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Specific Endophyte-Infected Grasses For The Aviation Industry Now A Reality

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Specific endophyte-infected grasses for the aviation industry now a reality



Auckland International
Airport Limited

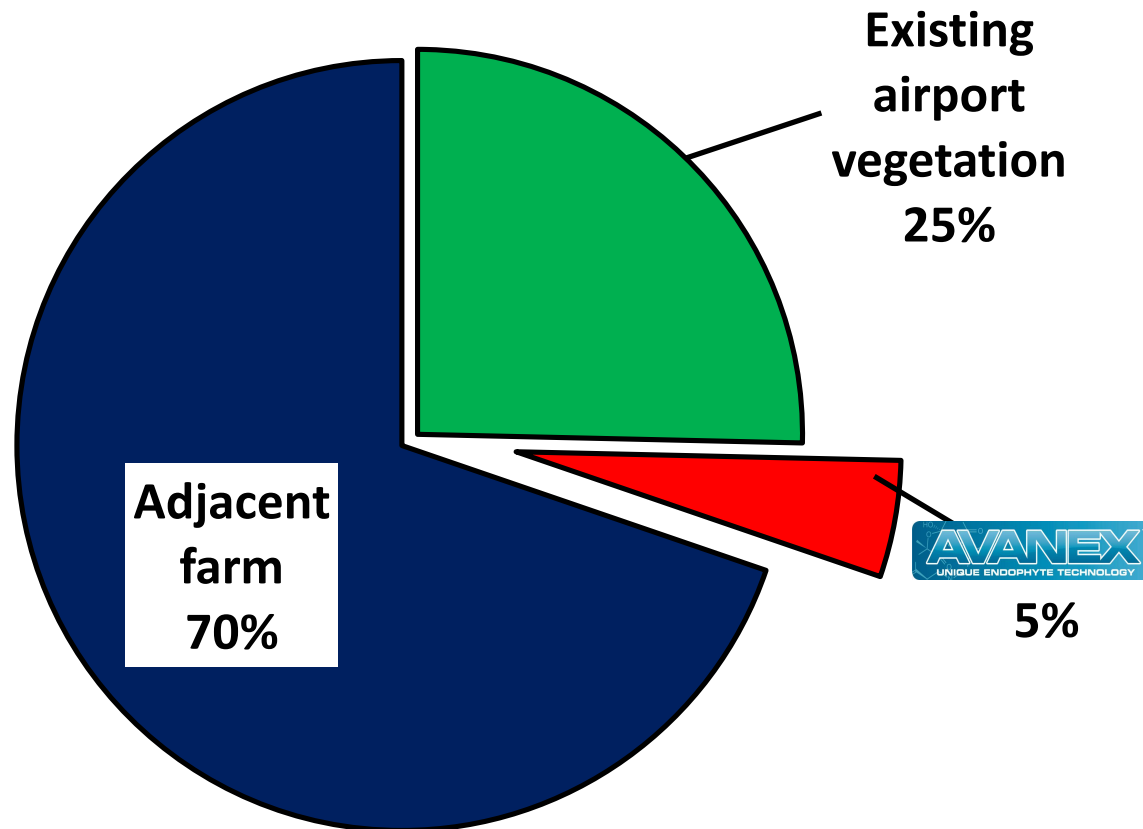
Christchurch
International

airport
Limited

Hamilton Airport

Bird Strike North American Conference Niagara September 2011

Christchurch Airport



THE UNSEEN REVOLUTION

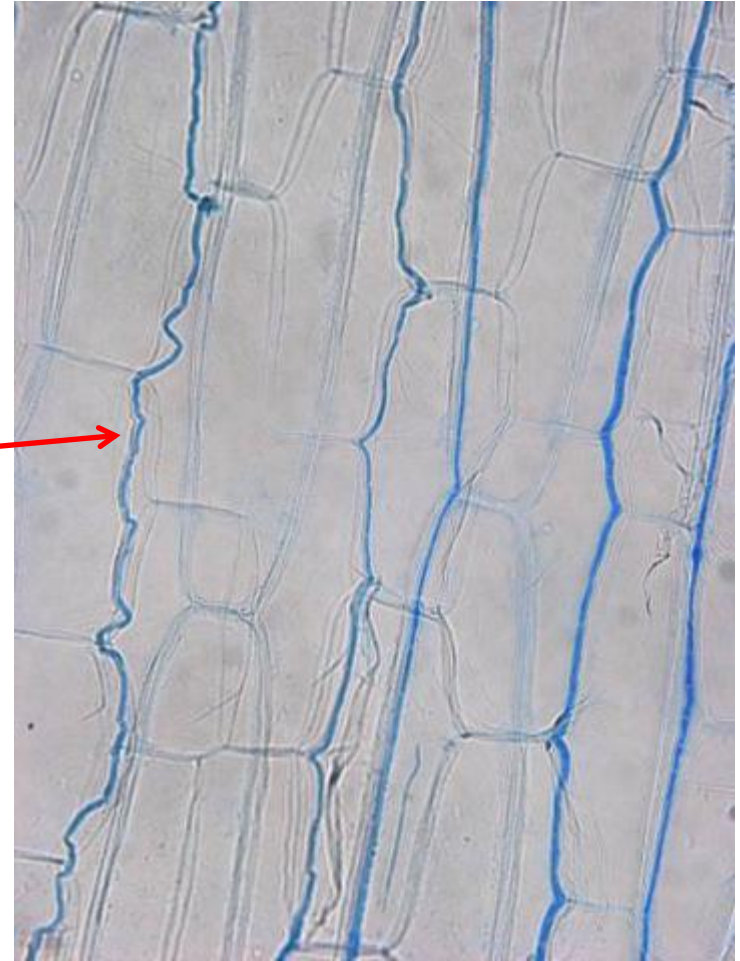
These blue squiggly lines are fungi living within the plant tissue, supercharging the host plant and helping to reshape agriculture.

**An invisible
fungi**

1. What are fungal endophytes?
2. Can they help the aviation industry? (RESULTS) 1996
3. NOT ALL ENDOPHYTES THE SAME?
4. Now it's up to you guys to adopt!

