

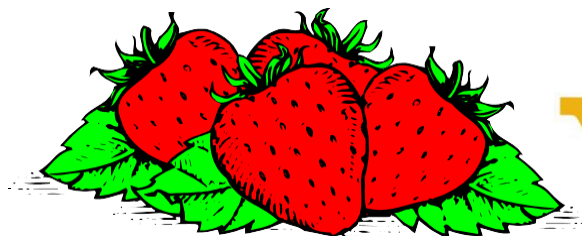
Epidemiology and Management of Strawberry Anthracnose

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All parts of strawberry plant can get disease; root, crown, petiole, runner, fruit



Anthracnose Fruit Rot
(Colletotrichum acutatum)



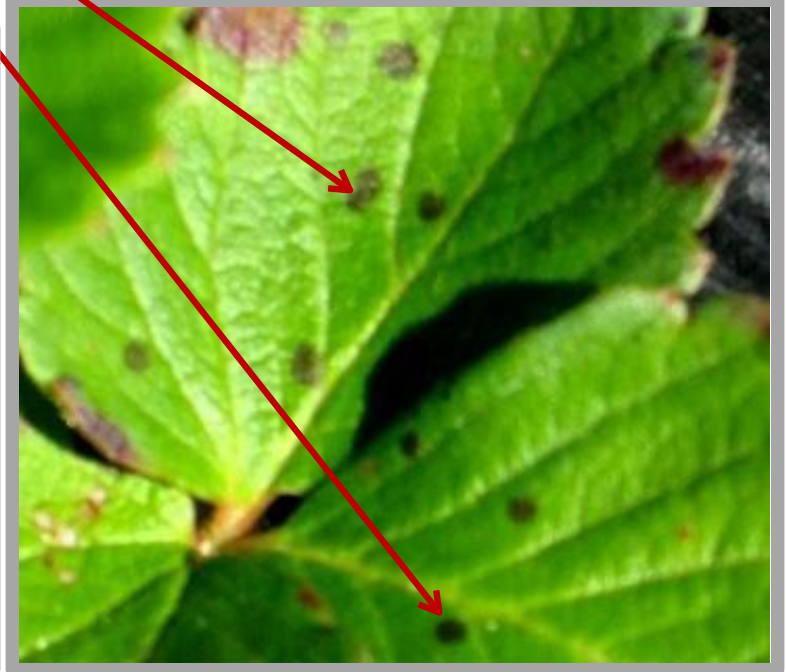
Profuse sporulation
under high humidity



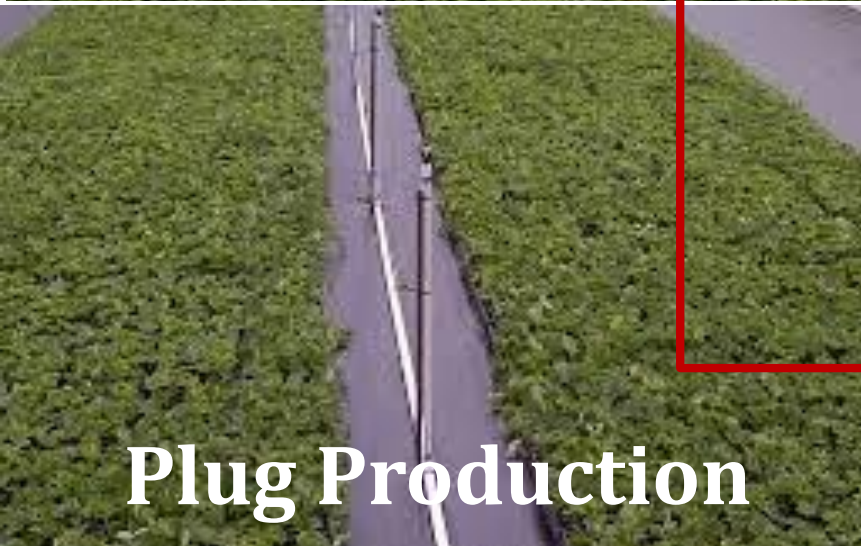
Anthracnose Crown Rot
(C. gloeosporioides)

Symptoms under high inoculum load

- Quiescently infected tips normally express symptom during plug production under mist
- Plants are not establishing in the field uniformly
- black irregular lesions on leaf
- Black lesion on runner and petiole



Strawberry Plant Supply



1. Clonal propagation; may keep and bring diseases with transplant supplies
2. Many of these diseases can be latent/hidden enemy
3. Shows up under favorable weather or plant maturity

What we know/what should we do?

