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Studies on incidence of major seasonal diseases in commercial improved silkworm crossbreeds MV1 x S8 and PM x FC2 (*Bombyx mori.* L*)* in Kolhapur, Maharashtra

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Abstract
In this study, the occurrence of significant seasonal diseases in newly developed silkworm crossbreeds MV1xS8 (Cavery gold) and PMxFC2 (Mysore gold) was documented at the Department of Zoology, Jaysingpur College, Jaysingpur, Kolhapur, Maharashtra, over the years 2021 and 2022, across three seasons (summer, rainy, winter). The larvae of these crossbreeds were assessed for illnesses such as Grasserie (BmNPV), Flacherie (BmIFV), (BmDNV), and Muscardine (Beauveria bassiana). Throughout the study, we recorded all three diseases. Over the course of two years, the average disease incidence was found to be higher in PM x FC2 (26.93%) compared to MV1 x S8 (16.86%). Flacherie and Grasserie showed higher incidence in PM x FC2 (11.61%, 7.63%), and this variation was seasonal. Muscardine incidence was greater in both crossbreeds during the winter season, at (7.95%, 7.66%). This study illustrates the incidence of diseases in both crossbreeds, which impacts the production of cocoons.

Keywords: MV1 x S8, PM x FC2, *BmNPV, BmIFV, BmDNV, Beauveria bassiana*, Productivity

Introduction

Silkworms are bred for the production of raw silk, a practice known as sericulture. China was the first to discover silk around 2700 BC. Silk is preferred over all other types of fibers due to its remarkable characteristics such as water permeability, thermal insulation, dyeing efficiency, and sheen. Referred to as the queen of textiles, silk is valued for its radiant luster, softness, elegance, durability, and strength. Historically, sericulture, particularly mulberry sericulture, has been mainly practiced in the southern states of India, including Karnataka, Tamil Nadu, and Andhra Pradesh, with some limited activity in West Bengal and Jammu and Kashmir. Currently, China and India are the two largest silk-producing nations globally, collectively accounting for over 65% of annual world production. India stands as the largest consumer of raw silk and silk products; sericulture is an agricultural activity that is highly labor-intensive and generates significant employment. India is the sole country producing all five commercially traded varieties of natural silk: Mulberry, Tropical Tasar, Oak Tasar, Eri, and Muga (Giridhar *et al*., 2010) [3]. Silk comprises fibroin (75%) protein secreted by two salivary glands in the larva's head, which forms a continuous filament fiber, along with gum sericin (25%) that binds the two filaments together. The Kolhapur district in Maharashtra combines coastal and inland climatic influences. Kolhapur generally receives about 95.23 millimeters (3.75 inches) of rainfall and experiences 136.09 rainy days (37.28% of the year) annually (Prakash *et al*., 2023) [5]. The temperature ranges from 10 to 35°C. While Kolhapur is cooler, it has a higher humidity level. Due to these climatic advantages, farmers in Kolhapur can cultivate sericulture crops throughout the year. The success of silkworm rearing relies heavily on quality feed (mulberry), quality breeds (eggs), and optimal hygienic conditions. Sericulture carries a significant risk of crop loss due to disease. In the Kolhapur district, Bivoltine double hybrid and bivoltine seed rearing are practiced. However, it has been noted that while the number of farmers is increasing, there is a simultaneous decline in the number of farmers each year. This trend is attributed to inadequate disease management throughout the seasons. To address this issue, two silkworm breeds were developed by CSR&TI, Mysore: MV1xS8 and PMxFC2 (*Bombyx mori.L*), which have shown favorable rearing outcomes in Karnataka and Andhra Pradesh based on disease performance. Considering these factors, a comparative study was conducted to examine the occurrence of major silkworm diseases such as Grasserie, Flacherie, and Muscardine in relation to different breeds and seasons.