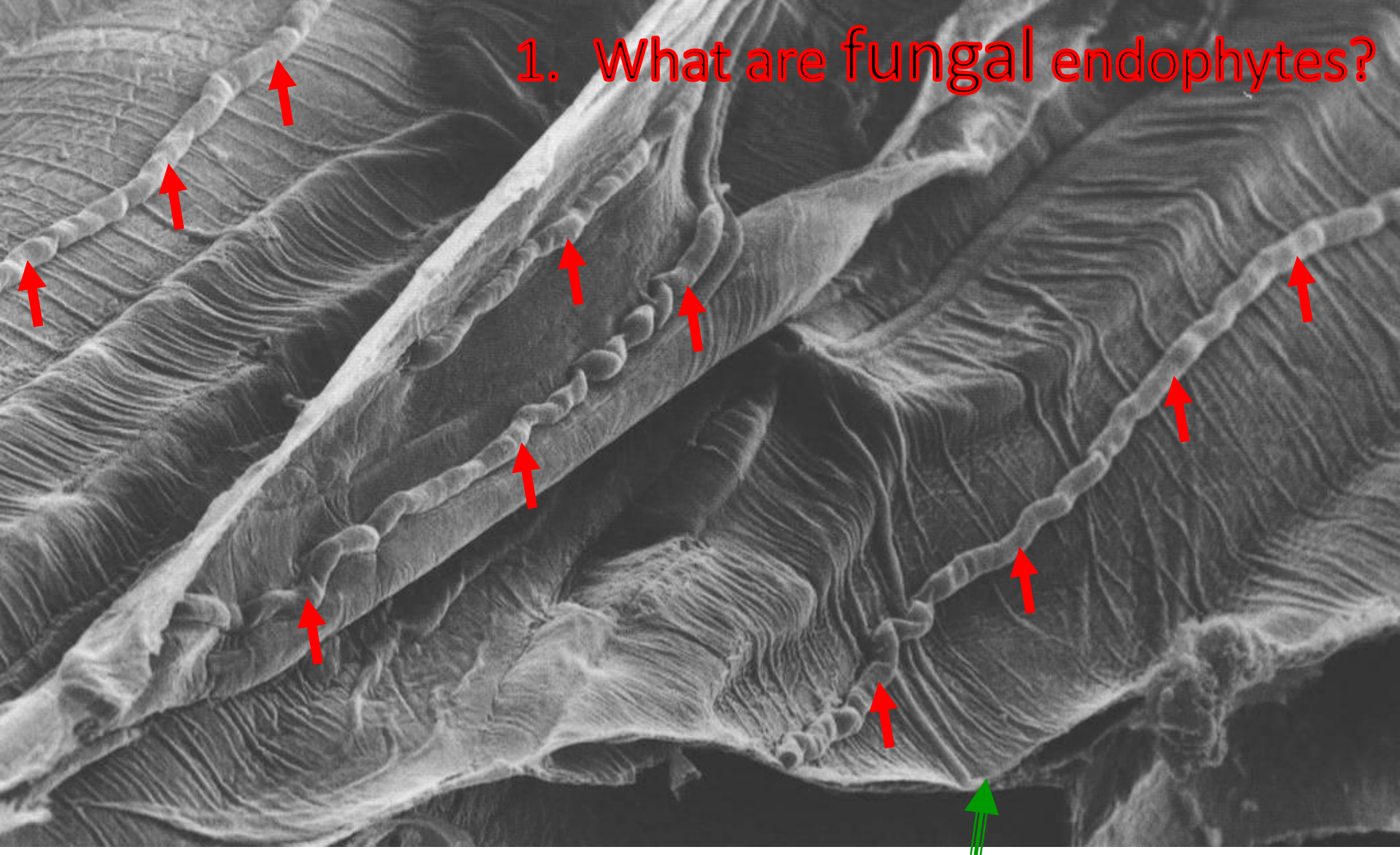
Photo Noble foundation

1. What are fungal endophytes?



Endophyte infected plants are symptomless

1. What are fungal endophytes?



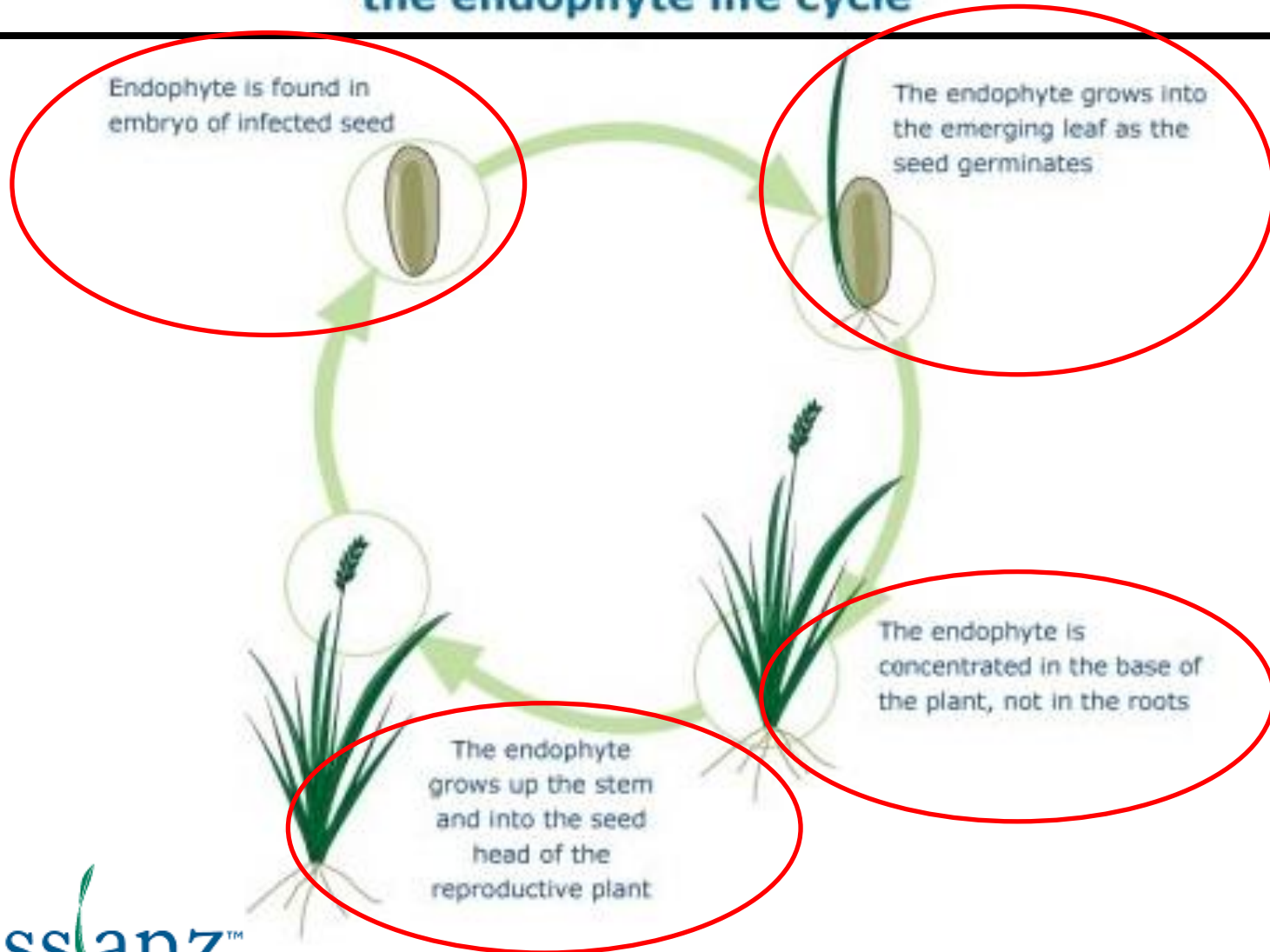
Fungal **endophyte** + Grass Plant

What are fungal endophytes?



