Comparative field assessment of alternatives to synthetic pesticides in smallholder cowpea grain storage



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Background

- Cowpea is widely grown in Sub-Saharan Africa as a source of protein, for income generation, and a portion is retained for seed

- Many farmers often sell their crop during the harvest time due to susceptibility to cowpea weevils, *Callosobruchus* spp.

- Synthetic pesticides are commonly used for pest control (Stathers *et al*., 2002), but farmers incur considerable postharvest losses after harvesting despite using them

- Losses can go up to 95% if no control measures are implemented (Baidoo *et al*., 2010)

- Reduced efficacy of these has led to over dosages and increased application frequencies – exposing users to food poisoning and resistance development by insects

Background cont..’

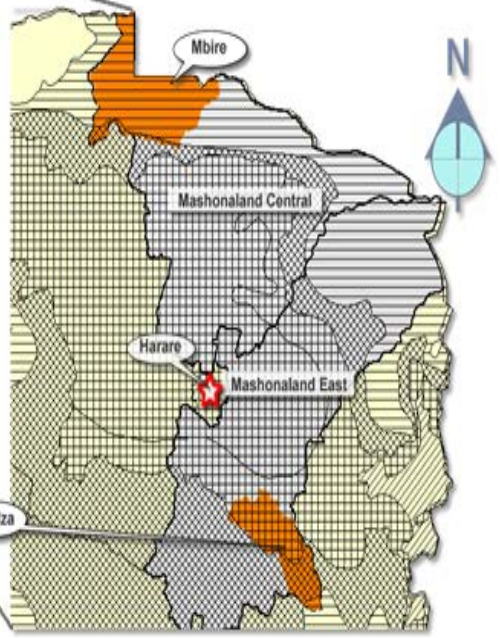
- A growing demand for pesticide-free food means new technologies have to be developed, deployed and adopted

- Botanical pesticides and hermetic treatments can be used as alternatives to synthetic pesticides if effective

- The current study seeks to determine the effectiveness of different storage technologies under smallholder conditions in Hwedza and Mbire districts of Zimbabwe

Study sites

Mbire (32 – 42°C, < 450 mm)



Hwedza (18-32°C, 650 – 1000 mm)

Treatments

Category	Treatment
Hermetic treatment	Metal silo
	Purdue Improved Crop Storage (PICS) bags
	Super grain bags
Synthetic pesticide based	Shumba super dust (fenitrothion 1% + deltamethrin 0.13%)
	Actellic gold dust (pirimiphos-methyl 0.16% + thiamethoxam 0.036%)
	ZeroFly bags (deltamethrin)
Botanical pesticides	*Colophospermum mopane* (Mopane) fresh leaves (1kg/50kg)#
	Eleusine coracana (Rapoko) chaff (3 cups =200g/50kg)*
Negative control	Untreated (no pesticide)

