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

Efficacy evaluation of a local diatomaceous earth
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.

![Graph showing mean damaged grain over storage period](image)
Results cont.. (moisture content)

Efficacy evaluation of a local diatomaceous earth
Results (insect population)

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

- Zimbabwe Phosphate Industries (Ltd) through Dorowa Minerals (Pvt) Ltd for facilitating collection of raw DE samples
- Crop Post Harvest Programme of the UK’s Dept for International Development (DFID) for the project funding
- The views and opinions expressed are not necessarily those of DFID or Zimbabwe Phosphate Industries Ltd.