- Multiple and longer plant multiplication cycles can occur in strawberry nurseries
- Pathogen can be rain splashed from many alternative hosts and infect plants without showing any symptom
- Plug production phase is relatively short (4-6 weeks) and the risk is relatively low
- Although very challenging, evaluation of tips and plug plants for latent infection, and sharing the information with fruit growers may help in taking the right decision

Epidemiology of strawberry anthracnose

- There are similarities in life style of both groups that cause predominantly fruit rot or crown rot
- Crown rot group is higher temperature loving compared to fruit rot group
- Nursery plants in eastern NC can get more infection with crown rot group than western NC
- Both can rain splashed to healthy plants from alternative hosts around
- Fungicide sensitivity of two groups are different
- Fungus can develop resistance against most effective products (QoIs)

Planning based on facts

- Growing plants in outdoor environment may require fungicide application at all production stages
- Knowing the name of the products used in previous stage would help rotating products
- Free flow of information is essential
- Clean plant supply frame work needs to be strengthened that will allow accessing previous information especially fungicide application
- This approach should help minimizing use of fungicides during fruit harvest

Know ahead of time what can happen (blossom blight)



Quantification of *Colletotrichum acutatum* Quiescent Infection on Strawberry Foliage by Real-time PCR to Predict Field Anthracnose Incidence



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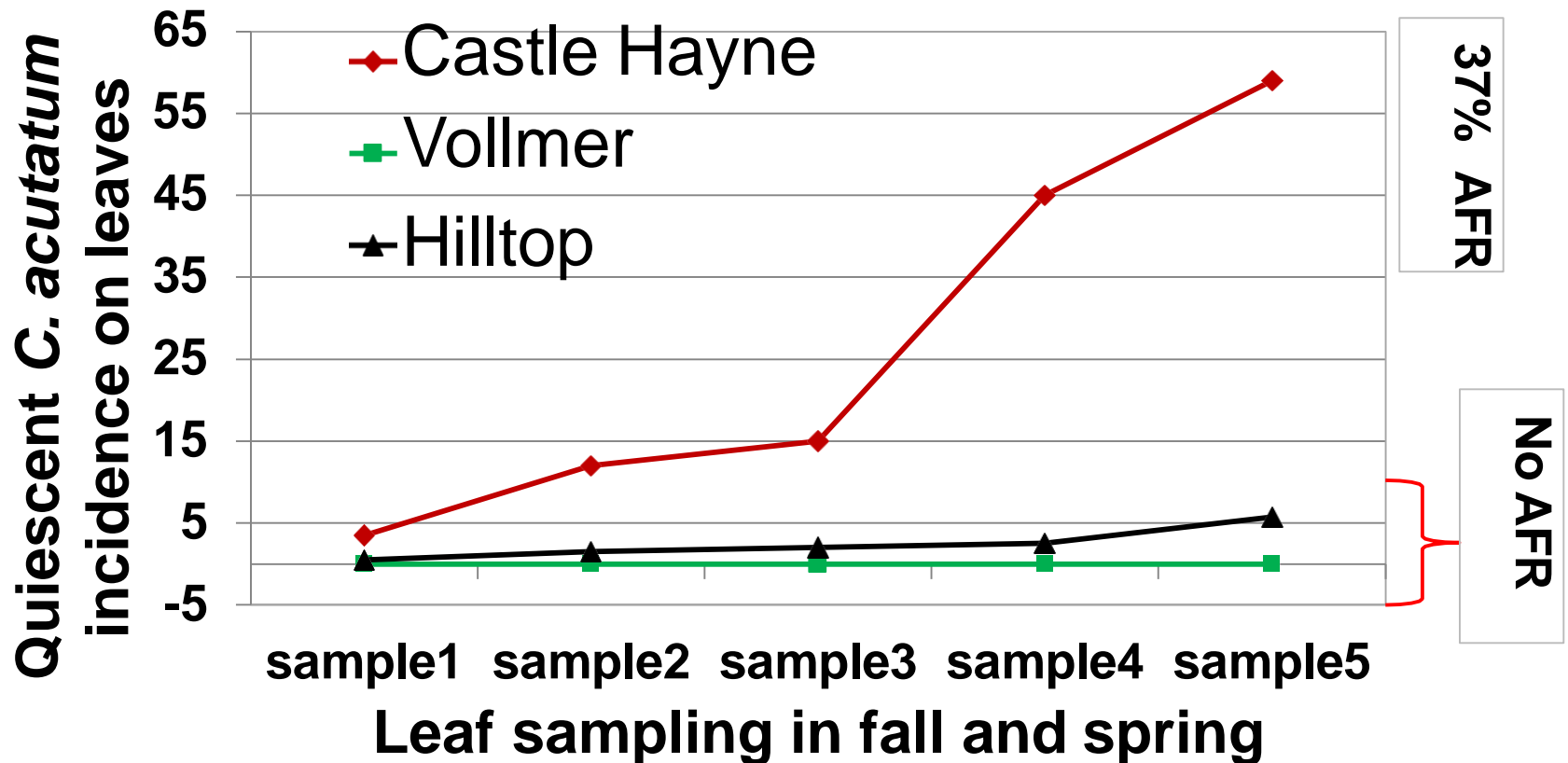
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California Strawberry Commission Production Research Report: 2011

