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Rearing kids on chlordecone contaminated soils: Activated carbon, a promising media to limit the transfer from soil to animal tissues

S. Yehya^{1,2}, M. Delannoy^{1*}, A. Fournier¹, M. Baroudi², G. Rychen¹, C. Feidt¹

¹ UR-AFPA, University of Lorraine / INRA, USC 340 54 518 Vandœuvre-lès-Nancy

² LSEE, Lebanese university / Tripoli-Lebanon

1. Introduction

Chlordecone (Kepone) (CLD) is an organochlorine pesticide, persistent organic pollutant¹, which was intensively used in French West Indies to fight the banana black weevil. Because of its toxicity and considerable levels in soil, it became a major threat for human health to address². Recent studies have shown that chlordecone contained in soil is extracted during the digestive process and assimilated by animals³. **Soil ingestion is the main exposure route for free range animals.** In order to ensure the production of safe animal foodstuffs, it is necessary to reduce the transfer from soil to animal tissues.

2. Objective

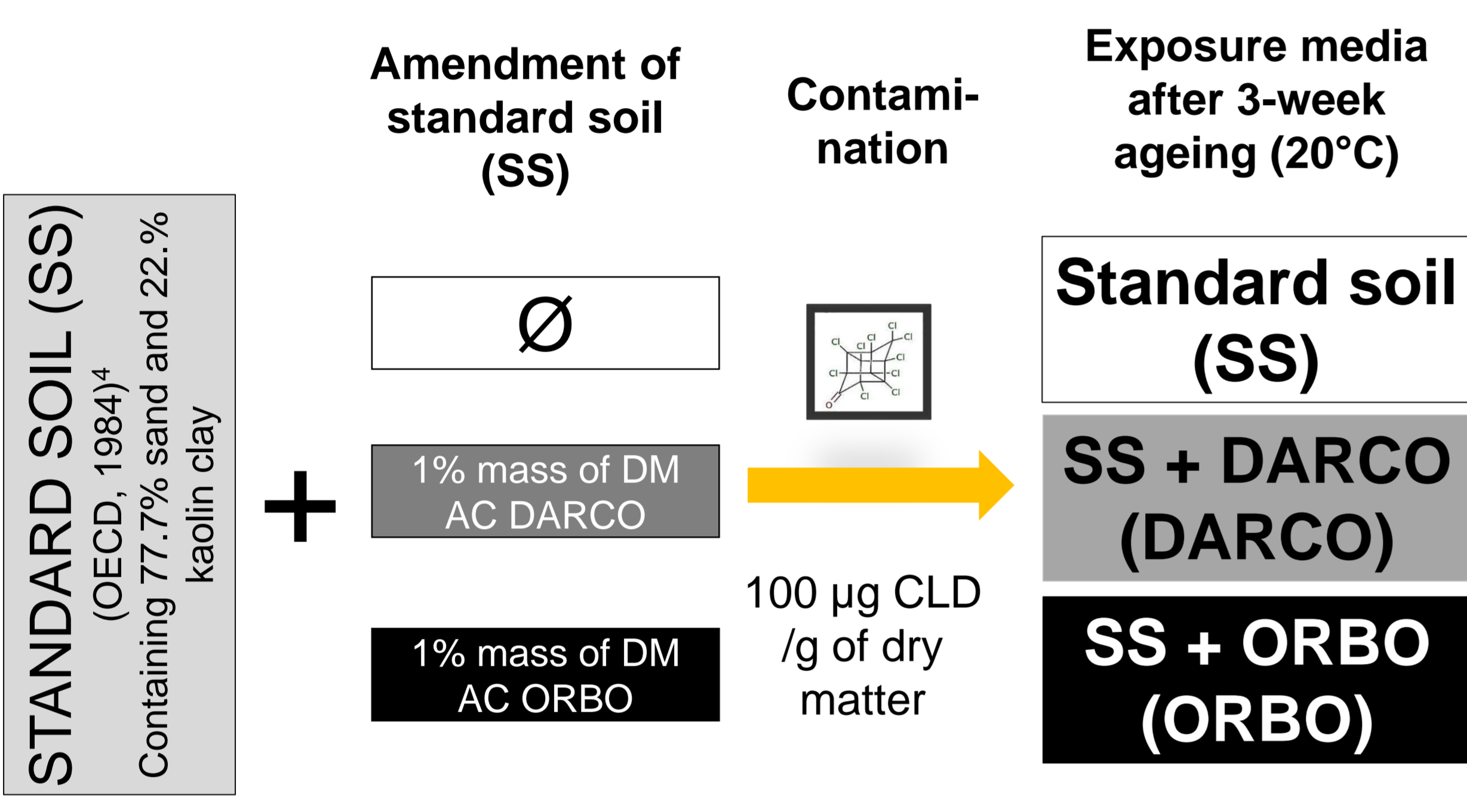
The present study intends to test whether two different activated carbons (AC) : ORBO (activated coconut charcoal, specific surface area (SSA) of 1070 m²/g) DARCO (lignite activated carbon, SSA of 793 m²/g), could limit the CLD transfer from soil to animal.

Hypotheses :

- AC limits the absorption of CLD through soil ingestion.
- This effect depends on the properties of AC.

3. Material & Methods

I – Preparation and contamination of artificial soils



II – In vivo assay

III – Analysis

Analysis of biological samples

Extraction
Analysis of CLD by LC-MS/MS.
Detection by mass spectrometry using a triple quadrupole.

