦C and 79±2%. Significant difference was observed among the multi x Bi hybrids in N x NB4D2 (EIV 66.43258) followed by MC1 x BC4 (EIV 49.57865) and MC4 x BC4 (EIV 42.69663).

Reelability : The reelability of the hybrids reared at 25±5◦C and 79±2% ranged from 70.515 (N x NB4D2) to 82.945% (MC4 x BC4). Significant difference was observed among the four Multi x Bi hybrids in MC4 x BC4 (60.82057) followed

by PM x CSR2 (EIV 54.92341), MC1 x BC4 (EIV 53.0744) and N x NB4D2 (EIV 33.62144).

Raw silk percentage : The raw silk percentage of the hybrids reared at 25±5◦C and 79±2% ranged from 20.005 (MC4 x BC4) to 26.035% (N x NB4D2) (Table 4). Significant difference was observed among the four Multi x Bi hybrids in N x NB4D2 (EIV 62.78802) followed by PM x CSR2 (EIV53.73272), MC1 x BC4 (EIV 49.86175) and MC4 x BC4 (EIV 35.0) .

Neatness : Neatness show much variation in the breeds . It ranged from 82 .5(PM x CSR2) to 89.5(MC4 x BC4). Significant difference was observed among the four Multi x Bi hybrids in MC4 x BC4 (57.49117) followed by N x NB4D2 (EIV 55.72438), MC1 x BC4 (EIV 53. 9576) and PM x CSR2 (EIV32.75618) at 25±5◦C and 79±2%, respectively.

Boil –off loss: It ranged from 27.25 (MC4 x BC4) to 28.49 (MC1 x BC4).Significant difference was observed among the four Multi x Bi hybrids in MC1 x BC4 (61.25) followed by N x NB4D2 (EIV 56.97917), PM x CSR2 (EIV 46. 45833) and MC4 x BC4 (EIV35.41667) at 25±5◦C and 79±2%, respectively.

Among all, PM x CSR2 in general showed better EI value in desirable direction for fifteen major rearing and reeling traits. Similar trend was also observed with respect to mean performance of crosses by Benchamin *et al,.* (1988), Tayade (1987), Kumaresan *et al.,* (2000) with respect to cocoon quality and productivity parameters under South Indian conditions.

Plate : 7 Photograph of Multi X BI Hybrid (PM × CSR 2)

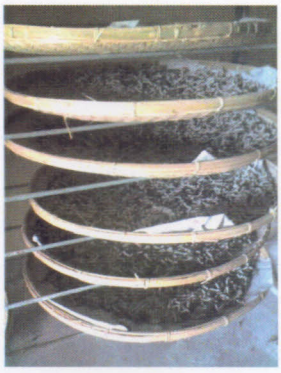
Plate : 8 Photograph of Multi X BI Hybrid (N × NB4D2)

Plate : 9 Photograph of Multi X BI Hybrid (MC1 × BC4)

Plate : 10 Photograph of Multi X BI Hybrid (MC4 × BC4)

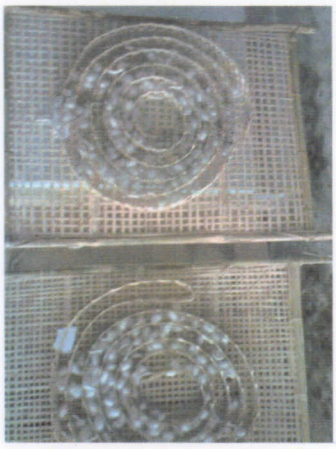
Plate : 11 Photograph of Marked Larvae

11 (a) Photograph of silk worm rearing



11 (b) Photograph of silk worm rearing

11 (c) Photograph of silk worm rearing



11 (d) Photograph of cocoons on mountage

Table 17 : Mean fecundity of different Multi × BI Hybrids during spring season

Hybrid	MC1xBC4	MC4xBC4	NXNB4D2	PMXCSR2
	307.05	354.55	297	351

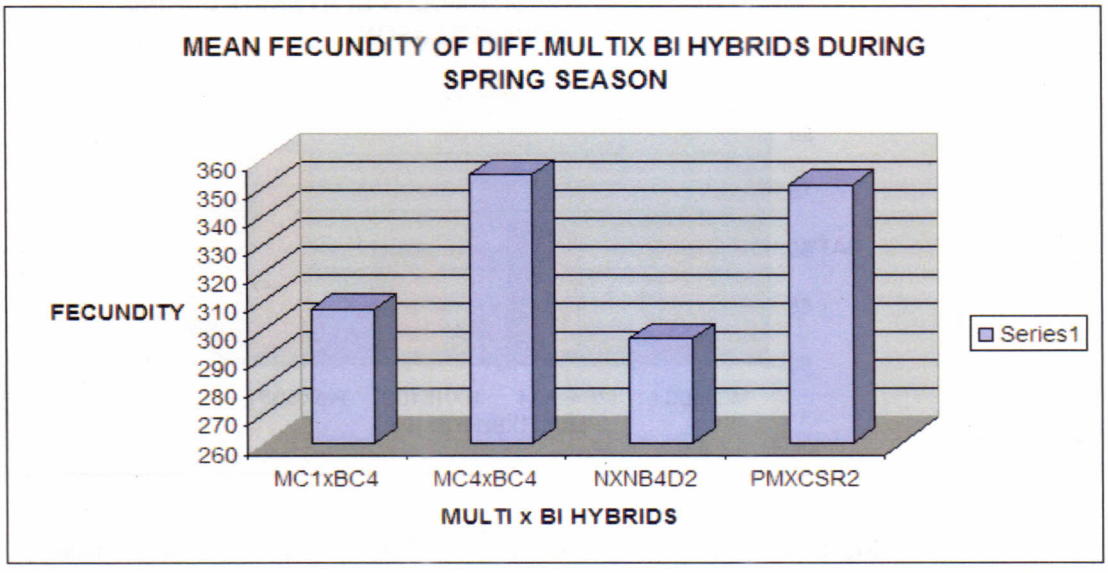


Fig 16 : Mean fecundity of Multi × BI Hybrids during spring season

Table 18 : Mean hatching % of different Multi × BI Hybrids during spring season

Hybrid	MC1xBC4	MC4xBC4	NXNB4D2	PMXCSR2
	71.485	70.025	67.595	77.48

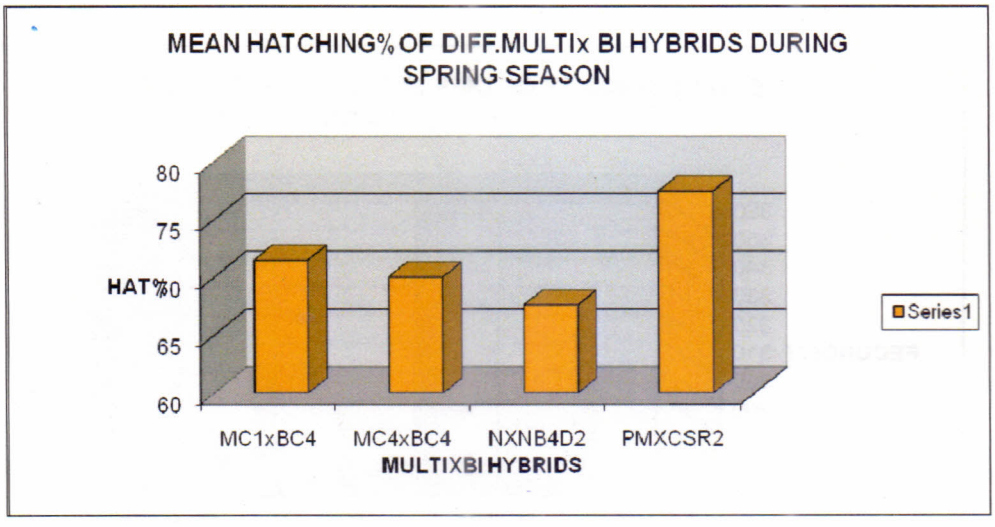


Fig 17 : Mean hatching % of Multi × BI Hybrids during spring season

Table 19 : Mean filament length (meters) of different Multi × BI Hybrids during spring season

