

Development of a Green Pesticide Ecosystem Using a Novel Potato Cyst Nematode Hatching Factor

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Background

Potato cyst nematodes cause serious yield losses in potato production worldwide. To ensure food security and promote sustainable agriculture, new pest control technologies with low environmental impact are urgently needed.

Previously Technology

Conventional nematicides have high environmental impact and require repeated application. Resistant cultivars face issues of yield, quality, and resistance breakdown. Trap crops require additional cropping periods, while known hatching factors are limited by low supply and high production costs.

Technical Significance

1. Points

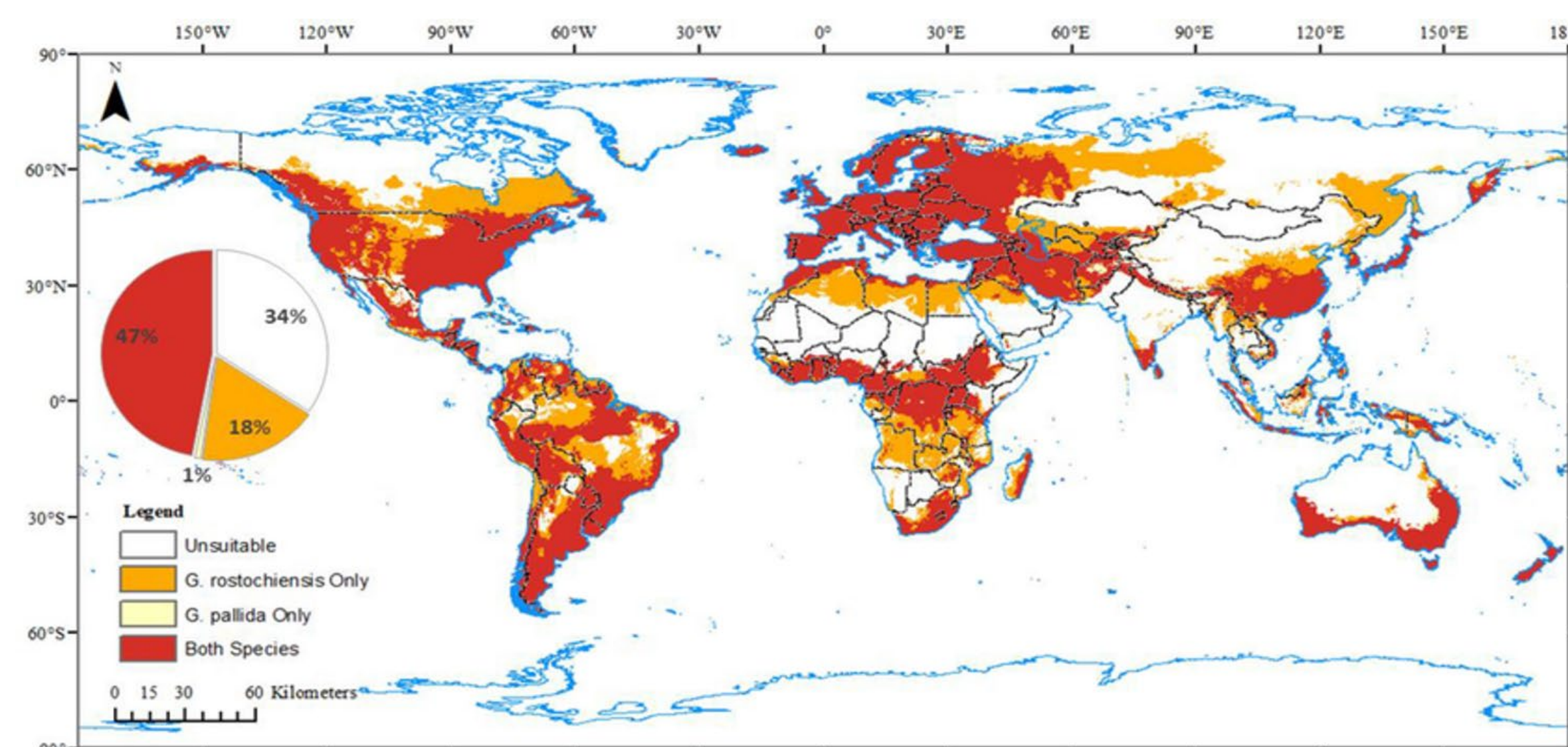


Fig.1 Potato cyst nematodes parasitize the roots of solanaceous crops such as potato and tomato. Infested fields can suffer yield losses of 30–80%. Globally, PCN causes major economic losses, estimated at several billion US dollars annually.

