

**Biological Control of Snoutbeetle, *Metapocyrtus*
(*Trachycyrtus*) spp. on Strawberry (*Fragaria x
ananas*) and Citrus (*Citrus* spp.) in the Cordillera
Region, Philippines**

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Fruit Production in the Cordillera

- strawberry and citrus is a major fruit crop in the Cordillera region of the Philippines
- Good source of income for farmers even on limited areas
- Production is considered successful but management of major pests and diseases is still a problem for both fruit crops



Strawberry

- mainly being grown in Benguet province but cultivation is now being done in other provinces in the Cordillera and other regions of the country
- fruit production is mostly done under open field but greenhouse production is being practiced for off-season fruit production and multiplication of planting materials
- major pests includes **white grubs of snoutbeetle (*Metapocyrtus (Trachycyrtus) spp.*)**



Snoutbeetle

Damage of white grubs on strawberry



Stunted growth, wilting, yellowing, death of seedlings



Citrus

- Widely grown in the Cordillera and other regions in the country
- Fruit production is under open field however, plant material production should be done under screenhouses
- Different varieties suitable for different agro-climatic condition and preferences of growers are being propagated
- Major pest affecting plant material production is **snoutbeetle (*Metapocyrtus (Trachycyrtus) spp.*)**.



Snoutbeetle

Damage of adult beetle on citrus



Chew leaves and shoots



Feeding results to defoliation and stunting of infested seedlings

-feeds on leaves/shoots

Damage of adult beetle on citrus



**Uninfested
budded seedling**



**Chew emerging shoots of newly budded
seedling – results to rebudding of sdlg**



**– feeds on emerging shoots of budded
seedlings**

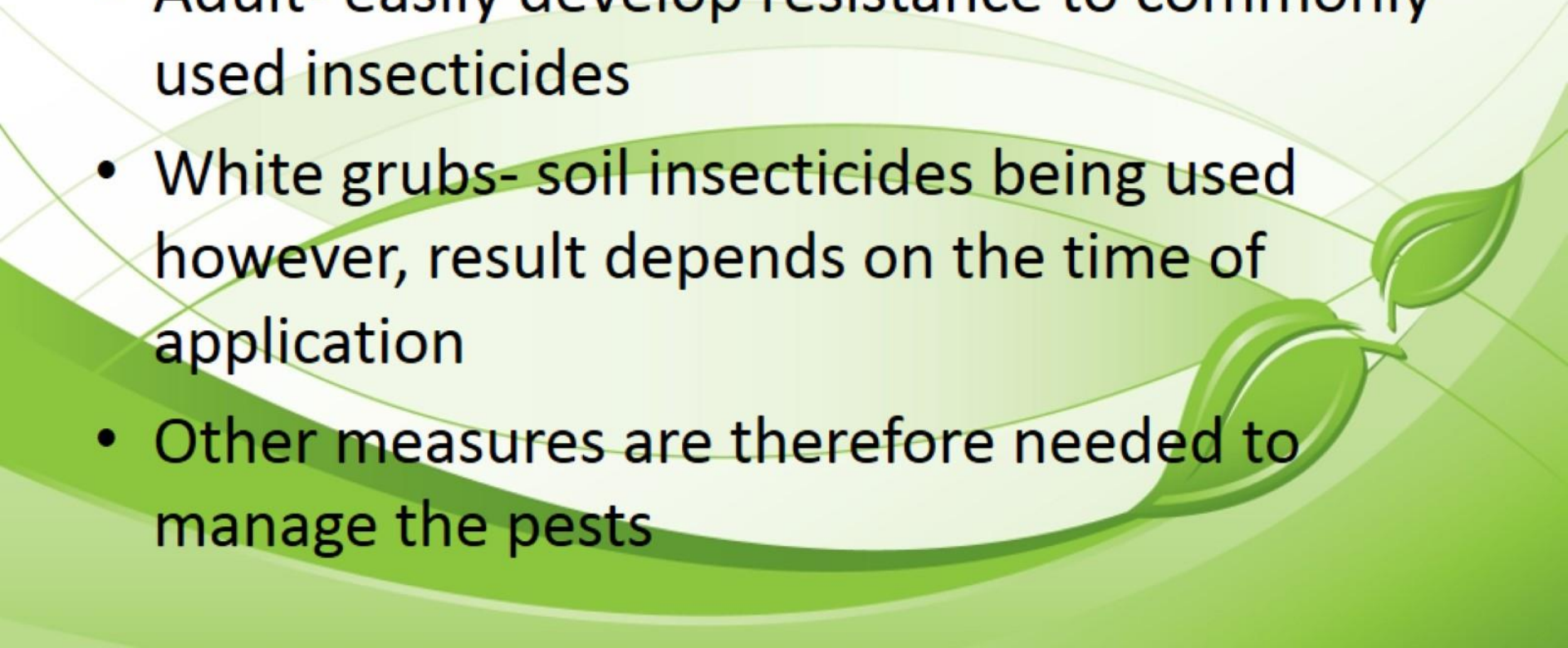
Damage of white grubs on citrus

Grubs feed on the roots and bark covered with soil

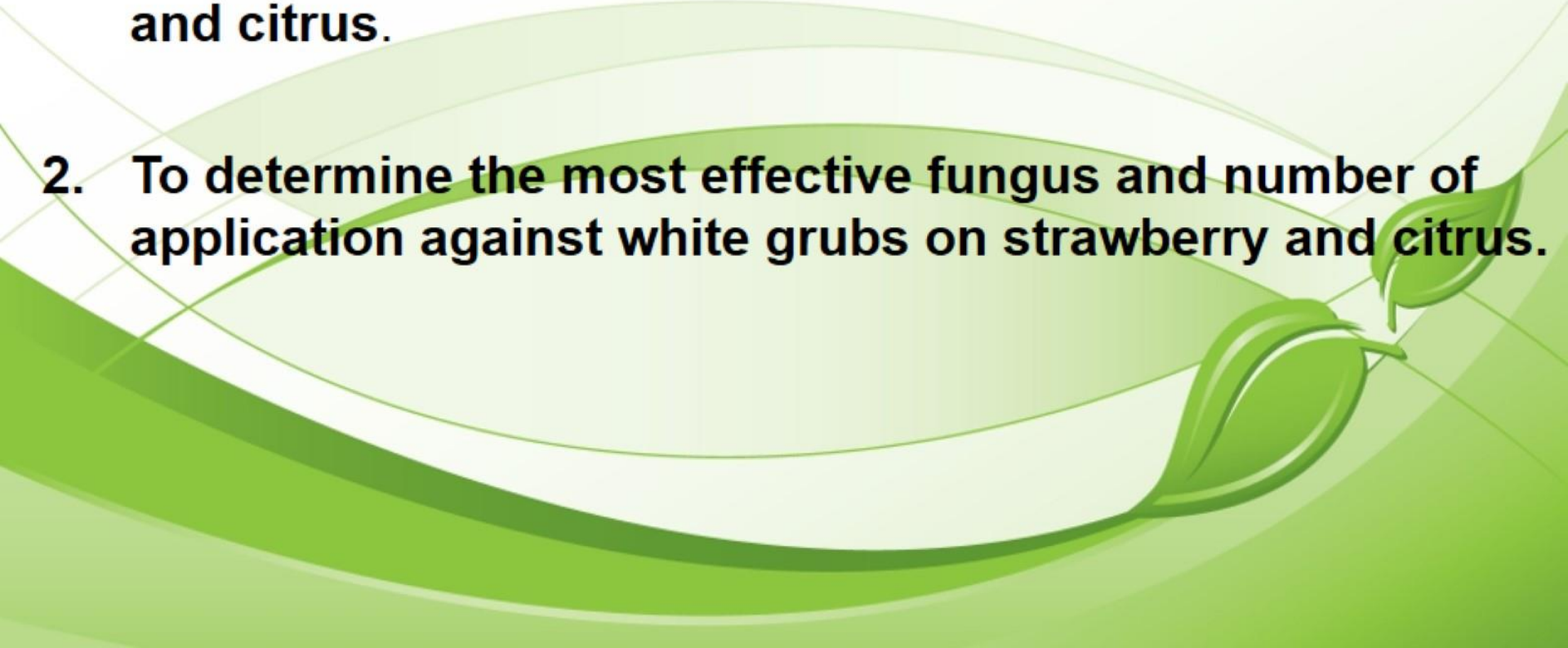


– feed on root system

Control of snoutbeetle

- Mainly use insecticides for adult and immature stages
 - Adult- easily develop resistance to commonly used insecticides
 - White grubs- soil insecticides being used however, result depends on the time of application
 - Other measures are therefore needed to manage the pests
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Objectives:

1. To evaluate *Metarrhizium anisopliae* and *Beauveria bassiana* as biological control agents against white grubs (*Metapocyrtus (Trachycyrtus) spp.*) on strawberry and citrus.
