EVALUATION OF THE EFFICACY OF A LOCALLY OCCURRING DIATOMACEOUS EARTH IN SMALLHOLDER STORES UNDER SUB- HUMID CONDITIONS

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Introduction and justification

Introduction

- Diatomaceous earth (DE) is obtained from diatomite

- Works by physical action of absorbing the waxy layer from insect cuticles
- Industrial uses e.g. water purification, brewing, paint fillers, plastic industry

Justification

- Grain weight loss in storage a threat in sub-Saharan Africa
- Local deposits identified, efficacy data of local DEs lacking
- Potential to reduce dependency on synthetic grain protectants
- Consumer and environmentally friendly
- Local DEs could stabilize prices

OBJECTIVES AND HYPOTHESES

Objectives

- Assessing the efficacy of local DE as a grain protectant
- Determining effective application rates of the local DE

Hypotheses

- Local DE is as effective as commercial synthetic insecticides and commercial DEs
- DEs work under sub-humid conditions of Harare

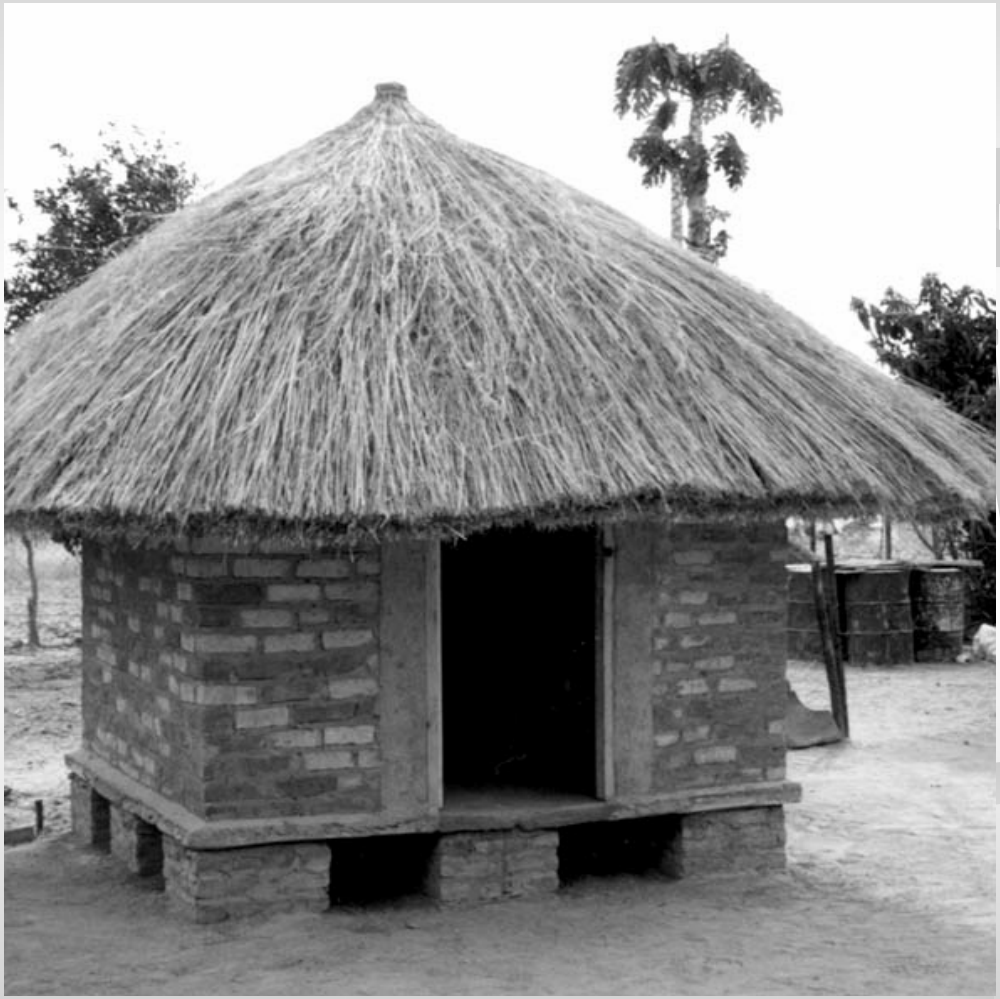
Review of literature

- DEs registered as grain protectants in many countries e.g. USA Canada, Brazil, Australia
- Dryacide® and Protect-it® , effective and persistent grain protectants in various agro-ecological regions in Zimbabwe Stathers, *et al.* (2002).
- Local company has applied for temporary registration of Protect-it®
- Similar work in Tanzania has generated interest in the private sector
- DE efficacy varies with source of DE, grain type and insect species (Korunic, 1997)

