AGRI MAGAZINE
(International E-Magazine for Agricultural Articles)
Volume: 03, Issue: 04 (April, 2026)
Available online at http://www.agrimagazine.in
©Agri Magazine, ISSN: 3048-8656

Artificial Intelligence in Pest Management of Ber (*Ziziphus mauritiana*): Opportunities, Benefits and Future Risks

*Purushotam Sharma[1], Mukesh Chand Bhateswer[2], Madan Lal Choudhary[3], R P Ghasolia[4], Rajeev Kumar Narolia[3] and Ratan Lal Sharma[5]
[1]Assistant Professor, SKNCOA (SKNAU), Jobner, Rajasthan, India
[2]SRF, SKNCOA (SKNAU), Jobner, Rajasthan, India
[3]Associate Professor, SKNCOA (SKNAU), Jobner, Rajasthan, India
[4]Professor, SKNCOA (SKNAU), Jobner, Rajasthan, India
[5]Assistant Professor, Agricultural Research Station, Jalore, Rajasthan, India
*Corresponding Author's email: purushotamsharma420@gmail.com

Ber (*Ziziphus mauritiana*) is an important arid fruit crop facing significant yield losses due to insect pests such as fruit fly, stone weevil, and leaf miners. Conventional pest management approaches are often reactive and chemical-intensive. Artificial Intelligence (AI) offers a transformative approach through early detection, forecasting, and precision interventions. This paper explores AI applications in ber pest management, highlights benefits such as reduced pesticide use and improved decision-making, and discusses future risks including data limitations, accessibility issues, and ecological concerns. Ber is widely cultivated in arid and semi-arid regions of India, particularly Rajasthan, where pest incidence significantly affects productivity and fruit quality. Major pests include:

- Fruit fly (*Carpomyia vesuviana*)
- Stone weevil (*Aubeus himalayanus*)
- Leaf miner (*Stigmella ziziphi*)
- Bark eating caterpillar (*Indarbela quadrinotata*)

Traditional pest control relies on calendar-based pesticide application, often leading to resistance and environmental hazards. AI-based pest management integrates data analytics, imaging, and predictive tools to improve efficiency and sustainability.

Study Area

Typical ber-growing regions such as Jobner, Bawal, and other AICRP-AZF centers.

Data Inputs for AI Models

- Historical pest incidence (your 10-year dataset)
- Weather parameters (temperature, humidity, rainfall)
- Crop phenology stages
- Remote sensing/drone imagery

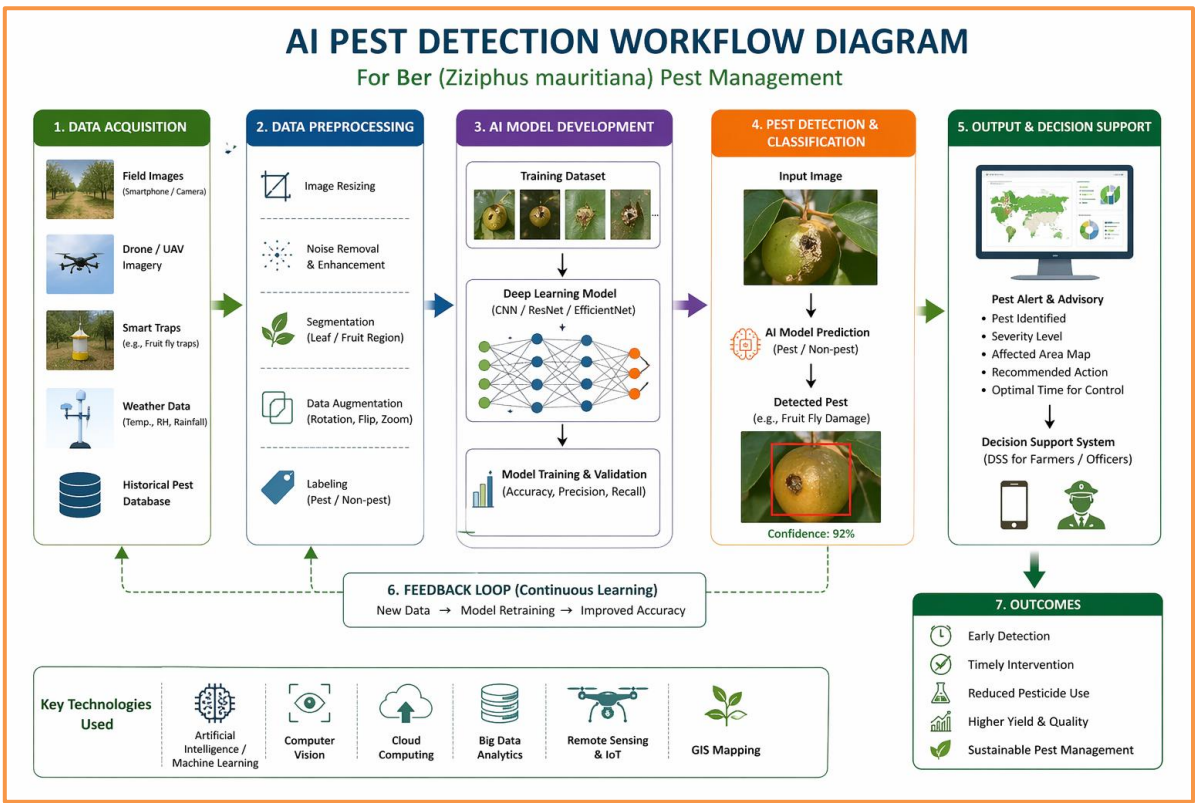
AI Techniques Used

- Machine Learning (Random Forest, SVM)
- Deep Learning (CNN for pest detection)
- Time-series forecasting models

Applications of AI in Ber Pest Management

Automated Pest Detection

AI-enabled image recognition systems can detect fruit fly oviposition marks and leaf miner damage using smartphone or drone images.

