CHAPTER-VII

Discussion

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The different traits of bivoltine x bivoltine hybrids for **pooled spring seasons** (S) are as follows:

1.Boils- off: Boils off is one of the important test of mulberry silk related to boiling of silk.

In this present investigation the three groups of hybrids (two groups consisting six bivoltine x bivoltine hybrids and one group of hybrids consisting of four multivoltine x bivoltine hybrids in two pooled seasons) were shown below:

In **Bivoltine x Bivoltine mulberry silkworm hybrids during pooled Spring seasons (commercial seasons)** ranged from 26.65 (CSR46 x CSR47) to 29.26 (CSR2 x CSR4). Difference was observed among the six Bi x Bi hybrids in **CSR2 x CSR4** (EIV 62. 07).

The characteristic boil-of trait among the six different **bivoltine x bivoltine hybrids during pooled spring** was not significant both at 0.01level and 0.05 level during pooled spring season ($F_{5,24}$=1.261, P=0.313>0.01) (Table 3.2.15)

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

The characteristic boil-off trait among the four different multivoltine x bivoltine hybrids during **pooled spring** differed statistically during pooled spring ($F_{3,16= 4.000, P=0.027<0.05}$) (Table 4.2.15). The difference between the mean yield of MC1 x BC4 is significantly different from one another. Also, the mean yield of MC4 x BC4 and N x NB4D2 is significantly different from one another at 0.05 level. Since and MC1 x BC4 and MC4 x BC4 are significantly different therefore MC1 x BC4 will be preferred to MC4 x BC4 and similarly MC4 x BC4 will be preferred to N x NB4D2.

Among the **six Bi x Bi hybrids, during pooled autumn seasons (commercial seasons)** ranged from 25.18 (APS45 x APS12) to 29.8 (APS105 x APS126). Among the six Bi x Bi hybrids, highest EI value observed in APS105 x APS 126 (EIV 72.738386) .

The trait boill off among the six different **bivoltine x bivoltine hybrids** differed statistically **during pooled autumn season** ($F_{5,24=7.856,p=0.000< 0.01}$) (Table 5.2.14).

The difference between the mean yield of Gen3 x Gen2 & APS45 x APS12,CSR2 x CSR4 & APS45 x APS12 ; APS105 x APS126 & APS45 x APS12 ; APS45 x APS12 & CSR46 X CSR47 are significantly different at 0.01 level.

Again, the nature of significant difference between SLD4 X SLD8 & APS45 x APS12 is at 0.05 level.

The investigation revealed that the trait boil-off showed seasonal variations in pooled spring and pooled autumn season because of the fact that hybrid CSR2 x CSR4 (EIV 62. 07) showed better performance in pooled spring and APS105 x APS 126 (EIV 72.738386) showed better performance in pooled autumn. Moreover, the results corroborates with the result of Krishnaswami and Narasimhana (1974), Watanabe (1928) that Seasonal studies made in both mulberry and non- mulberry silkworm revealed a different expression of different breeds to varied climatic conditions during different season. Also,Boil off loss ratio varies in different silkworm breeds Sinha *et al.*, 1992).

2. Effective rate of rearing by number: The effective rate of rearing by number is an important characteristic which is related to cocoon yield.

In this present investigation the three groups of hybrids (two groups consisting six bivoltine x bivoltine hybrids and one group of hybrids consisting of four multivoltine x bivoltine hybrids in two pooled seasons) showed as follows:

In **Bivoltine x Bivoltine mulberry silkworm hybrids during pooled Spring seasons (commercial seasons)** ranged from 3068 (APS45 x APS126) to 5391(APS105 x APS 126) reared at 25±5◦C and 79±2 % . Among the six hybrids highest evaluation index value was observed in the hybrid APS105 x APS 126(E IV 60. 50109) followed by SLD4 x SLD8 (EIV 56.60311) and CSR2 x CSR4 (EIV 56. 52489)

The characteristic Effective rate of rearing by number among the six different bivoltine x bivoltine hybrids is highly significant at 0.01 level during pooled spring ($F_{5,24=46.998,\ P=0.000<0.01}$) (Table 3.2.3) with respect to hybrids SLD4 X SLD8 & APS45 x APS12 ; SLD4 X SLD8 & CSR46 X CSR47; DUN17 x DUN18 & APS105 x APS126 ; DUN17 x DUN18 & APS45 x APS12 ; DUN17 x DUN18 & CSR46 X CSR47;CSR2 x CSR4 & APS45 x APS12 ; CSR2 x CSR4 & CSR46 x CSR47 and APS45 x APS12 & CSR46 x CSR47

The performances of **Multi x Bi hybrids** i.e MC1 x BC4 , MC4 x BC4 , N x NB4D2, PM x CSR2 during **pooled Spring season** at different temperature levels i.e., 24±3◦C and 25±5◦C with constant humidity of 79±2 % ranged from 3787.335 (MC1 x BC4) to 6455.33(PM X CSR2). 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

The characteristic effective rate of rearing by number (ERR by no.) among the four different multivoltine x bivoltine hybrids is highly significant at 0.01 level **during pooled spring** ($F_{3,16=28.014,\ P=0.000<0.01}$) (Table 4.2.3).

The difference between the mean yield of MC1 x BC4 & MC4 x BC4 ; MC1 x BC4& N x NB4D2 and MC1 x BC4 & PM x CSR2 are significantly different at 0.01 level.

Among the **six Bi x Bi hybrids, during pooled autumn seasons (commercial seasons** ranged from 3489 (Gen 3 x Gen 2) to 5918 (CSR46 x CSR47) reared at 25±5◦C and 79±2 % . Among the six hybrids highest evaluation index value was observed in the hybrid CSR46 x CSR47 (E IV 63.08016) followed by SLD4 x SLD8 (EIV 55.74526) and CSR2 x CSR4 (EIV 53. 96786)

The trait Effective rate of rearing by number among the six different bivoltine x bivoltine hybrids differed statistically during pooled autumn season ($F_{5,24=3235.636,p=0.000< 0.01}$). The difference between the mean yield of SLD4 X SLD8 & Gen3 x Gen2 ; SLD4 X SLD8 & APS105 x APS126 ; SLD4 X SLD8 & CSR46 x CSR47 and Gen3 x Gen2 & CSR2 x CSR4 ; Gen3 x Gen2 & APS105 x APS126 ; Gen3 x Gen2 & APS45 x APS12 ; Gen3 x Gen2 & CSR46 x CSR47 and CSR2 x CSR4 & APS105 x APS126 ; CSR2 x CSR4 & CSR46 x CSR47 ; APS45 x APS12 & CSR46 x CSR47 are significantly different at 0.01 level.

The **effective rate of rearing** is an important trait which is related to cocoon yield. **Here the present investigation** revealed that the trait showed seasonal variations **in pooled spring and pooled autumn season** because of the fact that the hybrid APS105 x APS 126(E IV 60. 50109) showed **better performance in pooled spring and** CSR46 x CSR47 (E IV 63.08016) **showed better performance in pooled autumn** corroborates with the view of Hajare *et al.*, (2007), Virk *et al.*, (2009) that seasonal studies made in both mulberry and non- mulberry silkworm revealed a different expression of different breeds to varied climatic conditions during different season.

3. Effective rate of rearing by weight:

The effective rate of rearing **by weight** is an important quantitative characteristic which is also related to cocoon yield.

In this present investigation the three groups of hybrids (two groups consisting six bivoltine x bivoltine hybrids and one group of hybrids consisting of four multivoltine x bivoltine hybrids in two pooled seasons) showed as follows:

In **Bivoltine x Bivoltine mulberry silkworm hybrids during pooled Spring seasons (commercial seasons)** the cocoon yield by weight ranged from 4.00 kg (APS45 x APS126)to 8.62 kg (SLD4 x SLD8)at 25±5◦C and 79±2% . Significant difference in cocoon yield among the six Bi x Bi hybrids was noticed in SLD4 x SLD8 (EIV 62.03947) followed by CSR2 x CSR4 (EIV 58.45395) and CSR46 x CSR47 (EIV 49.93421) .