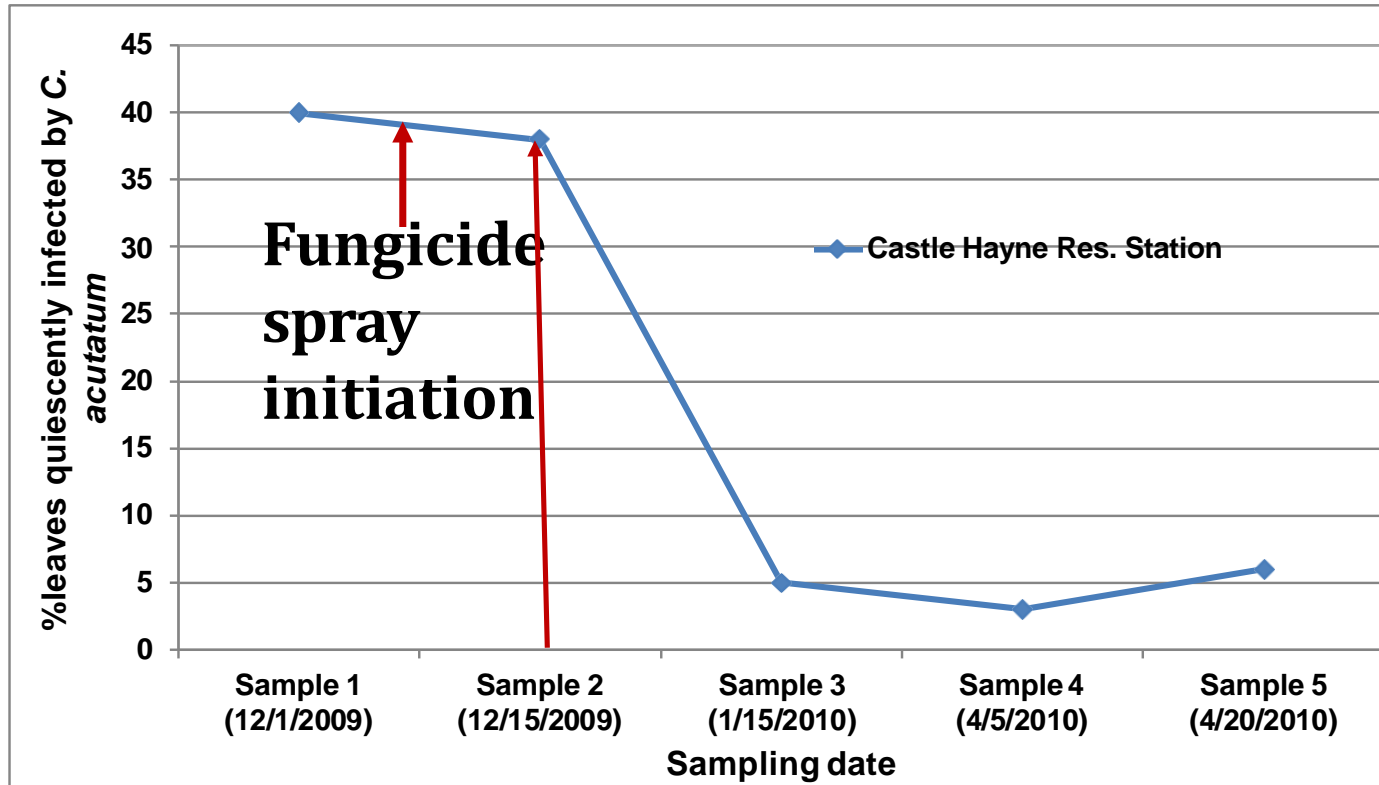
SUMMARY

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AFR prediction based on foliar quiescent infection



Reduction of latent infection due to fungicide program



Ensuring effective spray schedule

- Most effective group of fungicides (QoI/Strobis-FRAC 11) are most prone to resistance development
- It is possible that plants were sprayed with some kind of products, you need to know that
- So, you can rotate with different chemistries
- If nursery/plug facility used QoI twice within a year, you may not want to use the same
- If Pristine fails, Merivon is not a replacement as both are (7+11)
- Bring Multi site Captan or Thiram followed by Miravis: Pydiflumetofen+Fludioxonil (7+12)



Healthy root system (left) with many white roots and a healthy network of fibrous roots. Roots affected by Black root rot (right) have a poor fibrous root structure, are black or have many brown lesions, and take on a "rat-tail" appearance

Approach (Organic options for black root rot management)

- Pre-colonize plant root system with beneficial microbes (Terragrow) that will boost plant vigor and keep the harmful microbes at bay
1. Pasteurized planting mix
inoculation with probiotic bacteria
 1. Regular planting mix inoculation
 2. Mustard cover crop
 3. Anaerobic soil disinfestation (ASD)
 4. Non-treated
- replicated
4 times**

Treatment Description (first two plug production stage, 3rd field)