Endophyte lifecycle


the endophyte life cycle



Diversity in endophytes


- *Neotyphodium* fungal endophytes are **NOT** all the same, there is considerable diversity in their biochemical profiles.
- Our selections have been made from **wild-types world wide**
- AgResearch has the largest collection of grass endophytes in the world
- New Zealand is the recognised world leader in grass endophyte technology and its commercialisation

Basic science

- Understanding the life cycle of *Neotyphodium* endophytes (1980)
- Isolation from grasses and growth ex plant (1990)
- Inoculations challenges – into the plant (1995)
- Understanding the chemistry – discovering unknown alkaloids (1996-on going) 
- Transmission challenges – into the seed (1996 to date)
- Understanding genes controlling alkaloid expression
- Endophyte viability in seed

Multidisciplinary approach

Animal scientists




Mycologists



Chemists

Plant scientists




Seed scientists



Agronomists



Entomologists



AVANEXTM
UNIQUE ENDOPHYTE TECHNOLOGY

31 years

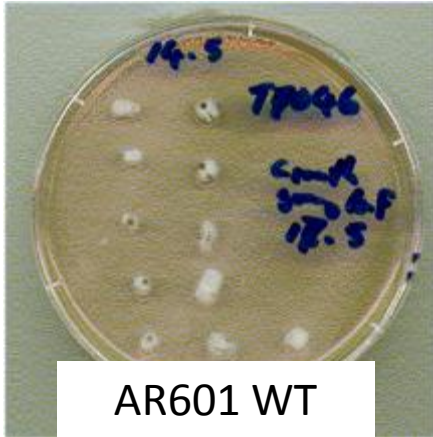
The Development of



- Examine global collections of endophytes
- Inoculated turf type cultivars
- Improve alkaloid expression from **the ordinary wild type**
- Further crossing and stability testing (in plant and seed)
- Compare alkaloid expression with **original wildtype**
- Bulk up seed (3 years)
- Test in field (birds-insects-airports)
- **Patented in USA/NZ/AU**

Development of AVANEX™

1



AR601 WT
from Europe

2



Jackal turf
type

3

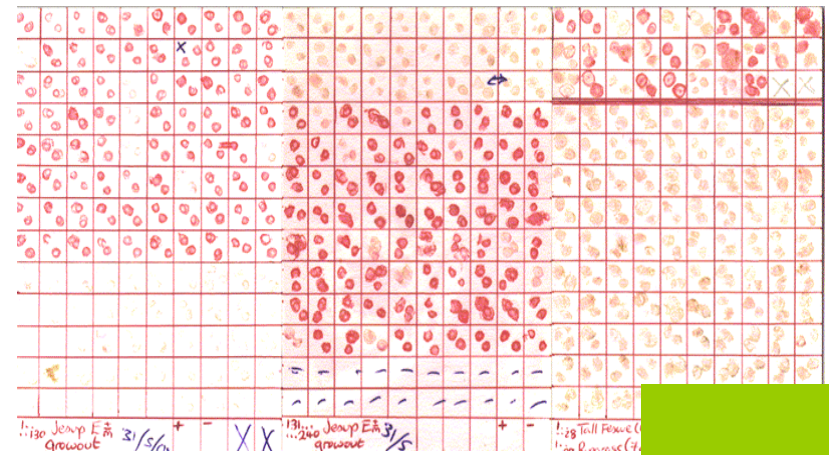


Grow out

4

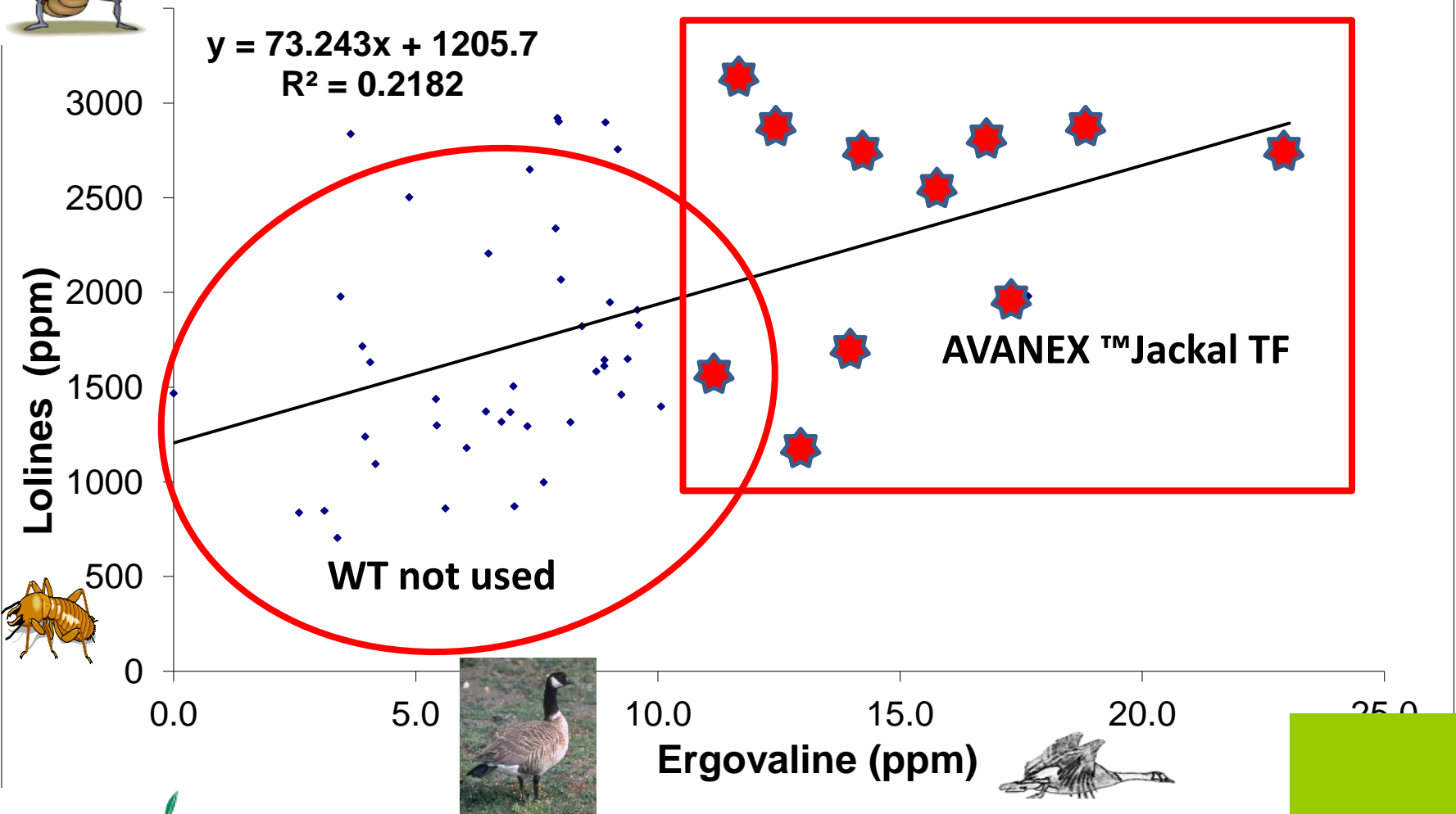


5



Test for presence

Selections improve from wildtype



Crossing these to get seed of AVANEX™

- Selection of 2 pair crosses for increasing loline



Increase ergovaline



- Grow out seeds to Chemo type and confirm endophyte presence



- Test for alkaloids



AVANEX™ Jackal tall fescue



ppm	Lolines	Ergovaline
Average	1820	8
Max	3150	23
Min	700	3
K31 Wild-type	520	1.4

NOTE THE AVERAGE IMPROVED



IS BETTER THAN

KENTUCKY 31 Wild-type

Bulk up from crosses



About 5 years work so far and another 3 years
to get commercial quantities of seed

