

Entomocomposting: An innovative strategy for sustainable organic waste management

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Background

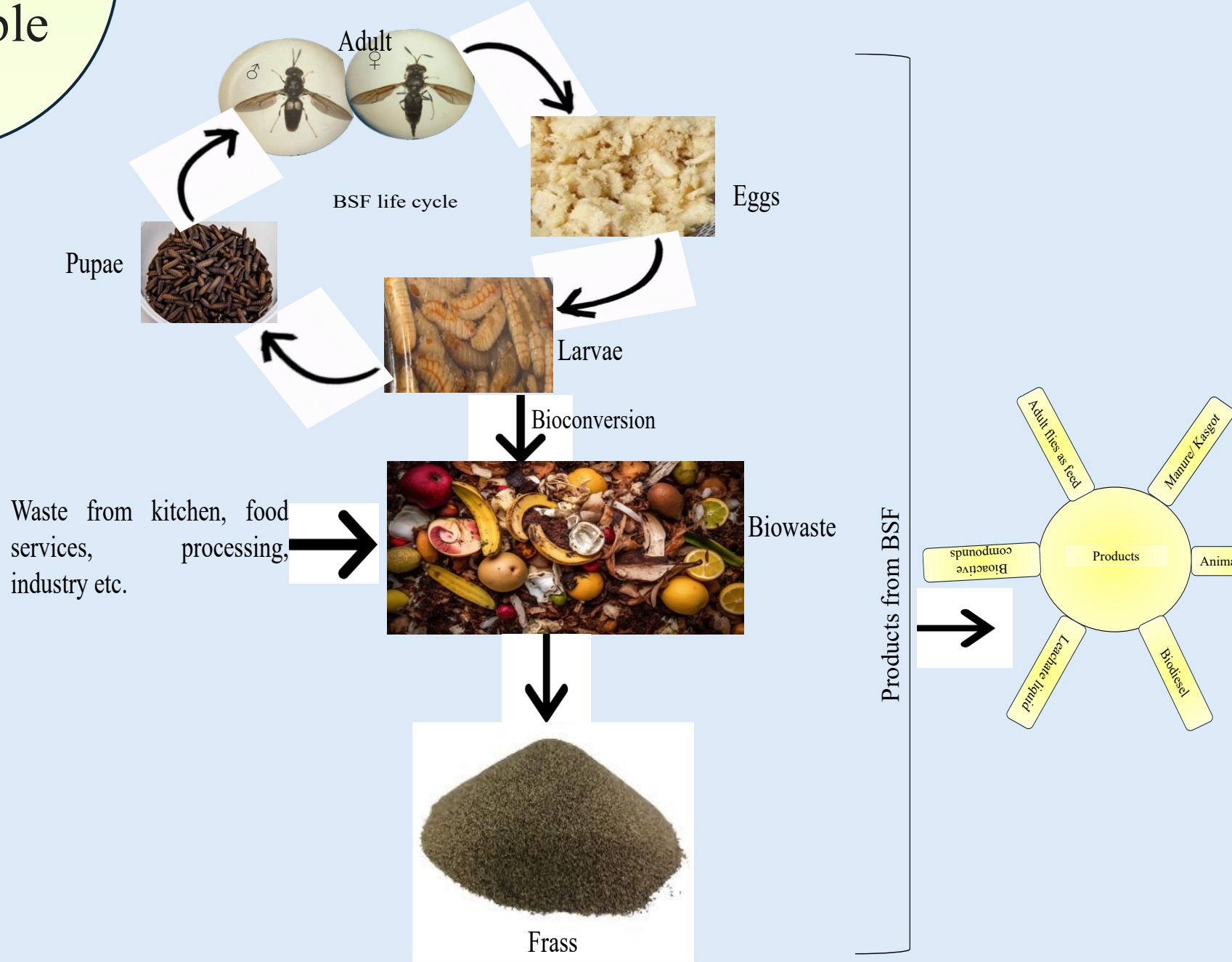
- Two billion tonnes of decomposable organic waste and over 30% of food waste is being produced or lost per year and only 16 % of these wastes is recycled,.
- With the increasing population, it is expected to increase by >3 folds
- Entomocomposting is a bioconversion process that utilizes insects, especially larvae, to decompose organic waste efficiently.
- Entomocomposting offers a sustainable alternative to traditional waste disposal

Process of bioconversion

- The process involves feeding organic waste to insect larvae, which consume the material and convert it into larval biomass and frass.
- In the case of the BSF, the lifecycle includes egg, larva, prepupa, pupa, and adult stages, completing in about 45 days.
- Frass, the insect excreta, serves as an excellent organic fertilizer rich in nutrients like nitrogen and phosphorus

Why Entomocomposting?

- Entomocomposting is an eco-friendly and cost-effective approach that requires minimal space and energy.
- Promotes circular economy principles by transforming waste into valuable resources.
- It rapidly breaks down organic waste while producing economically valuable by-products like protein-rich larvae and organic fertilizer.



Future Prospects

- It can be integrated with smart farming and decentralized waste systems in urban settings.
- Advances in insect breeding and genetic tools could improve waste degradation

Insects for Bioconversion

- Hermentia illucens* (Black soldier fly)
- Tenebrio molitor* (Mealworm)
- Acheta domesticus*(House cricket)
- Musca domestica*(Housefly)
- Drosophila suzukii* (cherry fruit fly)

Applications & Benefits

- Frass produced is used as an organic fertilizer.
- The harvested larvae can be used as food for feed
- This method supports efficient waste treatment, minimizes odour, reduces GHGs emissions and creates economic opportunities in waste valorization.
- This method also enables small-scale insect farming, creating livelihood opportunities for rural and urban households with minimal investment.

Challenges

- There are regulatory and legal concerns regarding the use of insects in feed
- Public acceptance remains a barrier, as insect-based products are not yet widely accepted culturally in many regions.
- Environmental factors like temperature, humidity can affect insect growth and waste conversion

Success stories

- ✓ Li et al., 2022, conducted a study on BSF larvae in greenhouse conditions showed that mixing 30% soybean curd residue with 70% kitchen waste improved larval growth, fat content, and waste conversion. The larvae had a high survival rate (98.75%) and good performance in terms of biomass, bioconversion, and feed efficiency.
- ✓ Bordien et al., 2022, reared mealworms larvae at 28°C, 55–60% humidity, and a 12-hour photoperiod in ventilated plastic containers. Larvae fed on wheat bran showed the highest growth and shortest development time (77.4 days), while those on rapeseed meal had the lowest feed conversion efficiency.

Conclusion

Entomocomposting is a promising solution for sustainable organic waste management using insects. It supports environmental conservation and scaling up this nature-based method can help us transition toward zero-waste and low-carbon futures

References

- Bordiean, A., Krzyzaniak, ' M., Stolarski, M.J., 2022. Bioconversion potential of agroindustrial byproducts by tenebrio molitor—long-term results. Insects 13, 810. <https://doi.org/10.3390/insects13090810>
- Li, X., Zhou, Z., Zhang, J., Zhou, S., Xiong, Q., 2022. Conversion of mixtures of soybean curd residue and kitchen waste by black soldier fly larvae (Hermetia illucens l.). Insects 13, 23. <https://doi.org/10.3390/insects13010023>