- #used in Mbire *used in Hwedza

Material and methods

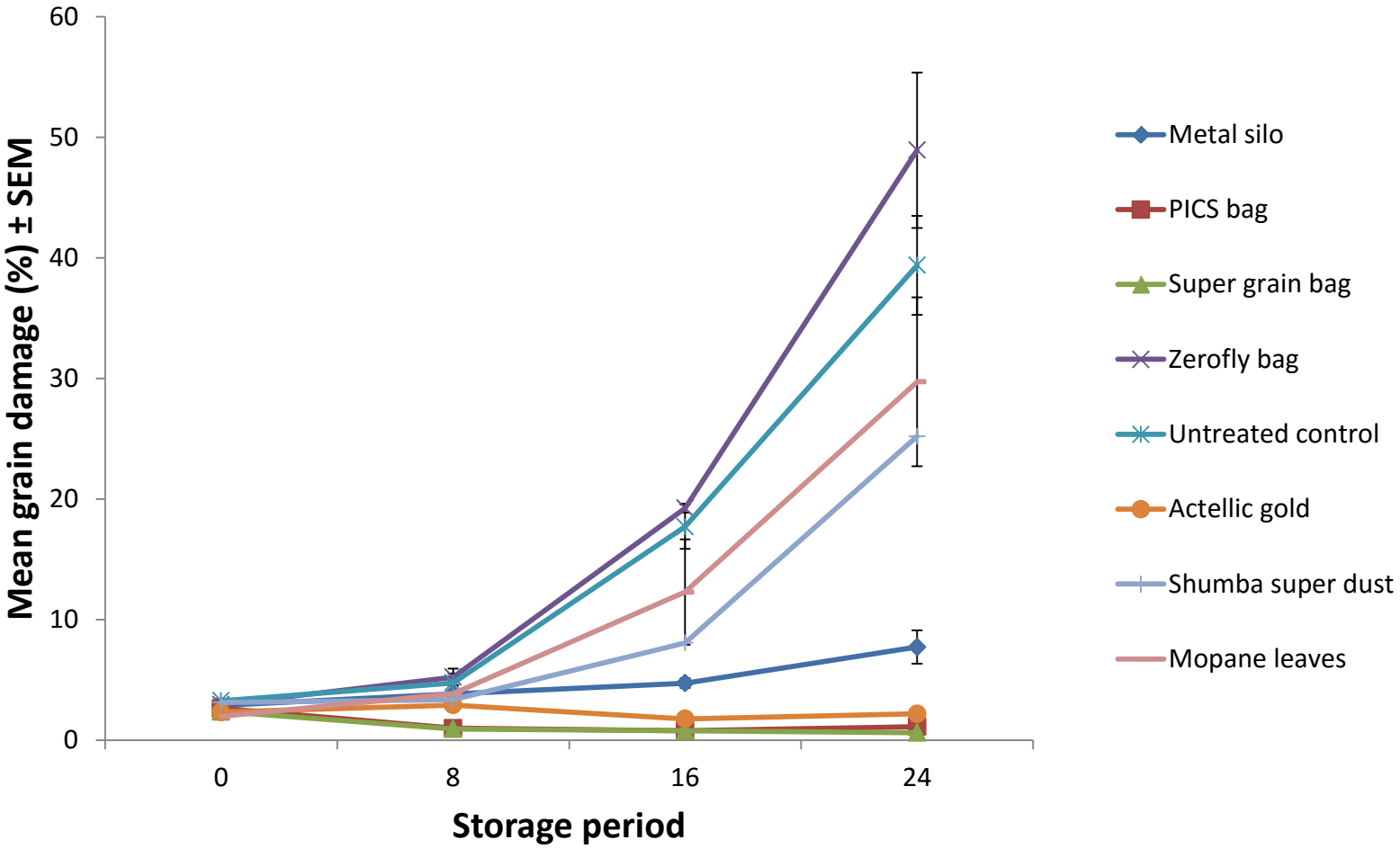
- Hermetic treatments are being compared to synthetic pesticides and local pesticidal plants
- Sampling is done at 8-week intervals over 10 months
- Parameters measured were insect grain damage, grain weight loss, number of total and live insects by species


