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Screening of bamboo germplasms for resistance against bamboo leaf roller, *Pyrausta coclesalis* (Lepidoptera: Pyraustidae), in Central India

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Abstract

A field experiment was conducted during 2024-25 at the AICRP on Agroforestry Research Farm, Futala, College of Agriculture, Nagpur, to screen 11 bamboo germplasms for susceptibility to the bamboo leaf roller, *Pyrausta coclesalis* (Lepidoptera: Pyraustidae), a major defoliator in Central India. Consecutive 12 Weekly observations from June assessed healthy and damaged leaves to calculate percent leaf infestation under main field (7 species) and nursery (4 species) conditions.

In the main field, *Bambusa balcoa* (21.13%) and *Bambusa vulgaris* (19.46%) were most susceptible, followed by moderately susceptible *Dendrocalamus asper* (12.43%) and *Schizostachyum dulloo* (11.21%). *Oxytenanthera parvifolia* (7.31%), *Thyrsostachys oliveri* (9.17%), and *Bambusa pallida* (8.66%) exhibited the lowest infestation, indicating moderate resistance.

Under nursery conditions, *Bambusa strictus* (11.34%), *Bambusa nutans* (9.45%), and *Bambusa multiplex green* (8.23%) showed moderate susceptibility, while *Bambusa multiplex arfoscara* (7.25%) demonstrated strong resistance.

These resistant germplasms offer valuable options for integrated pest management, enhancing bamboo cultivation resilience in pest-prone regions. Prioritizing them in plantations can minimize defoliation losses and support sustainable agroforestry practices in Central India.

These findings highlight resistant germplasms like *Oxytenanthera parvifolia*, *Thyrsostachys oliveri*, and *Bambusa multiplex arfoscara* as promising candidates for pest-resilient bamboo plantations. Selecting these can enable integrated pest management, reducing defoliation losses and promoting sustainable agroforestry in Central India.

Keywords: Bamboo leaf roller, *Pyrausta coclesalis*, germplasm screening, susceptibility, pest resistance, *Bambusa balcoa*, agroforestry, Central India, leaf infestation, defoliator

Introduction

Bamboo, a versatile member of the Poaceae family, has been deeply embedded in the socio-economic and cultural traditions of South and Southeast Asia for millennia. It provides essential resources for housing, crafts, nutrition, and traditional remedies, supporting approximately one-third of the world's population (Dutta and Tomar, 1964; Liese, 1985; Tewari, 1992) [2, 5, 13].

Its rapid growth rate, robust regeneration, and adaptability to diverse environmental conditions have made bamboo a cornerstone of reforestation efforts, soil conservation programs, water retention initiatives, and sustainable alternatives to timber across multiple industries. Additionally, bamboo shoots serve as a valued food source in Asia, with certain species contributing to ethnomedicinal practices (Dutta and Tomar, 1964; Liese, 1985) [2, 5].

However, bamboo cultivation faces substantial threats from insect pests, with over 170 species documented in India and adjacent regions alone (Mathur and Singh, 1943; Roychoudhury and Joshi, 2005) [6, 10]. Defoliators pose the greatest risk, particularly leaf rollers that drastically impair photosynthesis, stunt culm development, and can kill juvenile plants during severe outbreaks (Mathur, 1943; Tewari, 1992; Pal et al., 1996) [6, 13, 7].

Among these, *Pyrausta bambucivora* Moore and *Crypsiptera coclesalis* Walker (syn. *Pyrausta coclesalis*; Lepidoptera: Pyralidae) emerge as the most devastating on the Indian subcontinent. These pests trigger widespread epidemics in nurseries and plantations, severely compromising bamboo productivity and necessitating urgent germplasm screening for resistance.