 2. To determine the most effective fungus and number of application against white grubs on strawberry and citrus.
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- A decorative graphic of a green leaf with a stem and two smaller leaves, positioned in the bottom right corner of the slide. The background features light green wavy lines.

Methodology



2 fungi evaluated:



1. *Metarrhizium anisopliae*



2. *Beauveria bassiana*

Test insect:

White grubs of Snoutbeetle



Experimental plants:

Study 1. On Strawberry

Study 2. On Citrus

MASS PRODUCTION OF DIFFERENT ISOLATES OF *METARRHIZIUM* and *BEAUVERIA*



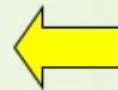
Stock culture
BPI, Manila



Fungus on oatmeal agar



Fungus on corn kernels



Fungus for application

Fungal treatments evaluated (for strawberry and citrus)

Treatments

Fungi/Fungal isolates

F₀

Control

F₁

M. anisopliae V (MA-V)

F₂

M. anisopliae RB (MA-RB)

F₃

M. anisopliae SB (MA-SB)

F₄

M. anisopliae RRB (MA-RRB)

F₅

B. bassiana

Fungal application

- soil application 1 week before transplanting strawberry runners and citrus rootstock seedlings

Fungal Treatments for 2 trials (for strawberry and citrus)

Trial 1:

Factor A: 5 fungal isolates

Factor B: Number of application (A)

A₁ - 1 application

A₂ - 2 application

A₃ - 3 application

Trial 2:

5 fungal isolates

Evaluation Trials

Study 1. White grubs on **strawberry** under nursery and field condition

Study 2. white grubs on **citrus** under nursery condition

Study 1.

Evaluation of *Beauveria bassiana* and *Metarrhizium anisopliae* against white grubs
on strawberry



STRAWBERRY TRIALS



Greenhouse trial



Field trial

Sample plants planted and maintained





Data collection

STUDY 2.

**Evaluation of *Beauveria bassiana* and
Metarrhizium anisopliae against white grubs on
citrus**





Prepared and applied fungal treatments



Prepared citrus rootstock seedlings



**Transplanted seedlings
1 wk after fungal application**

Maintain citrus rootstock seedlings





Sample seedlings being maintained and monitored

DATA COLLECTION



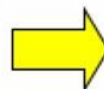
Infested seedlings Severely infested seedlings (mortalities)



SAMPLING OF POPULATION AND ROOT DAMAGE



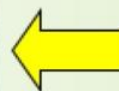
Sample seedlings



Check base of seedlings



Count grubs/pupae, infested seedlings, check root damage



Check roots and soil

Degree of Root damage



Uninfested citrus rootstocks

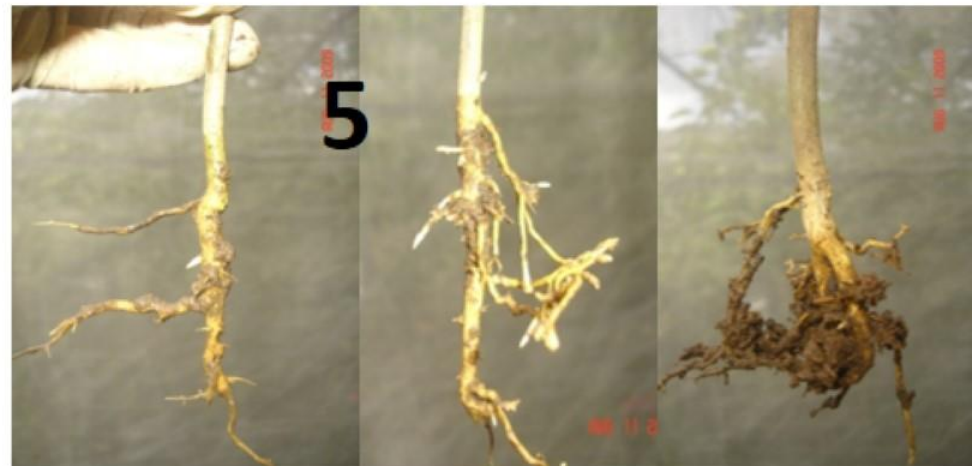


Severely infested citrus rootstock seedlings

Degree of Root damage on buddable citrus rootstocks



Uninfested rootstocks



DATA GATHERED (Strawberry and citrus):