ZeroFly
by VESTERGAARD

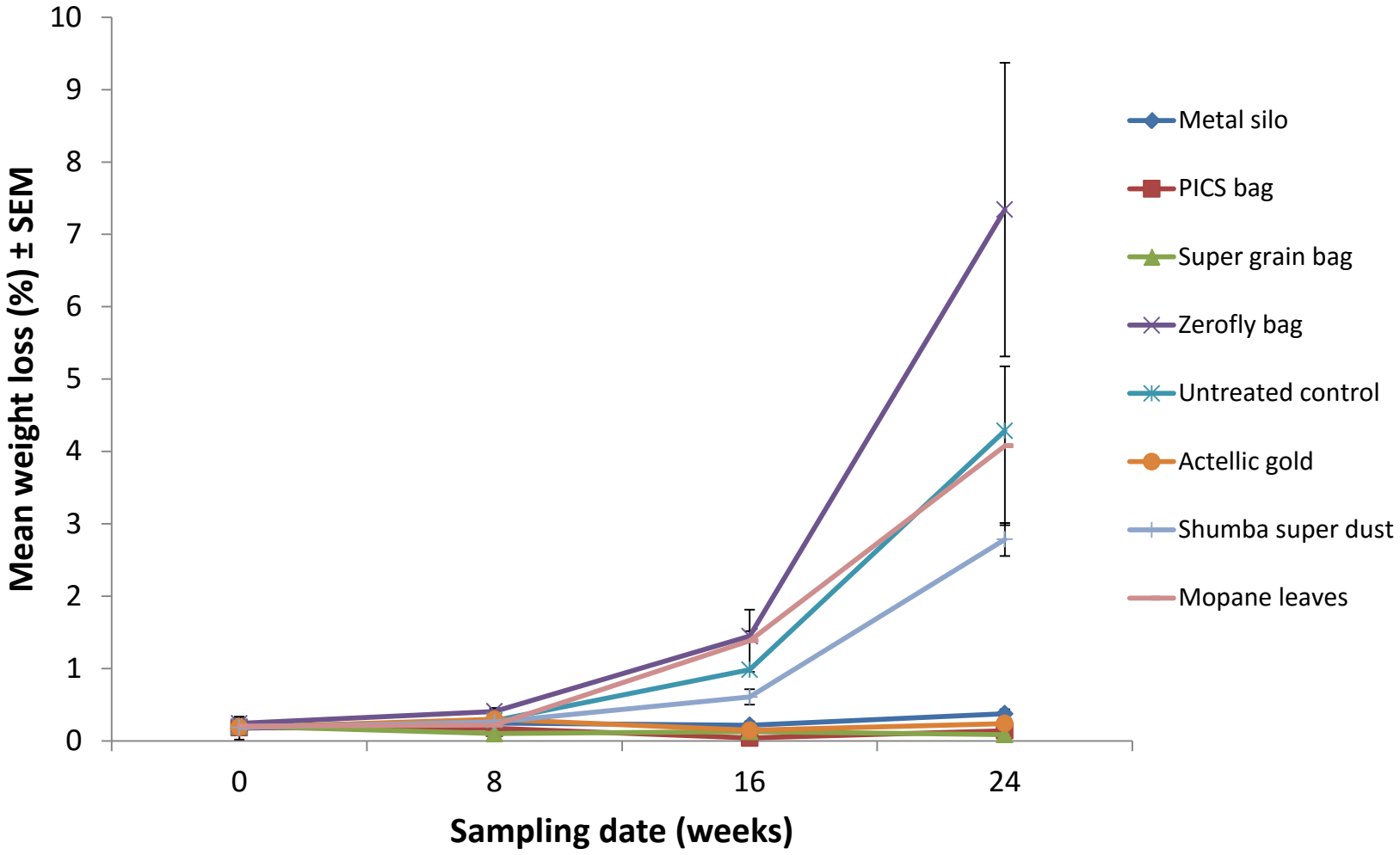
RESULTS - Mbire District

Effects of high temperatures