



# VALIDATION OF PESTICIDAL PLANTS USED TO CONTROL STORAGE INSECT PESTS

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DEVELOPMENT PARTNERSHIPS  
IN HIGHER EDUCATION



*MicKnight Workshop, 5-8<sup>th</sup> Dec 2011, Morogoro, Tanzania*

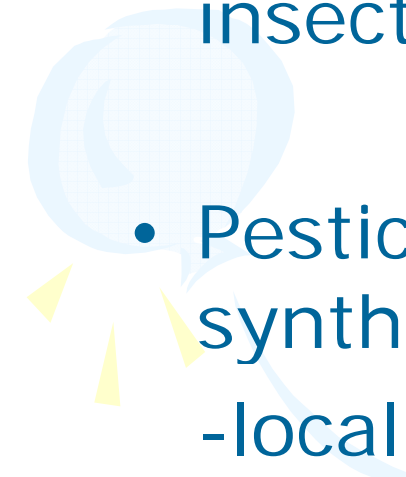

# Post-harvest losses (1)

- Post-harvest losses are recognised as being one of the critical constraints upon food security among many farmers across Africa.
- Farmers normally use synthetic pesticides which are usually effective but:
  - high cost
  - poor labelling and adulteration
  - resistance to insects
  - misuse of pesticides.
  - unavailability.
  - Environmental and healthy problems
- Demand a vigorous search for alternative pest control practices





## Post-harvest losses (2)

- Traditionally, farmers used and continue to use various cultural practices and herbal products for the control of storage insect pests
  - Pesticidal plants have advantage over synthetic insecticides because they are
    - locally available
    - believed to be safe
    - Environmental friendly
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# Process of validating pesticidal plants

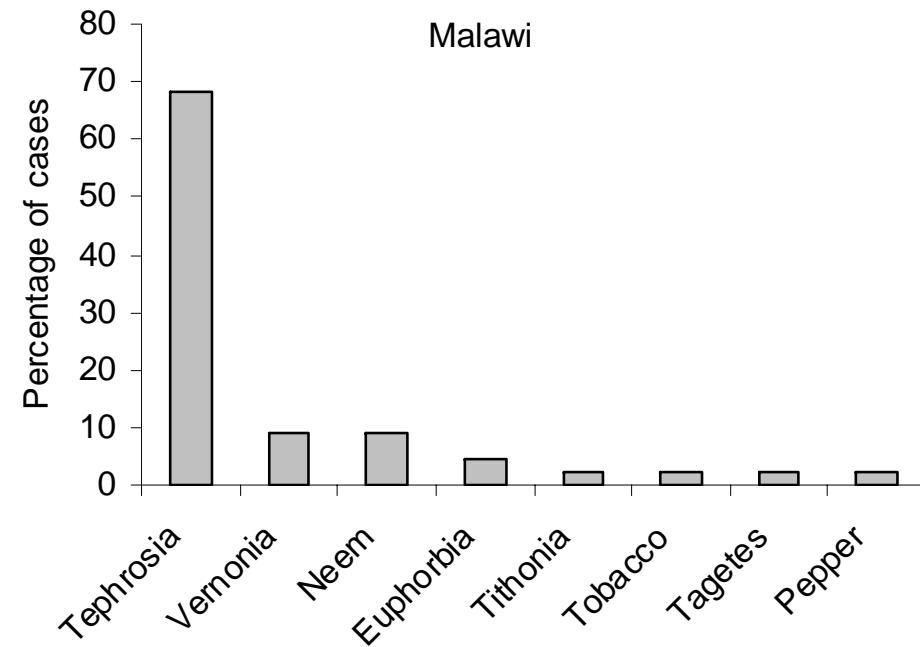
- Field surveys
- Literature review
- Farm trials
- Laboratory bioassays-bioactivity
- Chemistry
- Toxicity/safety issues

# Field surveys

Acquiring information from farmers about pest management and pesticidal plants use



Lead farmer being interviewed at Nchenachena EPA



(Kamanula et al., 2011)

# On-farm trials

- Collection of plant material
- Drying under shade
- Processing-pounding, sieving
- Application-admixing powdered plant material with grain (2%, 5 % w/w)