TEACHING AVOIDANCE BEHAVIOUR



Avoidance Behaviour

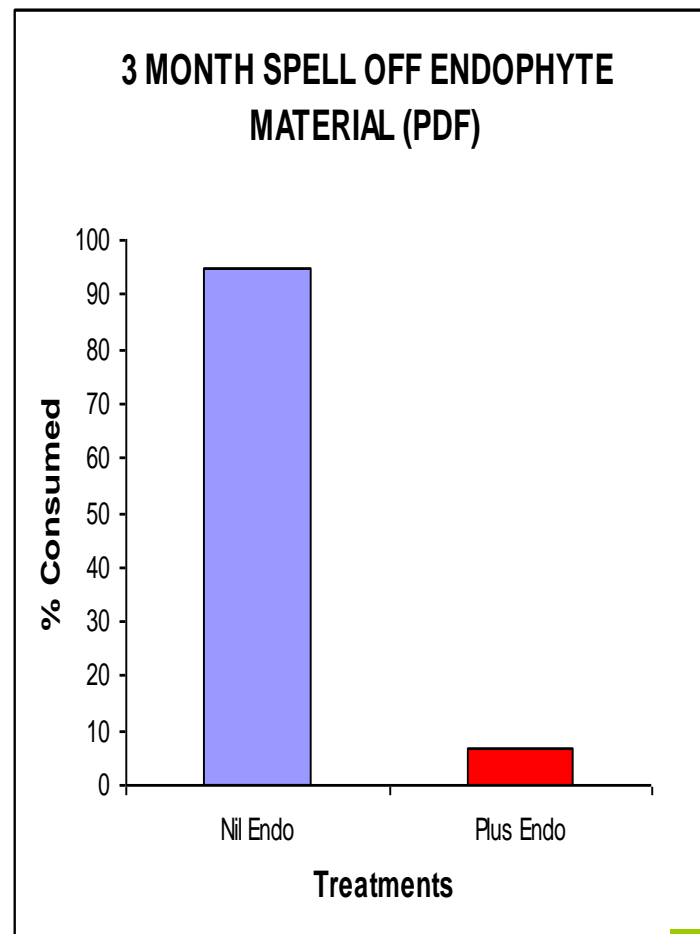


LOW ERGOVALINE



Post digestion feedback (PDF)