Materials and Methods

A novel crossbreed MV1xS8 was created by CSR&TI, Mysore (Sivaprasad *et al*., 2016) [6].This breed was designed to yield high-quality and abundant raw silk. Another crossbreed, PMxFC2, was also developed by the same institute (Naseema Begum *et al*., 2008) [1]. It was intended to ensure continuous silkworm rearing batches year-round for farmers. Both breeds are classified as multi-bivoltine (cross breeds). The current study was conducted at the silkworm rearing facility within the Department of Zoology at Jaysingpur College, Jaysingpur, Maharashtra, during the years 2021 and 2022. The research was conducted consistently across three seasons: summer, rainy, and winter, applying the standard silkworm rearing Package as detailed by Datta *et al*. (1996) [2]. During the larval stage, the silkworms were provided with the V1 variety of mulberry leaves for feeding. Careful attention was given to disinfecting the rearing house and utilizing appropriate bed disinfectants, such as slaked lime and Vijetha (Pompi Konwar *et al*., 2023)[4]. At the fifth instar larval stage, external examinations were performed to detect worms infected with Grasserie, flacherie, and Muscardine.

External examination of diseases

1. **Grasserie Symptoms**

- Shining skin and fail to moult.
- Fragile integument.
- Swollen inter segmental region.
- Turbid white haemolymph.

- In final stage of infection, larvae hangs upside down from the rearing tray/stand/mountage.

2. Flacherie Symptoms

- The external symptoms of infectious flacherie and Densonucleosis are similar.
- The larvae are retarded; appear dull, soft and flaccid.
- Cephalothoracic region becomes translucent and the larvae vomits gut juice and develop dysentery.

3. Muscardine Symptoms

- Body loses elasticity and black spot may appear, body becomes rubbery type.
- Gradually larvae become harder and mummify.
- Conidification occurs which gives colour to mummified larva (White in case of white muscardine and green in case of Green).

Every season two batches of 20,000 larvae each was reared prevailing ambient temperature and relative humidity was studied and recorded. Percent of Disease Incidence (%) was calculated by the following method of (Zagar *et al.*, 2010) [7]as mentioned below -

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$$\text{Disease incidence percentage} = \frac{\text{Number of diseased larvae}}{\text{Total number of larvae reared.}} \times 100$$

Tables 1: Season wise percentage of Grasserie disease incidence

Year -2021						Year -2022					
season	month	Grasserie %		Mean %		season	month	Grasserie %		Mean %	
		MV1XS8	PMXFC2	MV1XS8	PMXFC2			MV1XS8	PMXFC2	MV1XS8	PMXFC2
Summer	April	6.30	21.10	7.25	24.85	Summer	April	7.20	18.50	6.95	17.65
	May	8.20	28.60				May	6.70	16.80		
Rainy	July	6.70	16.30	4.45	12.40	Rainy	July	3.80	7.10	4.35	8.00
	August	2.20	8.50				August	4.90	8.90		
Winter	December	1.70	1.20	4.90	3.15	Winter	December	2.60	3.90	2.75	3.65
	January	8.10	5.10				January	2.90	3.40		
			Mean %	5.53	13.46				Mean %	4.68	9.76

Tables 2: Season wise percentage of Flacherie disease incidence

Year -2021						Year -2022					
season	month	Flacherie %		Mean %		season	month	Flacherie %		Mean %	
		MV1XS8	PMXFC2	MV1XS8	PMXFC2			MV1XS8	PMXFC2	MV1XS8	PMXFC2
Summer	April	2.10	7.20	2.40	13.60	Summer	April	4.20	4.80	4.75	5.5
	May	2.70	6.40				May	5.30	6.20		
Rainy	July	3.60	4.20	3.75	5.00	Rainy	July	6.40	7.30	6.25	7.70
	August	3.90	5.80				August	6.10	8.10		
Winter	December	1.10	1.00	1.40	1.30	Winter	December	2.50	1.00	2.55	1.40
	January	1.80	1.60				January	3.60	1.80		
			Mean %	3.77	9.95				Mean %	4.41	4.86

Tables 3: Season wise percentage of Muscardine disease incidence

Year -2021						Year -2022					
season	month	Muscardine%		Mean %		season	month	Muscardine %		Mean %	
		MV1XS8	PMXFC2	MV1XS8	PMXFC2			MV1XS8	PMXFC2	MV1XS8	PMXFC2
Summer	April	0.00	1.20	1.10	1.15	Summer	April	1.10	0.00	1.25	1.80
	May	1.10	1.10				May	1.40	1.80		
Rainy	July	0.00	0.00	1.80	1.90	Rainy	July	1.60	0.00	1.65	1.90
	August	1.80	1.90				August	1.70	1.90		
Winter	December	18.30	18.60	17.50	18.70	Winter	December	22.00	22.80	22.70	22.25
	January	16.70	18.80				January	23.40	21.70		
			Mean %	6.80	7.25				Mean %	8.53	8.65