-spraying grain with plant extract, dry treated grain under shade

-dipping sacks in plant extracts (2%, 5%)  
shade and store grain in

- Evaluate the efficacy of plant materials (6-7 months) by
  - farmers
  - researchers



treated sacks



# Collection & processing of PPs





# On-farm trials

**Table 1: Treatments**

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Treatment	Description	Dosage (% , w/w)
T1	Untreated maize grain	0
T2	<i>A. indica</i> leaf	2.0
T3	<i>A. indica</i> seed kernel	2.0
T4	<i>T. vogelii</i> leaf	2.0
T5	<i>T. diversifolia</i> leaf	2.0
T6	<i>V. amygdalina</i> leaf	2.0
T7	<i>L. javanica</i> leaf	2.0
T8	Actellic super dust	0.05
T9	<i>S. longepedunculata</i> root bark	2.0



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# Field trials

Farmers evaluation (by observation)

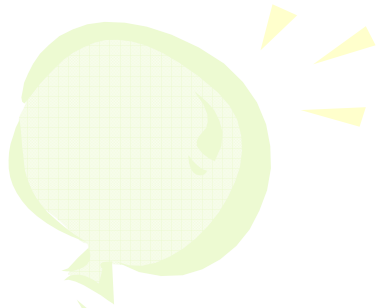
- Type of insects-black, brown, long, short, etc
  - When damage/insect appearance started
  - Degree of damage (qualitatively)
  - Ranking of plant material efficacy
  - Their views on sustainable utilisation of pesticidal plants
- 
- 



# Field trials

## Researchers evaluation

- Insects present on grain
- Moisture content (%)
- Weight loss –no. of damaged grains
  - no. of undamaged grains
  - wt of damaged & undamaged grains
- Insect grain damage (% , w/w)