Trial 1

- 1. Population of whitegrubs**

Trial 2

- 1. Growth of seedlings (strawberry)**
- 2. Height (cm) of seedlings (citrus)**
- 3. Population of white grubs**
- 4. Degree of root damage**
- 5. % infested seedlings**
- 6. % seedling mortality**



RESULTS

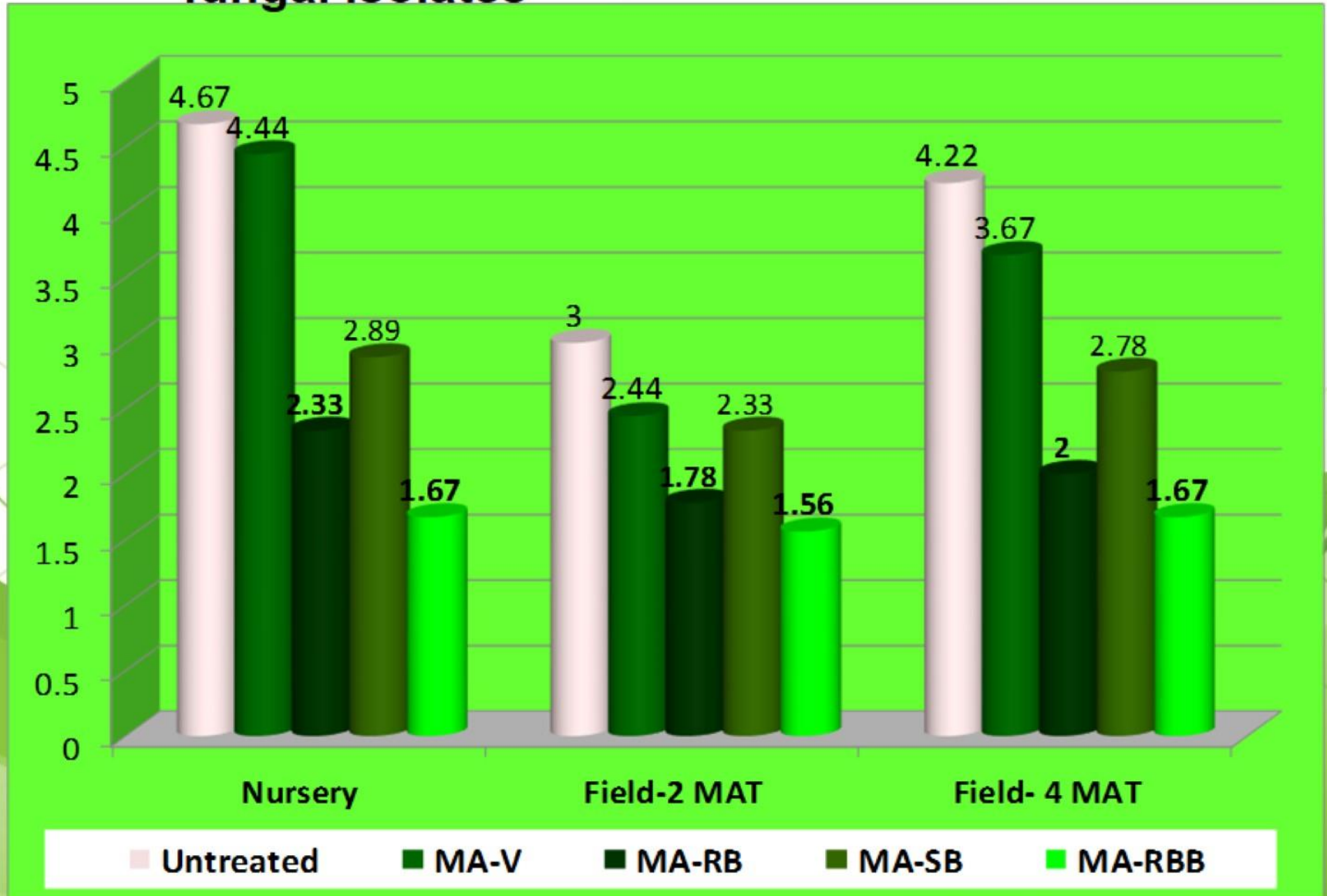
Study 1.

Strawberry

The background features several overlapping, wavy green lines that create a sense of movement and depth. On the right side, there are three stylized green leaves with prominent veins, arranged in a vertical sequence. The overall color palette is various shades of green, from light to dark, set against a white background.