Tables 4: Two years overall percentage of disease incidence

Disease	Year	Incidence %		Mean %	
		MV1XS8	PMXFC2	MV1XS8	PMXFC2
Grasserie	2021	5.53	13.46	5.10	11.61
	2022	4.68	9.76		
Flacherie	2021	3.77	9.95	4.09	7.37
	2022	4.41	4.80		
Muscardine	2021	6.80	7.25	7.66	7.95
	2022	8.53	8.65		
Total	2021	16.10	30.66	16.86	26.93
	2022	17.62	23.21		

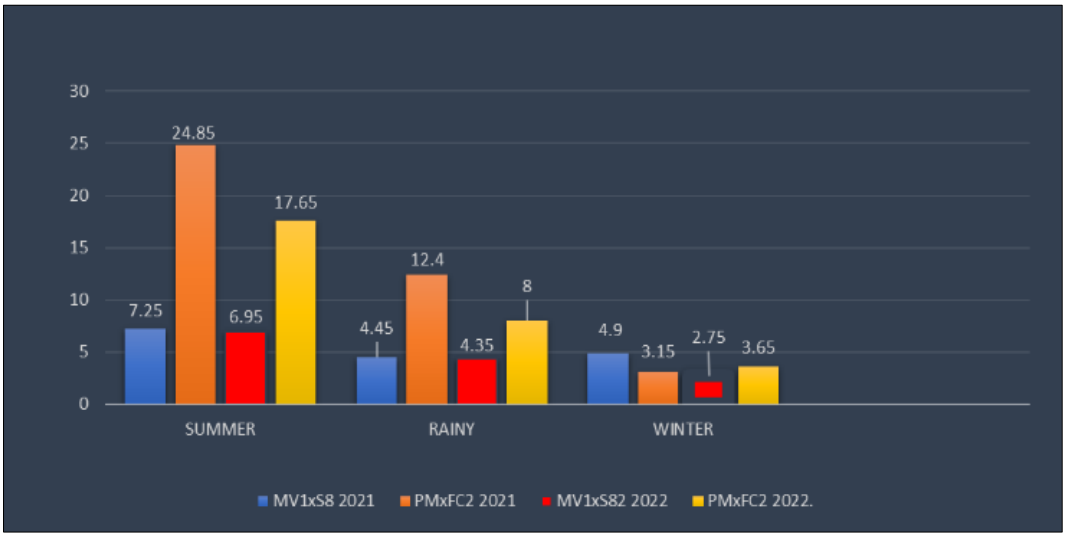

Fig 1: Season wise percentage of Grasserie disease incidence

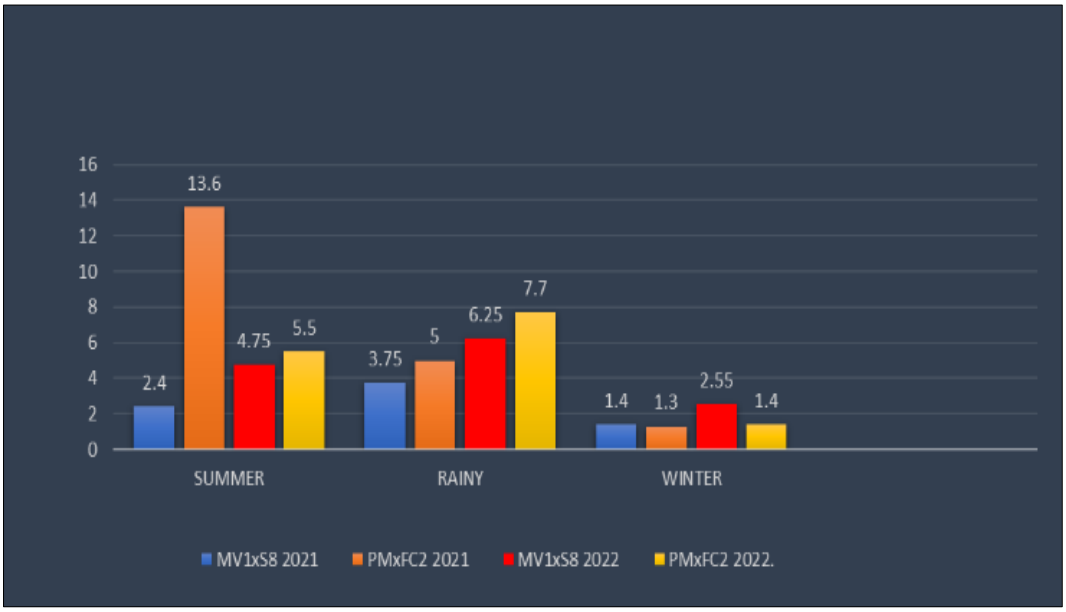

Fig 2: Season wise percentage of Flacherie disease incidence

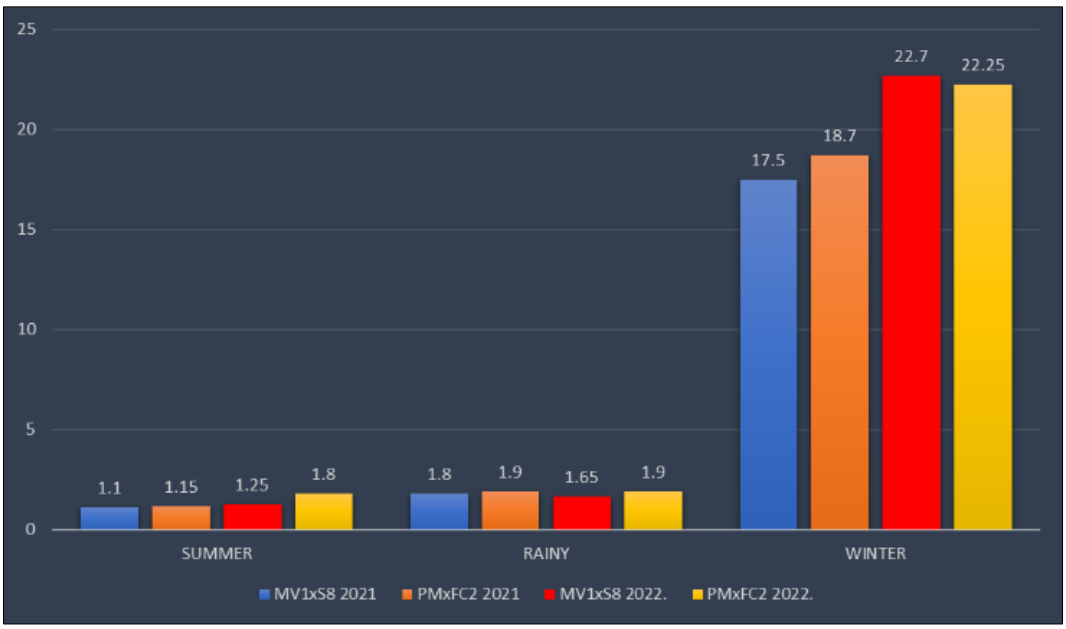

Fig 3: Season wise percentage of Muscardine disease incidence

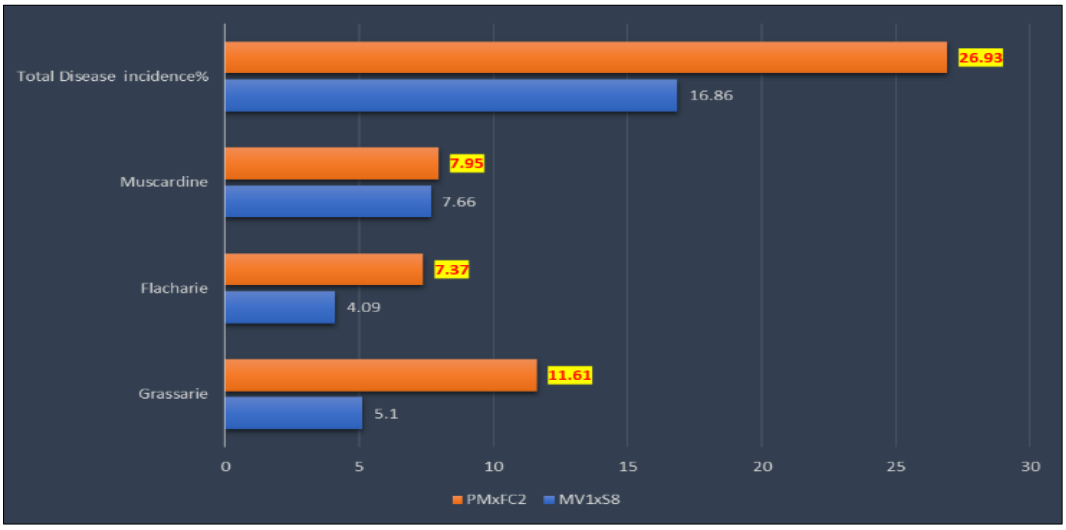

Fig 4: Two years overall percentage of disease incidence

Fig 5: Grasserie

Fig 6: Flacharie

Fig 7: Muscardine

Fig 8: Healthy larvae

Result and Discussion

1. Season wise percentage of Grasserie disease incidence

During year, 2021 Highest Grasserie disease percent was recorded in summer season (April & May) for PM X FC2 (24.85%) followed by (7.25%) in MV1 X S8. In 2022 same was recorded but percent of disease was lower than previous year in PM X FC2 i.e. (17.65%) followed by (6.95%) of MV1X S8. Minimum incidence was recorded in winter season during year, 2022 of (2.75%) in MV1X S8 followed by PM X FC2 (3.15%), in year, 2021.