Hybrid	MC1xBC4	MC4xBC4	NXNB4D2	PMXCSR2
	553.5	571	457.5	456

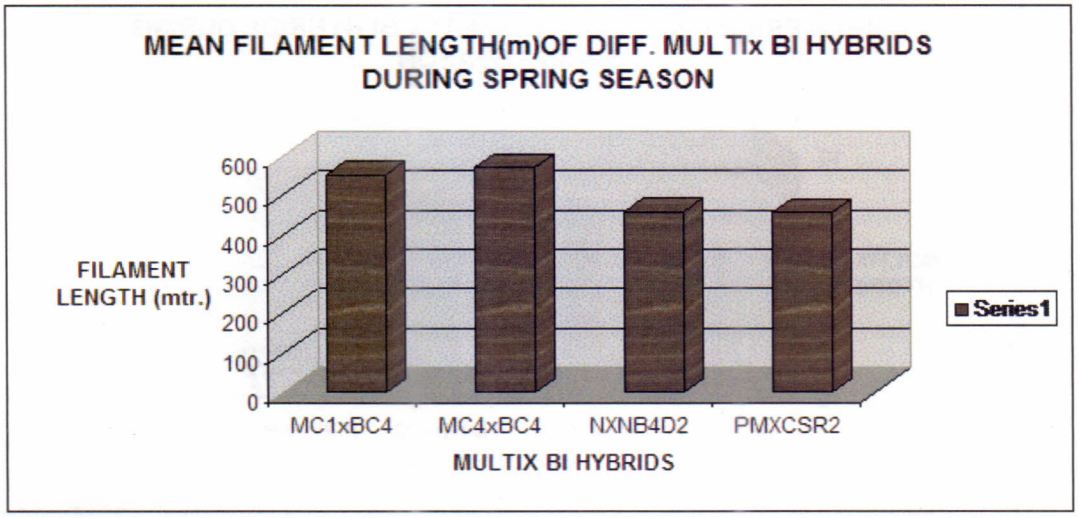


Fig 18 : Mean filament length (meters) of Multi × BI Hybrids during spring season

Table 20 : Mean ERR (By weight) of different Multi × BI Hybrids during spring season

Hybrid	MC1xBC4	MC4xBC4	NXNB4D2	PMXCSR2
	4.985	7.2365	7.51	8.46

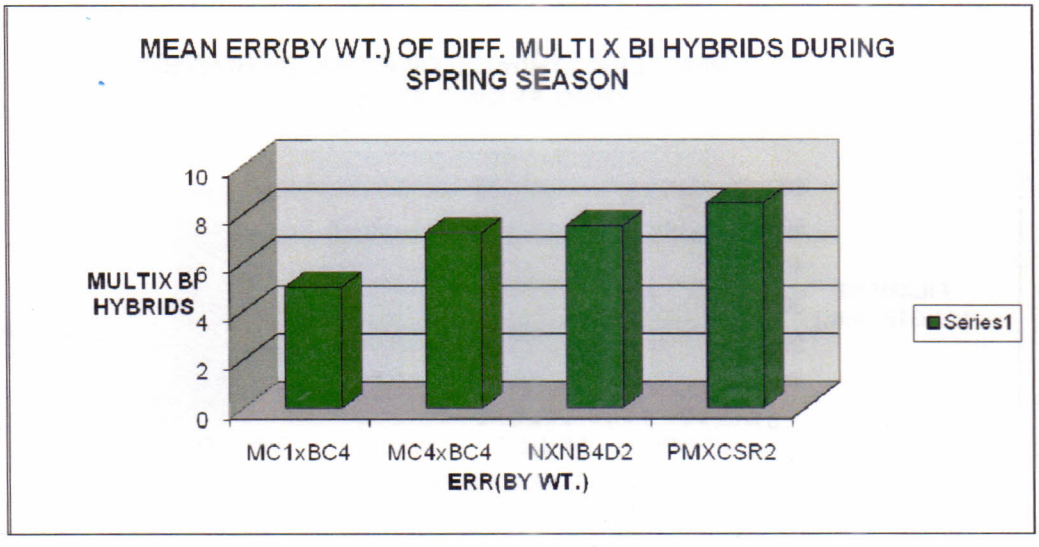


Fig 19 : Mean ERR (By weight) of Multi × BI Hybrids during spring season

Table 21 : Mean Cocoon weight (gm) of different Multi × BI Hybrids during spring season

Hybrid	MC1xBC4	MC4xBC4	NXNB4D2	PMXCSR2
	1.198	1.249	1.226	1.4465

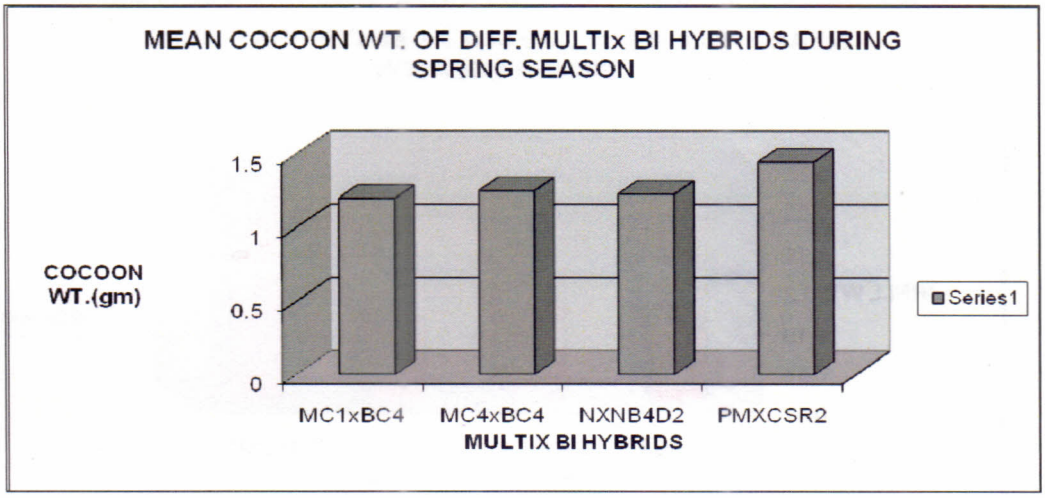


Fig 20 : Mean cocoon weight (gm) of Multi × BI hybrids during spring season

Table 22 : Mean shell weight of different Multi × BI Hybrids during spring season