# Data collection



# On-farm trials



A restaurant at Nchenachena EPA



# Monitoring and evaluation

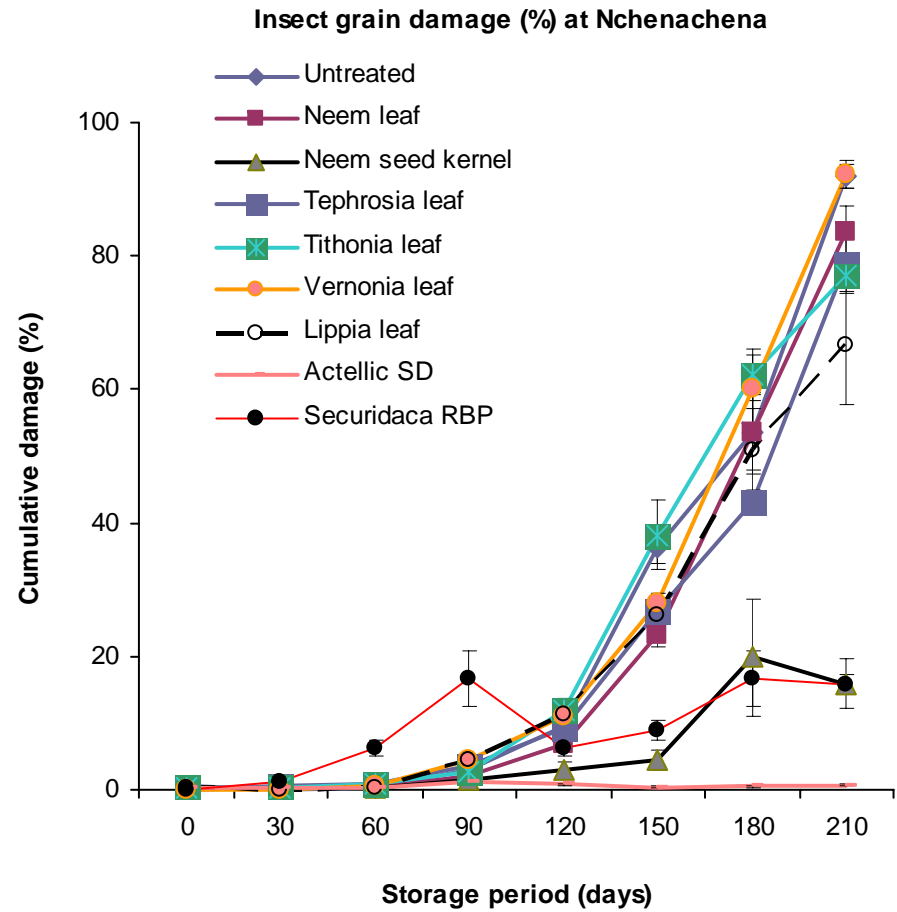
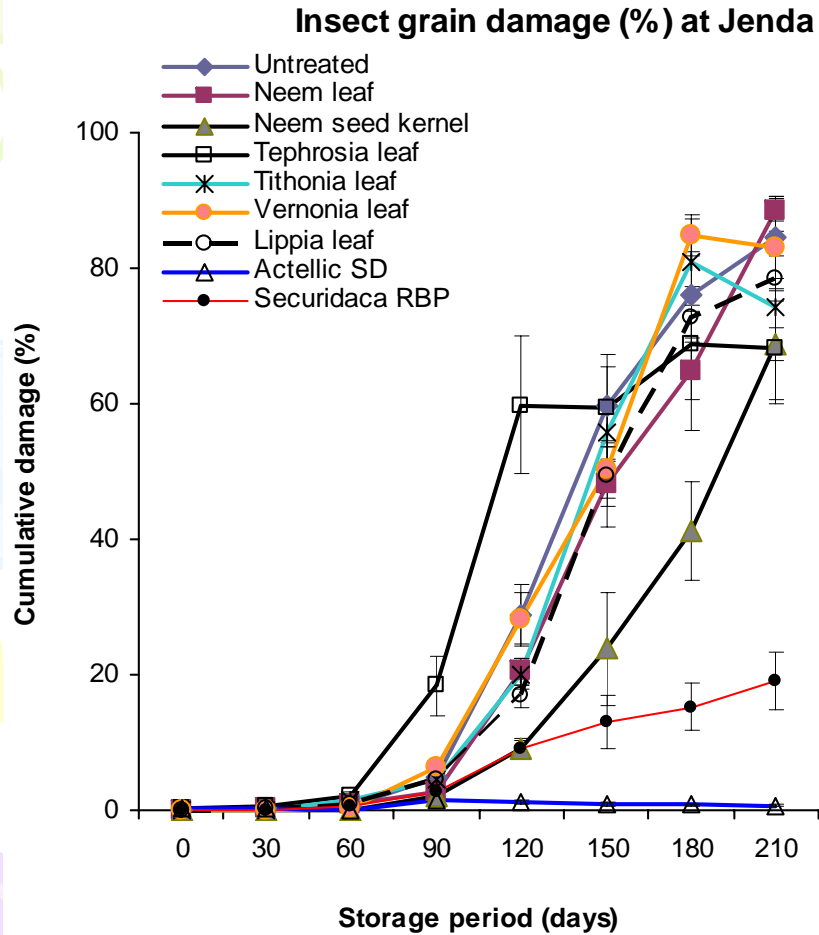
MZUNI DeIPHE Botanicals project Coordinator and the M&E officer from British Council-Malawi, interviewed lead farmers on how they evaluated the efficacy of the pesticidal plants against maize storage insect pests.

Farmers ranked Actellic super dust (1), Securidaca RB (2) and neem seed kernel (3) as being effective against maize storage insects.