on candles in metal silos

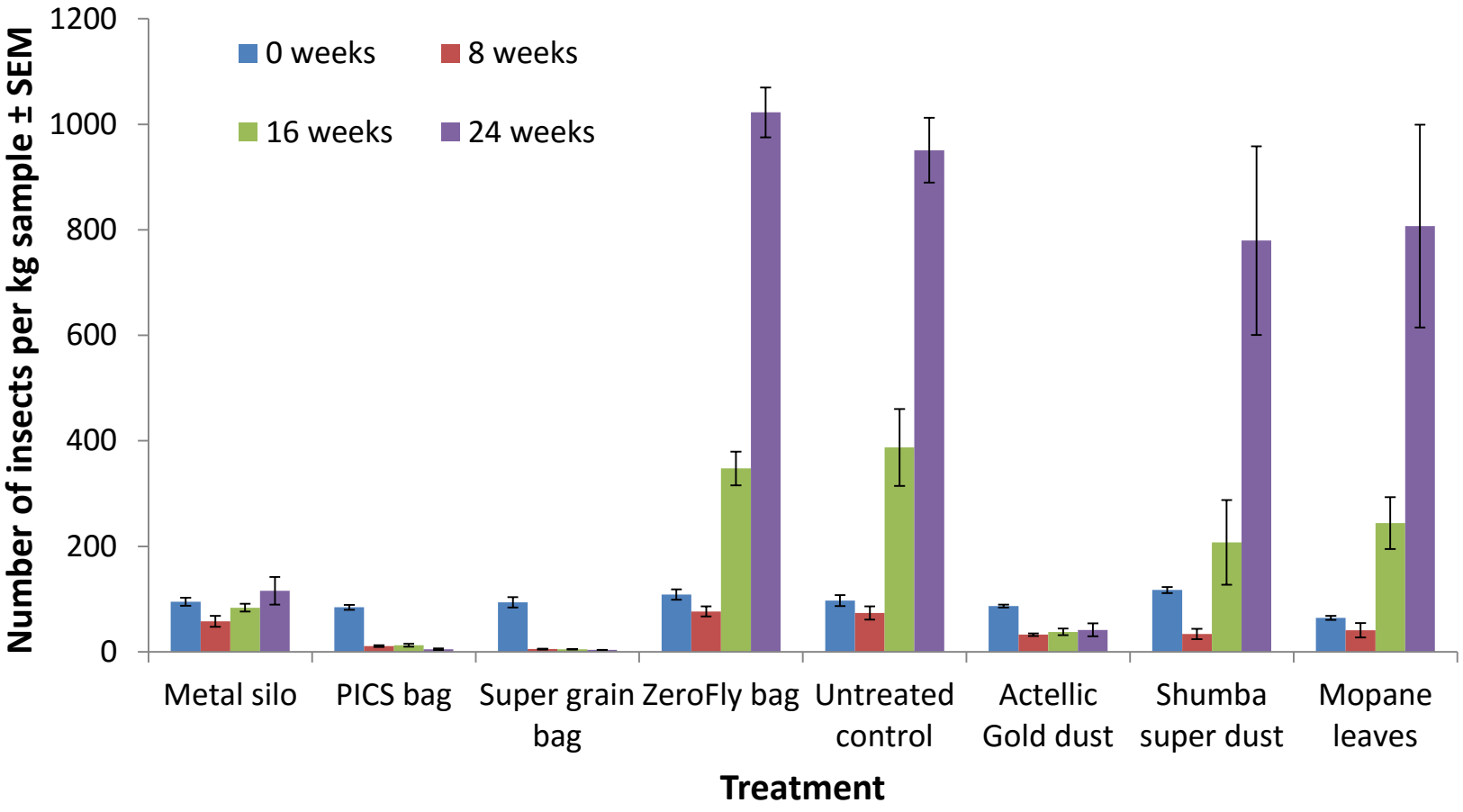
Percentage insect-grain damage (n=4)