Hybrid	MC1xBC4	MC4xBC4	NXNB4D2	PMXCSR2
	0.191	0.1965	0.1905	0.227

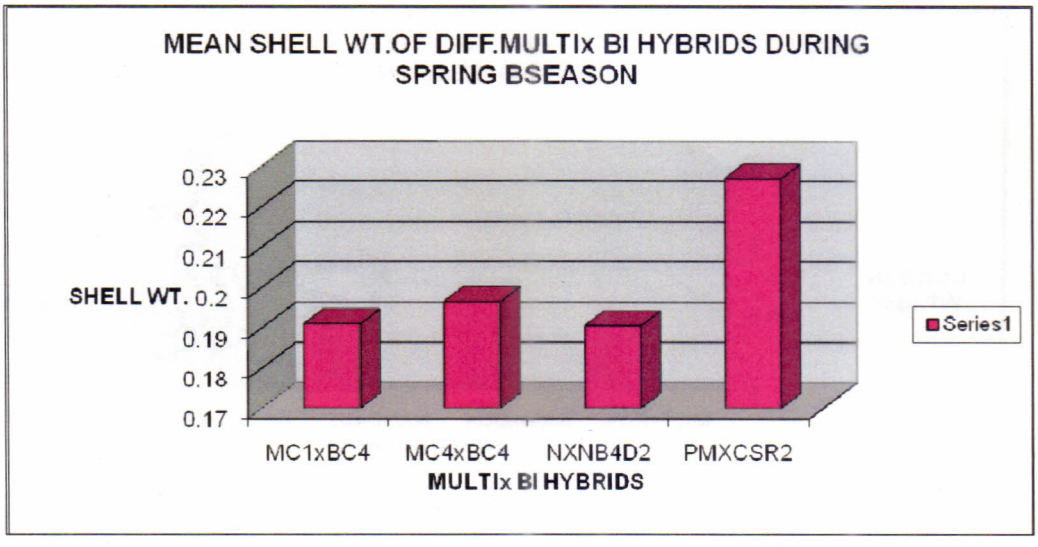


Fig 21 : Mean shell weight of Multi × BI hybrids during spring season

Table 23 : Mean SR% of different Multi × BI hybrids during spring season

Hybrid	MC1xBC4	MC4xBC4	NXNB4D2	PMXCSR2
	16.605	15.895	15.88	15.78

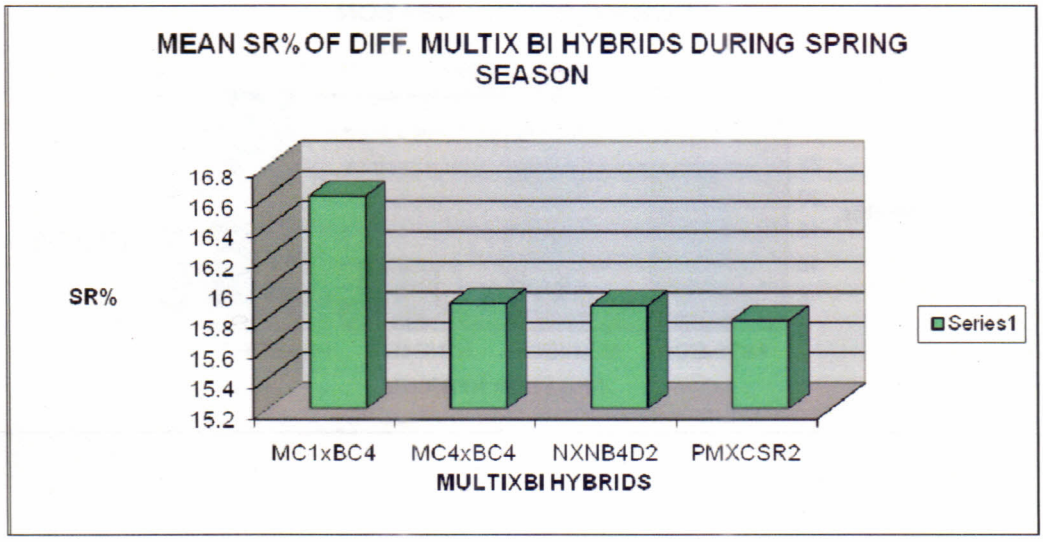


Fig 22 : Mean SR% of Multi × BI hybrids during spring season

Table 24 : Mean yield/100dfls. of different Multi × BI hybrids during spring season

Hybrid	MC1xBC4	MC4xBC4	NXNB4D2	PMXCSR2
	19.94	28.946	7.45	33.84

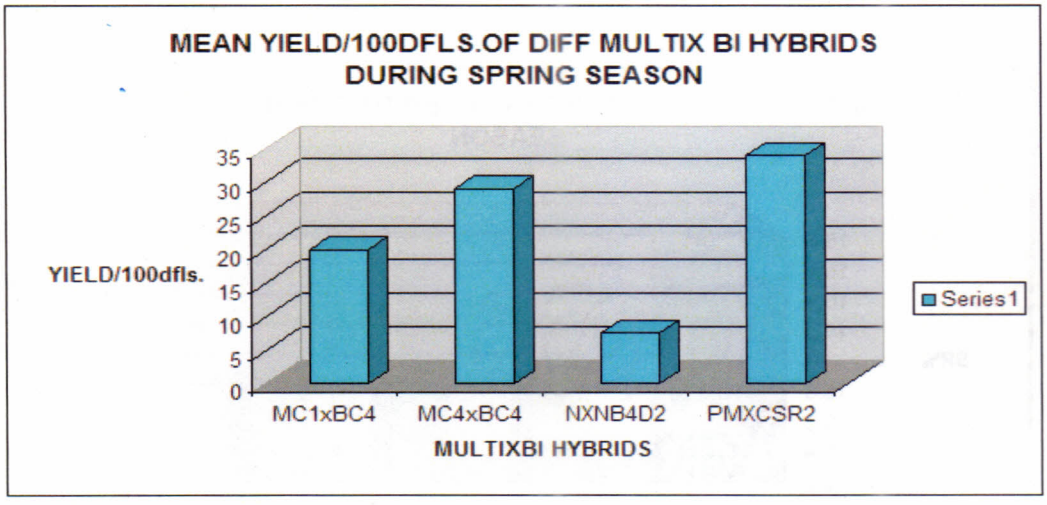


Fig 23 : Mean Yield/100dfls. of different Multi × BI hybrids during spring season

Table 25 : Mean ERR (by number) of different Multi × BI hybrids during spring season

Hybrid	MC1xBC4	MC4xBC4	NXNB4D2	PMXCSR2
	3787.355	5092.5	5501.335	6455.33

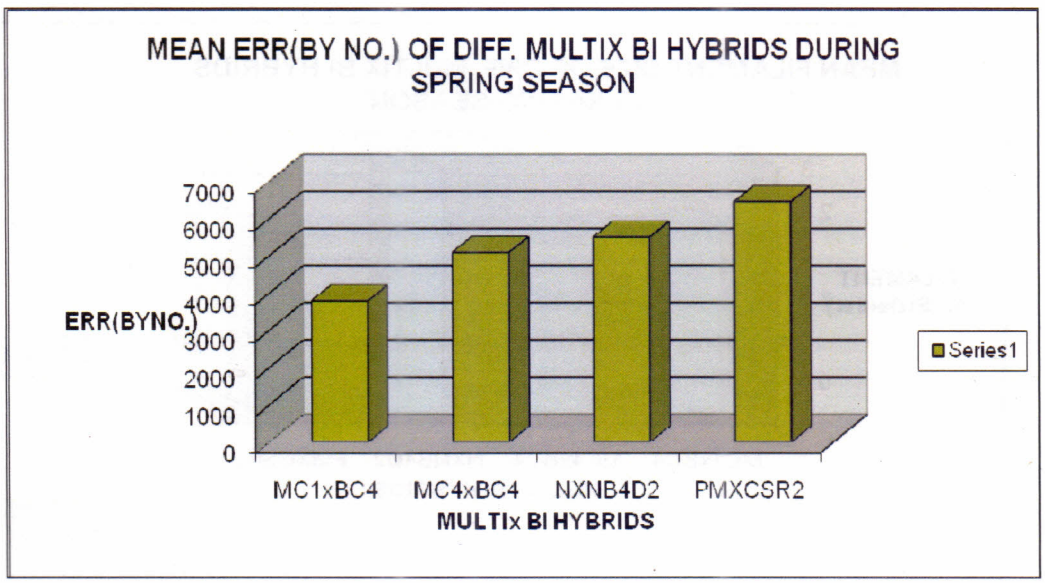


Fig 24 : Mean ERR (by number) of Multi × BI hybrids during spring season

Table 26 : Mean filament size (Denier) of different Multi × BI hybrids during spring season

Hybrid	MC1xBC4	MC4xBC4	NXNB4D2	PMXCSR2
	2.22	1.975	2.82	1.925

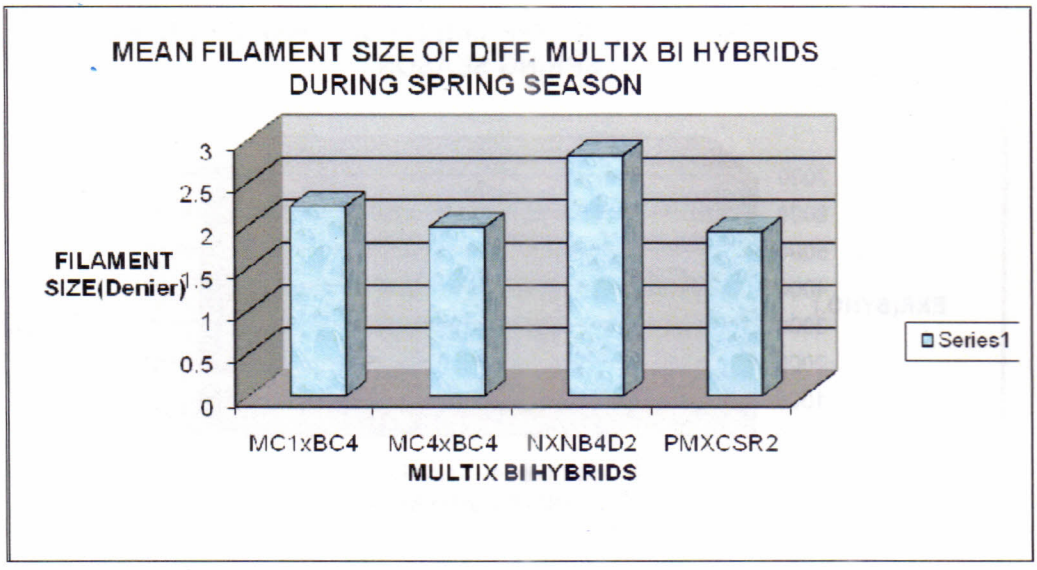


Fig 25 : Mean filament size (Denier) of Multi × BI hybrids during spring season

Table 27 : Mean reelability % of different Multi × BI hybrids during spring season