- 1. Non-treated Check (RM+NT+NF);**
- 2. Mustard cover crop (RM+NT+MCC);**
- 3. Regular TerraGrow (RM+TG+NF);**
- 4. Pasteurized TerraGrow (PM+TG+NF);**
- 5. ASD (RM+NT+ASD);**
- 6. Synergistic PM+TG+ASD**

Biofumigation with mustard cover crop/mustard meal



'Caliente' mustard at flowering stage



incorporation in plots

Considerations for Biofumigation

- Select high glucosinolate containing mustard cover crop such as 'Caliente 199' or mustard meal.
- Can provide both microbial and nematode suppression as well as add organic matters into the soil.
- Optimum stage – 50-70% flowering.
- Tissues macerated by flail mower or some other methods followed by immediate (within half an hour) incorporation into the soil.
- cover with plastic tarp to block gas for up to 10 days to obtain the best result.

- ASD on selected plots can be done in 3 steps:

1. Incorporation OM to provide C source to activate soil microbes. Mixing with a walk behind rototiller.
2. Cover the area with oxygen impermeable tarp.
3. In the third step, irrigate the soil to saturation to create anaerobic conditions and stimulate the anaerobic decomposition of incorporated organic material and enhance diffusion of by-products.
4. Accumulation of toxic/suppressive products (e.g. organic acids, volatile organic compounds) will kill pathogenic microbes.

Incorporation of C source (rice bran, mustard meal, grape pomace etc.)