The characteristic Effective rate of rearing by weight among the six different bivoltine x bivoltine hybrids is highly significant at 0.01 level during **pooled spring** ($F_{5,24=25.600,\ P=0.000<0.01)}$ (Table 3.2.4) with respect to hybrids DUN17 x DUN18 & CSR2 x CSR4 ; SLD4 X SLD8 & APS105 x APS126 ; SLD4 X SLD8 & APS45 x APS12; DUN17 x DUN18 & APS45 x APS12 ; CSR2 x CSR4 & APS105 x APS126; APS45 x APS12 & CSR46 x CSR47; APS105 x APS126 & APS45 x APS12.

Again, the nature of significant difference between SLD4 X SLD8 & DUN17 x DUN18 ;SLD4 x SLD8 & CSR46 x CSR47 and CSR2 x CSR4 & CSR46 x CSR47 is at 0.05 level.

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

The trait Effective rate of rearing by weight(ERR by wt.) among the four different multivoltine x bivoltine hybrids is highly significant at 0.01 level during pooled spring ($F_{3,16=17.342,\ P=0.000<0.01}$) (Table 4.2.1).

The difference between the mean yield of MC1 x BC4 & MC4 x BC4 ; MC4 x BC4 &N x NB4D2 and MC1 x BC4 & PM x CSR2 are significantly different at 0.01 level

Among the **six Bi x Bi hybrids, during pooled autumn seasons (commercial seasons** ranged from 4.815 kg (Gen 3 x Gen 2)to 8.765 kg (CSR46 x CSR47)at 25±5◦C and 79±2% . Significant difference in cocoon yield among the six Bi x Bi hybrids was noticed in CSR46 x CSR47 (EIV 55.88344) followed by CSR2 x CSR4 (EIV 50.67123) and SLD4 x SLD8 (EIV 46. 41841) .

The trait Effective **rate of rearing by weight** among the six different bivoltine x bivoltine hybrids differed statistically during **pooled autumn season** ($F_{5,24=76.814,p=0.000<\ 0.01}$) (Table 5.2.4).

The difference between the mean yield of SLD4 X SLD8 & Gen3 x Gen2 ;

SLD4 X SLD8 & APS105 x APS126 ; SLD4 X SLD8 & CSR46 x CSR47 ; Gen3 x Gen2 &

CSR2 x CSR4 ; Gen3 x Gen2 & APS45 x APS12 & Gen3 x Gen2 & CSR46 x CSR47 ; CSR2 x CSR4 & APS105 x APS126 ; APS105 x APS126 & APS45 x APS12 ; APS105 x APS126 & CSR46 x CSR47 are significantly different at 0.01 level.

The cocoon yield is related to the effective rate of rearing by weight.

The study revealed that the trait showed seasonal variations in pooled spring and pooled autumn season because **of the fact that** the hybrid SLD4 x SLD8 (EIV 62.03947) **showed better performance in pooled spring and** CSR46 x

CSR47 (EIV 55.88344) **showed better performance in pooled autumn.** Here in this our findings is almost similar with the findings of Quadir *et. al.*, (1997) who identified season specific silkworm hybrids for temperate climatic condition of Kashmir.

4. Fecundity:

The fecundity is an important quantitative characteristic which is also related to cocoon yield. The total number of eggs laid by a female moth is known as fecundity.

In this present investigation the three groups of hybrids (two groups consisting six bivoltine x bivoltine hybrids and one group of hybrids consisting of four multivoltine x bivoltine hybrids in two pooled seasons) showed as follows:

The analysed data revealed that fecundity of Bi x Bi hybrids reared at 25±5◦C and 79±2 % ranged from 432.5 (Dun17 x Dun 18) to 497.85 (CSR46 x CSR47).Among the six hybrids highest evaluation index value was observed in the hybrid CSR46 x CSR47 (EIV 60.90428) followed by CSR2 x CSR4 (EIV 60.00) and SLD4 x SLD8 (EIV 55.58888)

The characteristic fecundity among the six different bivoltine x bivoltine hybrids is highly significant at 0.01 level during **pooled spring** ($F_{5,24=10.373,\ P=0.000<0.01}$) (Table 3.2.1) with respect to DUN17 x DUN18 & CSR2 x CSR4; DUN17 x DUN18 & CSR2 x CSR4; DUN17 x DUN18 & APS105 x APS126; DUN17 x DUN18 & APS45 x APS12; DUN17 x DUN18 & CSR46 x CSR47

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

The trait fecundity among four different multivoltine x bivoltine hybrids are less ($F_{3,16=5.460,\ P=0.009<0.01\ and\ p=0.009.0.05}$) (Table 4.2.1).

Among the six Bi x Bi hybrids, during pooled autumn seasons (commercial seasons) reared at 25±5◦C and 79±2 % ranged from 414.4 (SLD4 x SLD8) to 461.15 (APS105 x APS 126).Among the six hybrids highest evaluation index value was observed in the hybrid APS105 x APS 126 (EIV 64.4527) followed by CSR2 x CSR4 (EIV 57.92343) and APS45 x APS126 (EIV 51.6498)

The trait fecundity among six different **Bi x Bi hybrids** differed statistically during **pooled autumn season** since $F_{3,24=5.259,p=0.002,0.01}$) (Table 5.2.1). The difference between the mean yield of SLD4 X SLD8 & CSR2 x CSR4 ; SLD4 X SLD8 & APS105 x APS126 are significant different at 0.05 level.

The fecundity is an important trait which is related to cocoon yield. **The study revealed that the trait showed seasonal variations in pooled spring and pooled autumn season** because of the fact that the hybrid CSR46 x CSR47 (EIV 60.90428) **showed better performance in pooled spring and** APS105 x APS 126 (EIV 64.4527) **showed better performance in pooled autumn** which is similar with the observation on fecundity of *Oligonychus pratensis,* Congdon *et al*., (1983)

5. Filament Length:

Filament length is an important character. Generally bivoltine breeds have greater length of filament length than the multivoltine breeds.The bivoltine hybrids measures 850 to 1000 meter.

In this present investigation the three groups of hybrids (two groups consisting six bivoltine x bivoltine hybrids and one group of hybrids consisting of four multivoltine x bivoltine hybrids in two pooled seasons) showed as follows:

In **Bivoltine x Bivoltine mulberry silkworm hybrids during pooled Spring seasons (commercial seasons)** the trait filament length ranged from 660 (APS45 x

APS126) to 816 m (CSR46 x CSR47) at 25±5◦C and 79±2% . Significant difference was observed among the six **Bi x Bi hybrids** in CSR46 x CSR47 (EIV 60.2653) followed by SLD4 x SLD8 (EIV 57.45165) and CSR2 x CSR4 (EIV 53.59422) .

The characteristic filament length among the six different bivoltine x bivoltine hybrids is highly significant at 0.01 level **during pooled spring** ($F_{5,24=12.037,\ P=0.000<0.01}$) (Table 3.2.9) with respect to hybrids SLD4 X SLD8 & APS105 x APS126; SLD4 X SLD8 & APS45 x APS12 ; DUN17 x DUN18 & APS45 x APS12; DUN17 x DUN18 & CSR46 x CSR47; CSR2 x CSR4 & CSR46 x CSR47; APS105 x APS126 & CSR46 x CSR47and APS45 x APS12 & CSR46 x CSR47.

Again, the nature of significant difference between CSR2 x CSR4 & APS45 x APS12 is at 0.01 level ($F_{5,24=12.037,\ P=0.000<0.05}$) (Table 3.2.9)

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

The trait filament length among the four different multivoltine x bivoltine hybrids is highly significant at 0.01 level during pooled spring ($F_{3,16=12.208,\ P=0.000<0.01}$) (Table 4.2.9).

The difference between the mean yield of MC1 x BC4 & N x NB4D2 ; MC1 x BC4 & PM x CSR2 and MC4 x BC4 & N x NB4D2; MC4 x BC4 & PM x CSR2 are significantly different at 0.01 level.