# On-farm trials

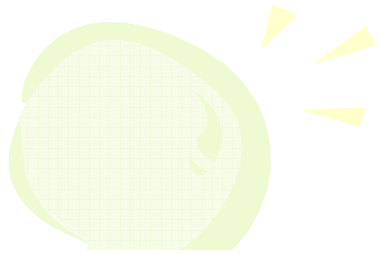


Ranking: Actellic

1/1

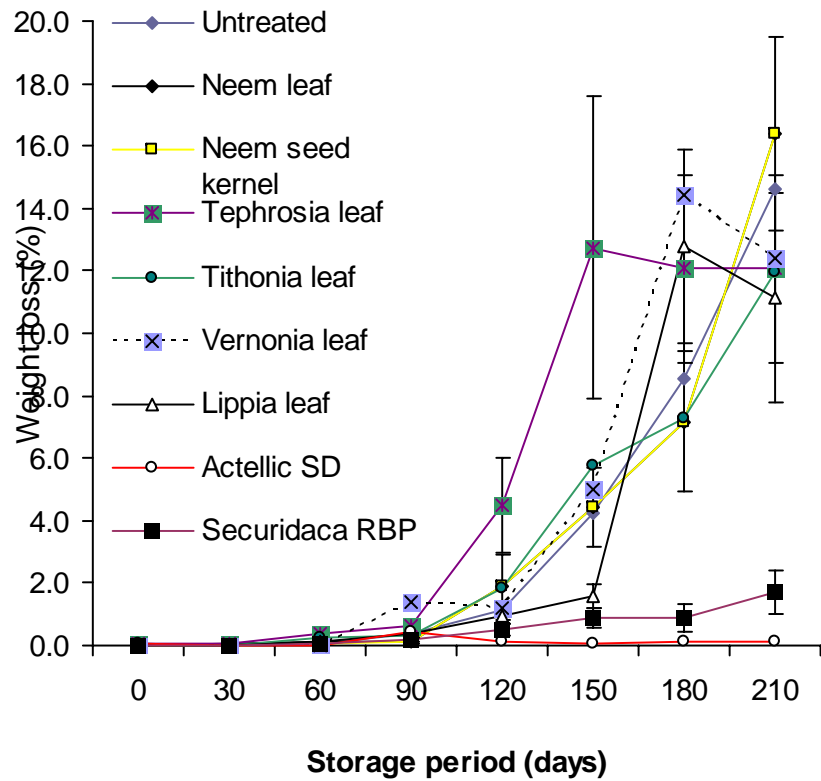
Securidaca RB 2/2

Neem SK 3/2

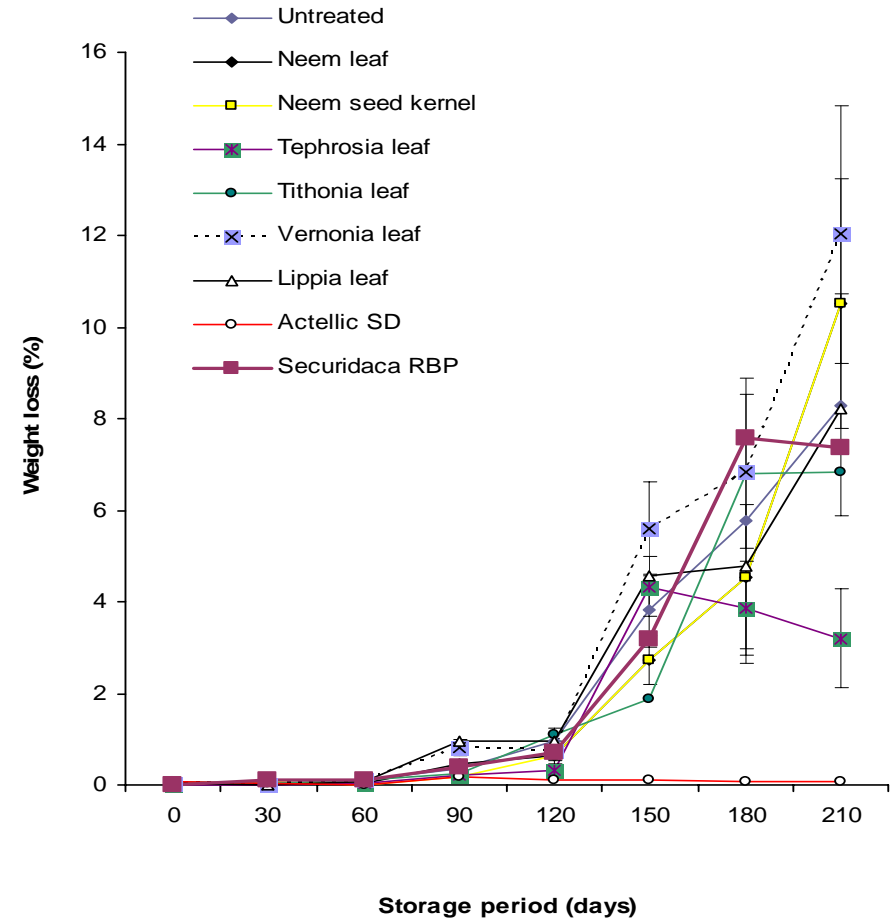


# Grain weight loss

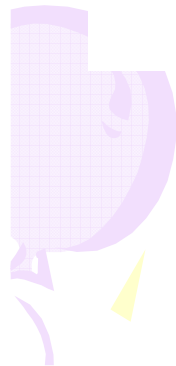
Weight loss at Jenda



Weight loss at Nchenachena



Ranking: Actellic 1  
 Securidaca 2  
 Lippia 3  
 Neem sk 4









# Laboratory bioassays

- Contact toxicity (24, 48 hrs)
- Fumigant toxicity(24,48 hrs)
- Repellence



# Chemistry *L. javanica*, *Securidaca*

Securidaca  
Lippia

Methyl salicylate  
Perillaldehyde  
Ipsdienone

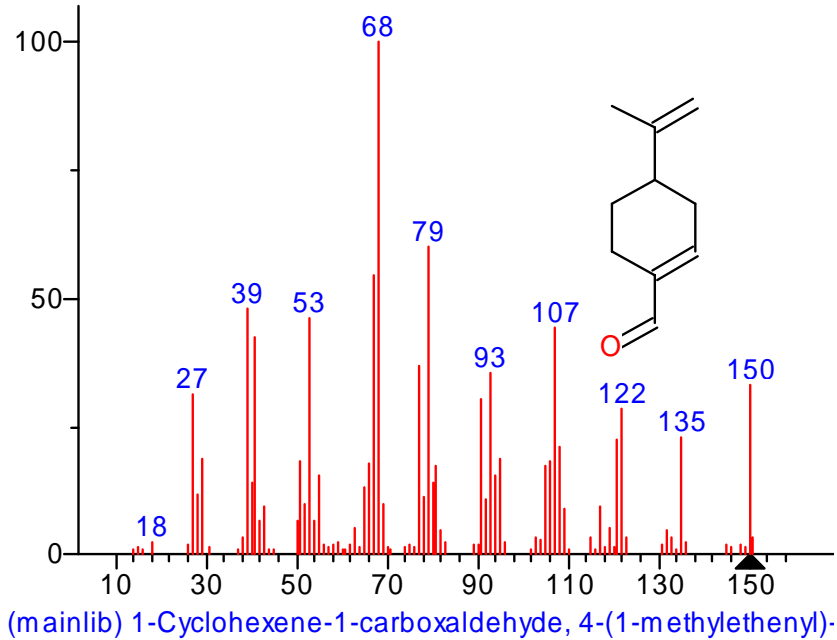


Figure 1: mass spectrum  
Of perillaldehyde