- Geese returned after 3 month spell
- PDF still working



Avoidance behaviour



Pellets high
Ergovaline

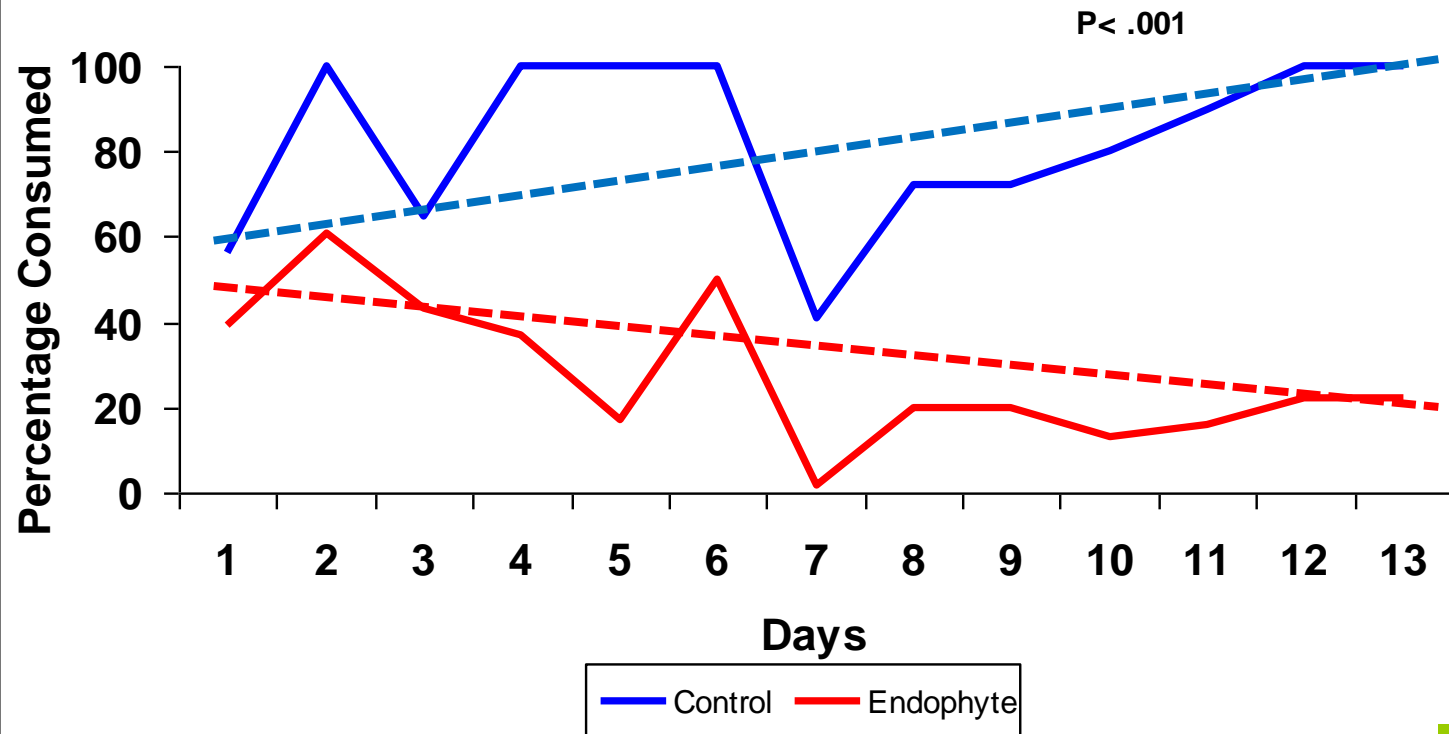
Treated Pellets



Learn to avoid



Consumption of pig pellets Gulls



FREE RANGE GEESE GRAZING



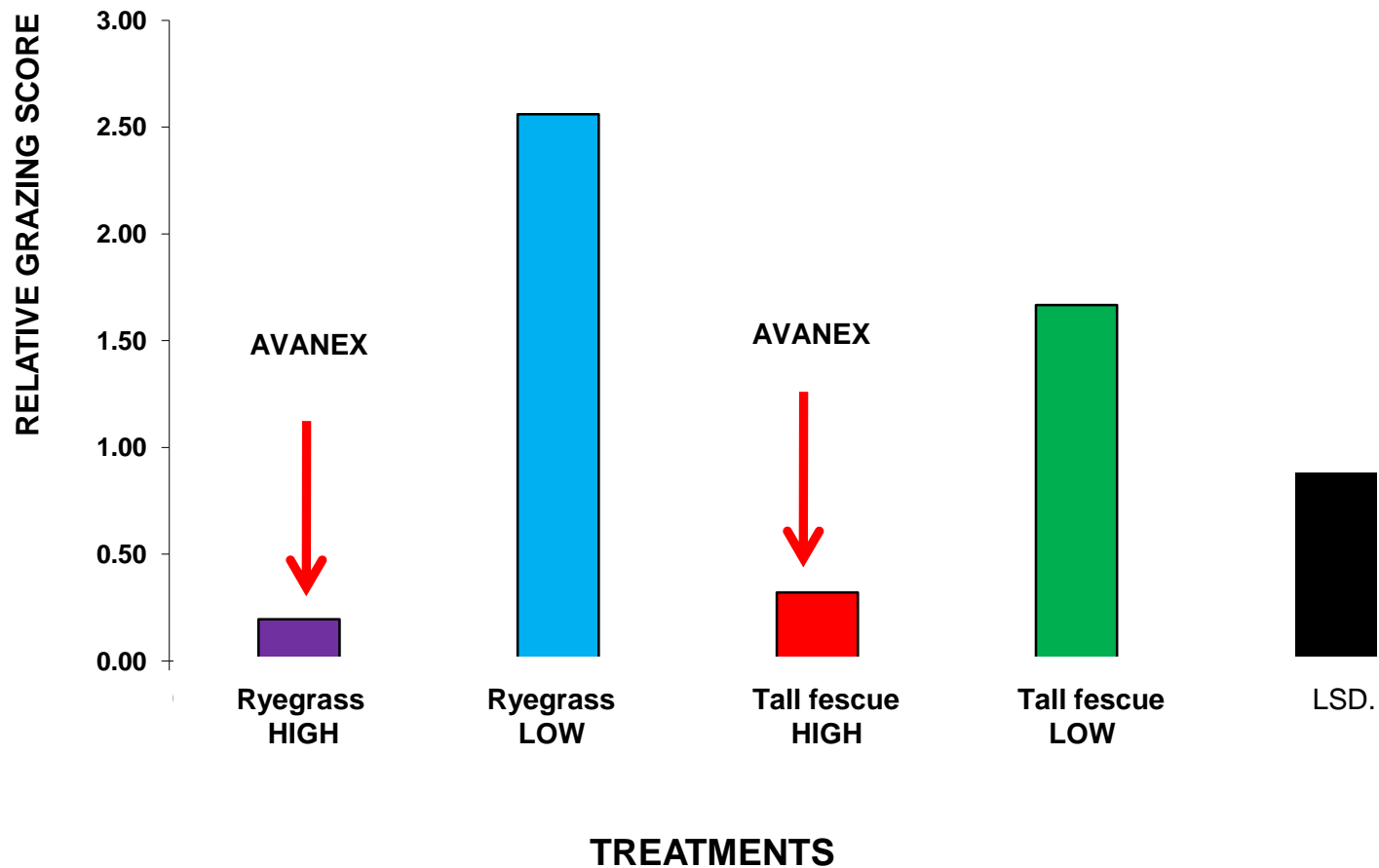
Avoidance geese



Early December Sample



Grazing score 5 Early December 2007 200 to 500 resident birds



AgResearch Bird Strike Trial "Great Plains Drill" Christchurch International Airport

FROM THE LAB TO THE FIELD

"The good stuff"