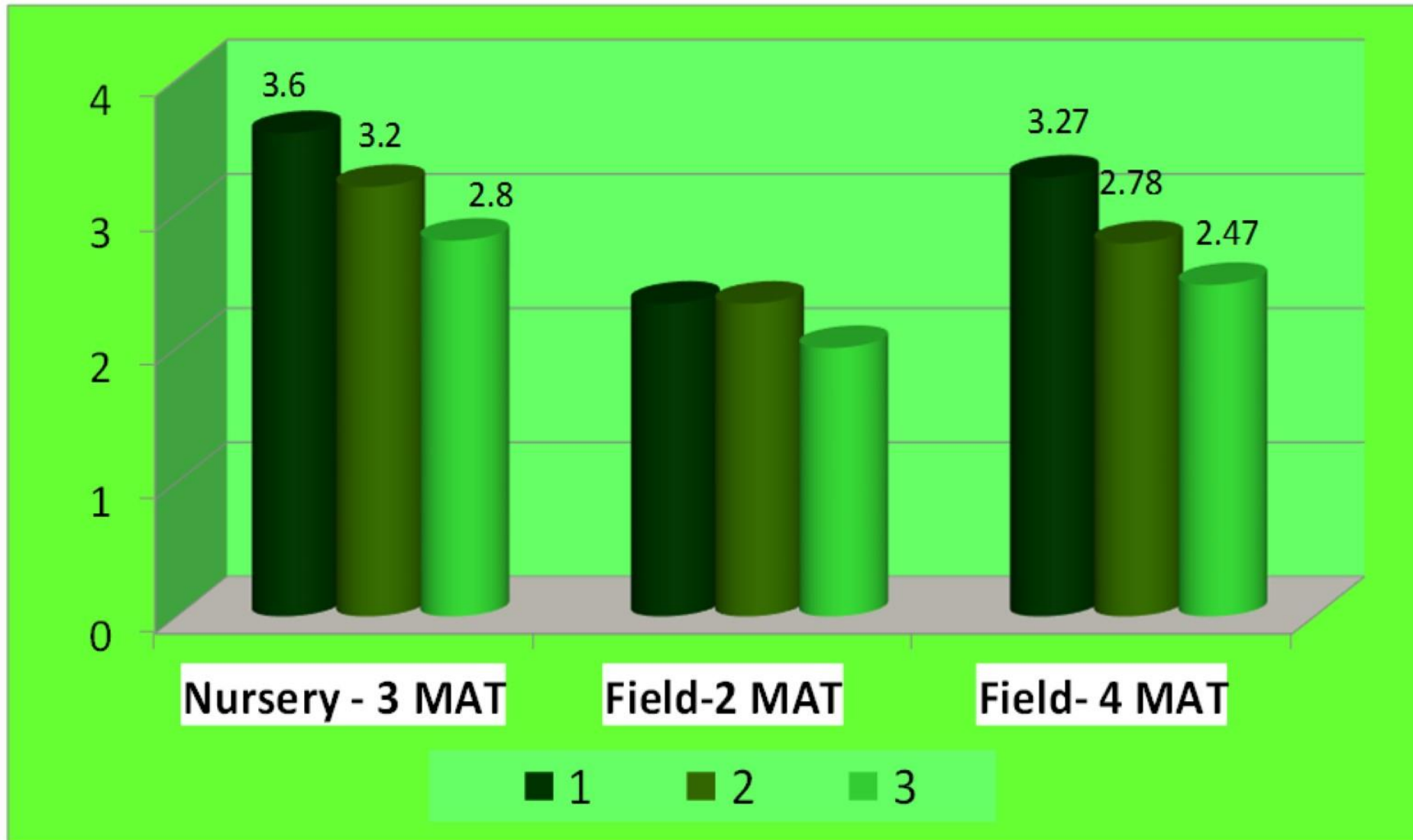
Trial 1

Fig. 1a. Population of grubs on strawberry as affected by fungal isolates



TRIAL 1

Fig. 1b. Population of white grubs on strawberry as affected by number of application



TRIAL 2

Fig. 1c. Growth of strawberry treated with *Metarrhizium* and *Beauveria*

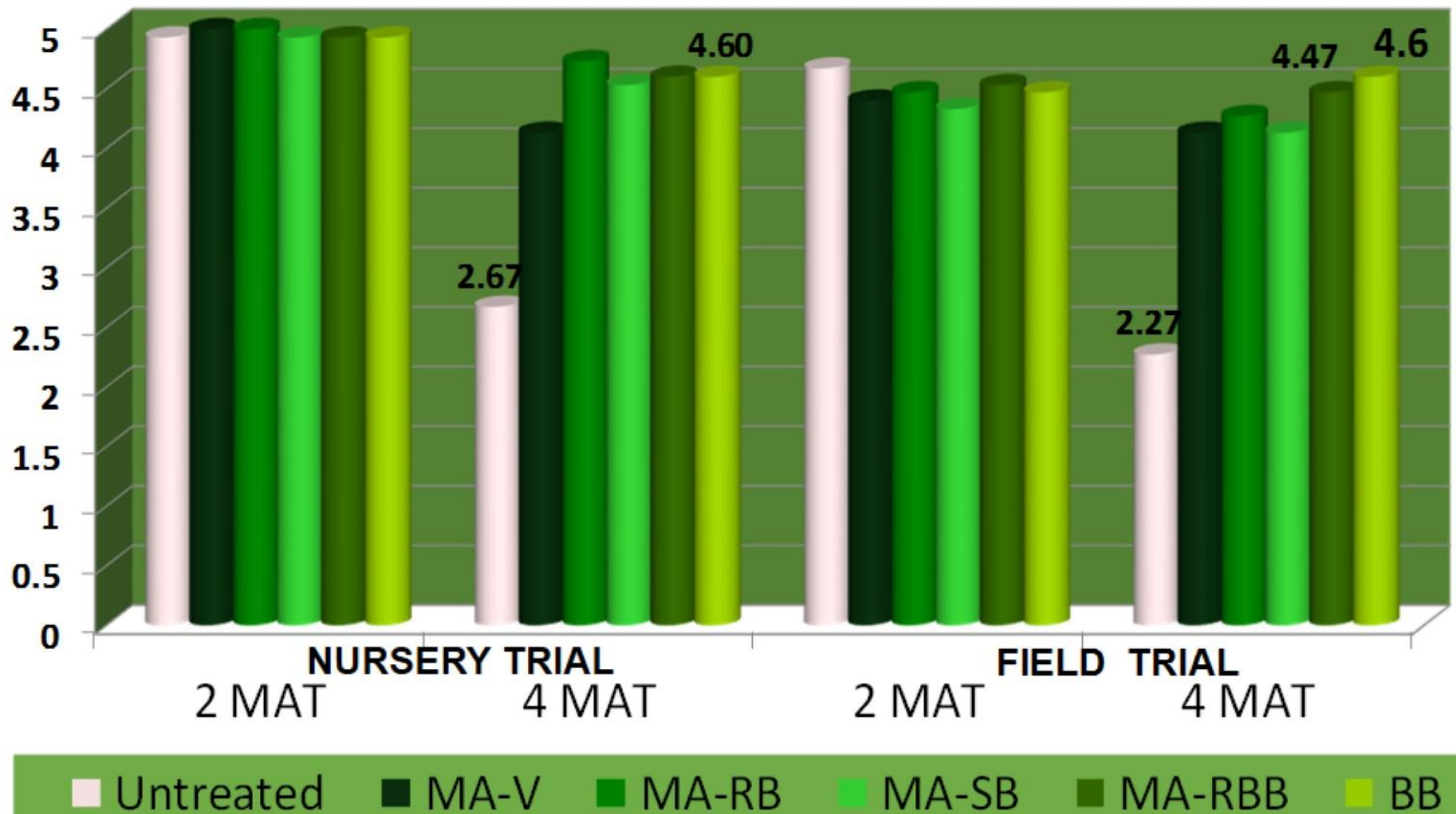


Fig. 1d. Grub pop'n and degree of root damage noted 4 MAT from strawberry treated with *Metarrhizium* and *Beauveria*