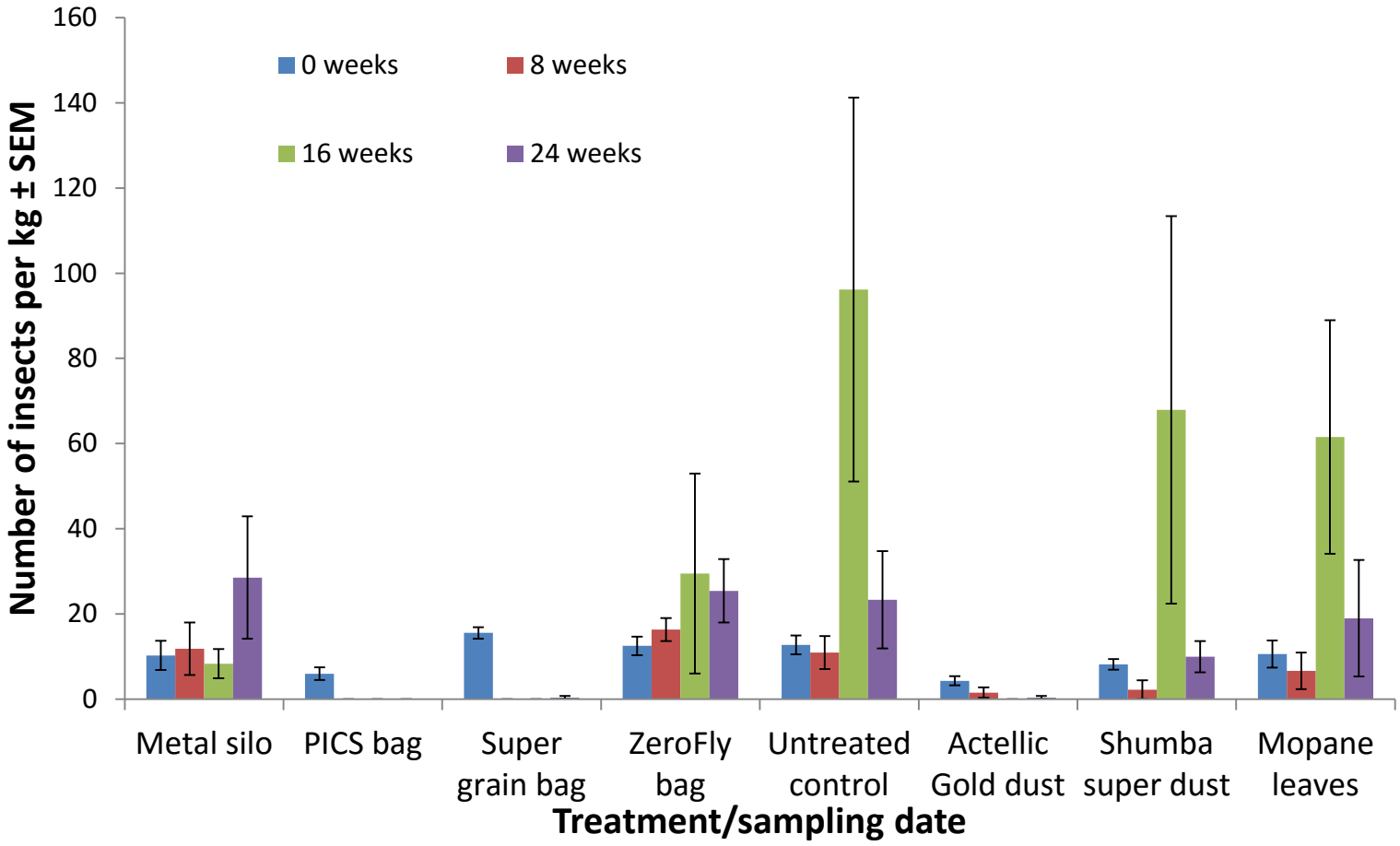
Grain weight loss in store (n=4)