Saturation of beds (under plastic)



Results: California trial

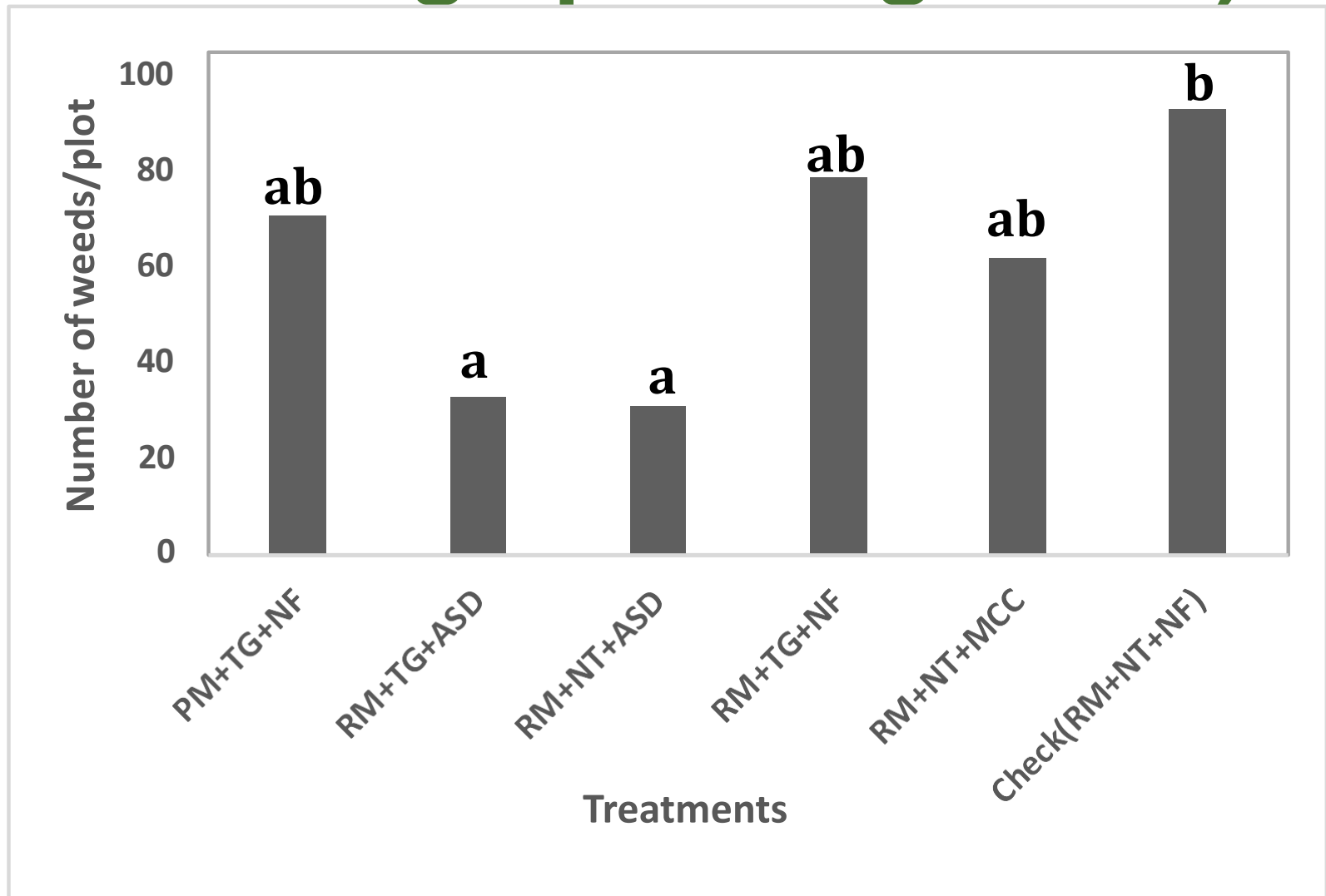