Among the **six Bi x Bi hybrids, during pooled autumn seasons (commercial seasons)** reared at 25±5◦C and 79±2 % ranged from 609.5 (APS45 x APS126) to 842 m (Gen 3 x Gen 2) at 25±5◦C and 79±2%. Significant difference was observed among the six Bi x Bi hybrids in Gen 3 x Gen 2 (EIV 69.51999) followed by SLD4 x SLD8 (EIV 55.67114) and CSR46 x CSR47 (EIV 52.22459) .

The trait average filament length among the six different bivoltine x bivoltine hybrids differed statistically during pooled autumn season ($F_{5,24=71.015,p=0.000<0.01}$) (Table 5.2.9).

The difference between the mean yield of SLD4 X SLD8 & Gen3 x Gen2; SLD4 X SLD8 & CSR2 x CSR4; SLD4 X SLD8 & APS105 x APS126 ; SLD4 X SLD8 & APS45 x APS12; SLD4 X SLD8 & CSR46 x CSR47 ; Gen3 x Gen2 & CSR2 x CSR4; Gen3 x Gen2 & APS105 x APS126 ; Gen3 x Gen2 & APS45 x APS12; Gen3 x Gen2 & CSR46 x CSR47;; APS105 x APS126 & CSR46 x CSR47 are significantly different at 0.01 level.

The filament length is an important trait of a good breed. . **The study revealed that the trait showed seasonal variations in pooled spring and pooled autumn season** because of the fact that the hybrid CSR46 x CSR47 (EIV 60.2653) **showed better performance in pooled spring and** Gen 3 x Gen 2 (EIV 69.51999) **showed better performance in pooled autumn** which is similar with the observation on filament length correspondent with the observation of Rao *et al.*,(1998) who revealed that the filament length is more in the hybrids.

6. Filament Size:

Filament Size or denier is the measure of the size of the cocoon filament. It can be defined as weight in grams of 9000 meter filament.

In this present investigation the three groups of hybrids (two groups consisting six bivoltine x bivoltine hybrids and one group of hybrids consisting of four multivoltine x bivoltine hybrids in two pooled seasons) showed as follows:

In Bivoltine x Bivoltine mulberry silkworm hybrids during pooled Spring seasons (commercial seasons) the trait filament size ranged from 2.53 (APS45 x APS12) to 3.11d (CSR2 x CSR4) at 25±5◦C and 79±2% . Significant difference was observed among the six Bi x Bi hybrids in by CSR46 x CSR47 (EIV 68 .18721) followed by CSR2 x CSR4 (EIV 64.61187) .

The characteristic filament size among the six different bivoltine x bivoltine hybrids is highly significant at 0.01 level during pooled spring ($F_{5,24=16.205,\ P=0.000<0.01)}$ (Table 3.2.10) with respect to hybrids SLD4 X SLD8 & CSR2 x CSR4 ; DUN17 x DUN18 & CSR2 x CSR4 ; CSR2 x CSR4 & APS45 x APS12 ; DUN17 x DUN18 & CSR46 x CSR47 ; APS45 x APS12 & CSR46 x CSR47&

Again, the nature of significant difference between CSR2 x CSR4 & APS105 x APS126 is at 0.05 level ($F_{5,24=16.205,\ P=0.000<0.05)}$ (Table 3.2.10)

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

The trait filament size among the four different multivoltine x bivoltine hybrids is highly significant at 0.01 level during pooled spring ($F_{3,16=26.036,\ P=0.000<0.01}$).

The difference between the mean yield of MC1 x BC4 & N x NB4D2 ; MC4 x BC4 & N x NB4D2 and N x NB4D2 & PM x CSR2 are significant at 0.01 level

Among the six Bi x Bi hybrids, during pooled autumn seasons (commercial seasons) reared at 25±5◦C and 79±2 % ranged from 2.27 (APS105 x APS126) to 2.75d (CSR2 x CSR4) at 25±5◦C and 79±2% . Significant difference was observed among the six Bi x Bi hybrids in CSR2 x CSR4 (EIV 61.97279) followed by Gen 3 x Gen 2 (54.14966) and SLD4 x SLD8(EIV 50.7483).

The trait average denier among the six different bivoltine x bivoltine hybrids differed statistically during pooled autumn season ($F_{5,24=6.248,p=0.000<0.01}$).

The difference between the mean yield of SLD4 X SLD8 & APS105 x APS126; Gen3 x Gen2 & APS105 x APS126 ; CSR2 x CSR4 & APS105 x APS126 ; APS105 x APS126 & CSR46 x CSR47 are significantly different at 0.01 level.

The filament size is an important trait of a good breed. . **The study revealed that the trait showed seasonal variations in pooled spring and pooled autumn season** because of the fact that the hybrid CSR46 x CSR47 (EIV 68.18721) **showed better performance in pooled spring and** CSR2 X CSR4 (EIV 61.97279) **showed better performance in pooled autumn which is** similar with the observation on filament size goes to the findings of Srivastava *et al.*, (1998) who revealed that the filament size of Daba ecoraces varies between 8.40 to 11.60d raised in four different seasons i.e. June and July, July and August, August and September., September and October respectively.

7. Filament weight:

In this present investigation the three groups of hybrids (two groups consisting six bivoltine x bivoltine hybrids and one group of hybrids consisting of four multivoltine x bivoltine hybrids in two pooled seasons) showed as follows:

In **Bivoltine x Bivoltine mulberry silkworm hybrids during pooled Spring seasons (commercial seasons)** the trait filament weight ranged from 20.255 (APS45 x APS12) to 26.925 cg (CSR2 x CSR4) at 25±5◦C and 79±2% . Significant

difference was observed among the six Bi x Bi hybrids in CSR2 x CSR4 (EIV 61.30515) followed by CSR46 x CSR47 (EIV 60.97426) and Dun17 x Dun 18 (EIV 54.05331) .

The characteristic filament weight among the six different bivoltine x bivoltine hybrids is highly significant at 0.01 level during pooled spring ($F_{5,24=86.461,}$ $P=0.000<0.01$) (Table 3.2.11) with respect to hybrids SLD4 X SLD8 & CSR2 x CSR4; SLD4 X SLD8 & APS105 x APS126 ; SLD4 X SLD8 & APS45 x APS12 ; SLD4 X SLD8 & CSR46 x CSR47; DUN17 x DUN18 & APS105 x APS126 ; DUN17 x DUN18 & APS45 x APS12 ; DUN17 x DUN18 &

CSR46 x CSR47 ; CSR2 x CSR4 & APS105 x APS126 ; CSR2 x CSR4 & APS45 x APS12;

APS105 x APS126 & CSR46 x CSR47 ; APS45 x APS12 & CSR46 x CSR47.

Again, the nature of significant difference between & DUN17 x DUN18 & CSR2 x CSR4 is at 0.05 level ($F_{5,24=86.461,}$ $P=0.000<0.05$) (Table 3.2.11)

The performances of **Multi x Bi hybrids** i.e MC1 x BC4 , MC4 x BC4 , N x NB4D2, PM x CSR2 during **pooled Spring season** at different temperature levels i.e., 24±3◦C and 25±5◦C with constant humidity of 79±2 % 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 (EIV 50.87873) , MC1 x BC4 (43.84886)and MC4 x BC4 (EIV 39.7188) .

The trait filament weight among the four different multivoltine x bivoltine hybrids is less significant at 0.05 level during pooled spring ($F_{3,16=4.809,}$ $P=0.014<0.05$) (Table 4.2.11).

So, the nature of significant difference between the said groups are also less significant.

Among the **six Bi x Bi hybrids, during pooled autumn seasons (commercial seasons)** reared at 25±5◦C and 79±2 % ranged from 17.925 (SLD4 x SLD8) to 23.83 cg (Gen 3 x Gen 2) at 25±5◦C and 79±2% . Significant difference was observed among the six Bi x Bi hybrids in Gen 3 x Gen 2 (EIV 70. 199) followed by APS105 x APS 126 (EIV 54.9005) and CSR46 x CSR47 (EIV 54.35323).