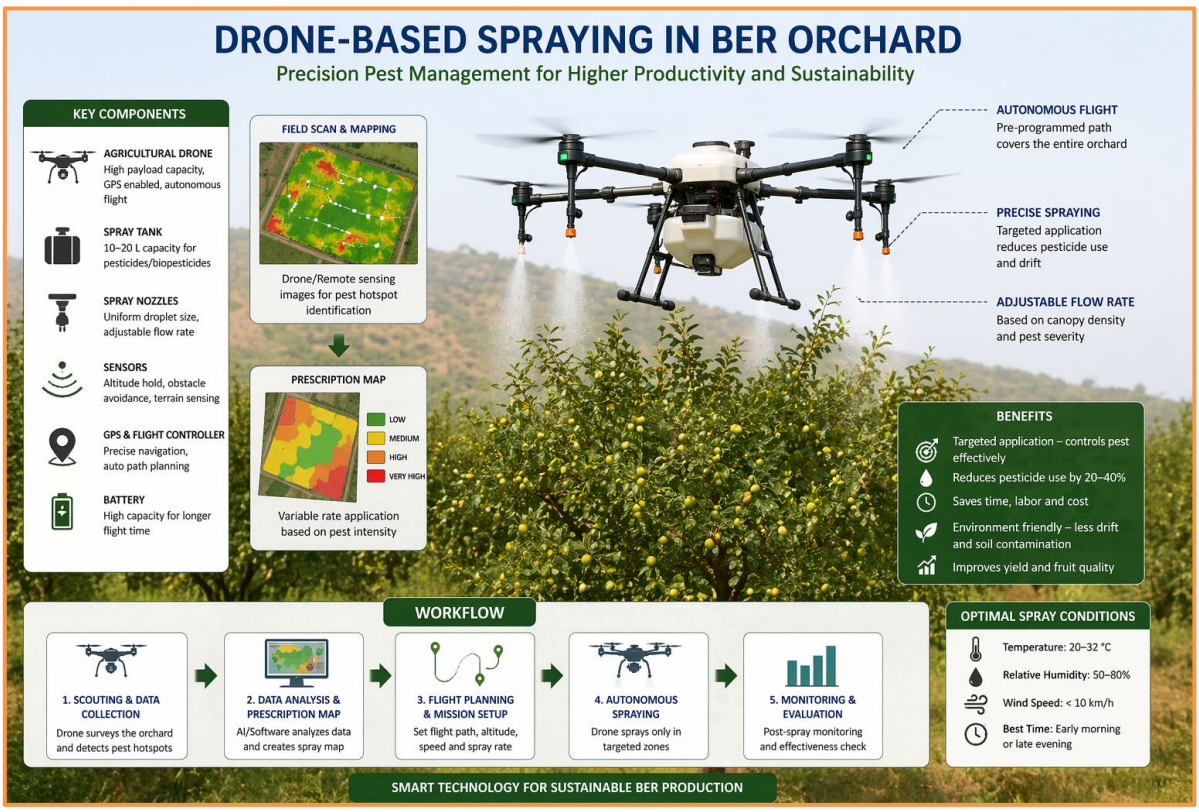


Pest Forecasting Models

AI models predict pest outbreaks based on weather and crop stage, helping in timely intervention.

Precision Spraying

Drone-based AI systems allow targeted pesticide application, reducing input cost and environmental contamination.



Decision Support Systems (DSS)

AI tools provide real-time recommendations for Integrated Pest Management (IPM).

Results and Discussion

Expected Outcomes (Based on Field Integration)

- Reduction in pesticide use by 20–40%
- Improved pest detection accuracy (>90%)
- Early warning of fruit fly outbreaks

Comparative Analysis

Parameter	Conventional Method	AI-Based Method
Pest detection	Manual, delayed	Real-time, automated
Pesticide use	High	Optimized
Cost efficiency	Moderate	High (long-term)
Environmental impact	High	Low

Benefits of AI in Ber Pest Management

- **Precision Agriculture**: Site-specific pest control
- **Sustainability**: Reduced chemical load
- **Early Warning**: Prevents severe infestations
- **Data-driven Decisions**: Improves IPM strategies

Future Risks and Challenges

Data Limitations

AI requires large datasets; variability in arid regions may affect model accuracy.

Accessibility Issues

Small farmers may not afford AI tools or lack technical skills.

Ecological Concerns

Over-optimization may ignore natural enemies and biodiversity.

Technological Dependence

Reduced reliance on indigenous knowledge systems.

Data Privacy

Farmer data ownership and misuse risks.

Future Research Directions

- Development of **region-specific AI models for Rajasthan**
- Integration with **Integrated Pest Management**
- Use of **IoT-based smart traps for fruit fly monitoring**
- AI-driven biological control strategies

Conclusion

AI has strong potential to revolutionize pest management in ber cultivation by improving precision, reducing pesticide use, and enhancing sustainability. However, its adoption must be balanced with ecological considerations, affordability, and farmer awareness. Integrating AI with traditional IPM practices will ensure long-term resilience in arid fruit production systems.