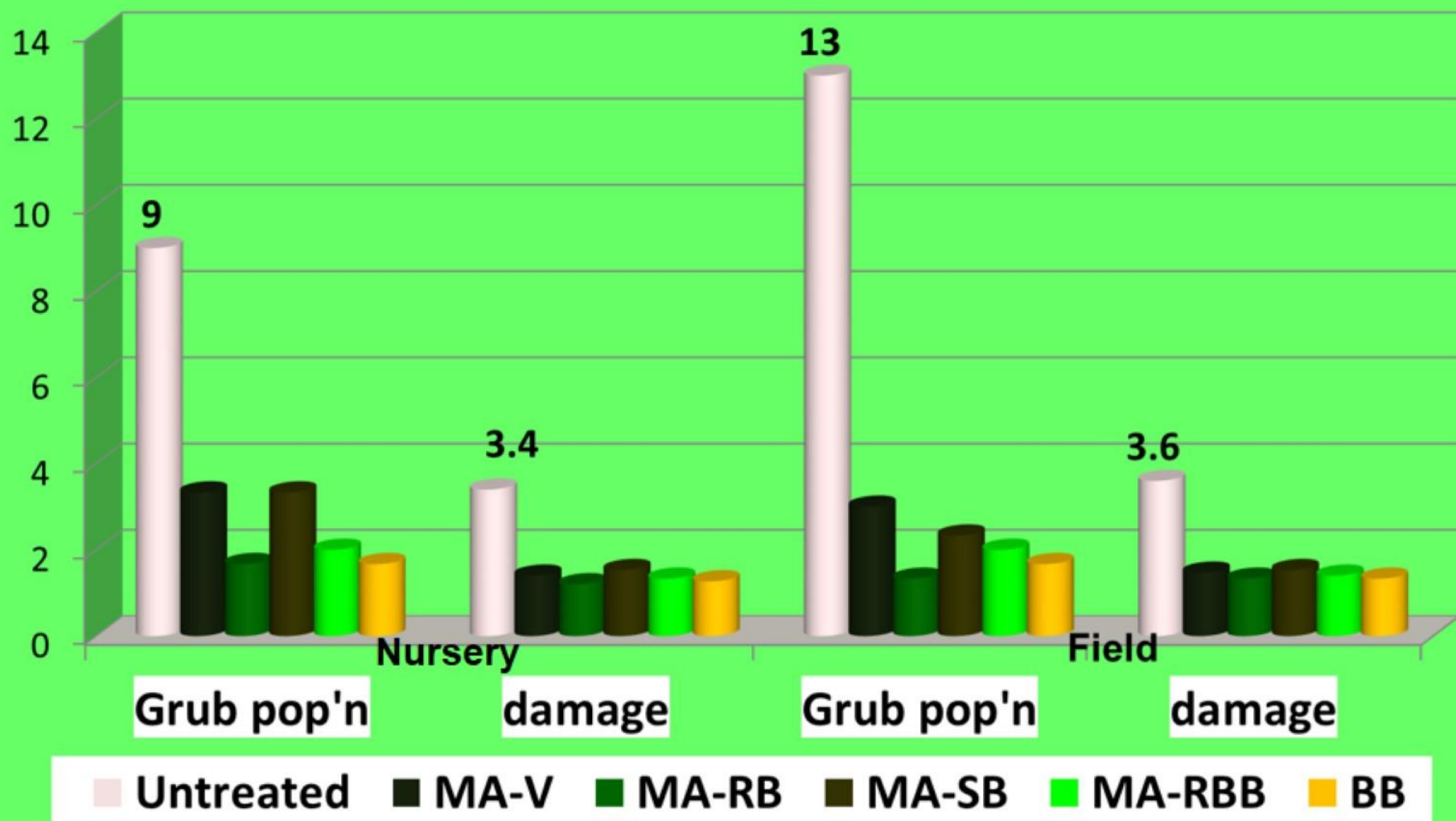
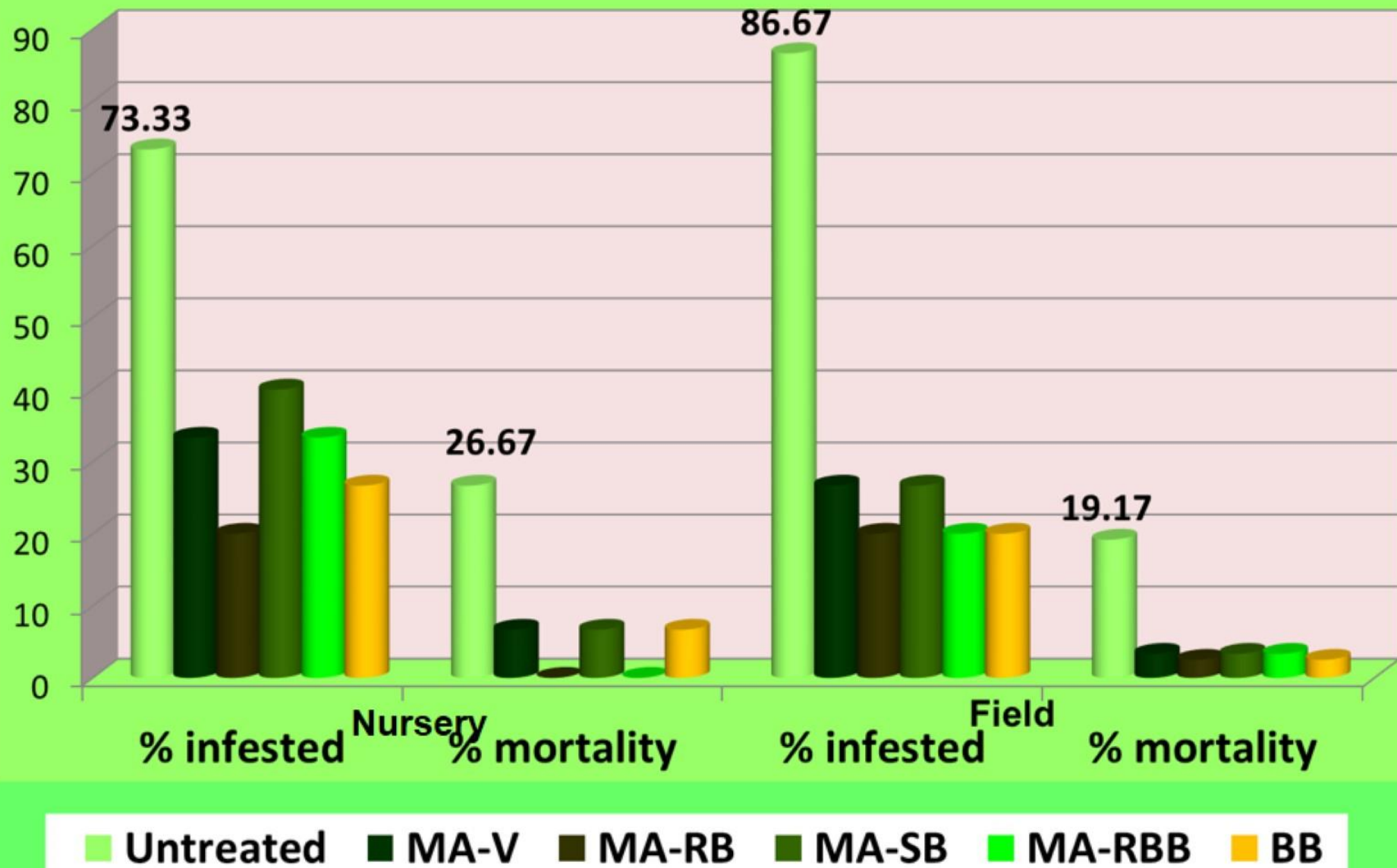