2. Results

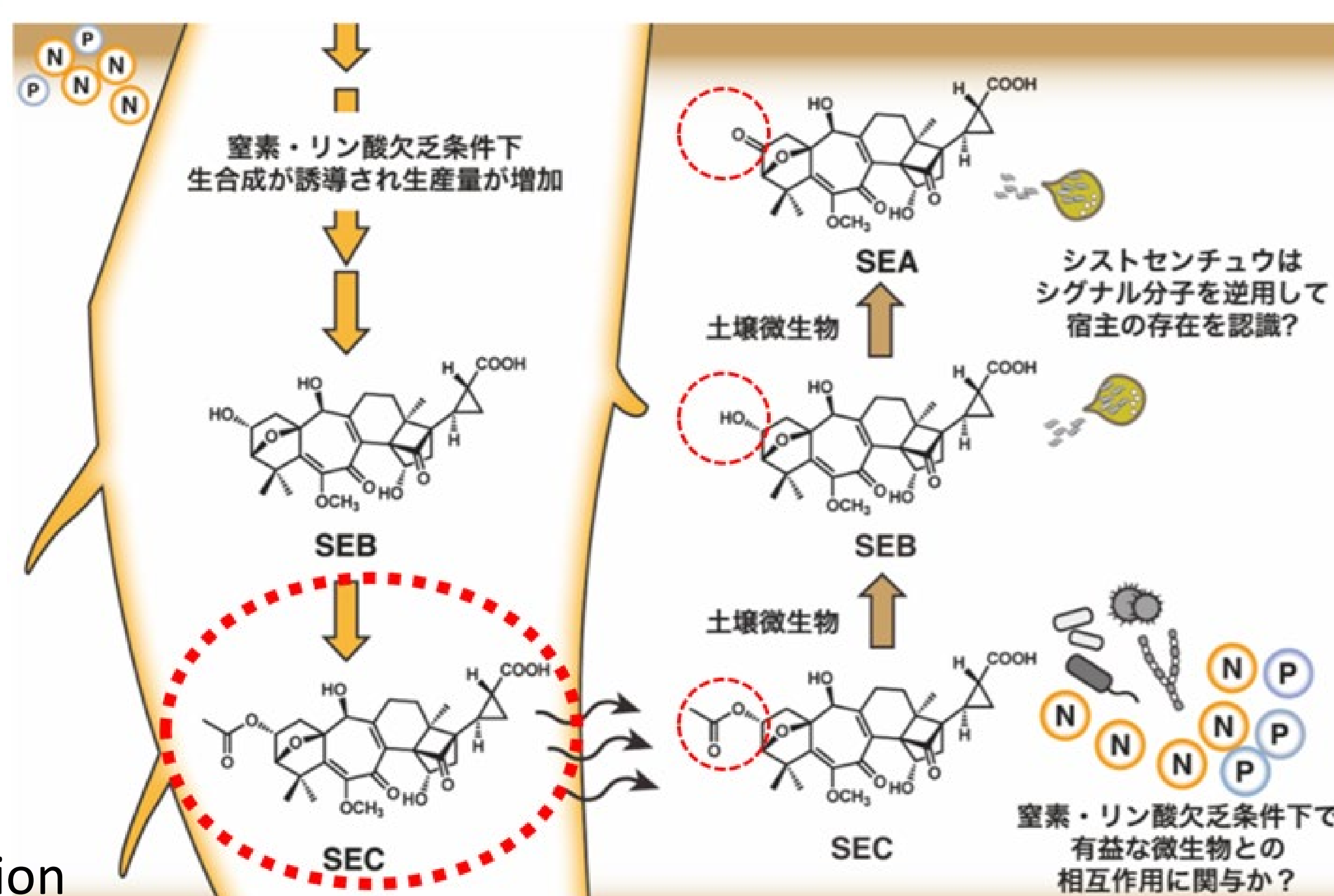


Fig.2 Kobe University discovered solanoeclepin C (SEC), a precursor of potato cyst nematode hatching factors, from hydroponic culture solution. Based on its potential as a green pesticide that induces nematode hatching, a patent application has been filed.