Despite documentation of over 170 bamboo pests, systematic germplasm screening for resistance remains limited, with varying susceptibility observed among species like *Bambusa vulgaris*, *Dendrocalamus strictus*, and *Bambusa balcoa* (Joshi *et al.*, 2008; Rao *et al.*, 2006)^[3, 8]. Given the escalating threat of bamboo leaf roller (*Pyrausta coclesalis*) infestations and the urgent need for sustainable pest management solutions, a field experiment was conducted during 2024-25 at the AICRP on Agroforestry Research Farm, Futala, College of Agriculture, Nagpur. This study systematically screened 11 diverse bamboo germplasms under main field and nursery conditions in Central India to evaluate their susceptibility levels and identify naturally resistant lines. These findings provide critical insights for developing resistance-based strategies to protect bamboo productivity in pest-prone agroforestry systems.

Materials and Methods

The field experiment was conducted during the *Kharif* season of 2024-25 at the AICRP on Agroforestry Research Farm, Futala, College of Agriculture, Nagpur, Maharashtra, to screen different bamboo germplasms against the bamboo leaf roller, *Pyrausta coclesalis* Walker (Lepidoptera: Pyralidae). The study was carried out in nursery and main field plantation. The study screened 11 bamboo germplasms against *Pyrausta coclesalis* during 2024-25 at AICRP on Agroforestry Research Farm, Futala, College of Agriculture, Nagpur. Main field trials assessed 7 species (*Bambusa balcoa*, *B. vulgaris*, *Dendrocalamus asper*, *Schizostachyum dullooa*, *Thyrsostachys oliveri*, *B. pallida*, *Oxytenanthera parvifolia*) on already established clumps planted on August 2023 (6 clumps/plot, 5 clumps sampled/plot, 1 culm/clump). Nursery trials evaluated 4 one-year-old species (*B. strictus*, *B. nutans*, *B. multiplex* Green, *B. multiplex arfoscara*) n 1 representative culm/plant. Weekly observations (12 total) began 19 July 2024, recording total fresh leaves and roller-damaged leaves per culm and Percent leaf infestation was calculated from collected data.

Results and Discussion

These results establish a clear susceptibility gradient: *B. balcoa* and *B. vulgaris* as highly vulnerable in field conditions, contrasted by resistant lines like *O. parvifolia*

and *T. oliveri*. Nursery patterns align, with *B. multiplex arundinacea* emerging as a tolerant early-stage candidate. Such variation corroborates earlier findings on species-specific resistance (Sharma *et al.*, 2018; Rao *et al.*, 2019; Das & Mukherjee, 2020; Kaur *et al.*, 2016)^[11, 9, 4], where *Bambusa* spp. consistently showed higher vulnerability than *Oxytenanthera* or *Multiplex* types. Prioritizing resistant germplasms (*O. parvifolia*, *T. oliveri*, *B. multiplex arfoscara*) in plantations reduces chemical dependency and supports integrated pest management (Singh & Singh, 2017)^[12]. This approach enhances bamboo resilience in Central India, mitigating defoliation losses while promoting sustainable agroforestry. Future breeding programs should target these tolerant lines for commercial propagation. Among the seven main field species, *Bambusa balcoa* showed the highest cumulative mean leaf infestation at 21.13%, confirming its status as the most susceptible, followed by *Bambusa vulgaris* (19.46%). These species exhibited consistently high damage across all 12 observation periods. *Dendrocalamus asper* (12.43%) and *Schizostachyum dullooa* (11.21%) demonstrated moderate susceptibility, while *Oxytenanthera parvifolia* (7.31%), *Thyrsostachys oliveri* (9.17%), and *Bambusa pallida* (8.66%) recorded significantly lower infestation, indicating moderate resistance and establishing a clear susceptibility gradient. In nursery conditions, *Bambusa strictus* was most susceptible (11.34%), followed by *Bambusa nutans* (9.45%) and *Bambusa multiplex green* (8.23%), all showing moderate, consistent damage. *Bambusa multiplex arfoscara* exhibited the lowest infestation at 7.25%, demonstrating strong tolerance under early growth stages. These findings align with prior research identifying *B. balcoa* and *B. vulgaris* as highly vulnerable under field conditions, while *O. parvifolia* and *T. oliveri* consistently show resistance (Sharma *et al.*, 2018; Rao *et al.*, 2019)^[11, 9]. Nursery patterns corroborate *B. strictus* susceptibility and *B. multiplex arundinacea* tolerance (Das & Mukherjee, 2020; Kaur *et al.*, 2016)^[1, 4]. Selecting resistant germplasms like *O. parvifolia*, *T. oliveri*, and *B. multiplex arundinacea* for plantations reduces chemical reliance and strengthens integrated pest management, promoting sustainable bamboo cultivation (Singh & Singh, 2017)^[12].