Fig. 1e. Percent infested and percent mortality of strawberry plants treated with *Metarrhizium* and *Beauveria*



RESULTS

Study 2.

Citrus

The background features several overlapping, wavy green lines that create a sense of movement and depth. On the right side, there are three stylized green leaves with prominent veins, arranged in a vertical cluster. The overall color palette is various shades of green, from light to dark, set against a white background.

Fig. 2a. Population of grubs on citrus as affected by fungal isolates (Trial 1)

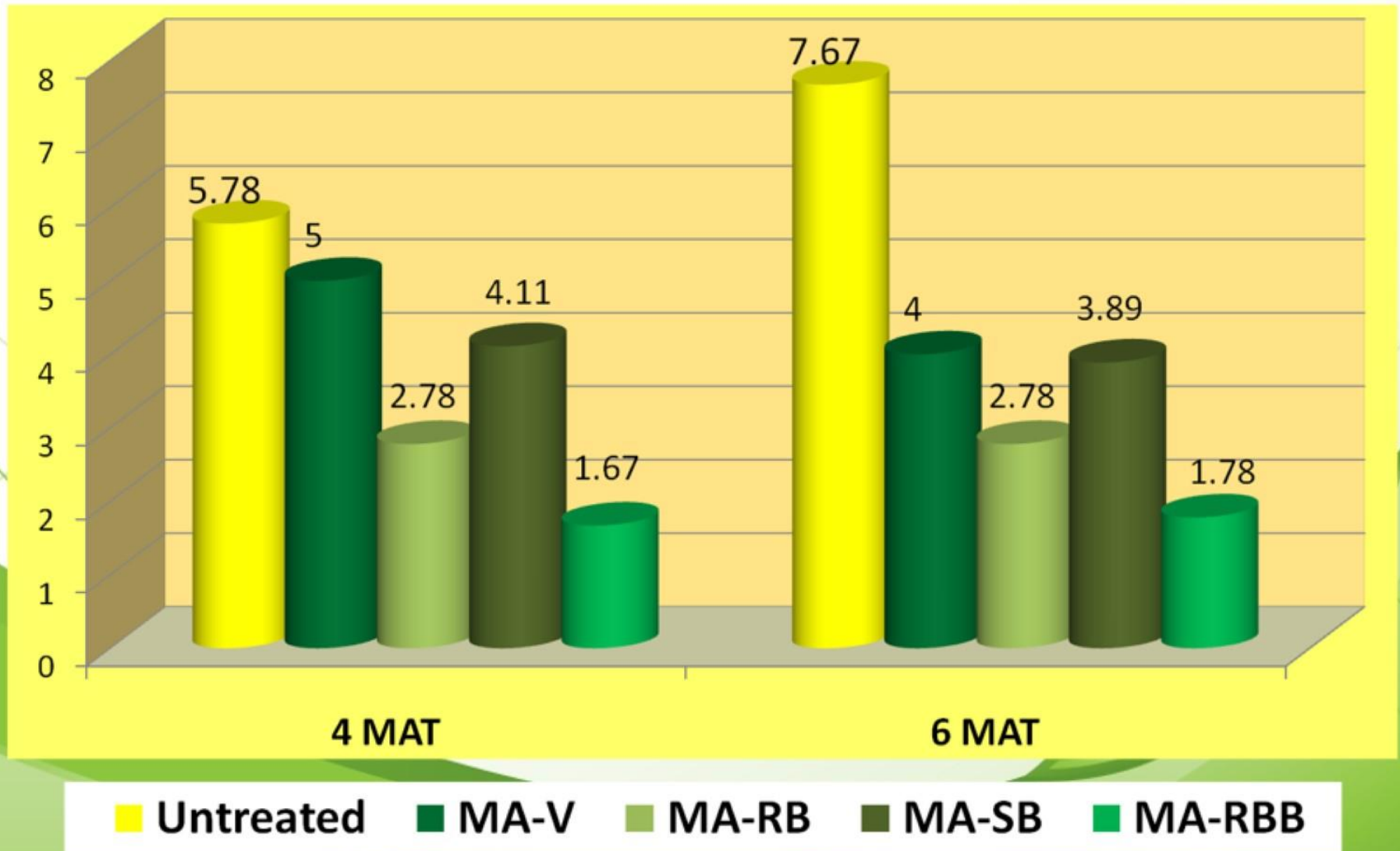


Fig. 2b. Height (cm) of citrus rootstock seedlings treated with *Metarrhizium* and *Beauveria* (Trial 2)