Hybrid	MC1xBC4	MC4xBC4	NXNB4D2	PMXCSR2
	79.045	82.945	70.515	79.5

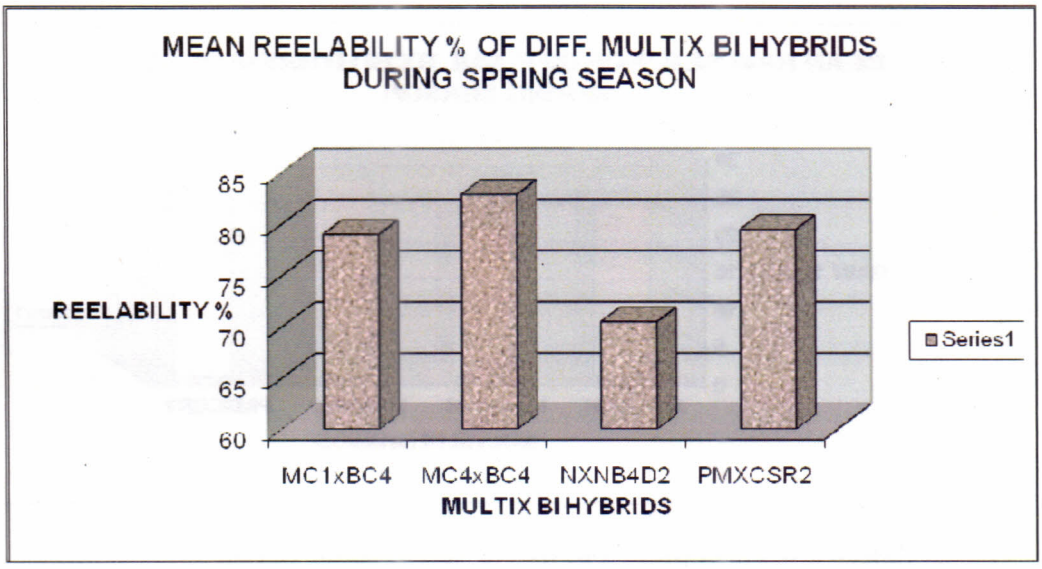


Fig 26 : Mean reelability % of Multi × BI hybrids during spring season

Table 28 : Mean raw silk of different Multi × BI hybrids during spring season

Hybrid	MC1xBC4	MC4xBC4	NXNB4D2	PMXCSR2
	22.96	20.005	26.035	24.07

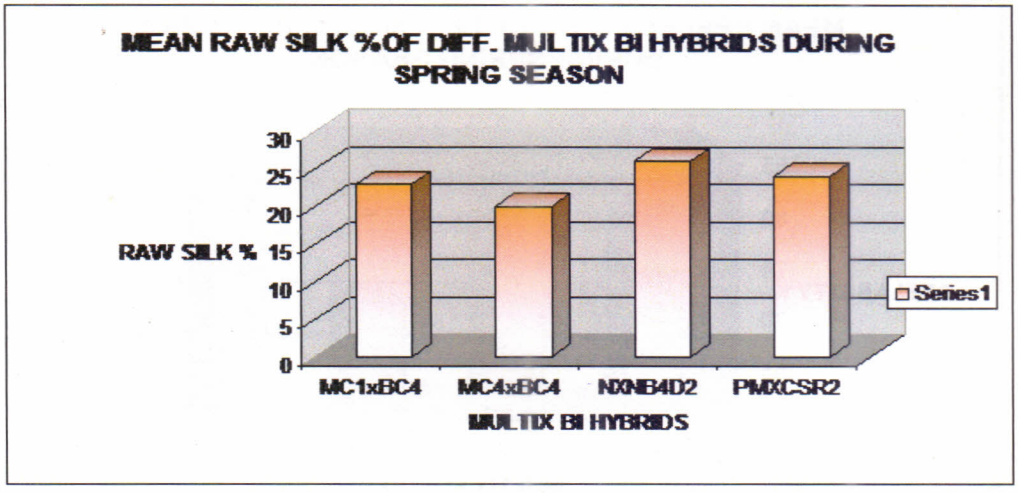


Fig 27 : Mean raw silk of Multi × BI hybrids during spring season

Table 29 : Mean Neatness % of different Multi × BI hybrids during spring season

Hybrid	MC1xBC4	MC4xBC4	NXNB4D2	PMXCSR2
	88.5	89.5	89	82.5

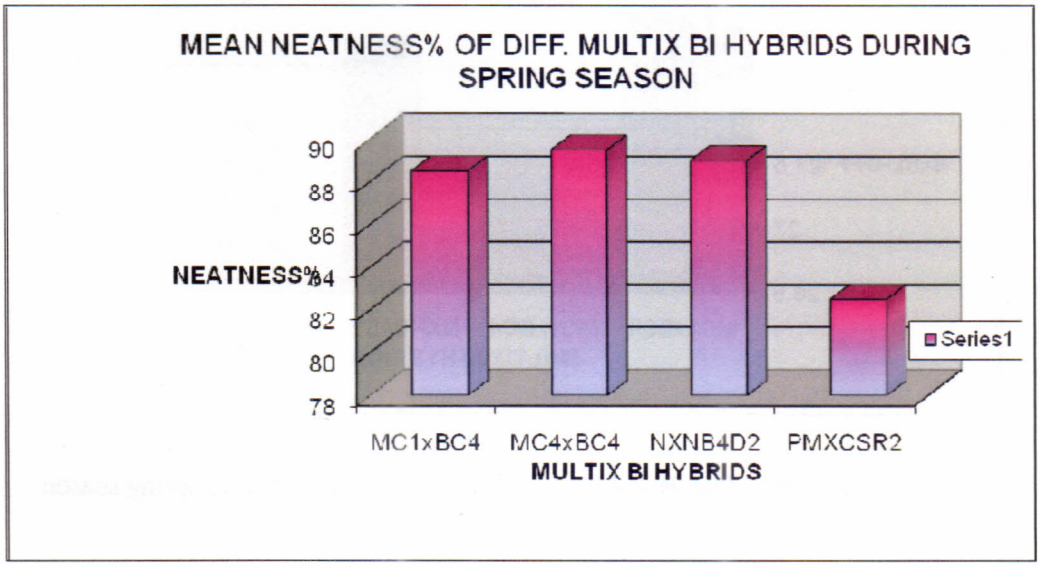


Fig 28 : Mean neatness % of Multi × BI hybrids during spring season

Table 30 : Mean Boil-off % of different Multi × BI hybrids during spring season

Hybrid	MC1xBC4	MC4xBC4	NXNB4D2	PMXCSR2
	28.49	27.25	28.285	27.78

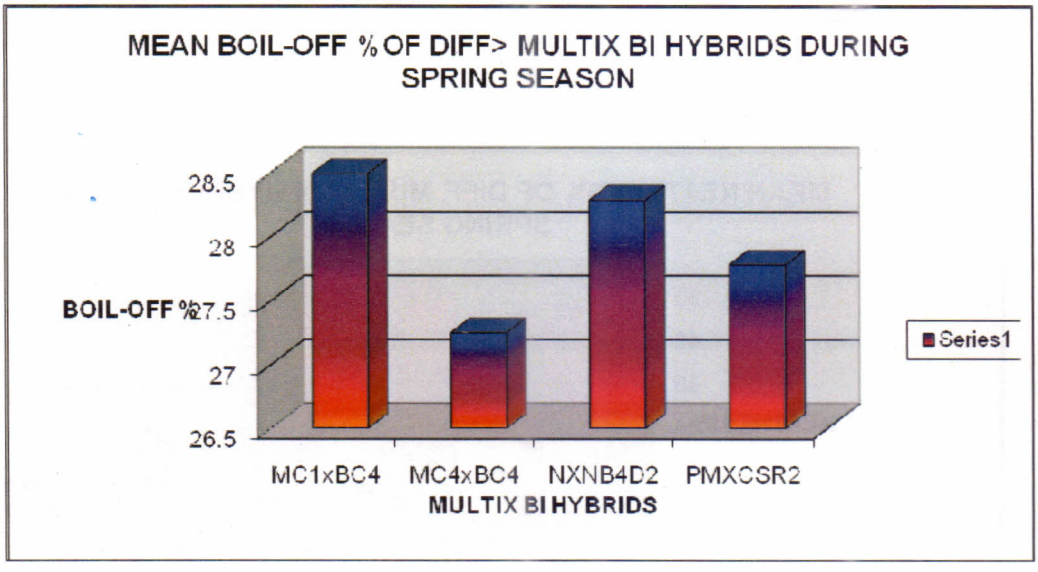


Fig 29 : Mean Boil-off % of Multi × BI hybrids during spring season

Table 31 : Mean filament weight (cg) of different Multi × BI hybrids during spring season

Hybrid	MC1xBC4	MC4xBC4	NXNB4D2	PMXCSR2
	13.52	13.285	13.92	14.78

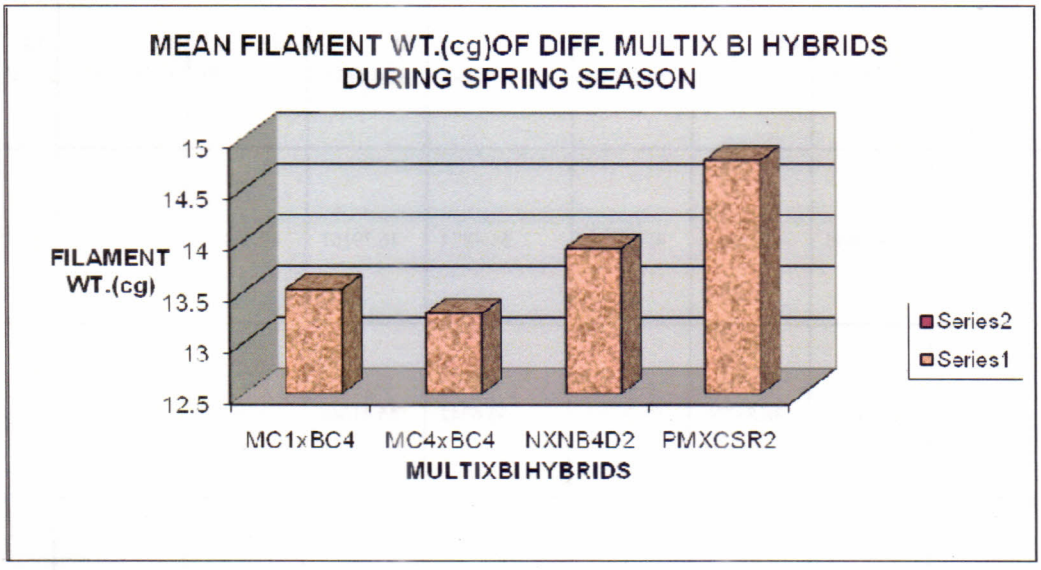


Fig 30 : Mean filament weight (cg) of Multi × BI hybrids during spring season

Table 32 : Evaluation index values of experimental hybrids for 15 quantitative traits under Assam condition are discussed below:

Sl .No.	BREED	EI value for Fecundity	EI value for Hat%	EI value for ERR(No)	EI value for ERR(WT.)	EI value for S.C.wt.(g)	EI value for S.S.wt.(g)	EI value for SR%	EI value for Yield/100 dfls.
		(a)	(b)	©	(d)	(e)	(f)	(g)	(h)
1	MC1 x BC4	EI 42.06628	EI 49.57418	EI 35.16394	EI 33.8148	EI 41.5625	EI 50	EI 67.1732523	EI 47.40379
2	MC4 x BC4	60.5848	45.56319	48.77783	51.4874	46.79167	49.14414	45.59271	56.3828514
3	N x NB4D2	38.14815	38.88736	53.04915	53.6342	45.41667	48.06306	45.13678	34.95115
4	PM x CSR2	59.20078	66.04396	63.00388	61.0911	52.88542	54.63964	42.09726	61.2622134

Contd.

EI value for Filament Length (M)	EI value for Filament Wt.	EI value for Filament Size (D)	EI value for Reelability (%)	EI value for Raw silk	EI value for Neatness (%)	EI value for Boil-off	TOTAL EVAL. INDEX	Av.	Rank
(I)	(j)	(k)	(L)	(m)	(n)	(o)			
EI	EI	EI	EI	EI	EI	EI	736.6147	49.1	
58.28469	43.84886	49.57865	53.0744	49.86175	53.9576	61.25			(II)
61.57974	39.7188	42.69663	60.82057	35	57.49117	35.41667	737.0482	49.13	(II)
40.209	50.87873	66.43258	33.62144	62.78802	55.72438	56.97917	723.9199	48.26	(III)
39.92657	65.99297	41.2680	54.92341	53.73272	32.75618	46.45833	7952820	53.01	(I)

PM x CR2 > MC4 x BC4 =MC1 x BC4> N x xNB4d2