CIAL SOUTHERN LIGHTS AREA

Drilling February 10



CIAL SOUTHERN LIGHTS AREA

April 10 well established



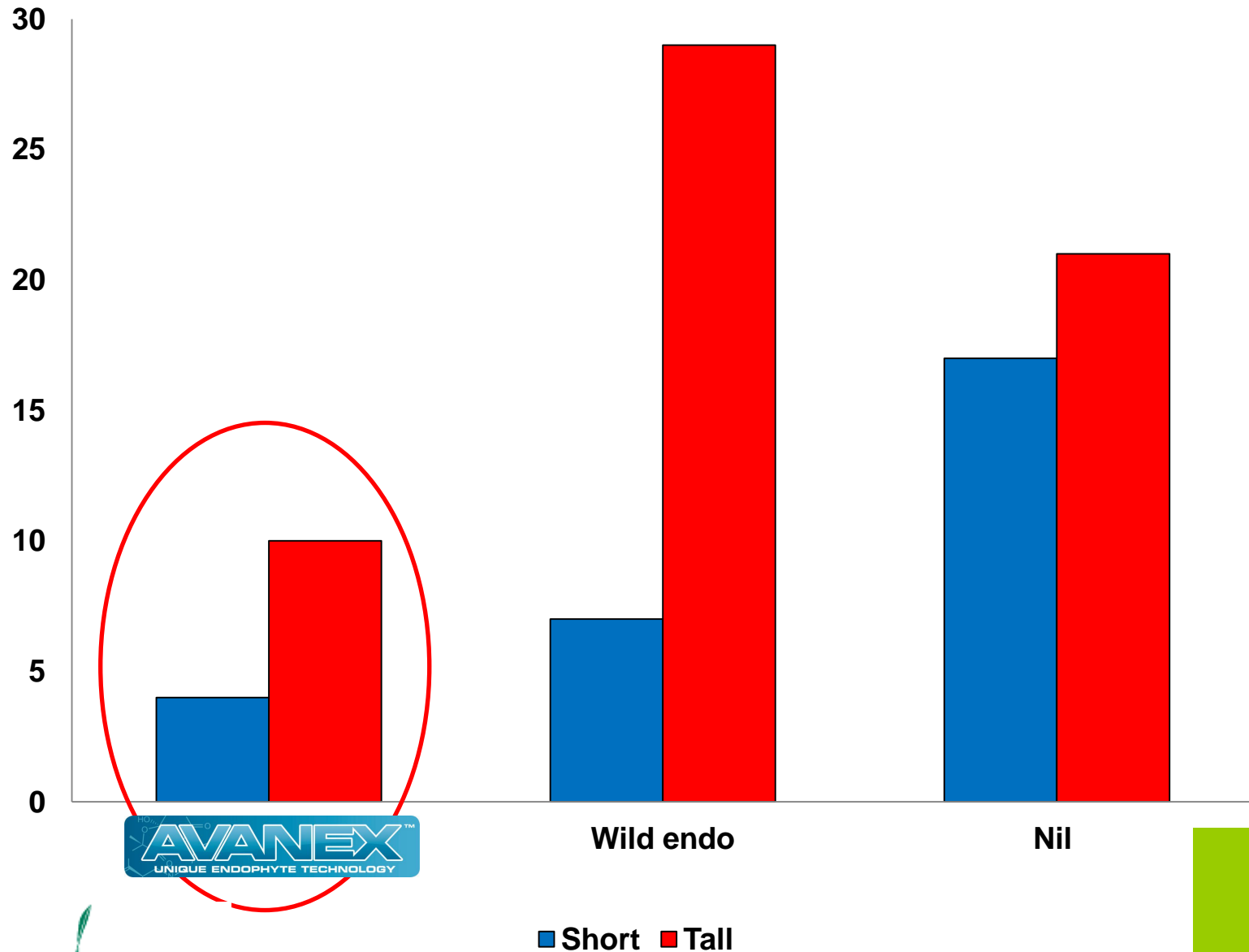
Insect data collections



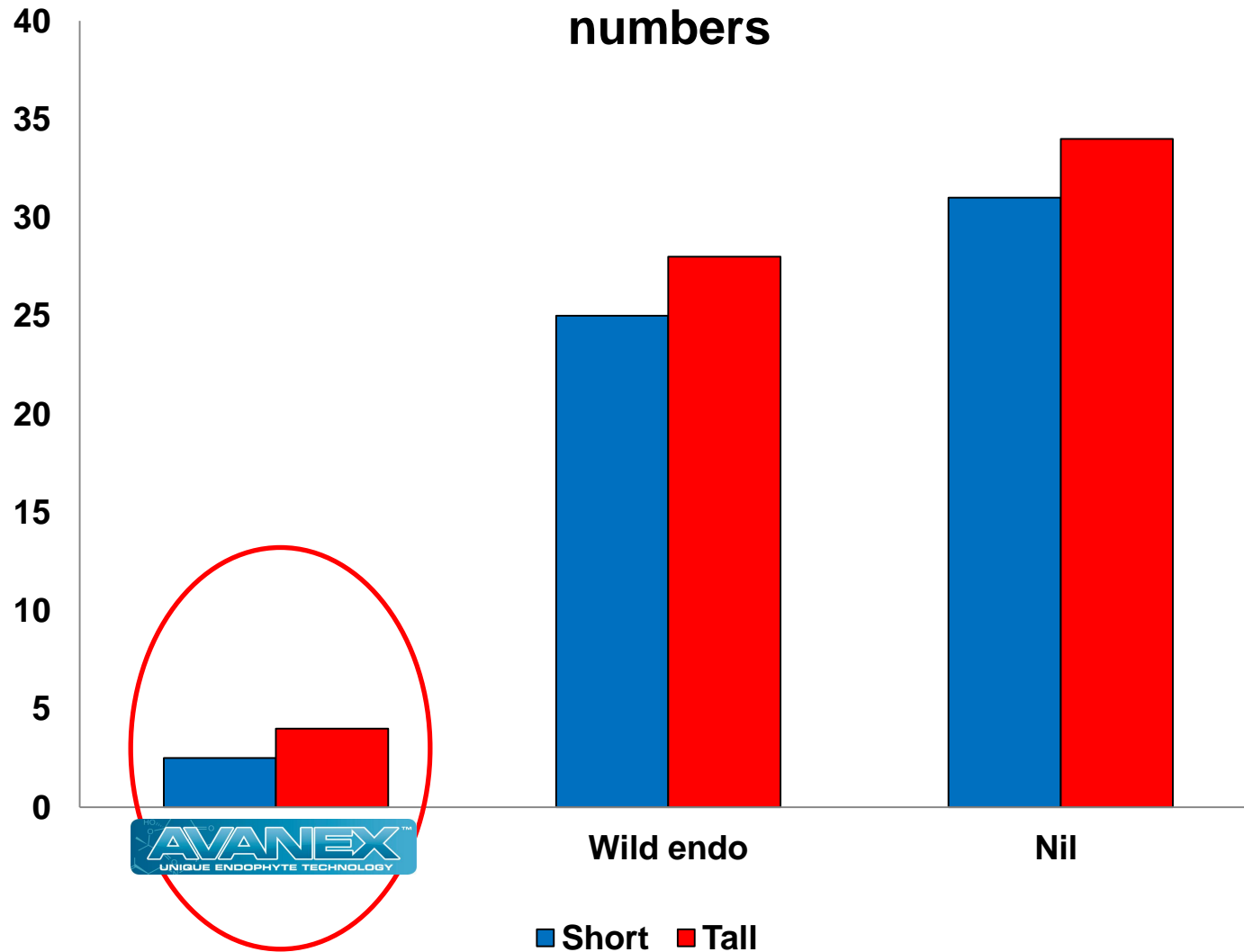
EXISTING



Average Dry weight of **above** ground insects (mg)



Average score of **below** ground insect numbers

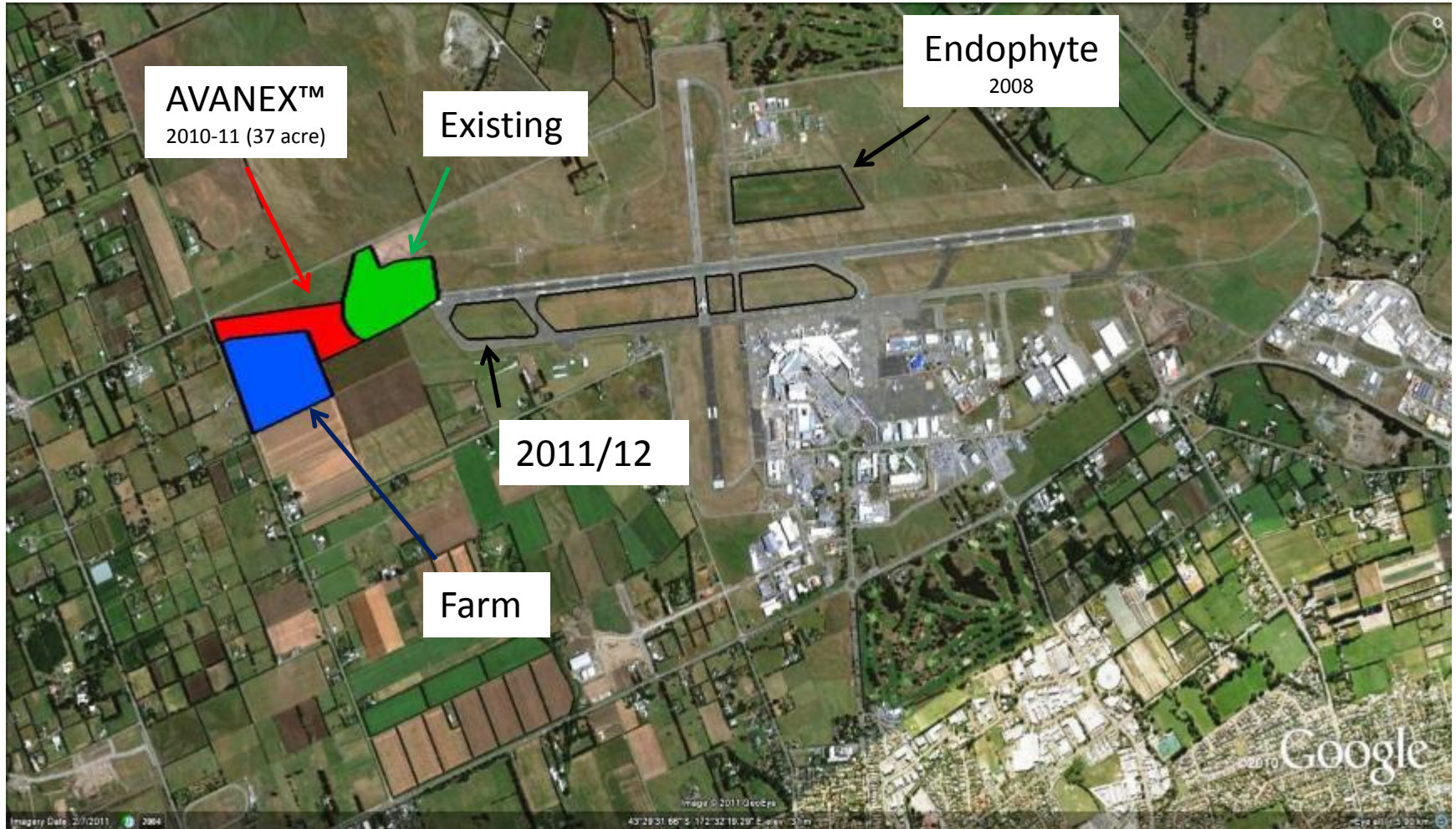


AVANEX™
UNIQUE ENDOPHYTE TECHNOLOGY

On a more light-hearted note.....



