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Repurposing *Spodoptera littoralis*: from pest to sustainable resource cycling model

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INTRODUCTION & AIM

Spodoptera littoralis, a widespread agricultural pest, may be repositioned as a functional bioconverter within sustainable food systems. In this study, we explore its potential beyond pest status by integrating it into a circular bioeconomy model.

Our goal is to evaluate how this generalist lepidopteran can valorize underutilized biomass and contribute to protein and bioactive compound production. Two alternative diet routes were tested:

- **Locally available plants,** selected for their high nutrient content, abundance in the wild, and low ecological footprint.
- **Cosmetically imperfect** but edible **vegetables** regularly excluded from formal supply chains, discarded by markets and commonly treated as communal waste.

METHODS

Colony

A closed colony of *Spodoptera littoralis* was maintained in the laboratory on three diets:

- Artificlal medium
- Dandelion leaves
- Beetroot–potato mix

Rearing

Larvae were reared across five generations under a 16:8 LD photoperiod, at ambient temperatures between 21.0–22.5°C

Key life history traits recorded:

- development time
- survival
- pupation success
- pupation success
- adult emergence
- fecundity

Preparation

At the final larval stage, we lyophilized and milled the powder. The resulting material was vacuum-sealed and stored at –24°C for further analysis.

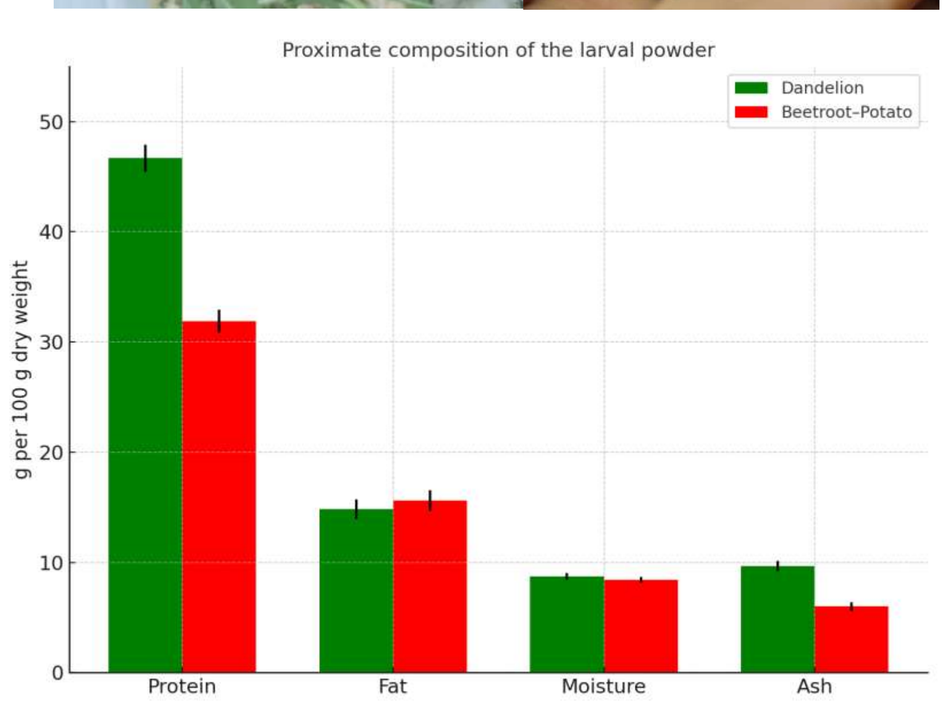
- Crude protein: Kieldahl method
- Moisture: AOAC 934.01
- Crude fat: Soxhlet method
- Ash: AOAC 942.05

All values expresed as g/100 g dry weight

RESULTS & DISCUSSION

This study demonstrates the preliminary nutritional adequacy of alternative local diets for *S. littoralis.* Life history monitoring across five generations revealed that larvae fed on dandelion leaves consistently developed faster, showed higher survival rates, and laid more eggs per cluster than those on the artificial diet.

The beetroot–potato mix supported stable development and showed no larval-pupal intermediates in several generations, indicating favorable physiological outcomes.



CONCLUSION

The observed values are consistent with known nutitional patterns in polyphagous noctuids:

- Dandelion-fed larvae showed higher protein and ash content,
- The beetroot–potato group had more fat

Both substrates yielded nutrient-rich biomass suitable for insect-based food and feed systems.

S. littoralis also exhibits potential for producing bioactive compounds relevant to health, biotechnology, and functional nutrition

While further research is needed, the prospects for high-performance bioconversion are clear