4.2 Statistical analysis of Multii x Bi hybrids on pooled spring seasons(commercial seasons)

One way Anova of Multivoltine x Bivoltine hybrids (pooled spring season):

Combined M X B : Oneway Anova on fecundity and rearing performance of different multi x bi hybrids(pooled spring) (Table 4.2.1)

ANOVA

fecundity

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	53446.838	3	17815.613	5.460	.009
Within Groups	52209.600	16	3263.100		
Total	105656.438	19			

Sl No.	Hybrids	Mean
01.	MC1 x BC4	306.1a
02.	MC4x BC4	354.6 a
03.	N x NB4D2	297a
04.	PM x CSR2	351a
	S.Ed±	36.1281
	$CD_{.05}$	63.0797

From ANOVA Table, it is seen that there is less significant difference among the performance of various multi bi hybrid with respect to the characteristic fecundity (pooled spring).

The nature of significant difference between the said groups are less.

Combined M X B : Oneway Anova on hatching and rearing performance of different multi x bihybrids (pooled spring) (Table 4.2.2)

ANOVA

hatching

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1064.595	3	354.865	32.231	.000
Within Groups	176.159	16	11.010		
Total	1240.754	19			

Sl No.	Hybrids	Mean
01.	MC1 x BC4	71.48 a
02.	MC4x BC4	70.02 a,b
03.	N x NB4D2	67.59 b
04.	PM x CSR2	77.49
	S.Ed±	2.0986
	$CD_{.05}$	3.6642

From ANOVA Table, it is seen that there is highly significant difference among the performance of the said groups of hybrids (multi x bi) with respect to the characteristic 'hatching' (pooled spring).

The nature of significant difference between the said groups are given us.

Vs	1	2	3	4
1	--	NS	*	**
2	--	--	NS	**
3	--	--	--	**
4	--	--	--	--

NS : Not significant

* : Significant at .05 level

** : Highly significant.

Combined M X B : Oneway Anova on effective rate of rearing by number and rearing performance of different multi x bi hybrids(pooled spring) (Table 4.2.3)

ANOVA

Effective rate of rearing by number

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	73471055.000	3	24490351.667	28.014	.000
Within Groups	13987622.800	16	874226.425		
Total	87458677.800	19			

Sl No.	Hybrids	Mean
01.	MC1 x BC4	3787.3
02.	MC4x BC4	5092.3 b
03.	N x NB4D2	5501.3 a,b
04.	PM x CSR2	6455.3 a
	S.Ed±	591.346
	$CD_{.05}$	1032.49

1. ANOVA—**Effective rate of rearing by number**

From ANOVA Table, it is observed that there is highly significant difference among the different levels of (M*B) hybrids with respect to the characteristic effective rate of rearing by number (pooled spring season).

The nature of significant difference between the levels of hybrid with respect to the said characteristic is given below.