Total insects per kg of grain (n=4)

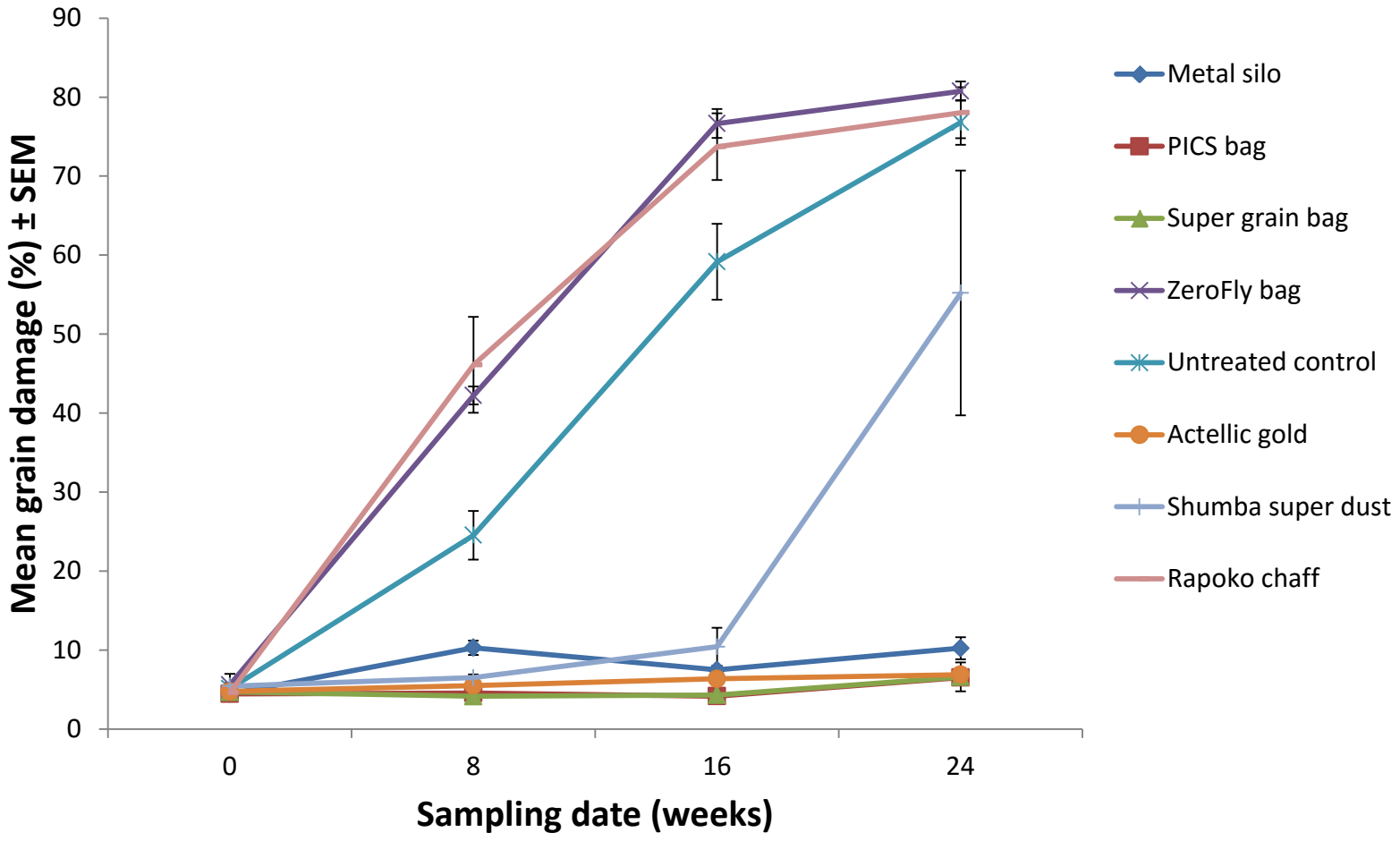


Total live insects per kg (n=4)