ASD 3 weeks/clear plastic

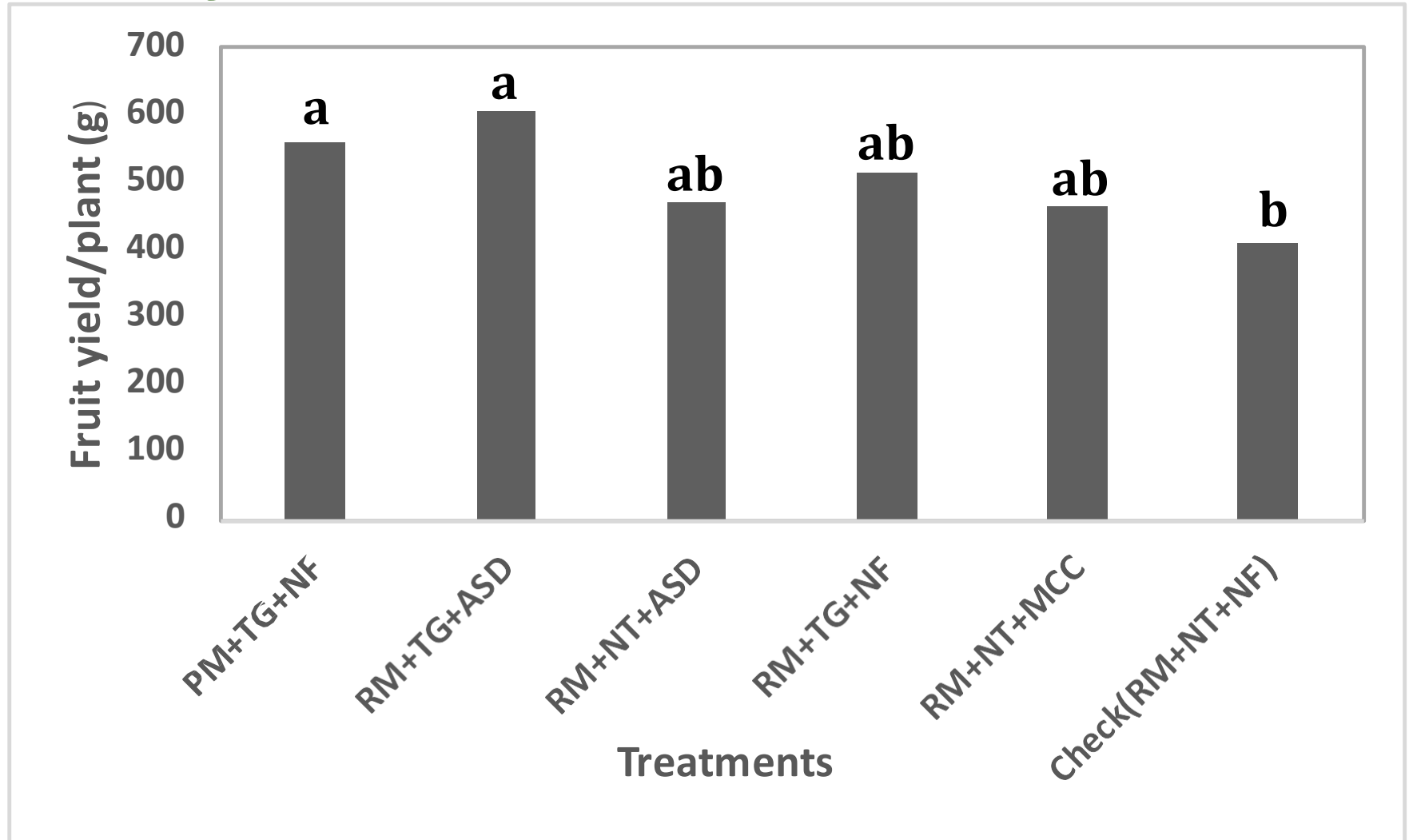
Untreated/clear

9 ton/ac rice bran used in ASD