Materials and methods

- Study carried out IAE, Hatcliffe, Harare
- 900kg of maize stored
- Raw DE collected from Chemutsi was finely ground
- 6 treatments admixed with grain prior to store loading
- Sampling was carried out at 8 weeks for 32 weeks from Oct-03 to May-04
- 1-1.5 kg samples randomly taken using multi-compartment probes

Trial granary

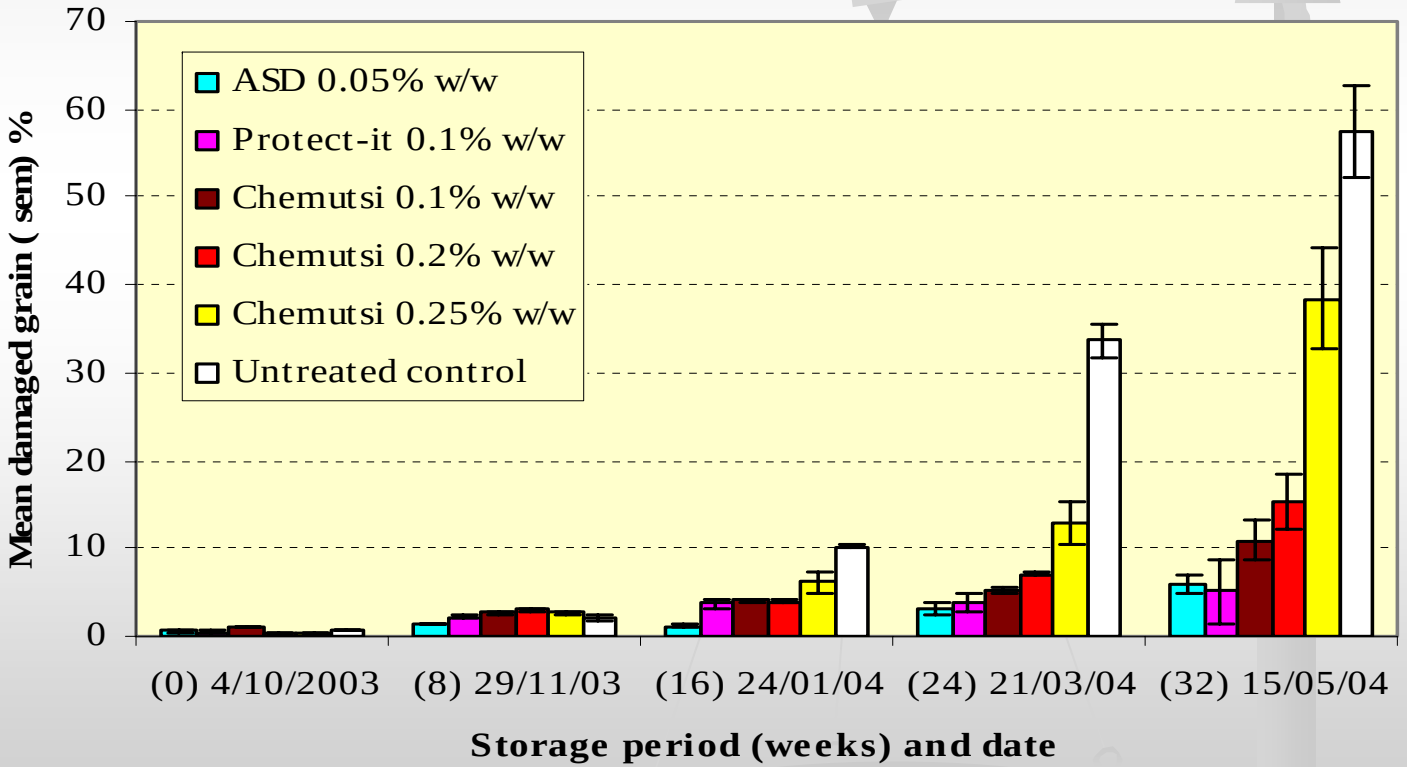


Sample and data analysis

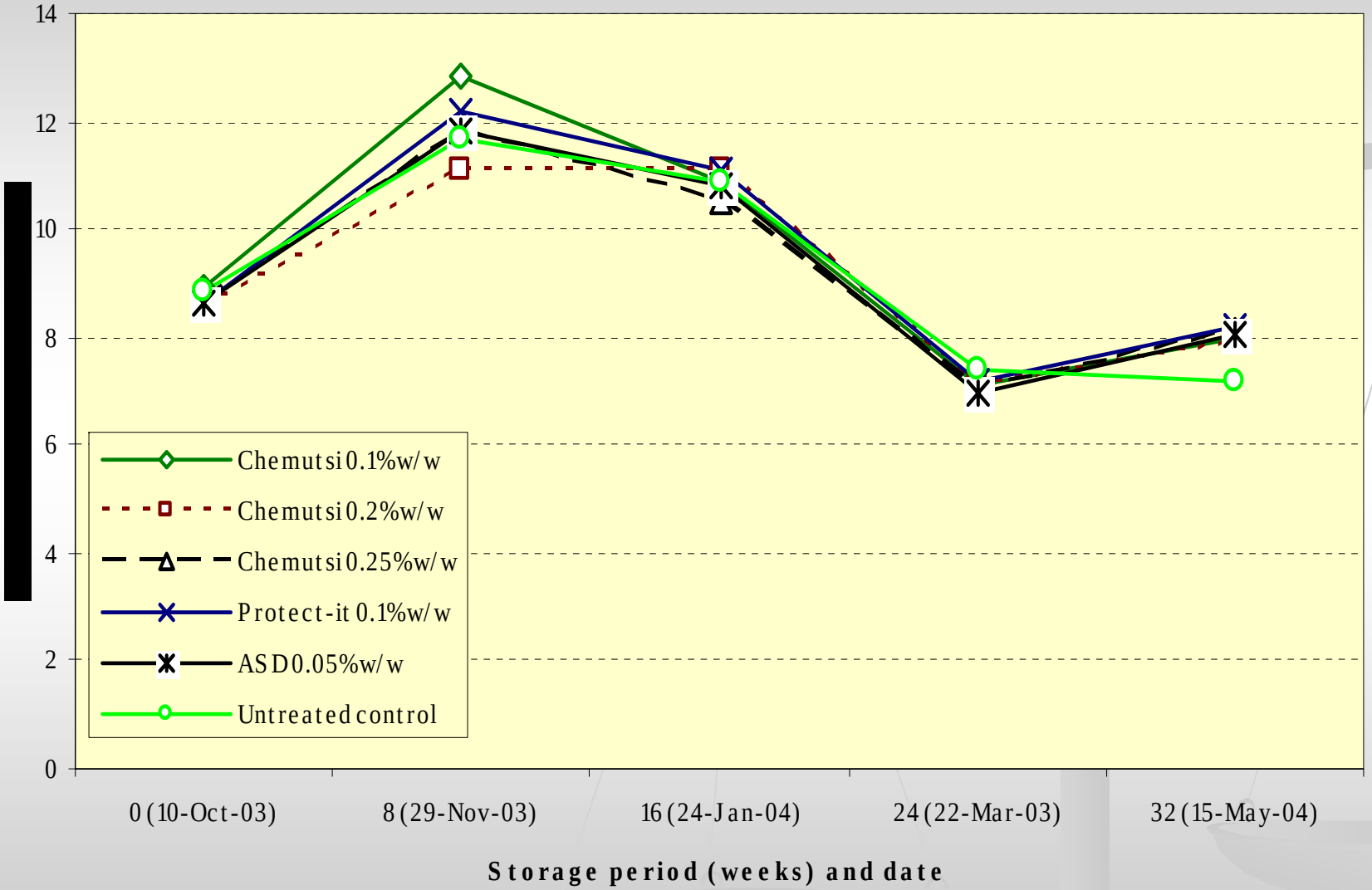
- Parameters measured: mean grain damage (%), total insect numbers/kg, mc
- mc on determined using the gravimetric method
- GENSTAT® used for statistical analysis
- Orthogonal contrasts used for comparison of means

Results cont.. (grain damage)

- Mean damage significantly different ($p<0.001$)
- No significant differences between Chemutsi 0.2% and 0.25% compared to Protect-it ® and ASD.
- Chemutsi 0.2%w/w and 0.25%w/w differed significantly from Chemutsi 0.1%w/w.