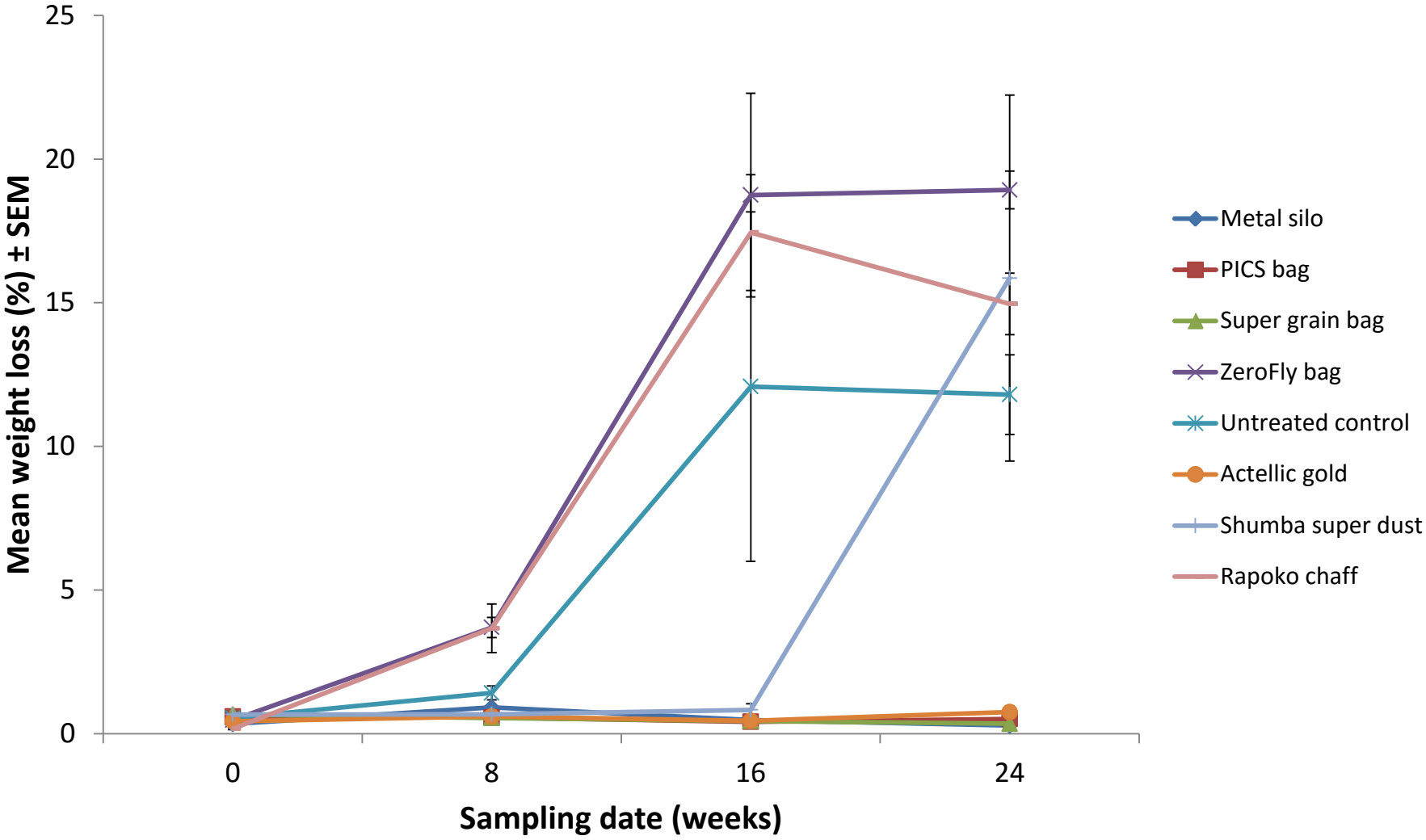


Results - Hwedza District

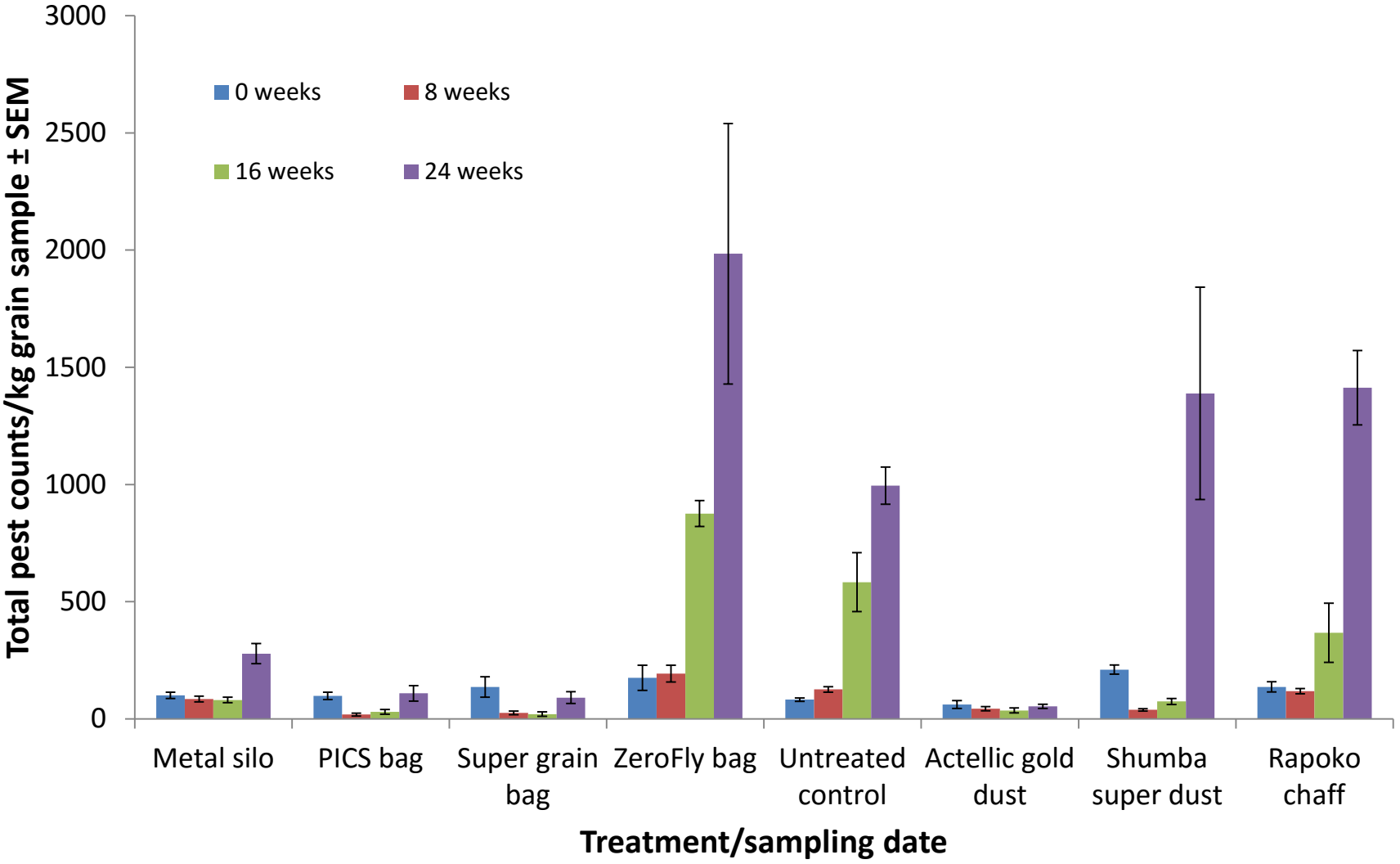
Percentage insect grain damage (n=4)