The filament weight which is a very important trait of a good breed **showed seasonal variations in pooled spring and pooled autumn season** because **of the fact that** the hybrid CSR2 x CSR47 (EIV 61.30515) **showed better performance in pooled spring and** Gen3 X Gen2(EIV70.199) **showed better performance in pooled autumn** which is similar with the findings of Srivastava *et al.*, (1998) who revealed that the filament weight of Daba ecoraces varies between 8.40 to 11.60d raised in four different seasons i.e. June and July, July and August, August and September. And September and October respectively.

8. Hatching percentage:

The hatching is defined as the number of eggs hatched out of total number of eggs laid by a female moth. It is one of the quantitative trait expressed in percentage.

In this present investigation the three groups of hybrids (two groups consisting six bivoltine x bivoltine hybrids and one group of hybrids consisting of four multivoltine x bivoltine hybrids in two pooled seasons) showed as follows:

In **Bivoltine x Bivoltine mulberry silkworm hybrids during pooled Spring seasons (commercial seasons)** the analysed data revealed that fecundity of Bi x Bi hybrids reared at 25±5◦C and 79±2% ranged from 51.4% (Dun17 x Dun 18) to 94.91 % (CSR2 x CSR4) . Hatching percentage was observed highest in CSR2 x CSR4 (EIV 58.71585) followed by CSR46 x CSR47 (EIV 58.04918)

The characteristic hatching percentage among the six different bivoltine x bivoltine hybrids is highly significant at 0.01 level during pooled spring ($F_{5,24=211.044,\ P=0.000<0.01}$) (Table 3.2.2) with respect to hybrids SLD4 X SLD8 & DUN17 x DUN18 ; SLD4 X SLD8 & APS105 x APS126 ; DUN17 x DUN18 & APS45 x APS12; DUN17 x DUN18 & CSR46 x CSR47 ; CSR2 x CSR4 & APS105 x APS126 ; APS105 x APS126 & APS45 x APS12 ; APS105 x APS126 & CSR46 x CSR47.

Again , the nature of significant difference between & DUN17 x DUN18 & CSR2 x CSR4 and CSR2 x CSR4 & APS45 x APS12 are at 0.05 level ($F_{5,24=211.044,\ P=0.000<0.05}$) (Table 3.2.2)

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

The trait hatching among four different multivoltine x bivoltine hybrids is highly significant at 0.01 level during pooled spring ($F_{3,16=32.231,\ P=0.000<0.01}$) (Table 4.2.2.)

So, the difference between the mean yield of MC1 x BC4 & N x N B4D2 is significant at 0.01 level and MC1 x BC4 & PM x CSR2 ; MC4 x BC4 & PM x CSR2 and N x NB4D2 & PM x CSR2 are significant at 0.01 level.

Among the six Bi x Bi hybrids, during pooled autumn seasons (commercial seasons) reared at 25±5◦C and 79±2 % ranged from 71.565 % (SLD4 x SLD8) to 87.5% (CSR2 xCSR4). Hatching percentage was observed highest in CSR2 x CSR4 (EIV 57.34686) followed by APS45 x APS12 (EIV 55.4797)

The trait hatching percentage among six different Bi x Bi hybrids differed statistically during pooled autumn season ($F_{5,24=33.208,p=0.000,0.01}$) (Table 5.2.2). The difference between the mean yield of SLD4 X SLD8 & CSR2 x CSR4 ; SLD4 X

SLD8 & APS105 x APS126 ; SLD4 X SLD8 & APS45 x APS12 ; SLD4 X SLD8 & CSR46 x CSR47 are significantly different at 0.01 level.

The hatching percentage is an important trait of a good breed. **Here in this study revealed that** the Bi x Bi hybrid CSR2 x CSR4**showed better performance both in pooled** autumn **and in pooled spring season respectively** with (EIV 57.34686) and (EIV 58.71585) respectively with a range of 51.5% (in pooled spring) to 57.34% (in pooled autumn). Raju *et al.*, (2003 recorded hatching percentage of three different hybrids viz. PM x C. Nichi, PM x 104, PM x C110 from 88.76 to 95.23 % in Karnataka condition under rainfed sericulture.

9. Neatness:

The neatness of the raw silk determines the quality of the finished woven silk. Silk threads have minimum neatness defects.

In this present investigation the three groups of hybrids (two groups consisting six bivoltine x bivoltine hybrids and one group of hybrids consisting of four multivoltine x bivoltine hybrids in two pooled seasons) showed as follows:

In **Bivoltine x Bivoltine mulberry silkworm hybrids during pooled Spring seasons (commercial seasons)** ranged from 91.5(SLD4 x SLD8, Dun17 x Dun 18) to 92.5 (, CSR2 x CSR4 , APS105 x APS 126 , APS45 x APS126 and CSR46 x CSR47) at 25±5◦C and 79±2% , respectively.

The characteristic neatness among the six different bivoltine x bivoltine hybrids shows ($F_{5,24=1.356,\ P=0.000>0.01}$) (Table 3.2.14) hence ,not significant.

The performances of **Multi x Bi hybrids** i.e MC1 x BC4 , MC4 x BC4 , N x NB4D2, PM x CSR2 during **pooled Spring season** at different temperature levels i.e., 24±3◦C and 25±5◦C with constant humidity of 79±2 % ranged from82 .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.

The trait neatness among four different multivoltine x bivoltine hybrids has no significant difference of the performance ($F_{3,16=13.356,\ P=0.480>0.01}$) and p = 0.480 >0.05 level in pooled spring rearing.

Among the six Bi x Bi hybrids, during pooled autumn seasons (commercial seasons) reared at 25±5◦C and 79±2 % ranged from 92.5 (Gen 3 x Gen 2) to 93.5 (CSR2 x CSR4) at 25±5◦C and 79±2% , respectively. The highest EI value observed in CSR2 x CSR4(EIV 65.6903)

There is no significant difference among six differrent bivoltine x bivoltine hybrids with respect to the characteristic neatness.

The neatness is an important trait of a good breed. Here, in this study revealed that the trait did not show much variation between the breeds. **During pooled autumn it ranged from 92.5 to 93.5 and during pooled spring it ranged from 91.5 to 92.5.** The result corroborates with the result obtained by N. Kumar *et al.,*(2006) who recorded that the percent improvement with respect to neatness for CSR46 over CSR18 was 2.6 % and it was slightly more (2.7%) for CSR47 over CSR49(2.7%) in tropical environment.

10. Yield:

It is a quantitative character of race or breeds or hybrids.It is a calculated value obtained from the weight of total cocoons produce from the rearing of 100 disease free layings.

In this present investigation the three groups of hybrids (two groups consisting six bivoltine x bivoltine hybrids and one group of hybrids consisting of four multivoltine x bivoltine hybrids in two pooled seasons) showed as follows:

In **Bivoltine x Bivoltine mulberry silkworm hybrids during pooled Spring seasons (commercial seasons)** Cocoon yield was calculated per 10,000 larvae brushed and expressed in terms of yield / 100 dfls (kg). The cocoon yield among the six Bi x Bi hybrids reared at 25±5◦C and 79±2% ranged from 16 (APS45 x APS12) to 34.48 kg. (SLD4 x SLD8) . Significant difference was observed among the six Bi x Bi hybrids in SLD4 x SLD8 (EIV 65.91)

The characteristic yield among the six different bivoltine x bivoltine hybrids is highly significant at 0.01 level during pooled spring ($F_{5,24=47.951,\ P=0.000<0.01}$) (Table 3.2.8) with respect to hybrids SLD4 X SLD8 & DUN17 x DUN18 ; SLD4 X SLD8 & APS105 x APS126 ; SLD4 X SLD8 & APS45 x APS12; SLD4 X SLD8 & CSR46 x CSR47; DUN17 x DUN18 & CSR2 x CSR4 ; DUN17 x DUN18 & APS45 x APS12; CSR2 x CSR4 & APS105 x APS126 ; CSR2 x CSR4 & APS45 x APS12 ; CSR2 x CSR4 & CSR46 x CSR47 ; APS105 x APS126 & APS45 x APS12; APS45 x APS12 & APS45 x APS12

The performances of **Multi x Bi hybrids** i.e MC1 x BC4 , MC4 x BC4 , N x NB4D2, PM x CSR2 during **pooled Spring season** at different temperature levels i.e., 24±3◦C and 25±5◦C with constant humidity of 79±2 % ranged from7.45 (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) .