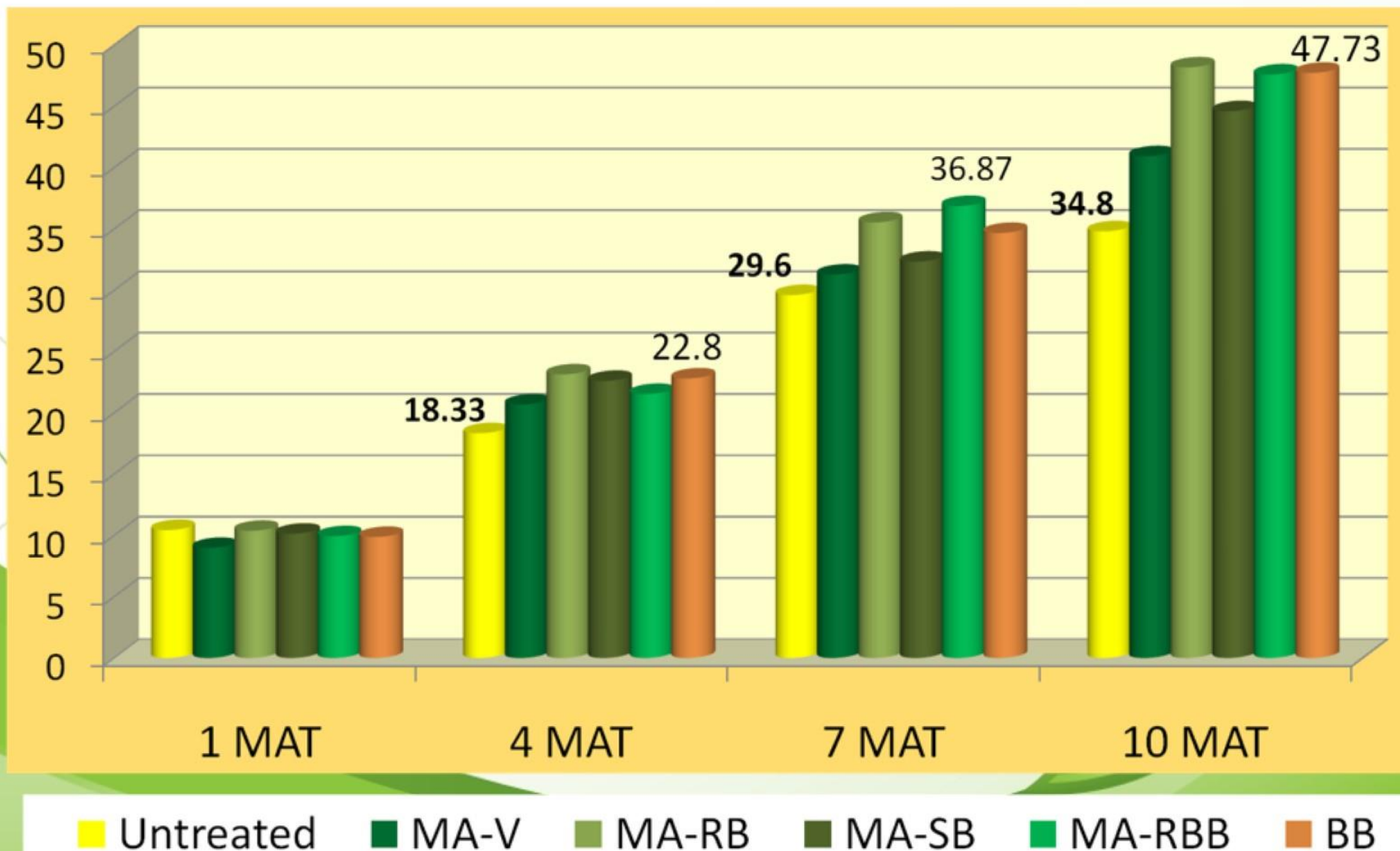
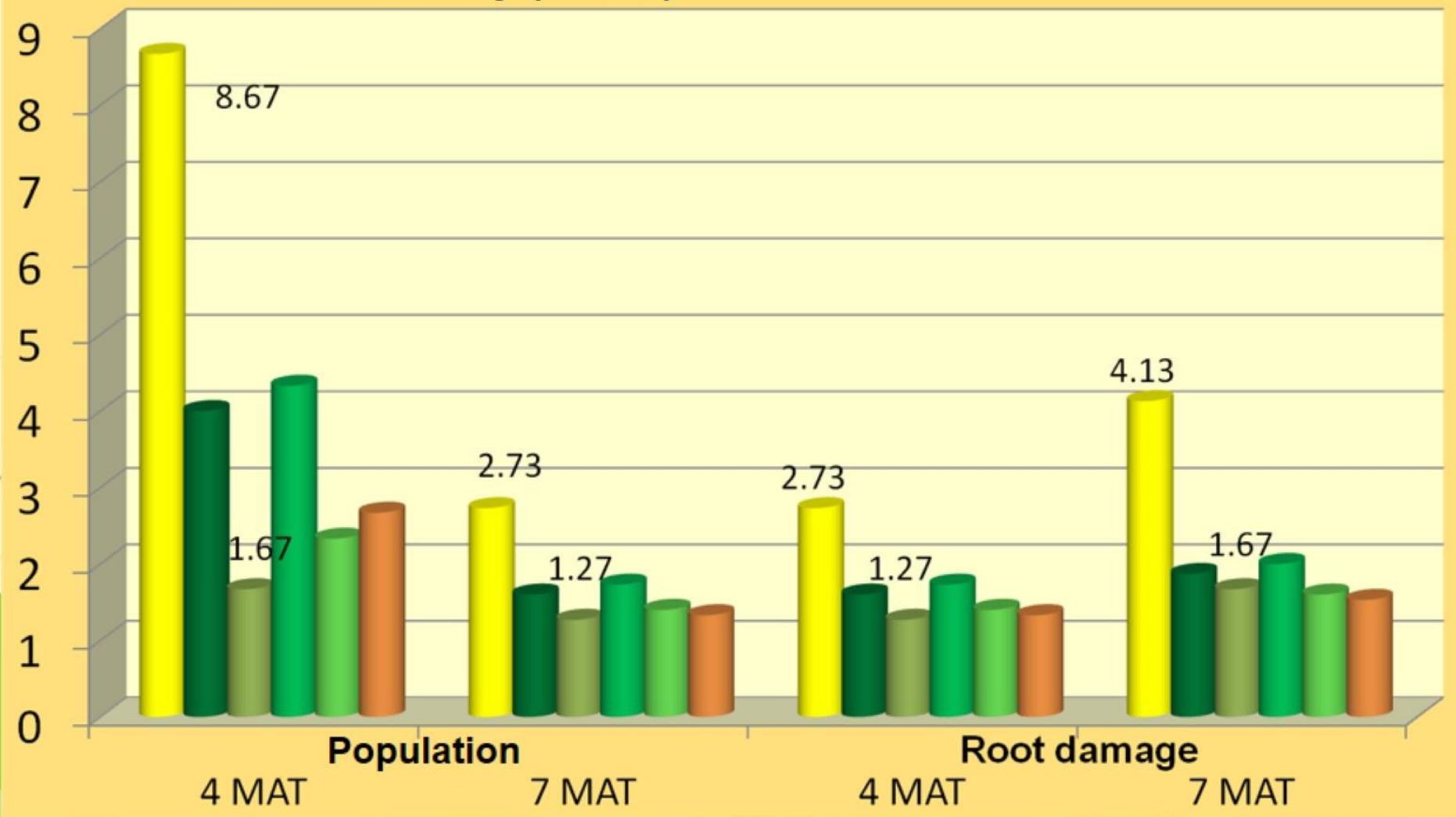