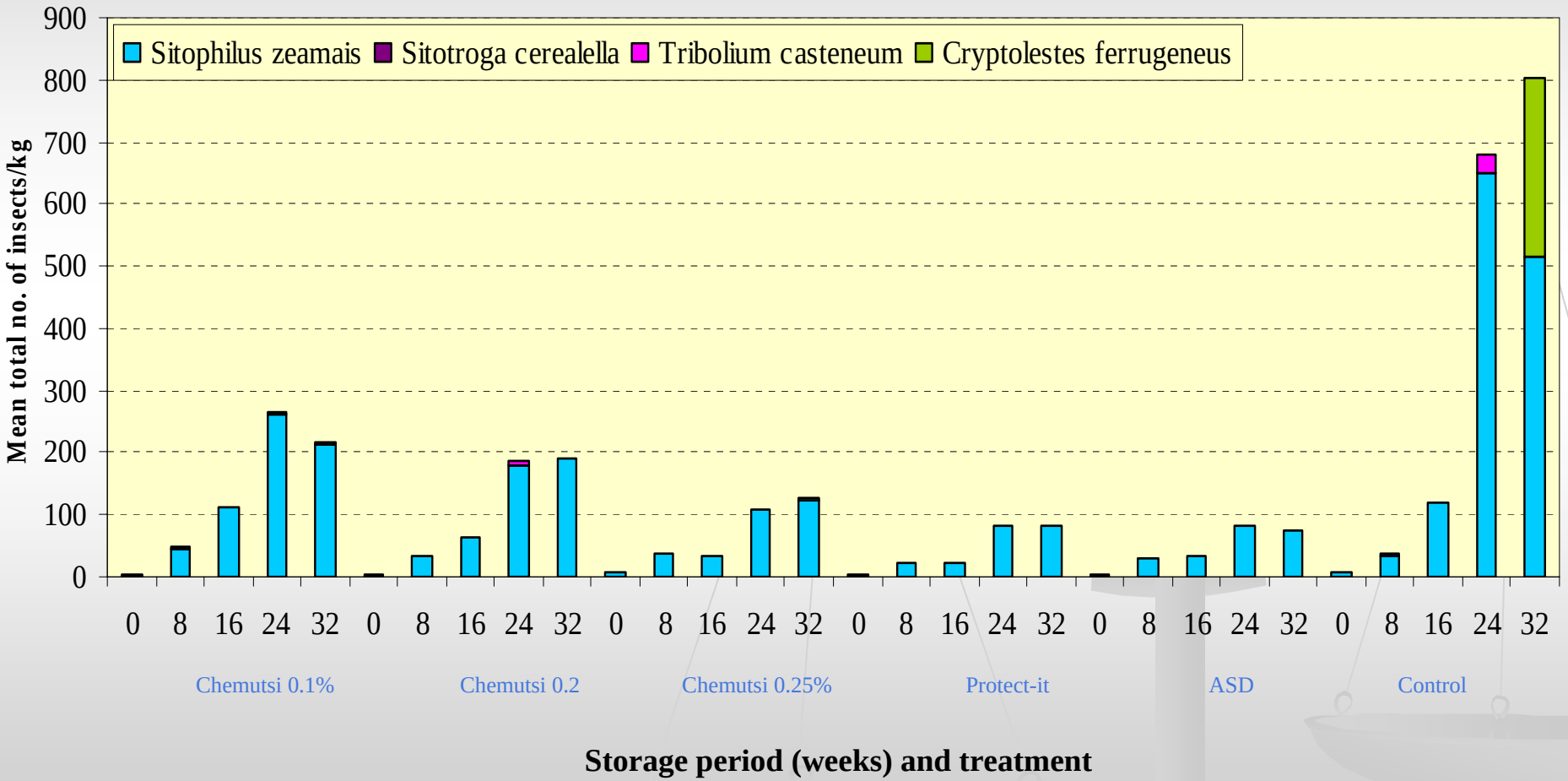


Results cont.. (moisture content)



Results (insect population)

- Chemutsi 0.1% differed significantly from higher concentrations ($p<0.001$)



Discussion

- Chemutsi DE was not effective at 0.1% indicating that insects may not have been picking up sufficient dose of DE to effect mortality.
- Cross infestation contributed to population increase in the trial DEs.
- DE was not affected by sub-humid conditions
- Grain protectants not different in the first 4 months of storage hence only grain to be stored longer periods should be treated.

Conclusions and recommendations

- Conclusions
- Local DE have potential as a grain protectants under sub-humid conditions
- Chemutsi 0.2% w/w and 0.25% w/w were as effective as the commercial DE and synthetic insecticide
- Recommendations
  - Chemutsi 0.2% recommended
  - Tests on DE physical characteristics and safety aspects required before registration
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