Vs	1	2	3	4
1	--	**	**	**
2	--	--	NS	**
3	--	--	--	NS
4	--	--	--	--

NS : Not significant

* : Difference is significant at .05 level

** : Difference is highly significant.

Combined M X B : Oneway Anova on effective rate of rearing by weight and rearing performance of different multi x bi hybrids(pooled spring) (Table 4.2.4)

ANOVA

Effective rate of rearing by weight

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	132.116	3	44.039	17.342	.000
Within Groups	40.631	16	2.539		
Total	172.747	19			

Sl No.	Hybrids	Mean
01.	MC1 x BC4	4.96
02.	MC4x BC4	7.24 a
03.	N x NB4D2	7.51 a
04.	PM x CSR2	8.46 a
	S.Ed±	1.008
	$CD_{.05}$	1.76

ANOVA—**Effective rate of rearing by weight** (pooled spring)

From ANOVA table, it is observed that there is highly significant difference among the performance of various multi bi hybrids with respect to the characteristic effective rate of rearing by weight

The nature of significant difference between the said groups, the following results are obtained.

Vs	1	2	3	4
1	--	**	**	**
2	--	--	NS	NS
3	--	--	--	NS
4	--	--	--	--

NS : Not significant

* : Difference is significant at .05 level

** : Difference is highly significant.

Combined M X B : Oneway Anova on single cocoon weight and rearing performance of different multi x bi hybrids (pooled spring) (Table 4.2.5)

ANOVA

Single cocoon weight

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.753	3	.251	26.651	.000
Within Groups	.151	16	.009		
Total	.904	19			

Sl No.	Hybrids	Mean
01.	MC1 x BC4	1.202 a
02.	MC4x BC4	1.249 a
03.	N x NB4D2	1.226 a
04.	PM x CSR2	1.447
	S.Ed±	.06
	$CD_{.05}$	.105

1. ANOVA on — **Single cocoon weight**

The results of the ANOVA table indicates that there is highly significant difference among the performance of various groups of hybrids (multi x bi) with respect to the characteristics ' Single cocoon weight'.

The nature of significance difference between the said groups are given us.

Vs	1	2	3	4
1	--	NS	*	**
2	--	--	NS	**
3	--	--	--	**
4	--	--	--	--

Combined M X B : Oneway Anova on single shell weight and rearing performance of different multi x bi hybrids(pooled spring) (Table 4.2.6)

ANOVA

Single shell weight

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.018	3	.006	9.066	.001
Within Groups	.011	16	.001		
Total	.029	19			

Sl No.	Hybrids	Mean
01.	MC1 x BC4	.190 b
02.	MC4x BC4	.196 a,b
03.	N x NB4D2	.190 b
04.	PM x CSR2	.226 a
	S.Ed±	.02
	$CD_{.05}$	.0349

ANOVA reveales that the multi x bivoltine hybrids are highly significant ($p<.01$) for the trait single shell weight.

From the CD and SEd value we see that the hybrids MC4 x BC4 , PM x CSR2 and MC1 x BC4, N x NB4D2 are at par.

Combined M X B : Oneway Anova on SR percentage and rearing performance of different multi x bi hybrids (pooled spring) (Table 4.2.7)

ANOVA

SR percentage

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.390	3	2.797	1.278	.316
Within Groups	35.001	16	2.188		
Total	43.391	19			

Sl No.	Hybrids	Mean
01.	MC1 x BC4	16.59 a
02.	MC4x BC4	15.89 a
03.	N x NB4D2	15.9a
04.	PM x CSR2	15.78 a
	S.Ed±	.936
	$CD_{.05}$	1.634

From the ANOVA table, it is clear that the difference of the performance among the various groups of hybrid(Multi * Bi) with respect to the characteristics ' SR' is not significant.

Combined M X B : Oneway Anova on yield and rearing performance of different multi x bi hybrids (pooled spring) (Table 4.2.8)

ANOVA

Yield

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2113.848	3	704.616	16.736	.000
Within Groups	673.649	16	42.103		
Total	2787.498	19			

Sl No.	Hybrids	Mean
01.	MC1 x BC4	19.84
02.	MC4x BC4	28.98 a
03.	N x NB4D2	30.04 a
04.	PM x CSR2	33.84 a
	S.Ed±	4.104
	$CD_{.05}$	7.166

From the ANOVA table, it is seen that the difference of the performance among the various groups of hybrids (Multi x Bi) with respect to the characteristic ' yield ' is highly significant.

The nature of significant difference between the said groups are given us.

Vs	1	2	3	4
1	--	**	**	**
2	--	--	NS	NS
3	--	--	--	NS
4	--	--	--	--

NS : Not significant

* : Significant at .05 level

** : Highly significant.

Combined M X B : Oneway Anova on filament length and rearing performance of different multi x bi hybrids(pooled spring) (Table 4.2.9)

[DataSet0] data combined M X B in SPSS.sav

ANOVA

Filament length

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	225831.600	3	75277.200	12.208	.000
Within Groups	98660.400	16	6166.275		
Total	324492.000	19			

Sl No.	Hybrids	Mean
01.	MC1 x BC4	553.3 a
02.	MC4x BC4	571.2 a
03.	N x NB4D2	457.5 b
04.	PM x CSR2	456 b
	S.Ed±	49.664
	$CD_{.05}$	86.713

ANOVA reveals that the Multi x bivoltine hybrids are highly significant ($p<.01$) for the trait filament length.. From the CD and SEd value we see that the hybrids MC1 x BC4, MC4x BC4and N x NB4D2, PM x CSR2 are at par.

Combined MXB

ANOVA—Filament length.

From ANOVA Table, it is observed that there is highly significant difference among the groups of hybrid (multi x bi) with respect to the characteristics 'filament length' (pooled spring).

The nature of significant difference between the said groups are given below.

Vs	1	2	3	4
1	--	NS	**	**
2	--	--	**	**
3	--	--	--	NS
4	--	--	--	--

NS : Not significant

* : Difference is significant at .05 level

** : Difference is highly significant

Combined M X B : Oneway Anova on filament size and rearing performance of different multi x bi hybrids(pooled spring) (Table 4.2.10)

ANOVA

Filament size

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10.100	3	3.367	26.036	.000
Within Groups	2.069	16	.129		
Total	12.168	19			

Filament size

Sl No.	Hybrids	Mean
01.	MC1 x BC4	2.22 a
02.	MC4x BC4	1.975 a
03.	N x NB4D2	2.819
04.	PM x CSR2	1.925 a
	S.Ed±	.227
	$CD_{.05}$	.396

ANOVA— (MXB) **Filament size**.

From ANOVA Table, it is observed that there is highly significant difference among the groups of hybrid (bi x bi) with respect to the characteristics 'filament size' (pooled spring).

The nature of significant difference between the said groups are given us.

Vs	1	2	3	4
1	--	NS	**	NS
2	--	--	**	NS
3	--	--	--	**
4	--	--	--	--

NS : Not significant

* : Difference is significant at .05 level

** : Difference is highly significant.

Combined M X B : Oneway Anova on filament weight and rearing performance of different multi x bi hybrids (pooled spring) (Table 4.2.11)

[DataSet0] data combined M X B in SPSS.sav

ANOVA

Filament weight

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	25.903	3	8.634	4.809	.014
Within Groups	28.727	16	1.795		
Total	54.630	19			

Sl No.	Hybrids	Mean
01.	MC1 x BC4	13.52a,b
02.	MC4x BC4	13.28 b
03.	N x NB4D2	13.92 a,b
04.	PM x CSR2	14.78 a
	S.Ed±	.847
	CD.05	1.479

ANOVA—**Filament weight**

From ANOVA table, it is seen that there is less significant difference among the performance of the groups of hybrid (multi x bi) with respect to the characteristic 'filament weight' (pooled spring).

The nature of significant difference between the said groups are abo less significant.

Combined M X B : Oneway Anova on raw silk and rearing performance of different multi x bi hybrids (pooled spring) (Table 4.2.12)

[DataSet0] data combined M X B in SPSS. sav

ANOVA

Raw silk

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	380.830	3	126.943	27.032	.000
Within Groups	75.136	16	4.696		
Total	455.967	19			

Sl No.	Hybrids	Mean
01.	MC1 x BC4	22.96 b
02.	MC4x BC4	20.00
03.	N x NB4D2	26.03 a
04.	PM x CSR2	24.07 a,b
	S.Ed±	1.371
	$CD_{.05}$	2.394

ANOVA on — **Raw silk.**

From ANOVA Table, it is seen that the difference among the performance of the groups of hybrids with respect to the characteristic 'raw silk' is highly significant.