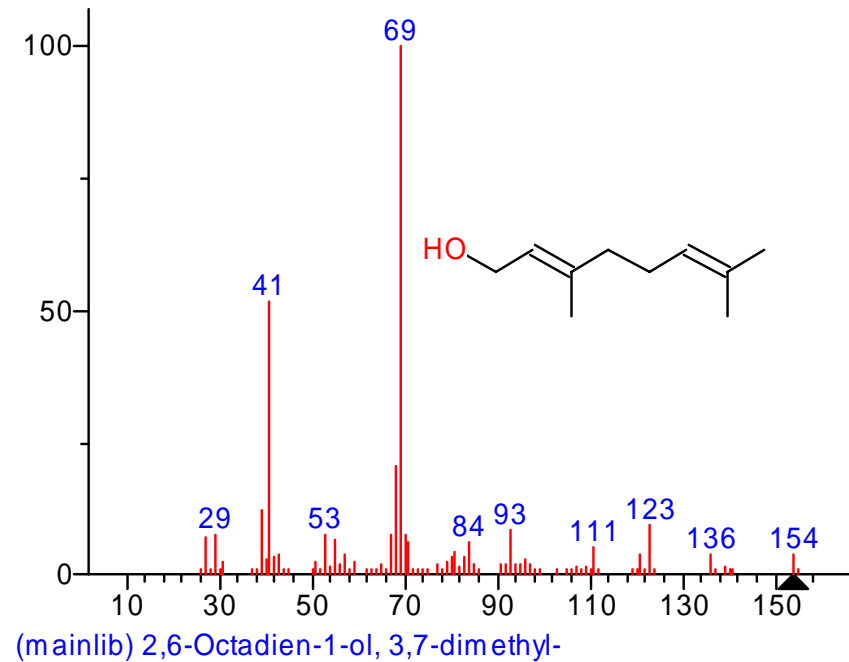


Figure 2: mass spectrum  
Of linalool

# Dissemination of results



Mzuzu University students (top left) and DARS researchers (bottom) explaining to the audience on a field day at Champhira

Farmers from Nchenachena (top) and Champhira (bottom) EPAs displaying the research findings to the audience

# Dissemination of results (2)

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## Mzuni validates neem as maize pesticide

BY THOKOZANI CHENJEZI

THE Department of Chemistry of Mzuzu University (Mzuni) has validated neem and muuluka as pesticidal plants which could alternatively be used to effectively control storage insect pests which attack maize grain and bean seeds.