The trait yield among four multivoltine x bivoltine hybrids is highly significant at 0.01 level during pooled spring season ($F_{3,16=16.736,\ P=0.000<0.01}$) (Table 4.2.8).

The difference between the mean yield of MC1 x BC4 & MC4 x BC4 ; MC1 x BC4 & N x NB4D2 and MC1 x BC4 & PM x CSR2 are significant difference at 0.01 level.

Among the **six Bi x Bi hybrids, during pooled autumn seasons (commercial seasons)** reared at 25±5◦C and 79±2 % ranged from 19.26 (Gen 3 x Gen 2) to 35.06 kg. (CSR46 x CSR47) . Significant difference was observed among the six Bi x Bi hybrids in CSR46 x CSR47(EIV 59.87009) followed by CSR2 x CSR4 (EIV 55. 42332) and SLD4 x SLD8 (EIV 51. 78747) .

The trait average yield/100 dfls among among the six differrent bivoltine x bivoltine hybrids differed statistically during pooled autumn season ($F_{5,24=73.851,p=0.000<0.01}$).

The difference between the mean yield of SLD4 X SLD8 & Gen3 x Gen2 ; SLD4 X SLD8 & APS105 x APS126 ; SLD4 X SLD8 & CSR46 x CSR47 ; Gen3 x Gen2 & CSR2 x CSR4 ; Gen3 x Gen2 & APS45 x APS12; Gen3 x Gen2 & CSR46 x CSR47; CSR2 x CSR4 & APS105 x APS126 ; CSR2 x CSR4 & CSR46 x CSR47 ; APS105 x APS126 & APS45 x APS12; APS105 x APS126 & CSR46 x CSR47; APS45 x APS12 & CSR46 x CSR47 are significantly different at 0.01 level.

Again, the nature of significant difference between CSR2 x CSR4 & APS45 x APS12 is at 0.05 level.

The yield /100 dfls which is an important economic trait of a good breed **showed seasonal variations in pooled spring and pooled autumn season** because of the fact that the Bi x Bi hybrid CSR46 x CSR47(EIV 59.87009) **showed better performance in pooled** autumn **and** SLD4 x SLD8 (EIV 65.91) **showed better performance in pooled spring .**Moreover, in pooled autumn season the yield /100 dfls ranges from19.26 to 35.06 kg..and in pooled spring season it ranges from16 kg. to 34.48kg.which goes to the observation of Kumar *et al.*,(2003) that in room temperature the silkworm can produce cocoons of 18kg.to21kg in bi x bivoltine breed.

11. Raw silk:

This value indicates the cost of cocoons in the overall cost structure of the reeled silk.The quantity of silk reeled from cocoon is called percentage of raw silk yield.This is greatly governed by cocoon quality.

In this present investigation the three groups of hybrids (two groups consisting six bivoltine x bivoltine hybrids and one group of hybrids consisting of four multivoltine x bivoltine hybrids in two pooled seasons) showed as follows:

In **Bivoltine x Bivoltine mulberry silkworm hybrids during pooled spring seasons (commercial seasons)** the raw silk percentage of the hybrids reared at 25±5◦C and 79±2% ranged from 29.715 (APS45 x APS12) to 35.88% (CSR46 x CSR47). Significant difference was observed among the six Bi x Bi hybrids in CSR2 x CSR4 (EIV 61.10879) followed by CSR46 x CSR47 (EIV 61.04603) .

The characteristic raw silk among the six different bivoltine x bivoltine hybrids is highly significant at 0.01 level during pooled spring ($F_{5,24=121.300,\ P=0.000<0.01}$) with respect to hybrids SLD4 X SLD8 & CSR2 x CSR4 ; SLD4 X SLD8 & APS105 x APS126; SLD4 X SLD8 & APS45 x APS12; SLD4 X SLD8 & CSR46 x CSR47 ; DUN17 x DUN18 & CSR2 x CSR4; DUN17 x DUN18 & APS105 x APS126 ; DUN17 x DUN18 & APS45 x APS12 ; DUN17 x DUN18 & CSR46 x CSR47 ; CSR2 x CSR4 & APS45 x APS12 ; APS105 x APS126 & APS45 x APS12

Again, the nature of significant difference between APS45 x APS12 & CSR46 x CSR47 is at 0.05 level ($F_{5,24=121.300,\ P=0.000<0.05}$) (Table 3.2.12)

The performances of **Multi x Bi hybrids** i.e MC1 x BC4 , MC4 x BC4 , N x NB4D2, PM x CSR2 during **pooled spring season** at different temperature levels i.e., 24±3◦C and 25±5◦C with constant humidity of 79±2 % ranged from20.005 (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) .

The trait raw silk among four different multivoltine x bivoltine hybrids is highly significant difference of the performance ($F_{3,16=27.032,\ P=0.000<0.01}$) (Table 4.2.12).

The difference between the mean yield of MC1 x BC4 & MC4 x BC4; MC1 x BC4 & N x N B4D2 ; MC4 x BC4 & N x NB4D2 and MC4 x BC4 & PM x CSR2 are significant at 0.01 level.

Among the **six Bi x Bi hybrids, during pooled autumn seasons (commercial seasons)** reared at 25±5◦C and 79±2 % ranged from 24.75 (APS105 x APS126) to 33.36% (APS45 x APS126). Significant difference was observed among the six Bi x Bi hybrids in APS45 x APS126 (EIV 66.38436) followed by CSR46 x CSR47 (EIV 56.20521) and SLD4 x SLD8(EIV 44.69055).

The trait average raw silk among the six differrent bivoltine x bivoltine hybrids differed statistically during pooled autumn season ($F_{5,24=16.204,p=0.000<\ 0.01}$) (Table 5.2.11).

The difference between the mean yield of SLD4 X SLD8 & Gen3 x Gen2 ; SLD4 X SLD8 &

APS105 x APS126 ; Gen3 x Gen2 & APS45 x APS12 ; APS105 x APS126 & APS45 x APS12 ; APS105 x APS126 & CSR46 x CSR47 are significantly different at 0.01 level.

Again, the nature of significant difference between SLD4 X SLD8 & APS45 x APS12; Gen3 x Gen2 & CSR46 x CSR47 and CSR2 x CSR4 & CSR46 x CSR47 are at 0.05 level.

The raw silk is an important trait of a good breed. **Here, in this study revealed that the trait showed seasonal variations in pooled spring and pooled autumn season** because **of the fact that** the Bi Bi hybrid APS45 x APS126 (EIV

66.38436) **showed better performance in pooled** autumn **and** CSR2x CSR4(EIV 61.10879) showed better performance in pooled spring which is to some extent similar with the observation made by N. Kumar *et al.,* (2006) who recorded that the percent improvement with respect to raw silk for CSR46 over CSR18 was 5.0 % and it was relatively less (4.5%) for CSR47 over CSR49 in tropical environment.

. 12. Average single shell weight :

Shell weight is an important characteristic, which is closely related to silk yield. higher the shell weight ,more will be the raw silk yield. Shell content depends on breed also. The shell weight was calculated by taking 25females (♀) and 25 males (♂) cocoon shells taken randomly from each replication.

In this present investigation the three groups of hybrids (two groups consisting six bivoltine x bivoltine hybrids and one group of hybrids consisting of four multivoltine x bivoltine hybrids in two pooled seasons) showed as follows:

In **Bivoltine x Bivoltine mulberry silkworm hybrids during pooled Spring seasons (commercial seasons)** the shell weight ranged from 0.2995 (APS105 x APS 126) to 0.3985 g (SLD4 x SLD8) at 25±5◦C and 79±2 % . at 25±5◦C and 79±2◦C . Significant difference in shell weight for all the hybrids was recorded in SLD4 x SLD8 (EIV 65.78791) followed by (CSR46 x CSR47) (EIV 51.07239) and APS45 x APS126 (EIV 51.37027) .