Christchurch Airport as at Sep 2011

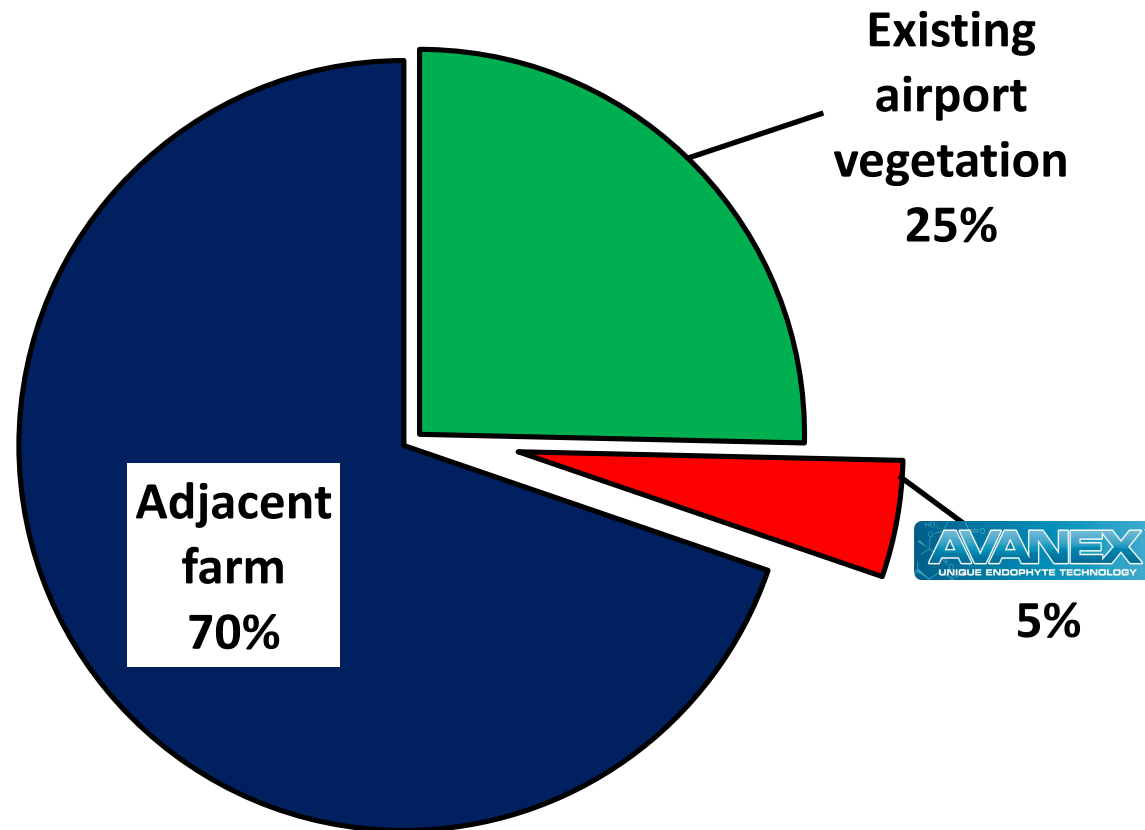


Collecting data

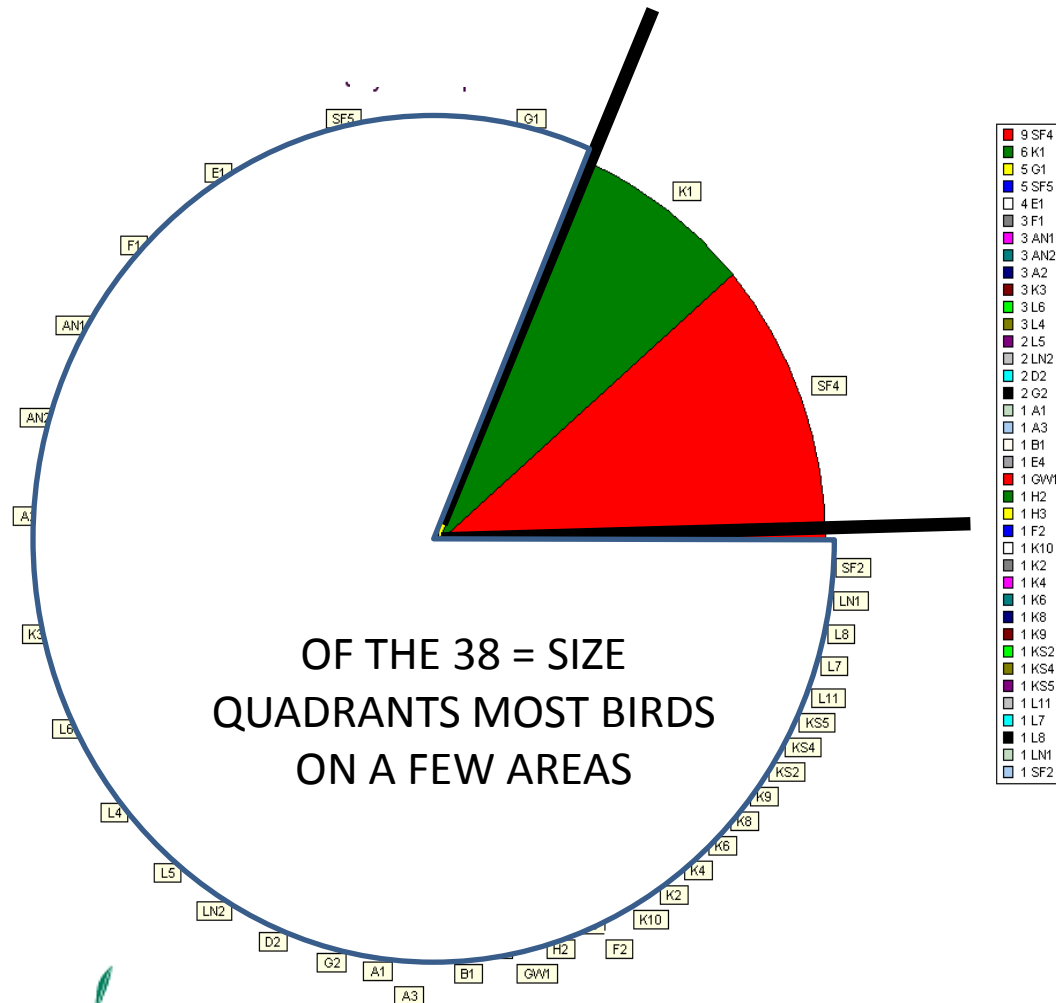


Species and behaviour twice a day

12 months Christchurch Airport



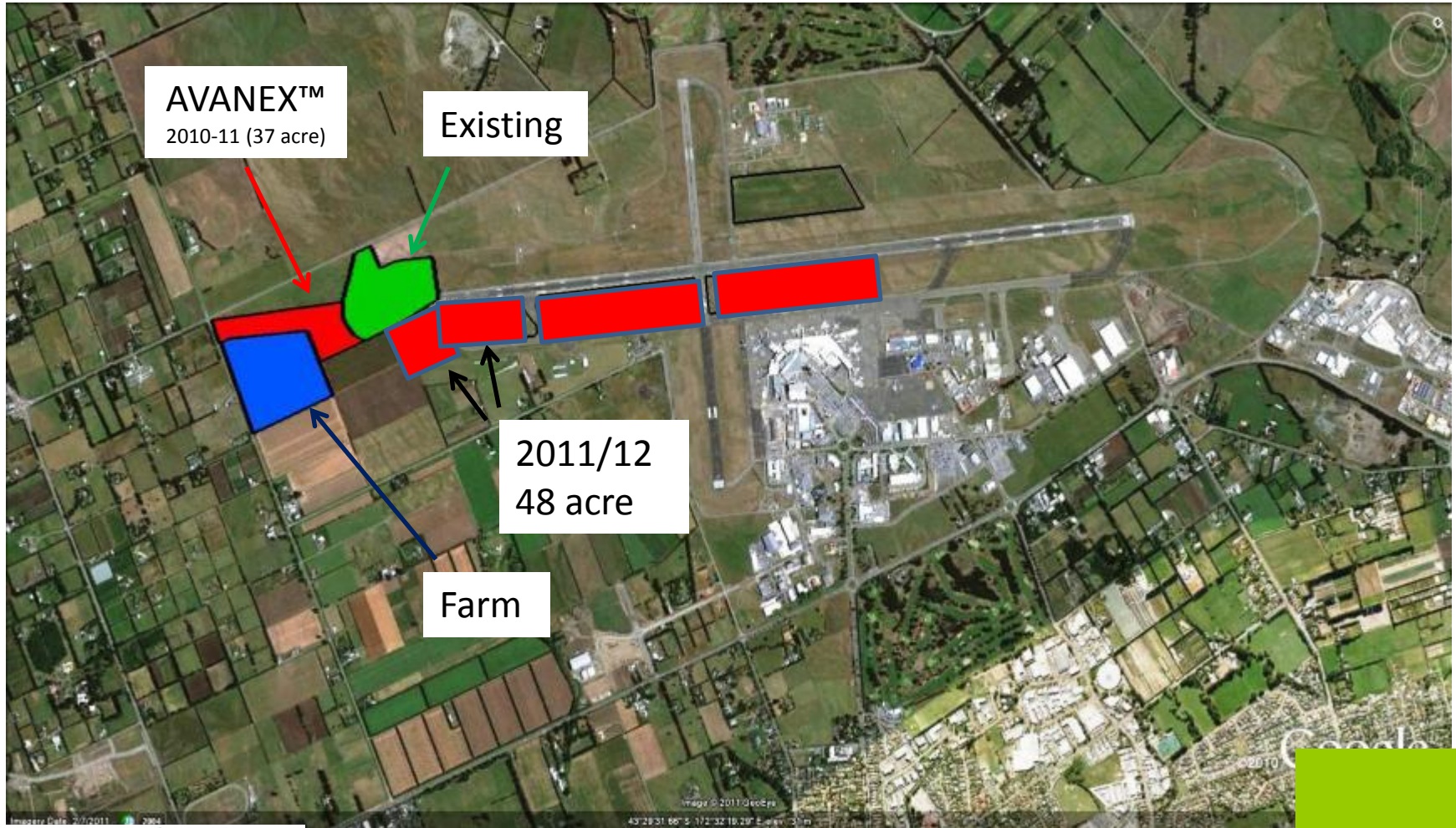