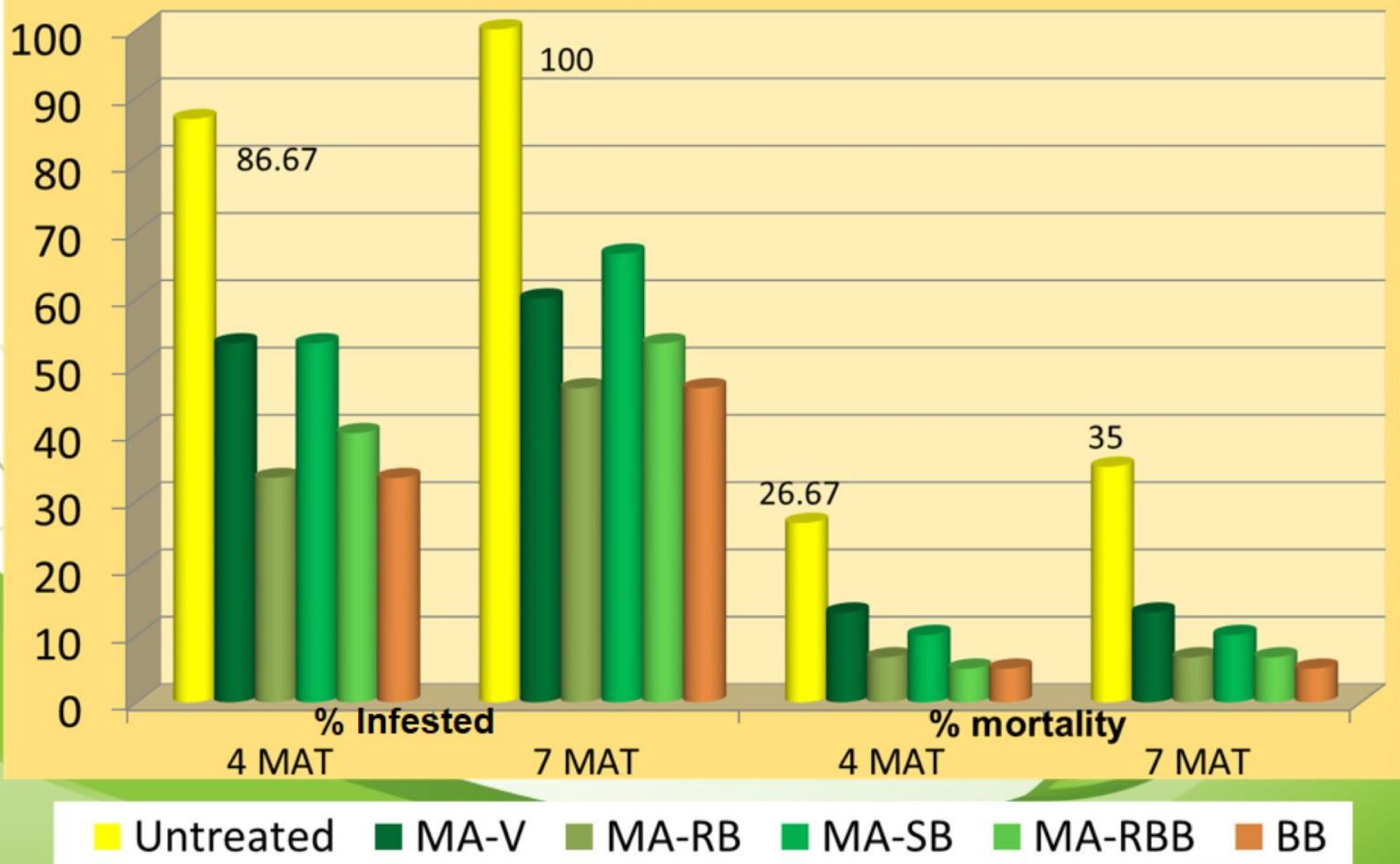


Fig. 2c. Mean population and degree of damage of white grubs from citrus seedlings treated with *Metarrhizium* and *Beauveria* under nursery (Trial 2)



■ Untreated
 ■ MA-V
 ■ MA-RB
 ■ MA-SB
 ■ MA-RBB
 ■ BB

Fig. 2d. Mean percent infested and percent mortality of citrus seedlings treated with *Metarrhizium* and *Beauveria* under nursery (Trial 2)



Effect of *Beauveria* and *Metarrhizium*

- **fungus-treated citrus seedlings are significantly different with untreated seedlings**



lower population of immature stages



**Mild to moderately damaged roots
Less number of infested seedlings**



**Well developed roots
Better growth of seedling**

Summary

- Snoutbeetle (*Metapocyrtus (Trachycyrtus) spp.*) is a destructive pest of strawberry and citrus
- White grubs are more destructive on strawberry and adult and white grubs on citrus
- *Beauveria bassiana* and *Metarrhizium anisopliae* could reduce population and damage of snoutbeetle and *Beauveria* and MA-RB and MA-RBB are more effective against the pest
- Both fungi applied 1 week before transplanting and 1 to 2 monthly applications 1 month after transplanting significantly reduce population damage of white grubs

- Production of 1000 asexually propagated citrus seedlings using integrated management practices against white grubs could result to a net income of P43,250.00 and ROCE of 154%.

Recommendation

For better management of snoutbeetle, the fungus as BCA should be integrated with the following practices:

- Use clean planting materials. Check eggs or grubs on the roots of strawberry runners and citrus seedling before pricking or transplanting to prevent early infestation and damage.
- Use uninfested soil media for propagation of planting materials. Avoid using soil/soil media from infested area or pots to avoid early infestation of the pest.

- For strawberry, area for fruit production should be properly plowed to expose possible immature stages (eggs, grubs, pupae) to predators and sunlight.
- Apply *Metarrhizium* or *Beauveria* as biological control agent wk before transplanting and 1 to 2 follow-up application/s 1 month after transplanting to augment first application
- Both fungi could be used under conventional and organic production system.

- Regularly monitor plants and snoutbeetle. Monitor population and damage of adults on the leaves and shoots and check symptoms of grub infestation for early management of the pest. Check roots of wilting or yellowing plants.
- Properly dispose infested plants or soil to prevent further infestation especially under nursery where continuous production of planting materials is being done.



**THANK YOU
VERY
MUCH!!!**