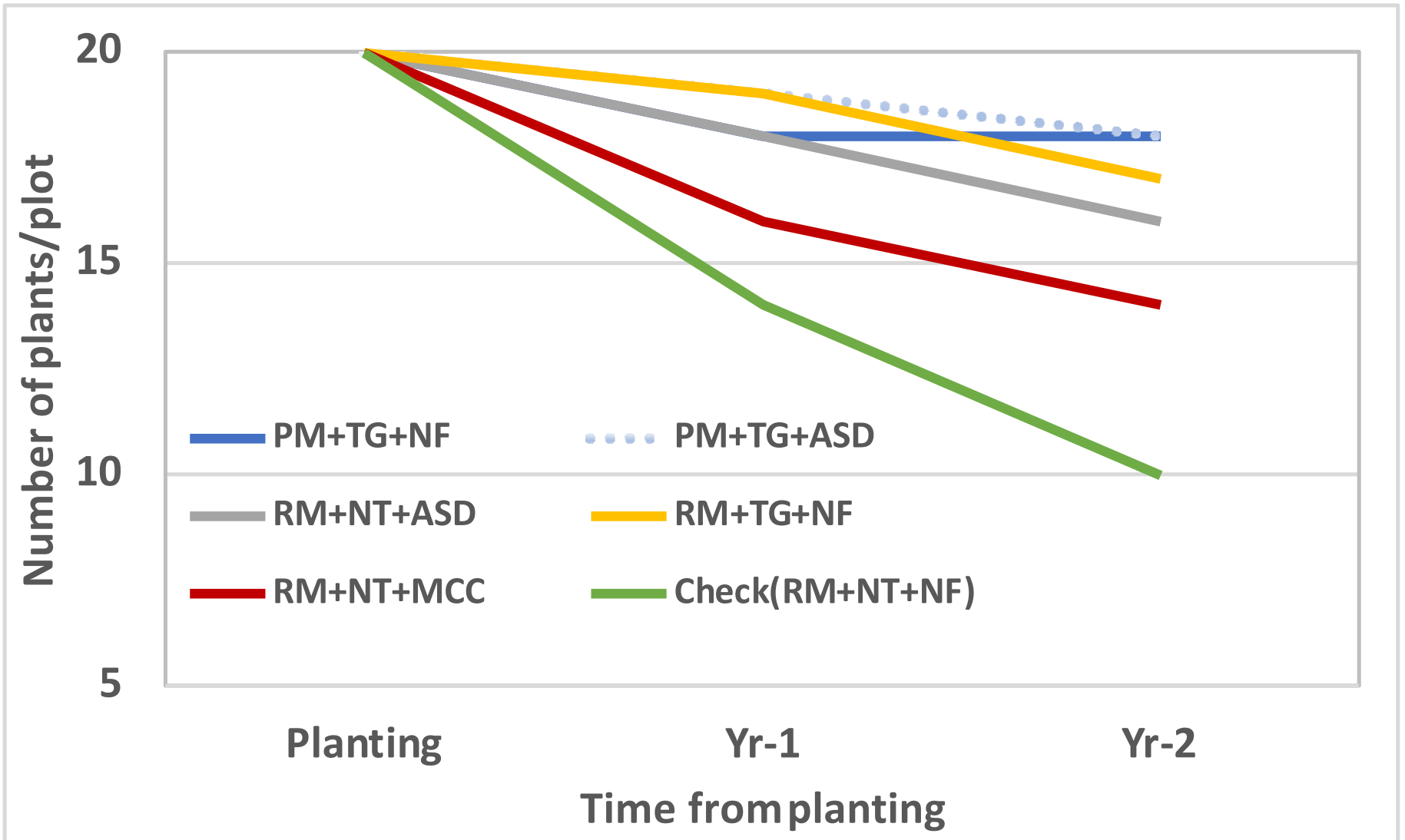
Results from our study (weeds grew through planting holes)