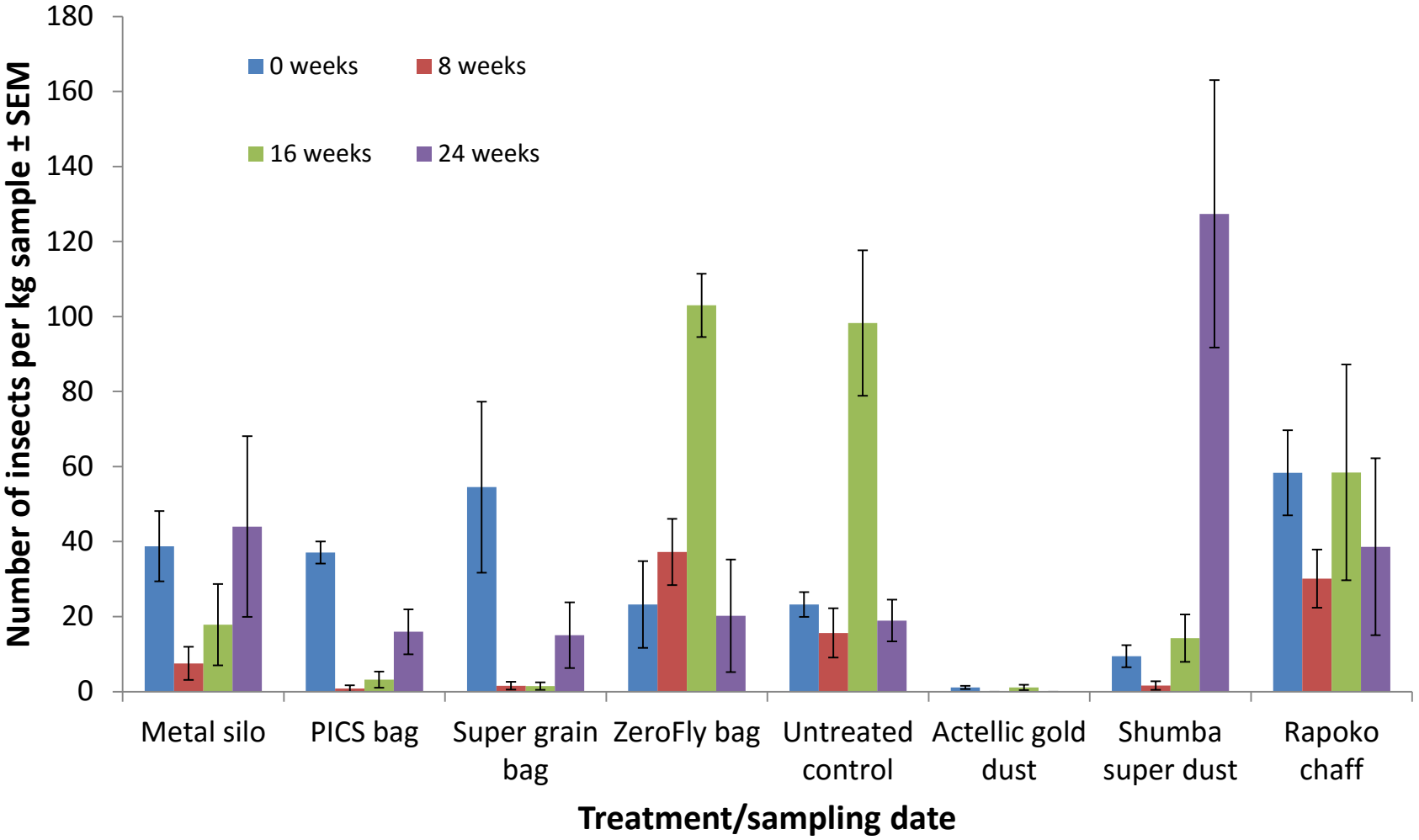
Percentage grain weight loss per kg (n=4)



Number of Total insects per kg (n=4)



Number of live insects per kg (n=4)



Grain weight loss

Mbire district			Hwedza district	
Treatment	**Baseline**	**24 weeks**	**Baseline**	**24 weeks**
Metal silo	0.14^{a}	0.37^{ab}	0.34^{a}	0.28^{a}
PICS bag	0.14^{a}	0.14^{a}	0.6^{a}	0.51^{a}
Super grain bag	0.1^{a}	0.09^{a}	0.66^{a}	0.35^{a}
ZeroFly bag	0.15^{a}	7.34^{d}	0.47^{a}	18.92^{c}
Untreated control	0.13^{a}	4.28^{c}	0.54^{a}	11.8^{b}
Actellic gold	0.16^{a}	0.24^{a}	0.43^{a}	0.75^{a}
Shumba super dust	0.14^{a}	2.78b^{c}	0.67^{a}	15.86^{bc}
Mopane leaves/Rapoko chaff	0.11^{a}	4.77^{c}	0.17^{a}	14.96^{bc}
P-value	**0.99**	**<.001**	**0.39**	**<.001**

Results Summary

- Significant differences ($p < 0.05$) in grain damage percentages between treatments – high damage in ZeroFly bag, Shumba super dust, rapoko chaff and untreated control

- Hermetic treatments (Metal silo, PICS bags and SGBs managed to suppress pest build-up and grain damage throughout the storage period

- Variation in the performance of pesticides - Actellic Gold dust worked better than Shumba Super dust

- Mopane fresh leaves suppressed pest build up during the first four months of storage
- High damage and loss recorded in Hwedza than in Mbire

Recommendations

- Need to test promising technologies under different climatic conditions
- Tests to determine if re-use is possible under different site-specific conditions
- Sharing results with end-users (farmers and consumers)
- Training on proper use of the technologies
- Further experiments (laboratory tests) on chemical composition of Mopane; testing different plant parts
- Development of optimization strategies

Acknowledgements

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THANK YOU