The characteristic average Single Shell weight among the six different bivoltine x bivoltine hybrids is highly significant at 0.01 level during pooled spring ($F_{5,24=9.947,\ P=0.000<0.01)}$ with respect to hybrids SLD4 X SLD8 & DUN17 x DUN18 ; SLD4 X SLD8 & APS105 x APS126 ; CSR2 x CSR4 & APS105 x APS126 ; APS105 x APS126 & APS45 x APS12 ; APS105 x APS126 & CSR46 x CSR47

Again , the nature of significant difference between SLD4 x SLD8 & APS45 x APS12 is at 0.05 level ($F_{5,24=9.947,\ P=0.000<0.05}$) (Table 3.2.6)

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

Among the **six Bi x Bi hybrids, during pooled autumn seasons (commercial seasons)** reared at 25±5◦C and 79±2 % ranged from 0.2595 (APS105 x APS 126) to 0.3225 g (CSR46 x CSR47) at 25±5◦C and 79±2 % . at 25±5◦C and 79±2◦C . Significant difference in shell weight for all the hybrids was recorded in CSR46 x CSR47 (EIV 61.86404) followed by (CSR2 x CSR4) (EIV 57.23684) and Gen 3 x Gen 2 (EIV 55.26316) .

The trait single shell weight among the six different bivoltine x bivoltine hybrids differed statistically during pooled autumn season ($F_{5,24=17.421,p=0.000<\ 0.01}$) (Table 5.2.6).

The difference between the mean yield of SLD4 X SLD8 & APS105 x APS126 ;

Gen3 x Gen2 & APS105 x APS126 ; Gen3 x Gen2 & APS45 x APS12 ; CSR2 x CSR4 &

APS105 x APS126 ; CSR2 x CSR4 & APS45 x APS12 ; APS105 x APS126 & CSR46 X CSR47 ; APS45 x APS12 & CSR46 x CSR47 are significantly different at 0.01 level.

The single shell wt.is an important trait of a good breed. **Here in this study revealed that the trait showed seasonal variations in pooled spring and pooled autumn season** because of the fact that the Bi Bi hybrid CSR46 x CSR47(EIV

61.86404) showed better performance in pooled autumn and SLD4 x SLD8(EIV 65.78791) showed better performance in **pooled spring** .Moreover, in pooled autumn season the single shell weight ranges from 0.259 g. to 0.322 g. and in **pooled** spring season it ranges from 0.299 to 0.398 g .which goes to the observation of Begum *et al.,*(2003) that in laboratory condition the polyvoltine x bivoltine hybrids showed 0.304 to 0.416 g. of single shell weight which is slightly higher than the value bi x bi hybrids.

13. Average single cocoon weight :

Cocoon weight includes the cocoon shell, pupa and pupal exuviae. Weight vary with race .It is an important racial character. Female cocoon are heavier than male. The cocoon weight was calculated by taking 25 females (♀) and 25 males (♂) cocoon taken randomly from each replication.

In this present investigation the three groups of hybrids (two groups consisting six bivoltine x bivoltine hybrids and one group of hybrids consisting of four multivoltine x bivoltine hybrids in two pooled seasons) showed as follows:

In **Bivoltine x Bivoltine mulberry silkworm hybrids during pooled Spring seasons (commercial seasons)** cocoon weight among hybrids reared at 25±5◦C and 79±2% ranged from 1.52 (Dun17 x Dun 18) to 1.729 g (SLD4 x SLD8). Significant difference in single cocoon weight among the six Bi x Bi hybrids was noticed in SLD4 x SLD8 (EIV 67.28571) followed by (Dun17 x Dun 18) (EIV 62.57).

The characteristic average Single cocoon weight among the six different bivoltine x bivoltine hybrids is highly significant at 0.01 level during pooled spring ($F_{5,24=4.032,\ P=0.008<0.01}$) (Table 3.2.5)

Again , the nature of significant difference between SLD4 x SLD8 & APS105 x APS126 is at 0.05 level ($F_{5,24=4.302,\ P=0.008<0.05}$ (Table 3.2.5)

The performances of **Multi x Bi hybrids** i.e MC1 x BC4 , MC4 x BC4 , N x NB4D2, PM x CSR2 during **pooled spring season** at different temperature levels i.e., 24±3◦C and 25±5◦C with constant humidity of 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).

The trait single cocoon weight among four different multivoltine x bivoltine hybrids is highly significant at 0.01 level during pooled spring season ($F_{3,16=26.651,\ P=0.000<0.01}$). (Table 4.4.5)

The difference between the mean yield of MC1 x BC4 & PM x CSR2 ; MC4 x BC4 & PM x CSR2 ; N x NB4D2 & PM x CSR2 are significant at 0.01 level and MC1 x BC4 &N x N B4D2 are significant at 0.05 level

Among the **six Bi x Bi hybrids, during pooled autumn seasons (commercial seasons)** reared at 25±5◦C and 79±2 % ranged from 1.3735 (APS105 x APS 126) to 1.5535 g (Gen 3 x Gen 2) . Significant difference in single cocoon weight among the six Bi x Bi hybrids was noticed in Gen 3 x Gen 2 (EIV 61.18333) followed by (CSR2 x CSR4) (EIV 57.26667) and CSR46 x CSR47(EIV 52. 1667) .

The trait single cocoon weight among the six different bivoltine x bivoltine hybrids differed statistically during **pooled autumn season** ($F_{5,24=7.491,p=0.000<\ 0.01}$) (Table 5.2.5).

The difference between the mean yield of Gen3 x Gen2 & APS105 x APS126; Gen3 x Gen2 & APS45 x APS12 ; CSR2 x CSR4 & APS105 x APS126 ; CSR2 x CSR4 & APS45 x APS12 ; APS105 x APS126 & CSR46 x CSR47 and APS45 x APS12 & CSR46 x CSR47 are significantly different at 0.01 level.

The single cocoon wt.is an important trait of a good breed. **Here in this study revealed that the trait showed seasonal variations in pooled spring and pooled autumn season** because of the fact' that the Bi Bi hybrid Gen3x Gen2(EIV 61.18333) showed better performance **in pooled** autumn **and** SLD4 x SLD8(EIV 67.28571) **showed better performance in pooled spring. Moreover, in pooled autumn season the** single cocoon weight ranges from 1.484 gm. to 1.725 gm.and in pooled spring season it ranges from 1.52 to 1.729 gm.which goes to the observation of Chatterjee (1992) that in laboratory condition the silkworm can produce cocoons of 1.7 to 1.9 gm. of single cocoon weight.

14. Reelability:

The reelability of cocoon is closely related to cocoon yield. Reelability vary with the breed.

In this present investigation the three groups of hybrids (two groups consisting six bivoltine x bivoltine hybrids and one group of hybrids consisting of four multivoltine x bivoltine hybrids in two pooled seasons) showed as follows:

In **Bivoltine x Bivoltine mulberry silkworm hybrids during pooled Spring seasons (commercial seasons)** reelability of the hybrids reared at 25±5◦C and 79±2% ranged from 82.855 (APS45 x APS12) to 85.11% (Dun17 x Dun 18). Significant difference was observed among the six Bi x Bi hybrids in Dun17 x Dun 18 (EIV 66.79487) followed by SLD4 x SLD8 (EIV 58.782057) .

The characteristic reelability among the six different bivoltine x bivoltine hybrids are less significant during pooled spring ($F_{5,24=2.786,\ P=0.40<0.0}$) (Table 3.2.13)

The performances of **Multi x Bi hybrids** i.e MC1 x BC4 , MC4 x BC4, N x NB4D2, PM x CSR2 during **pooled Spring season** at different temperature levels

i.e., 24±3◦C and 25±5◦C with constant humidity of 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).