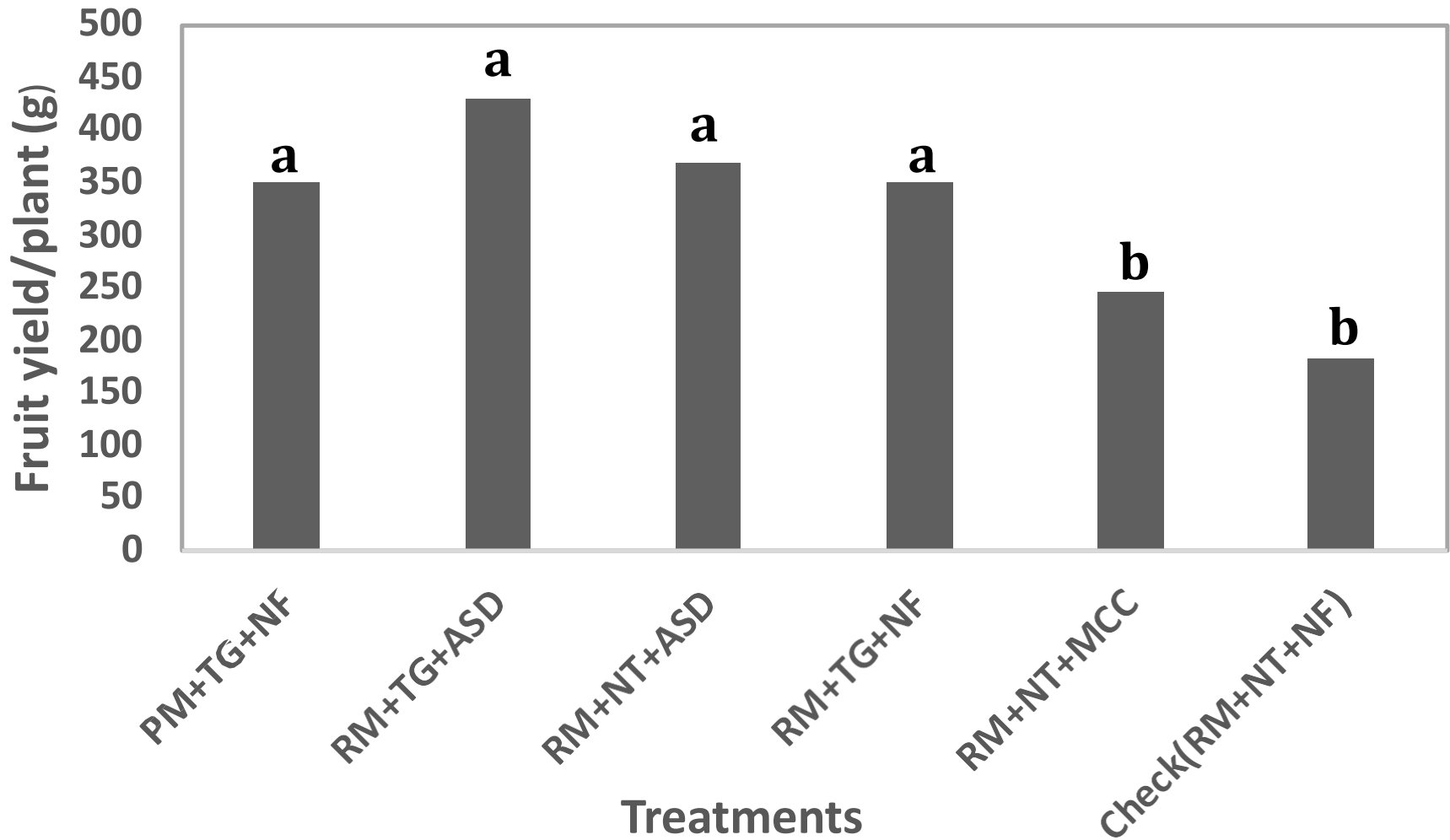
Results from our study (1st year fruit yield)



Plant Mortality in Different Treatments



Second year fruit yield



Plot Description:

- 1) Non-treated
Check(RM+NT+NF);**
- 2) Mustard cover crop
(RM+NT+MCC);**
- 3) Regular TerraGrow
(RM+TG+NF);**
- 4) Pasteurized
TerraGrow
(PM+TG+NF);**
- 5) ASD (RM+NT+ASD);**
- 6) Synergistic
PM+TG+ASD**





QUESTIONS?

THANK YOU!

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