Insights from Asia: South Korea

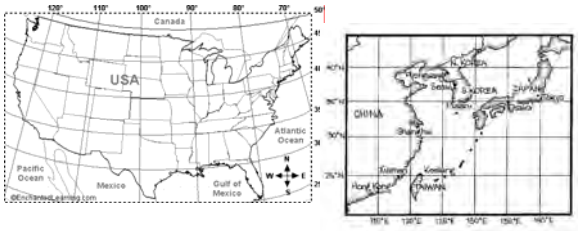
2011 BMSB Working Group Meeting

[Suck-Dung Namoo Norinjae]

***Halyomorpha halys* (= *H. mista*)**

Yong-Lak Park
Entomology @ West Virginia University

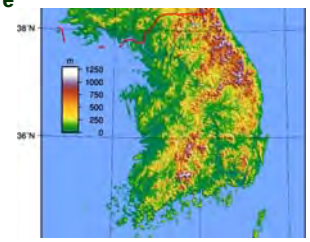
U.S. and Far East



Korean Agriculture

Intensive land use

- **Staple food: rice**
- **Highest yield per acre**
- **Intercropping**
- **Greenhouse**



50 million people

Korean Agriculture

Korean Agriculture

Korean Agriculture

BMSB in Korean

***Halyomorpha halys* (= *H. mista*)**

[Suck-Dung Namoo Norinjae]

Rotten Tree Stink Bug

Methods of Data Collection

RDA (Rural Development Administration)

= USDA + University Extension in the U.S.

National Universities

= Land-Grant University in the U.S.

Pesticide Company

Registered pesticides for stinks bugs

Articles and reports published in Korea

Mostly off-line resources written in Korean

Major Korean Stink Bugs

Riptortus clavatus | *Piexodorus hybneri* | *Dolycoris baccarum* | *Claucias subpunctatus* | **BSMB** | *Plautuia stali*

RDA, Korea

Pest Status of BMSB in Korea

Forest pest of

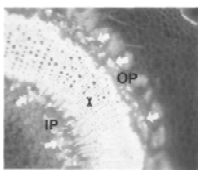
Paulownia

Pest Status of BMSB in Korea

Vector of paulownia witches' broom (PWB)

Thought that virus was the agent

Later, MLO (mycoplasma-like organisms)



Bak et al. 1993

Pest Status of BMSB in Korea

PWB transmitted to

periwinkle (*Catharanthus roseus*)

Bak et al. 1993

By BSMB and *Cyltopetis tenuis* are vectors

USDA

Pest Status of BMSB in Korea

Major pest on

- **Soybean**
- **Sweet persimmon**
- **Yuzu**
- **Citrus**

Soybean & BMSB in Korea

Life cycle & damage

- **1-2 generations per year**
- **Generally first observed in late July**
  - **No BMSB in R2 stage (full bloom)**
  - **Rapid increase in R6 stage (full seed)**
  - **Population peak at R8 stage (full maturity)**

Soybean & BMSB in Korea

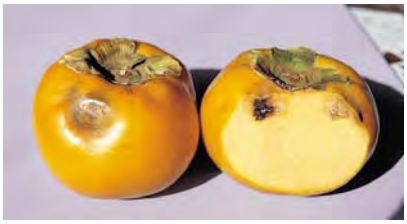
Soybean variety & pesticide test

- **Son et al. 2000**
- **Tested 40 different soybean varieties**
- **Found that**
  - no BMSB found in two varieties
  - >12 BMSB found in one variety
- **Some pesticides provided soybean protection**
  - Fenitrothion
  - Triaazophos
  - Carbaryl

Persimmon & BMSB in Korea

Persimmon in Korea

- **The 2nd most harvested fruit after apple in Korea**
  - **ca. 280,000 ha**
- **> 10% of growers do intensive pest control**



Persimmon & BMSB in Korea

Tannin

- **Lee et al. 2002**
- **Increases as fruit matures**
- **1.5-3% tannin in a fruit in June and July**
  - Not good as food for BMSB
  - Fewer BMSB caught in June and July

Soluble tannin

- **Known to affect development of stink bugs**

Sampling BMSB

Black light trap in persimmon

- **Chung et al. 1995**
  - August was the best
  - No capture after September

Mercury light trap vs. pheromone in persimmon

- **Lee et al. 2002**
  - Aggregation pheromone of *Plautia stali*
    - = Methyl (E, E, Z)-2, 4, 6 Decatrienoate
  - More BMSBs were attracted to light trap
  - Pheromone traps caught BMSB one month earlier

BMSB Traps in Korea

RDA, Korea

Cultural Control of BMSB

Avoid intercropping

- **No beans in persimmon orchard**
  - Reduced chemical control: 3→1 spray

Stink bug screen

- **Physical blocking**
- **Screen after R2 stage of soybean**

Chemical Control of BMSB

Field test of pesticide efficacy

- **Chung et al. 1995**
- **Tested 5 chemicals**
  - deltamethrin, ethofenprox, fenitrothion, fenthion, phenthoate
- **All worked**
  - Deltamethrin and fenthion were the best to kill BMSB

Registered Products for Stink Bugs

Persimmon

- **Etofenprox**
- **Thiamethoxam**

Apple

- **Beta-cyfluthrin**
- **Bifenthrin**
- **Clothianidin**
- **Dinotefuran**
- **Etofenprox**

Bean

- **Bifenthrin**
- **Clothianidin**
- **Dinotefuran**
- **Etofenprox**
- **Fenitrothion**
- **Lambda-cyhalothrin**
- **Thiamethoxam**

Tea

- **Fenitrothion**
- **Thiamethoxam**

Biological Control of BMSB

Really big deal in Korea

- **Environment-friendly agriculture**
- **Well-being boom in Korea**
- **Acreage increased ca. 90 times in 5 years**

Searching for natural enemies of BMSB

- **Lim et al. 2007**
- **Looked for egg parasitoids of BMSB**
- ***Trissolcus nigripedius* (Hymenoptera: Scelionidae)**
- **Observed three steps of oviposition**
  - Drumming
  - Oviposition
  - Marking

Biological Control of BMSB

Searching for natural enemies of BMSB

- **Lim et al. 2007**

Found that

- *T. nigripedius* showed all the behaviors
  - Drumming, Oviposition, & Marking
- But, no adult *T. nigripedius* emerged

Recent Research of BMSB in Korea

Mating behavior of BSMB

Son and Park, 2009 (conference presentation)

Results

Highest mating frequency in 9pm-6am

Role of presence of absence of antennae

Both sex > male only > female only > none

Recent Research of BMSB in Korea

Mating and oviposition (lab study)

Kang et al. 2010 (conference presentation)

Results

Mating behavior

1. Male antennae touch female abdomen
2. Female erect her abdomen
3. Male turns and mate

Oviposition

13-39 egg masses (average of 28.5 eggs per mass)

2.5 min to lay one egg

Total oviposition time was ca. 1 hr 20 min

Recent Research of BMSB in Korea

GC-MS and GC-EAD

Kim et al. 2010 (conference presentation)

Results

Hexane extracts included

9 major compounds in both sexes

More (Z)-2-Decenylacetate in male

More (E)-2-decenal in female

GC-EAD

4-Oxo-(E)-2-hexenal

Tridecane: strong responses by both male and female

(Z)-2-Decenylacetate

Recent Research of BMSB in Korea

Catechin: astringent taste

Song et al. 2008

Stink bug may provide better flavor to tea

Plants produce chemical by stink bug damage

Results

Damaged tea leaves contained lower

Water

Tannin

Nitrogen

Caffeine

Catechin