The trait reelability among four different multivoltine x bivoltine hybrids is highly significant between the mean yield of MC1 x BC4 & N x NB4D2 ; MC4 x BC4 & N x NB4D2 and N x NB4D2 & PM x CSR2 are significant at 0.01 level ($F_{3,16=67.216,\ P=0.000<0.01}$) (Table 4.2.13)

Again, the nature of significant difference between MC1 x BC4 & MC4 x BC4 is at 0.05 level.

Among the **six Bi x Bi hybrids, during pooled autumn seasons (commercial seasons)** reared at 25±5◦C and 79±2 % ranged from 76.60 (Gen 3 x Gen 2) to 85.10% (CSR46 x CSR47). Significant difference was observed among the six Bi x Bi hybrids in CSR46 x CSR47 (EIV 65.46763) followed by APS45 x APS126 (EIV 61.13309)and APS105 x APS126 (EIV 52.71583).

The trait average reelability among the six differrent bivoltine x bivoltine hybrids differed statistically during pooled autumn season ($F_{5,24=29.355,p=0.000<\ 0.01}$) (Table 5.2.12).

The difference between the mean yield of SLD4 X SLD8 & Gen3 x Gen2 ;

SLD4 X SLD8 & CSR2 x CSR4 ; Gen3 x Gen2 & APS105 x APS126 ; Gen3 x Gen2 & APS45 x APS12 ; Gen3 x Gen2 & CSR46 x CSR47 ; CSR2 x CSR4 & APS105 x APS126 ; CSR2 x CSR4 & APS45 x APS12; CSR2 x CSR4 & CSR46 x CSR47 are significantly different at 0.01 level.

Again, the nature of significant difference between APS105 x APS126 & CSR46 x CSR47 is at 0.05 level.

The reelability is an important quantitative trait of a good breed. . **Here in this study revealed that the trait showed seasonal variations in pooled spring and pooled autumn seasòn** because of the fact that the hybrid Dun17 x DUN 18 (EIV 66.79487) showed better performance in **pooled spring and** CSR46 X CSR47(EIV65.46763) showed better performance in **pooled autumn** which is similar with the observation of N. kumar *et al.*, (2006) who recorded that the percent improvement with respect to reelability for CSR46 over CSR18 was 3.5 % in tropical environment.

15. Silk ratio:

Cocoon shell ratio plays an important factor in silkworm rearing. The weight percentage of cocoon shell to the whole cocoon weight is called "cocoon shell ratio".. It vary with race and sex .Male cocoon is 2 to 3% higher in shell ratio over female cocoon shell.

In this present investigation the three groups of hybrids (two groups consisting six bivoltine x bivoltine hybrids and one group of hybrids consisting of four multivoltine x bivoltine hybrids in two pooled seasons) showed as follows:

In **Bivoltine x Bivoltine mulberry silkworm hybrids during pooled Spring seasons (commercial seasons)** the analyzed data revealed that shell ratio among the six Bi x Bi hybrids reared at 25±5◦C and 79±2 % ranged from 19.595 % (APS105 x APS 126) to 22.97 % (SLD4 x SLD8) . Significant difference was observed among the six Bi x Bi hybrids in APS45 x APS126 (EIV 70.581605)) followed by SLD4 x SLD8 (EIV 59.8512173) .

The characteristic Silk Ratio among the six different bivoltine x bivoltine hybrids are less significant during pooled spring ($F_{5,24=2.943}$, P=0.333<0.01) (Table 3.2.7)

The performances of **Multi x Bi hybrids** i.e MC1 x BC4 , MC4 x BC4 , N x NB4D2, PM x CSR2 during **pooled spring season** at different temperature levels i.e., 24±3◦C and 25±5◦C with constant humidity of 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)

The trait shell ratio among four different multivoltine x bivoltine hybrids is not significant. The tested hybrids are at par($F_{3,16=1.278,\ P=0.316<0.01}$) (Table 4.2.7)

Among the **six Bi x Bi hybrids, during pooled autumn seasons (commercial seasons)** reared at 25±5◦C and 79±2 % ranged from 18.785 % (APS105 x APS 126) to 21.675 % (CSR46 x CSR47) . Significant difference was observed among the six Bi x Bi hybrids in CSR46 x CSR47 (EIV 60.461143) followed by CSR46 x CSR47 (EIV 61.14432) and SLD4 x SLD8 (EIV 55.9350

The difference between the mean yield of SLD4 X SLD8 & APS105 x APS126 ;

SLD4 X SLD8 & CSR46 x CSR47 ; Gen3 x Gen2 & CSR46 x CSR47; CSR2 x CSR4 & APS105 x APS126 ; APS105 x APS126 & CSR46 x CSR47; APS45 x APS12; & CSR46 X CSR47 are significantly different at 0.01 level.

The shell ratio is an important economic trait of a good breed. **Here in this study revealed that the trait showed seasonal variations in pooled spring and pooled autumn season** because of the fact that the Bi Bi hybrid CSR46 x CSR47(EIV 60.461143) showed better performance **in pooled** autumn **and** APS45x APS126(EIV 70.581605) **showed better performance in pooled spring .**Moreover, in **pooled autumn season** the shell ratio ranges from 20.01 gm. to 22.49 gm.and in pooled spring season it ranges from 19.59 to 22.97 gm.which goes to the observation of Chatterjee (1992a, 1992b) that in laboratory condition the silkworm can produce cocoons of 19 to 20 gm. of shell ratio.

Correlation co-efficients of Bivoltine x Bivoltine hybrids during pooled spring season:

Correlation co-efficients of Bivoltine x Bivoltine hybrids during pooled spring season:

SlD4 x SLD8 (First hybrid):Based on the study of correlation co-efficient between various qualitative traits of **1st hybrid** (SlD4 x SLD8) under pooled spring season and on basis of the calculated values of | t | (two tailed test) under the null hypothesis **Ho : ρ=O,** i.e. the correlation coefficient is not significant, the following observations were made:

Correlation co-efficients between hatching & effective rate of rearing by weight (ERR by wt.) ; hatching & yield is significant at 0.05 level. (Table 3.2.16)

Again correlation co-efficient between effective rate of rearing by number (ERR by no.) & effective rate of rearing by weight (ERR by wt.); between effective rate of rearing by number & yield : between effective rate of rearing by weight (ERR by wt.) and yield is highly significant (both at 0.01 &0.05 level)

DUN17 x DUN18 (Second hybrid) (Table 3.2.17) **:** Based on the study of correlation co-efficient between various qualitative traits of **2nd hybrid** (DUN17 x DUN18) under pooled spring season and on basis of the calculated values of | t | (two tailed test) under the null hypothesis **Ho : ρ=O,** i.e. the correlation coefficient is not significant, the following observations were made:

Correlation co-efficients between effective rate of rearing by weight (ERR by wt.) & yield is **highly significant** and between single shell weight (single shell weight) & silk ratio (SR%) is **significant**.

CSR2 x CSR4(Third hybrid) (Table 3.2.18) **:** Based on the study of correlation co-efficient between various qualitative traits of **third hybrid** (CSR2 x CSR4) under pooled spring and on basis of the calculated values of | t | (two tailed test) under the null hypothesis **Ho : ρ=O,** i.e. the correlation coefficient is not significant, the following observations were made:

Correlation co-efficients between hatching & effective rate of rearing by number (ERR by no.) ; between hatching & effective rate of rearing by weight (ERR by Wt.) ; between hatching & yield ; between effective rate of rearing by weight (ERR by wt.) & yield is **highly significant** both in 0.01 level and 0.05 level.

APS105 x APS126(Fourth hybrid) (Table 3.2.19)**:** Based on the study of correlation co-efficient between various qualitative traits of **fourth hybrid** (APS105 x APS126) under pooled spring season and on basis of the calculated values of | t | (two tailed test) under the null hypothesis **Ho : ρ=O,** i.e. the correlation coefficient is not significant, the following observations were made:

Correlation co-efficients between fecundity & effective rate of rearing by weight (ERR by Wt.) is **significant** at 0.05 level. Again , effective rate of rearing by number (ERR by no.) & yield is highly significant both in 0.01 level and 0.05 level.