Significance

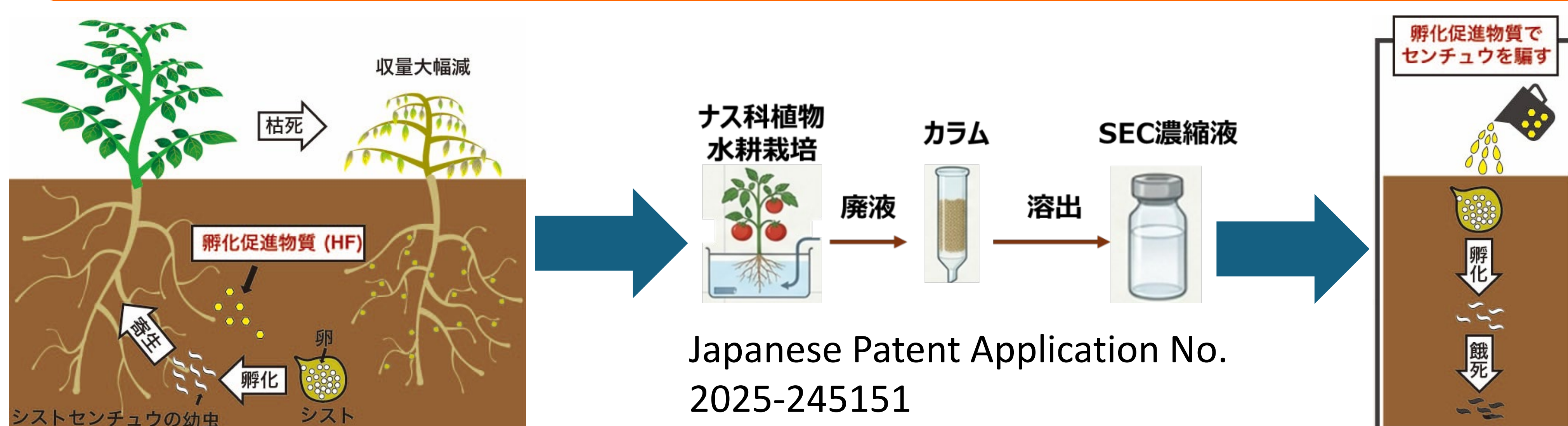


Fig3 Green Pesticide Ecosystem Using Solanoeclepin C

SEC is present at relatively high concentrations in hydroponic wastewater from solanaceous plants. By concentrating SEC using adsorbent resins and related technologies, we aim to develop a practical, environmentally friendly pesticide for field application.

Future Prospective

Possible Applications

- SEC concentrate can be applied before potato planting or during fallow periods to induce PCN egg hatching in the absence of host plants, reducing nematode density in soil.
- The use of hydroponic wastewater contributes to resource recycling.
- This technology may reduce chemical nematicide use, support organic farming, protect seed potato production areas, and strengthen sustainable agriculture.

Possible Collaboration

Kobe University is developing a green pesticide based on solanoeclepin C (SEC) from hydroponic wastewater. We welcome collaboration with companies interested in raw material supply, manufacturing, quality control, field validation, and commercialization.

Publications & IP

- Shimizu K et al. Solanoeclepin B, a hatching factor for potato cyst nematode. Science Advances. 2023;9(11).Akiyama R et al.
- Solanoeclepin C, a root-secreted molecule converted by rhizosphere microbes to hatching factors for potato cyst nematodes. New Phytologist. 2025;247(3):1370–1381.
- Japanese Patent Application No. 2025-245151,

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