The nature of significant difference between the said groups with respect to the characteristic "raw silk" are as.

Vs	1	2	3	4
1	--	**	**	NS
2	--	--	**	**
3	--	--	--	NS
4	--	--	--	--

NS : Not significant

* : Significant at .05 level

** : Highly significant

Combined M X B : Oneway Anova on reelability and rearing performance of different multi x bi hybrids (pooled spring) (Table 4.2.13)

ANOVA

Reelability

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1676.405	3	558.802	67.216	.000
Within Groups	133.015	16	8.313		
Total	1809.421	19			

Sl No.	Hybrids	Mean
01.	MC1 x BC4	79.04 a
02.	MC4x BC4	82.94
03.	N x NB4D2	70.51
04.	PM x CSR2	79.5 a
	S.Ed±	1.824
	$CD_{.05}$	3.185

ANOVA—**Reelability.**

From ANOVA table, it is observed that there is highly significant difference among the performance of the various groups of hybrid (Multi x Bi) with respect to the characteristics 'reelability' (pooled spring).

Again, the nature of significant difference between the said groups are as follows.

Vs	1	2	3	4
1	--	*	**	NS
2	--	--	**	NS
3	--	--	--	**
4	--	--	--	--

Combined M X B : Oneway Anova on neatness and rearing performance of different multi x bi hybrids (pooled spring) (Table 4.2.14)

ANOVA

Neatness

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	643.750	3	214.583	13.356.	.480.
Within Groups	.000	16	.000		
Total	643.750	19			

ANOVA on — **Neatness**.

From the ANOVA table, it is seen that there is no significant difference of the performance among the groups of hybrid with respect to the characteristic ' neatness' (pooled spring).

Combined M X B : Oneway Anova on boil-off and rearing performance of different multi x bi hybrids (pooled spring) (Table 4.2.15)

ANOVA

Boil-off

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	18.434	3	6.145	4.000	.027
Within Groups	24.576	16	1.536		
Total	43.010	19			

Sl No.	Hybrids	Mean
01.	MC1 x BC4	28.49 a
02.	*MC4x BC4*	27.25 a
03.	N x NB4D2	28.28 a
04.	PM x CSR2	27.78 a
S.Ed±		.784
$CD_{.05}$		1.369

ANOVA—**Boils-off** (combined M*B)

From ANOVA table, it is observed that there is significant difference among the different levels of multi * bi hybrids with respect to the characteristic boil-off .

The nature of significant difference between the levels of hybrid with respect to the said characteristic is given below. (pooled spring season).

Vs	1	2	3	4
1	--	*	NS	NS
2	--	--	*	NS
3	--	--	--	NS
4	--	--	--	--

NS : Not significant

* : Difference is significant at .05 level

** : Difference is highly significant

Correlation co-efficients of Multivoltine x Bivoltine hybrids (pooled spring season) :

Simple correlation co-efficients between fecundity and other qualitative traits for the 1st multi x bi hybrid (MCon1 X BCon4)) (pooled spring) (Table 4.2.16)

Correlations

Character		fecundity	hatching	errbyno	errbywt	sgcocnwt	sgshlwt	SR	yield
Fecundity	Pearson Correlation	1	.635	.181	.198	.296	-.282	-.353	.198
	Sig. (2-tailed)		.250	.770	.749	.629	.646	.561	.749
	N	5	5	5	5	5	5	5	5
Hatching	Pearson Correlation	.635	1	.563	.356	.482	.150	-.166	.356
	Sig. (2-tailed)	.250		.323	.556	.411	.809	.789	.556
	N	5	5	5	5	5	5	5	5
Errbyno	Pearson Correlation	.181	.563	1	.900*	.842	.873	.685	.900*
	Sig. (2-tailed)	.770	.323		.037	.073	.053	.202	.037
	N	5	5	5	5	5	5	5	5
Errbywt	Pearson Correlation	.198	.356	.900*	1	.966**	.850	.821	1.000**
	Sig. (2-tailed)	.749	.556	.037		.008	.068	.088	.000
	N	5	5	5	5	5	5	5	5
Sgcocnwt	Pearson Correlation	.296	.482	.842	.966**	1	.744	.703	.966**
	Sig. (2-tailed)	.629	.411	.073	.008		.149	.185	.008
	N	5	5	5	5	5	5	5	5
Sgshlwt	Pearson Correlation	-.282	.150	.873	.850	.744	1	.920*	.850
	Sig. (2-tailed)	.646	.809	.053	.068	.149		.027	.068
	N	5	5	5	5	5	5	5	5
SR	Pearson Correlation	-.353	-.166	.685	.821	.703	.920*	1	.821
	Sig. (2-tailed)	.561	.789	.202	.088	.185	.027		.088
	N	5	5	5	5	5	5	5	5
Yield	Pearson Correlation	.198	.356	.900*	1.000**	.966**	.850	.821	1
	Sig. (2-tailed)	.749	.556	.037	.000	.008	.068	.088	
	N	5	5	5	5	5	5	5	5

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Conclusion C.C of Pooled (Multi& Bi) spring.

1. **Characteristics** : 1st breed (Mcon1 x Bcon4).

level	1	2	3	4	5	6	7	8
1	--	NS	NS	NS	NS	NS	NS	NS
2	NS	--	NS	NS	NS	NS	NS	NS
3	NS	NS	--	NS	NS	NS	NS	NS
4	NS	NS	NS	--	NS	Sig(*)	NS	Sig(**)
5	NS	NS	NS	NS	--	NS	NS	NS
6	NS	NS	NS	Sig(*)	NS	--	NS	Sig(*)
7	NS	NS	NS	NS	NS	NS	--	NS
8	NS	NS	NS	Sig(**)	NS	Sig(*)	NS	--

NS : Not significant

Sig(*) : Significant at .05 level

Sig(**) : Highly significant (both at .05 and .01 levels).

From the above results, it is seen that the C.C of the following characteristics.

i) Between effective rate of rearing by weight and single cocoon weight is significant.

ii) Between effective rate of rearing by weight and yield is highly significant.

iii) Between single cocoon weight and yield is significant.

Correlations

Simple correlation co-efficient between fecundity and other qualitative traits of second breed Multi x BI hybrid(MC4 x BC4)(pooled autumn) (Table 4.2.17)

Correlations

		fecundity	hatching	errbyno	errbywt	sgcocnwt	sgshlwt	SR	yield
Fecundity	Pearson Correlation	1	-.466	.027	-.052	-.512	.288	.790	-.052
	Sig. (2-tailed)		.429	.966	.934	.378	.638	.112	.934
	N	5	5	5	5	5	5	5	5
Hatching	Pearson Correlation	-.466	1	-.243	-.050	.495	.220	-.445	-.050
	Sig. (2-tailed)	.429		.694	.936	.396	.722	.453	.936
	N	5	5	5	5	5	5	5	5
Errbyno	Pearson Correlation	.027	-.243	1	.887*	-.396	-.878	-.187	.887*
	Sig. (2-tailed)	.966	.694		.045	.509	.050	.763	.045
	N	5	5	5	5	5	5	5	5
Errbywt	Pearson Correlation	-.052	-.050	.887*	1	.035	-.640	-.488	1.000**
	Sig. (2-tailed)	.934	.936	.045		.955	.245	.405	.000
	N	5	5	5	5	5	5	5	5
Sgcocnwt	Pearson Correlation	-.512	.495	-.396	.035	1	.462	-.768	.035
	Sig. (2-tailed)	.378	.396	.509	.955		.433	.129	.955
	N	5	5	5	5	5	5	5	5
Sgshlwt	Pearson Correlation	.288	.220	-.878	-.640	.462	1	.210	-.640
	Sig. (2-tailed)	.638	.722	.050	.245	.433		.735	.245
	N	5	5	5	5	5	5	5	5
SR	Pearson Correlation	.790	-.445	-.187	-.488	-.768	.210	1	-.488
	Sig. (2-tailed)	.112	.453	.763	.405	.129	.735		.405
	N	5	5	5	5	5	5	5	5
Yield	Pearson Correlation	-.052	-.050	.887*	1.000**	.035	-.640	-.488	1
	Sig. (2-tailed)	.934	.936	.045	.000	.955	.245	.405	
	N	5	5	5	5	5	5	5	5

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Conclusion : C.C of pooled (Multi & Bi) spring.