APS45 x APS12(Fifth hybrid) (Table 3.2.20) **:** Based on the study of correlation co-efficient between various qualitative traits of **fifth hybrid** (APS45 x APS12) under pooled spring season and on basis of the calculated values of | t | (two tailed test) under the null hypothesis **Ho : ρ=O,** i.e. the correlation coefficient is not significant, the following observations were made:

Correlation co-efficients between effective rate of rearing by number (ERR by no.) & effective rate of rearing by weight (ERR by wt.) ; effective rate of rearing by number (ERR by no.) & yield; effective rate of rearing by weight (ERR by wt.) & yield is **highly significant** both in 0.01 level and 0.05 level.

CSR46 x CSR47(sixth hybrid) (Table 3.2.21) **:** Based on the study of correlation co-efficient between various qualitative traits of **sixth hybrid (CSR46 x CSR47)** under pooled spring season and on basis of the calculated values of | t | (two tailed test) under the null hypothesis **Ho : ρ=O,** i.e. the correlation coefficient is not significant, the following observations were made:

Correlation co-efficients between hatching and single shell weight (single sheel weight) ;

between effective rate of rearing by weight (effective rate of rearing by weight) & silk ratio (SR%) ; between effective rate of rearing by weight (effective rate of rearing by weight) & yield are significant at 0.05 level and 0.01 level. Again, correlation co-efficients between fecundity and effective rate of rearing by number (effective rate of rearing by number) is significant at 0.05 level.

Correlation co-efficients of multivoltine x bivoltine hybrids during pooled spring season:

MC1 x BC4(1st muti x bi hybrid) (Table 4.2.16) **:** Based on the study of correlation co-efficient between various quantitative traits of **1st**multivoltine x bivoltine hybrid(MC1 x BC4) under pooled spring season and on basis of the calculated values of | t | (two tailed test) under the null hypothesis **Ho : ρ=O,** i.e. the correlation coefficient is not significant, the following observations were made:

Correlation co-efficients between hatching & effective rate of rearing by number (ERR by no.) ; between hatching & effective rate of rearing by weight (ERR by wt.) ; hatching & yield ; between effective rate of rearing by number & effective rate of rearing by weight(ERR by weight) ; between effective rate of rearing by weight (ERR by wt.) & yield ; between single cocoon weight & silk ratio (SR%) is significant at 0.05 level.

Again, effective rate of rearing by number & yield is highly significant (both at 0.05 and 0.01 level)

MC4 x BC4(2nd muti x bi hybrid) (Table 4.2.17) **:** Based on the study of correlation co-efficient between various qualitative traits of **2nd** multivoltine x bivoltine hybrid(MC4 x BC4) under pooled spring season and on basis of the calculated values of | t | (two tailed test) under the null hypothesis **Ho : ρ=O,** i.e. the correlation coefficient is not significant, the following observations were made:

Correlation co-efficients between effective rate of rearing by number (ERR by no.) & effective rate of rearing by weight (ERR by wt.) ;between effective rate of rearing by number(ERR by no.) & yield is significant at 0.05 level.

Again effective rate of rearing by weight(ERR by wt.) & yield is highly significant (0.01 level)

N x NB4D2(3rd muti x bi hybrid) (Table 4.2.18) **:** Based on the study of correlation co-efficient between various qualitative traits of **3rd** multivoltine x bivoltine hybrid(N x NB4D2) under pooled spring season and on basis of the calculated values of | t | (two tailed test) under the null hypothesis **Ho : ρ=O,** i.e. the correlation coefficient is not significant, the following observations were made:

Correlation co-efficient between effective rate of rearing by weight(ERR by wt.) &

single cocoon weight (sg.c.wt.) ; between single cocoon weight & yield is significant. Again,

effective rate of rearing by weight(ERR by wt.)and yield is highly significant.

PM x CSR2(4th muti x bi hybrid) (Table 4.2.19) **:** Based on the study of correlation co-efficient between various qualitative traits of 4th multivoltine x bivoltine hybrid **(PM x CSR2)** under pooled spring season and on basis of the calculated values of | t | (two tailed test) under the null hypothesis **Ho : ρ=O,** i.e. the correlation coefficient is not significant, the following observations were made:

Correlation co-efficient between effective rate of rearing by weight (ERR by wt.) & single cocoon weight and between single cocoon weight & yield is highly significant (both at 0.01 and 0.05).

Correlation co-efficients of btivoltine x bivoltine hybrids during pooled Autumn season:

SLD4 x SLD8 (1st bi x bi hybrid) (Table 5.2.15) **:** Based on the study of correlation co-efficient between various quantitative traits of **1st** bivoltine x bivoltine hybrid(SLD4 xSLD8) under pooled autumn season and on basis of the calculated values of | t | (two tailed test) under the null hypothesis **Ho : ρ=O,** i.e. the correlation coefficient is not significant, the following observations were made: Correlation co-efficients between fecundity & effective rate of rearing by number (ERR by no.) is significant ; between effective rate of rearing by weight(ERR by wt.) & single cocoon weight ; between effective rate of rearing by weight & yield; between shell ratio & yield is highly significant both at at 0.05 level and 0.01 level .

Gen3 x Gen2 (2nd bi x bi hybrid) (Table 5.2.16) **:** Based on the study of correlation co-efficient between various quantitative traits of **2nd** bivoltine x bivoltine hybrid (**Gen3 x Gen2**) under pooled autumn season and on basis of the calculated values of | t | (two tailed test) under the null hypothesis **Ho : ρ=O,** i.e. the correlation coefficient is not significant, the following observations were made:

Correlation co-efficients between effective rate of rearing by weight & yield is highly significant both at at 0.05 level and 0.01 level .

CSR2 x CSR4(3rd bi x bi hybrid) (Table 5.2.17) **:** Based on the study of correlation co-efficient between various quantitative traits of **3rd** bivoltine x bivoltine hybrid (**CSR2 x CSR4**) under pooled autumn season and on basis of the calculated values of | t | (two tailed test) under the null hypothesis **Ho : ρ=O,** i.e. the correlation coefficient is not significant, the following observations were made:

Correlation co-efficients between characteristics effective rate of rearing by weight & yield is highly significant both at at 0.05 level and 0.01 level .

APS105 x APS12(4th bi x bi hybrid) (Table 5.2.18) **:** Based on the study of correlation co-efficient between various quantitative traits of **4th** bivoltine x bivoltine hybrid (**APS105 x APS12**) under pooled autumn season and on basis of the calculated values of | t | (two tailed test) under the null hypothesis **Ho : ρ=O,** i.e. the correlation coefficient is not significant, the following observations were made:

Correlation co-efficient between characteristics effective rate of rearing by number & effective rate of rearing by weight is significant at 0.01 level. Between effective rate of rearing by number & yield; between effective rate of rearing by weight & yield is highly significant both at 0.05 level and 0.01 level .

APS45 x APS12(5th bi x bi hybrid) (Table 5.2.19) **:** Based on the study of correlation co-efficient between various quantitative traits of **5th** bivoltine x bivoltine hybrid (**APS45 x APS12**) under pooled autumn season and on basis of the calculated values of | t | (two tailed test) under the null hypothesis **Ho : ρ=O,** i.e. the correlation coefficient is not significant, the following observations were made:

Correlation co-efficient between fecundity & effective rate of rearing by number; between effective rate of rearing by weight & single cocoon weight is highly significant.

Again between effective rate of rearing by weight & single shell weight; between effective rate of rearing by weight & yield; between single cocoon weight & yield is highly significant both at 0.01 level and 0.05 level .

CSR46 x CSR47(6th bi x bi hybrid) (Table 5.2.20) **:** Based on the study of correlation co-efficient between various quantitative traits of **6th** bivoltine x bivoltine hybrid (**CSR46 x CSR47**) under pooled autumn season and on basis of the calculated values of | t | (two tailed test) under the null hypothesis **Ho : ρ=O,** i.e. the correlation coefficient is not significant, the following observations were made:

Correlation co-efficient between fecundity & shell ratio; between single shell weight & single shell ratio is highly significant at 0.01 level. between effective rate of rearing by weight & yield is highly significant both at 0.05 level and 0.01 level .