2. Season wise percentage of Flacherie disease incidence

Highest Flacherie disease incidence percentage was recorded during year, 2021 (13.6 %) in rainy season (July and &August) for PM X FC2 followed by in year, 2022 (6.25%) in MV1 X S8. Minimum incidence was record during year, 2021 (1.3 &1.4 %) in winter.

3. Season wise percentage of Muscardine disease incidence

Muscardine disease was recorded nearly equal proportion in

both cross breeds in all seasons but showed highest peak in both cross breeds during winter season in (22.70%) in MV1 X S8 followed by (22.25%) in PM X FC2 in year, 2022

4. Season wise overall percentage of disease incidence

Highest overall disease incidence was recorded by PM X FC2 crossbreed during year 2021 and 2022 of (26.93%) followed by MV1 X S8 of (16.86%)

Conclusion

New improved cross breed MV1 X S8 showed more resistance to Grasserie and flacherie but muscardine disease was observed more in both crossbreeds. Overall incidence percentage of all three diseases was more in PM X FC2. Survival rate was more in MV1 X S8 from above result it is concluded that New improved cross breed MV1 X S8 showed satisfied disease resistivity as compared with PM x FC2 and good survival rate in all seasons during year, 2021 and 2022.

References

1. Begum NAR, Basavaraja HK, Joge PG, Palit AK. Evaluation and identification of promising bivoltine Breeds in the silkworm, *Bombyx mori L*. International Journal of Industrial Entomology,2008:16(1):15-20.
2. Datta RK, Basavaraja HK, Mano Y. In: *Manual on Bivoltine rearing, race maintenance and multiplication*, Central sericultural Research and Training Institute, Mysore, India, 1996, 1-25.
3. Giridhar K, Mahanya JC, Kantharaju BM, Nagesh S. Raw Silk production. Indian Silk,2010:8(1):27-29.
4. Pompi K, Monimala S, Surajit K, Hemanta S, Aparupa B. Disease incidence, larval parameters and mortality of mulberry silkworm, *Bombyx mori L*. effected by bed disinfectants. Environment Conservation Journal,2023:24(3):54-62.
5. Prakash S, Chougule1, Kishor V, Gaikwad2, Smt. Sharmili S, Patil3, *et al*. A Study Rainfall Pattern of Kolhapur District Based on Statistical Methods. International Journal of Research Publication and Reviews,2023:4(6):2186-2191
6. Sivaprasad V, Dayandada Mal, Reddy N, Balavenkatasubbaiah M, Kulkarni SB, Kariyappa. Development of a new Improved crossbreed "Cavery gold" (MV1XS8) for south Indian sericulture. Indian J. Seric,2016:55(1-2):1-7.
7. Zagar MA. Studies on pathogenicity of Nosema *bombycisNageli* to silkworm, Bombyx mori, L. And its management. Sher-e-Kashmir University of Agricultural Sciences and Technology, Shalimar, 2010.