2. **Characteristics** : 2nd breed :

level	1	2	3	4	5	6	7	8
1	--	NS	NS	NS	NS	NS	NS	NS
2	NS	--	NS	NS	NS	NS	NS	NS
3	NS	NS	--	NS	NS	NS	NS	NS
4	NS	NS	NS	--	NS	Sig(*)	NS	Sig(**)
5	NS	NS	NS	NS	--	NS	NS	NS
6	NS	NS	NS	Sig(*)	NS	--	NS	Sig(*)
7	NS	NS	NS	NS	NS	NS	--	NS
8	NS	NS	NS	Sig(**)	NS	Sig(*)	NS	--

NS : Not significant

Sig(*) : Significant at .05 level

Sig(**) : Highly significant (both at .05 and .01 levels).

From the above results, it can be concluded that the C.C for the following characteristics.

i) Between effective rate of rearing by number and effective rate of rearing by weight is significant.

ii) Between effective rate of rearing by number and yield is significant.

iii) Between effective rate of rearing by weight and yield is highly significant.

Correlations

Simple correlation co-efficient between fecundity and other qualitative traits of 3rd breed (NX NB4D2)(pooled spring) (Table 4.2.18)

Correlations

		fecundity	hatching	errbyno	errbywt	sgcocnwt	sgshlwt	SR	yield
Fecundity	Pearson Correlation	1	.572	.025	-.286	-.586	-.242	.490	-.286
	Sig. (2-tailed)		.314	.968	.641	.299	.695	.402	.641
	N	5	5	5	5	5	5	5	5
Hatching	Pearson Correlation	.572	1	.352	-.330	-.220	-.201	-.354	-.330
	Sig. (2-tailed)	.314		.562	.588	.722	.746	.559	.588
	N	5	5	5	5	5	5	5	5
Errbyno	Pearson Correlation	.025	.352	1	.739	.308	.677	-.140	.739
	Sig. (2-tailed)	.968	.562		.154	.614	.209	.822	.154
	N	5	5	5	5	5	5	5	5
Errbywt	Pearson Correlation	-.286	-.330	.739	1	.568	.923*	.261	1.000**
	Sig. (2-tailed)	.641	.588	.154		.317	.025	.672	.000
	N	5	5	5	5	5	5	5	5
Sgcocnwt	Pearson Correlation	-.586	-.220	.308	.568	1	.781	-.075	.568
	Sig. (2-tailed)	.299	.722	.614	.317		.119	.905	.317
	N	5	5	5	5	5	5	5	5
Sgshlwt	Pearson Correlation	-.242	-.201	.677	.923*	.781	1	.286	.923*
	Sig. (2-tailed)	.695	.746	.209	.025	.119		.641	.025
	N	5	5	5	5	5	5	5	5
SR	Pearson Correlation	.490	-.354	-.140	.261	-.075	.286	1	.261
	Sig. (2-tailed)	.402	.559	.822	.672	.905	.641		.672
	N	5	5	5	5	5	5	5	5
Yield	Pearson Correlation	-.286	-.330	.739	1.000**	.568	.923*	.261	1
	Sig. (2-tailed)	.641	.588	.154	.000	.317	.025	.672	
	N	5	5	5	5	5	5	5	5

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Conclusion : C. C of pooled (Multi & Bi) spring.

3. Characteristics : 3rd breed

level	1	2	3	4	5	6	7	8
1	--	NS	NS	NS	NS	NS	NS	NS
2	NS	--	NS	NS	NS	NS	NS	NS
3	NS	NS	--	NS	NS	NS	NS	NS
4	NS	NS	NS	--	NS	Sig(*)	NS	Sig(**)
5	NS	NS	NS	NS	--	NS	NS	NS
6	NS	NS	NS	Sig(*)	NS	--	NS	Sig(*)
7	NS	NS	NS	NS	NS	NS	--	NS
8	NS	NS	NS	Sig(**)	NS	Sig(*)	NS	--

NS : Not significant

Sig(*) : Significant at .05 level

Sig(**) : Highly significant (both at .05 and .01 levels).

From the above results, it is observed that the C.C for the following characteristics.

i) Between effective rate of rearing by weight and single cocoon weight is significant.

ii) Between effective rate of rearing by weight and yield is highly significant.

iii) Between single cocoon weight and yield is significant.

Correlations

Simple correlation co-efficient between fecundity and other qualitative traits of 4th hybrid (PM×CSR2)(pooled spring) (Table 4.2.19)

Correlations

		fecundity	hatching	errbyno	errbywt	sgcocnwt	sgshlwt	SR	yield
Fecundity	Pearson Correlation	1	.068	-.260	.096	.116	-.198	-.175	-.135
	Sig. (2-tailed)		.913	.672	.878	.853	.750	.778	.829
	N	5	5	5	5	5	5	5	5
Hatching	Pearson Correlation	.068	1	-.918*	-.932*	-.022	.244	.245	-.928*
	Sig. (2-tailed)	.913		.028	.021	.972	.693	.691	.023
	N	5	5	5	5	5	5	5	5
Errbyno	Pearson Correlation	-.260	-.918*	1	.902*	.159	.137	-.224	.990**
	Sig. (2-tailed)	.672	.028		.036	.798	.826	.717	.001
	N	5	5	5	5	5	5	5	5
Errbywt	Pearson Correlation	.096	-.932*	.902*	1	.351	-.006	-.504	.950*
	Sig. (2-tailed)	.878	.021	.036		.563	.993	.386	.013
	N	5	5	5	5	5	5	5	5
Sgcocnwt	Pearson Correlation	.116	-.022	.159	.351	1	.575	-.903*	.237
	Sig. (2-tailed)	.853	.972	.798	.563		.310	.036	.701
	N	5	5	5	5	5	5	5	5
Sgshlwt	Pearson Correlation	-.198	.244	.137	-.006	.575	1	-.179	.136
	Sig. (2-tailed)	.750	.693	.826	.993	.310		.773	.828
	N	5	5	5	5	5	5	5	5
SR	Pearson Correlation	-.175	.245	-.224	-.504	-.903*	-.179	1	-.312
	Sig. (2-tailed)	.778	.691	.717	.386	.036	.773		.610
	N	5	5	5	5	5	5	5	5
Yield	Pearson Correlation	-.135	-.928*	.990**	.950*	.237	.136	-.312	1
	Sig. (2-tailed)	.829	.023	.001	.013	.701	.828	.610	
	N	5	5	5	5	5	5	5	5

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Conclusion : C.C of pooled (Multi & Bi) spring season.

4. **Characteristics : 4th Hybreed.**

level	1	2	3	4	5	6	7	8
1	--	NS	NS	NS	NS	NS	NS	NS
2	NS	--	Sig(*)	Sig(*)	NS	NS	NS	Sig(*)
3	NS	Sig(*)	--	Sig(*)	NS	NS	NS	Sig(**)
4	NS	Sig(*)	Sig(*)	--	NS	NS	NS	Sig(*)
5	NS	NS	NS	NS	--	NS	Sig(*)	NS
6	NS	NS	NS	NS	NS	--	NS	NS
7	NS	NS	NS	NS	Sig(*)	NS	--	NS
8	NS	Sig(*)	Sig(**)	Sig(*)	NS	NS	NS	--

NS : Not significant

Sig(*) : Significant at .05 level

Sig(**) : Highly significant (both at .05 and .01 levels).

From the above results it is seen that the coefficient of corral for the following characteristics.

i) Hatching and effective rate of rearing by number is significant.
ii) Hatching and effective rate of rearing by weight is significant.
iii) Hatching and yield is significant
iv) Effective rate of rearing by number and effective rate of rearing by weight is significant.
v) Effective rate of rearing by number and yield is highly significant.
vi) Effective rate of rearing by weight and yield is significant.
vii) Single cocoon weight and SR is significant.