This was disclosed on Saturday when Mzuni organised a field day at Champhira in Mzimba where farmers showed trial results of using different pesticidal plants to control insect pests in stored maize and beans.

Mzuni is developing a scientific component of the use of the pesticidal plants in controlling post-harvest pesticides.

Mzuni's senior lecturer in chemistry, John Kamanula, who is one of the coordinators of the research, said the farmers observed that neem and muuluka were very effective in controlling maize seeds and that neem worked just the same as acetylic in pesticide control when applied beans.

"When we did the evaluation ourselves at Mzuzu University with our colleagues at Lunyangwa Research Station, we found out that Neem controls damage in stored beans and the damage is very low, just the same with Acetylic Super Dust," said Kamanula.

He said the damage control of neem seed kernel was three percent, which is the same as Acetylic Super Dust.

Kamanula added that pesticide control using pesticidal plants is cheaper to poor farmers, and that the organic substances do not pollute the environment since they are easily biodegradable unlike the inorganic pesticides which are not easily degraded, expensive and pollute the environment.

In the research, Mzuni is working with farmers who identify plants they indigenously use to control pesticides in beans and maize and the university then evaluates the compounds in the



GOING LOCAL—Farmers showing branches of the pesticidal plants and the prepared pesticides in bottles.—Picture by Thokozeni Chenjezi

plants which contribute largely to the effectiveness of the pesticidal plants as it is developing a scientific model of use and effectiveness of the pesticidal plants.

The farmers monitored the effectiveness of damage control of pesticidal plants in maize and beans which could be alternatively used with chemical insecticides and the plants included neem, muuluka, mitezga, galinga, heji, soyo and chuzi.

The field day was organised to let the farmers present their findings on the effective part of the pesticidal plants and that was where they identified Neem and Muuluka as the most effective plants.

The researchers from Mzuni validated the farmers' findings after conducting a parallel and scientific evaluation.

"If our research is to be meaningful, it has to be applied. And this is a good example where communities are involved and appreciate the results of our research. So it's not just pure research, it is an applied research.

"Apart from training students, research has to show some outcomes and that is why we are excited as a University," said Deputy Vice Chancellor for Mzuni, Associate Professor Orton Msiska.

Professor Msiska said it was also exciting to note that the research would also contribute to achieving food security as it would solve the problem of after harvest loss of food to storage pest as a lot of farmers fail to buy the expensive chemical insecticides.

British Council Director Julian Baker said the research was fascinating as it was answering to the needs of farmers

in Malawi and that it also ensured sustainability in food security considering that it involved the farmers themselves.

"It's a great [research] as it looks at solving problems with solutions which are readily available here which is going to be cost effective and enable the community to have more food and keep money in their pockets," said Baker.

Mzuni is working with farmers in the project and in partnership with Lunyangwa Research Station and the Natural Resources Institute department of the University of Greenwich of the United Kingdom through the Development Project for Higher Education Links (Delphel) programme which is aimed at finding solutions to help in the progression of the millennium challenge goals.

The Daily Times 4 May 2010



# Pesticidal plant use advocacy

Promoting use of pesticidal plants through:

- Traditional dances
- Drama
- Church/political leaders



Advocating importance of using PPs-Nchenachena EPA



Traditional dancers advocating importance of using pesticidal plants –Champhira EPA



# References

Kamanula, J., Sileshi, G.W., Belmain, S.R., Sola, P., Mvumi, B.R., Nyirenda, G.K.C., Nyirenda, P. and Stevenson, P.C. (2011). Farmers' insect pest management practices and pesticidal plant use in the protection of stored maize and beans in Southern Africa. *International Journal of Pest Management*, 57 (1), 41-49.





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