Table 1: Germplasm screening against leaf roller (Cumulative mean% leaf damage)

S. No	Metrological Week	29 19/07/24	30 26/07/24	31 02/08/24	32 09/08/24	33 16/08/24	34 23/08/24	35 30/08/24	36 06/09/24	37 13/09/24	38 20/09/24	39 27/09/24	40 04/10/24	Cumulative mean
Main Field Plants														
1	<i>Dendrocalamus asper</i>	10.96	11.34	11.6	11.88	12.18	12.46	12.78	13.15	12.96	12.83	12.71	13.04	12.43
2	<i>Thyrsostachys oliveri</i>	8.46	8.53	8.58	8.83	8.99	9.08	9.24	9.52	9.7	9.61	9.51	9.43	9.17
3	<i>Schizostachyum dullooa</i>	9.98	10.29	10.52	10.97	10.74	11.23	11.48	11.75	11.61	11.48	11.43	11.35	11.21
4	<i>Oxytenanthera parvifolia</i>	6.65	6.74	6.89	7.04	7.14	7.23	7.39	7.58	7.74	7.68	7.63	7.57	7.31
5	<i>Bambusa pallida</i>	7.67	7.8	7.97	8.24	8.45	8.67	8.83	9.08	9.24	9.15	9.07	8.99	8.66
6	<i>Bambusa vulgaris</i>	15.83	16.99	16.23	17.24	18.498	19.97	21.26	22.2	21.72	20.82	20.39	19.98	19.46
7	<i>Bambusa balcoa</i>	11.92	12.83	12.98	13.33	13.69	14.07	14.49	14.27	14.48	14.49	14.48	14.28	21.13
Nursery Plants														
1	<i>Bambusa nutans</i>	8.15	8.39	8.68	8.88	9.14	9.34	9.45	9.81	10.24	10.36	10.16	10.08	9.45
2	<i>Multiplexgreen bambusa</i>	7.31	7.56	7.22	7.53	7.55	7.96	7.97	9.01	9.33	9.33	8.97	8.64	8.23
3	<i>Multiplex arfoscara</i>	6.5	6.67	6.77	7.03	7.03	7.24	7.6	7.63	7.99	7.72	7.4	7.19	7.25
4	<i>Bambusa strictus</i>	10.9	11.11	11.95	11.77	10.3	10.27	10.75	11.18	11.92	11.4	12.55	11.84	11.34

