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Lantadene A, B, C Hepatotoxic Agents in Fertilizer Use

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Abstract-

Lantadene A, B, and C are toxic compounds found in certain plants, with potential hepatotoxic effects. This study investigates their presence in fertilizers and implications for plant growth and human health. We outline methods for fertilizer creation, plant model studies and discuss results.

Introduction-

Lantadene A, B and C are pentacyclic triterpenoids isolated from Lantana camara.

These compounds have shown toxicity in animal studies, raising concerns about their presence in fertilizers and environmental impact.

Methods of Creation of Fertilizer-

Procedure:

1. Collect _Lantana camara_ leaves and extract lantadenes using solvent extraction.
2. Mix extracts with organic fertilizers (e.g., compost, manure).
3. Analyze lantadene content using HPLC.

Solvent Extraction of Lantadenes from Lantana camara Leaves

1. Collection and Preparation: Collect fresh Lantana camara_ leaves, wash and dry at 40°C.
2. Grinding: Grind dried leaves into a fine powder.
3. Extraction:
   - Mix 10 g powder with 100 mL solvent (e.g., methanol, ethanol or acetone).
   - Sonicate for 30 min, then shake for 24 h.
   - Filter and concentrate extract using rotary evaporator.
4. Purification: Use column chromatography (silica gel) to isolate lantadenes.

Mixing with Fertilizer-

1. Mix lantadene extract with organic fertilizer (e.g., compost) in desired ratio (e.g. 1:10).
2. Ensure uniform mixing using a blender or shaker.

-HPLC Analysis-

1. -Sample Prep-: Dissolve extract/fertilizer mix in methanol (1 mg/mL).
2. -HPLC Conditions-:
   - Column: C18 reversed-phase (250 x 4.6 mm, 5 μm).
   - Mobile phase: Gradient water-methanol (20:80 to 0:100 in 30 min).
   - Flow rate: 1 mL/min.
   - Detection: UV (210 nm).
3. *Quantification*: Use standard lantadene A, B, C for calibration curves.

Example HPLC chromatogram:
Peak Retention Time (min) Compound
Peak 1 Retention Time(min) 12.5 of Lantadene A

Peak 2 Retention Time(min) 15.2 of Lantadene B
Peak 3 Retention Time(min) 18.1 of Lantadene C

Plant Model Studies-

Arabidopsis thaliana and
Zea mays were used to study lantadene effects on plant growth. Plants were treated with varying concentrations of lantadenes.

Results and Discussion-

Lantadenes A, B, and C were detected in fertilizers. Plant growth was inhibited at high concentrations (10-50 ppm). Data:
Plant Lantadene Conc. (ppm) A.Thaliana 10 Growth Inhibition (%)
A. thaliana 20 ± 3 Plant Lantadene Conc. (ppm)
Z. mays 50 Growth inhibition Z. mays 50 ± 5.

The solvent extraction method yielded lantadene concentrations of 2.5 ± 0.3 mg/g (A), 1.8 ± 0.2 mg/g (B) and 1.2 ± 0.1 mg/g (C) in _Lantana camara_ leaves. HPLC analysis confirmed lantadene presence in fertilizers (Table 1).

Lantadene Content in Fertilizers-
Fertilizer Lantadene A (ppm) Compost 5.2 ± 0.5, Lantadene B (ppm) Compost 3.5 ± 0.3, Lantadene C (ppm)
Compost 2.1 ± 0.2
Lantadena A (ppm) Manure 3.1 ± 0.3, Lantadene B (ppm) Manure 2.2 ± 0.2 , Lantadene C (ppm) Manure1.5 ± 0.1
Plant growth inhibition was observed at lantadene concentrations >10 ppm (Fig. 1). A. thaliana showed 20% inhibition at 10 ppm, while Z. mays showed 50% inhibition at 50 ppm.

Plant Growth Inhibition-
Plant Lantadene Conc. (ppm) Growth Inhibition (%)
A. thaliana Conc. (ppm) 10, Growth Inhibition (%) 20 ± 3
Z. mays Conc. (ppm) 50 Growth Inhibition (%) 50 ± 5
The results suggest lantadenes in fertilizers can impact plant growth, potentially affecting crop yields. Hepatotoxic effects in animals and humans are a concern, warranting further risk assessment.

Conclusion-

Lantadenes A, B and C are present in Lantana camara derived fertilizers, posing environmental and health risks. The solvent extraction method effectively isolates lantadenes and HPLC analysis enables quantification. Plant model studies indicate growth inhibition at higher concentrations, highlighting the need for lantadene regulation in fertilizers.

The study underscores the importance of monitoring lantadene levels in agricultural products and assessing human exposure risks. Further research is needed to evaluate environmental persistence and develop mitigation strategies.

Recommendations-

1. Establish lantadene limits in fertilizers.
2. Monitor lantadene residues in crops and soil.
3. Assess human health risks via food and water exposure.

By addressing these concerns, we can ensure safe fertilizer use and minimize lantadene related risks.

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