Relative bioavailability calculation

Determination of the retention offers by AC against standard (reference)

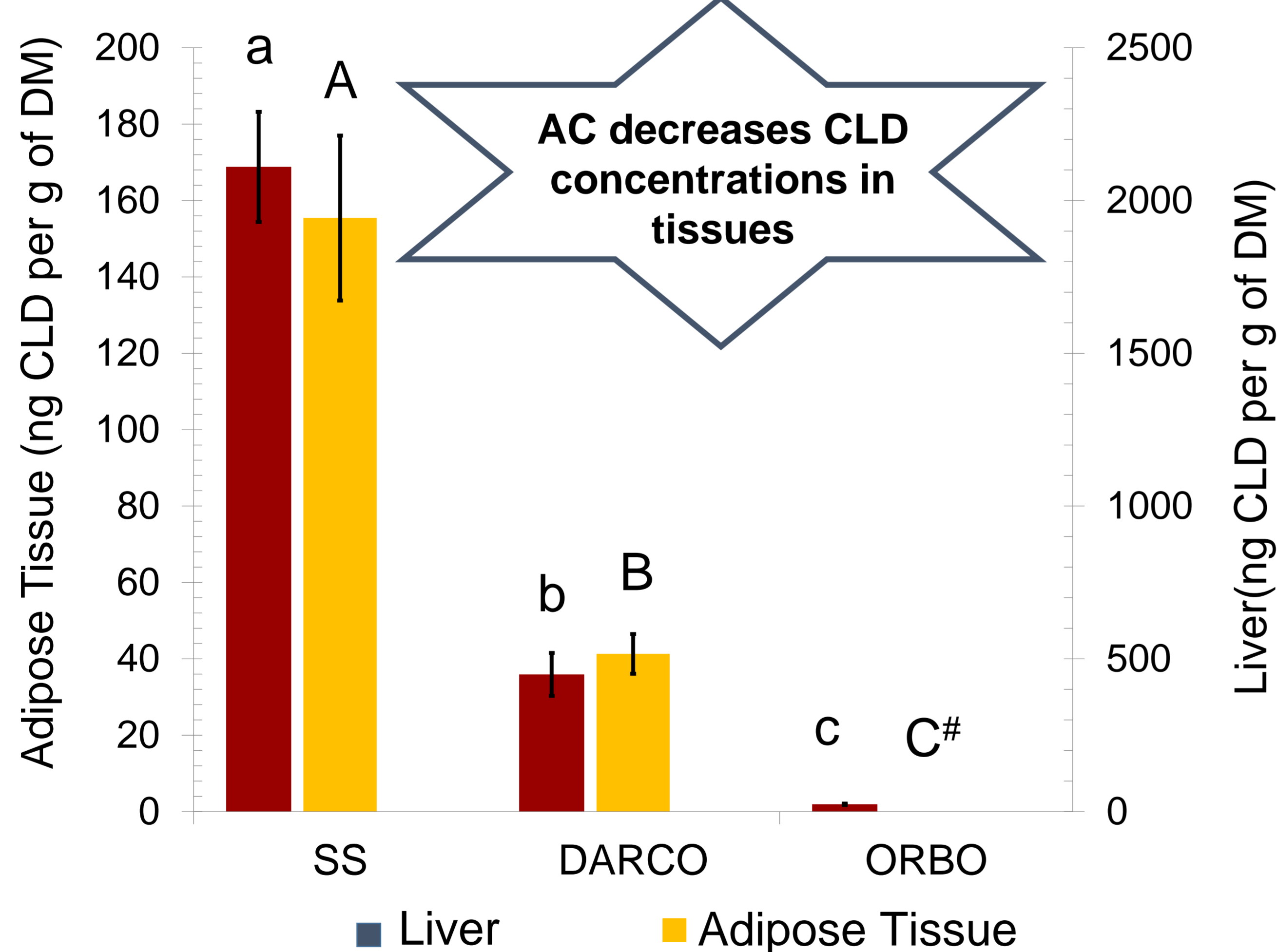
$$RBA_{CLD} (\%) = \frac{C_{AC}^{\circ}}{C_{SS}^{\circ}}$$

RBA_{CLD}: relative bioavailability of CLD in tested soil amended with AC

C_{AC}[°] and C_{SS}[°] are respectively concentrations of CLD found in the same target tissue after ingestion of one AC soil or SS

4. Results

Concentration of CLD in target tissues



Relative bioavailability (%)

Treatment	Liver	Adipose Tissue
DARCO	25.3 % ^a [17,8% - 32,8%]	36.5 % ^A [26,3% - 46,63%]
ORBO	1.35 % ^b [1,1% - 1,6%]	1.8 % ^B [NE]

RBA values (%) and respective 95% confidence interval are presented

NE: non estimated confidence interval as concentrations in adipose tissue were lower than LOQ

Line without a common letter differ significantly (p>0.05)

#: < Limit of Quantification (LOQ=2 ng/g of DM)
Column without a common letter differ significantly (p>0.05)

5. Conclusion & Perspectives

This study leads to conclude that :

- AC could dramatically reduce the relative bioavailability of CLD (up to 98% for ORBO).
- Extent of this limitation depends of the properties of AC.
- This result obtained with artificial soils is considered as a first step prior to on-field experiments.