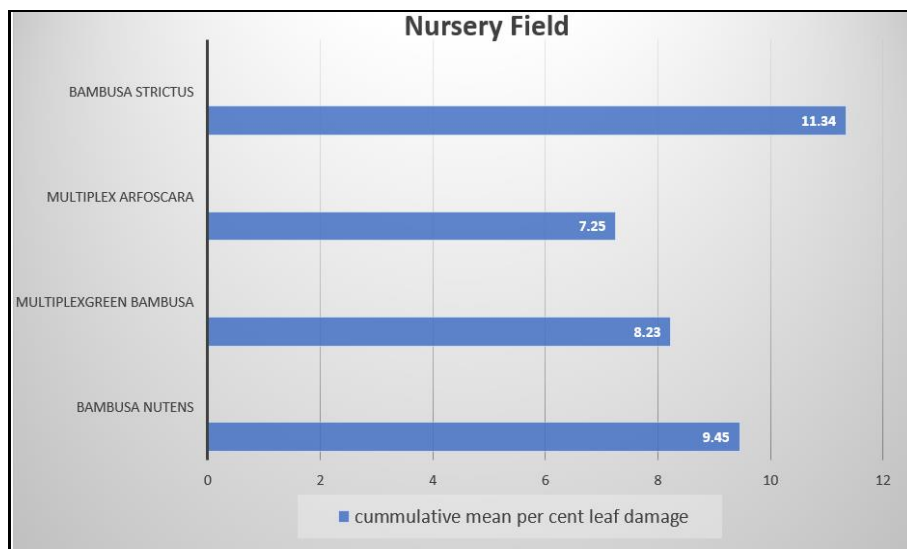


Fig 1: Effect on cumulative mean of Percent leaf damage by leaf roller in Nursery

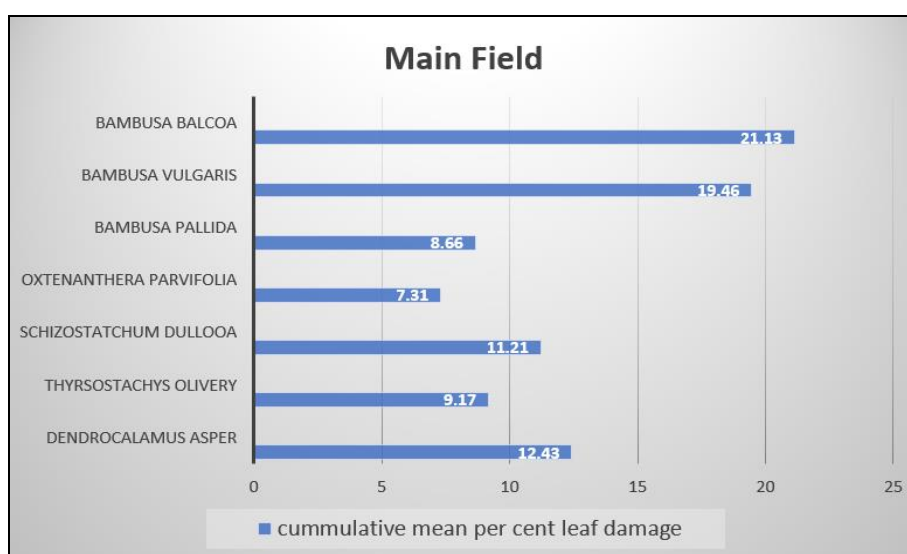


Fig 2: Effect on cumulative mean of Percent leaf damage by leaf roller in Main field

Conclusion

The field study conducted during 2024-25 at the AICRP on Agroforestry Research Farm, Futala, College of Agriculture, Nagpur, revealed marked variation in susceptibility of 11 bamboo germplasms to *Pyrausta coclesalis* under field and nursery conditions. In main field trials, *Bambusa balcoa* (21.13%) and *B. vulgaris* (19.46%) proved most susceptible, while *Oxytenanthera parvifolia* (7.31%), *Thyrsostachys oliveri* (9.17%), and *B. pallida* (8.66%) demonstrated moderate resistance. Under nursery conditions, *Bambusa strictus* (11.34%) showed highest vulnerability, whereas *B. multiplex arundinacea* (7.25%) exhibited strong tolerance. These results clearly indicate that resistant germplasms such as *O. parvifolia*, *T. oliveri*, and *B. multiplex arfoscara* can be confidently recommended for pest-resilient plantations and nursery stock in Central India. Although susceptible commercial species remain widely planted, prioritizing tolerant varieties alongside IPM practices will reduce defoliation losses and promote sustainable bamboo cultivation.

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