CIAL BIRD DISPERSALS JULY 2011



New areas for
AVANEX™ sowing
based on this data.

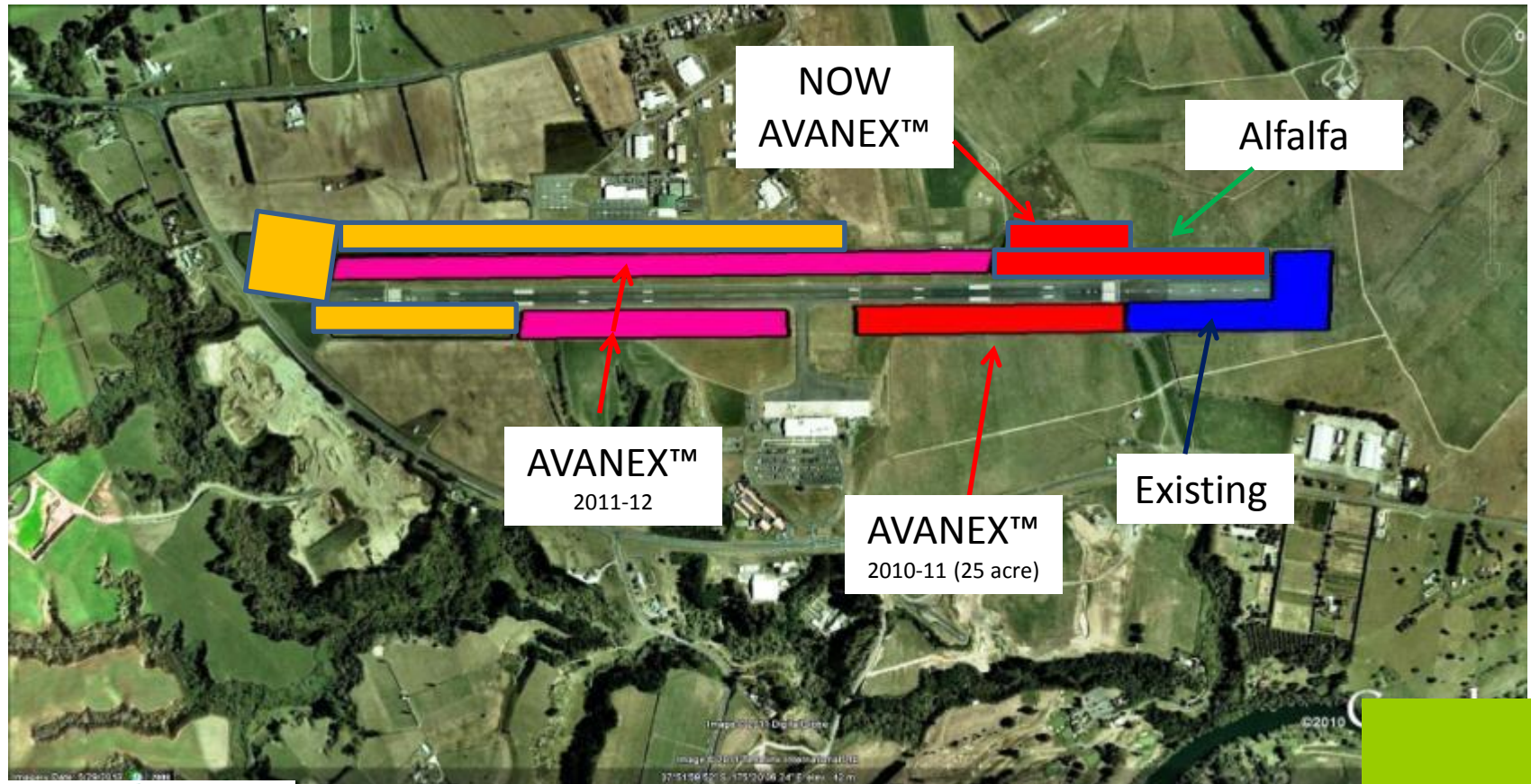
Most bird activity

Christchurch Airport



Hamilton Airport

Will be the first airport to get data on pre & post

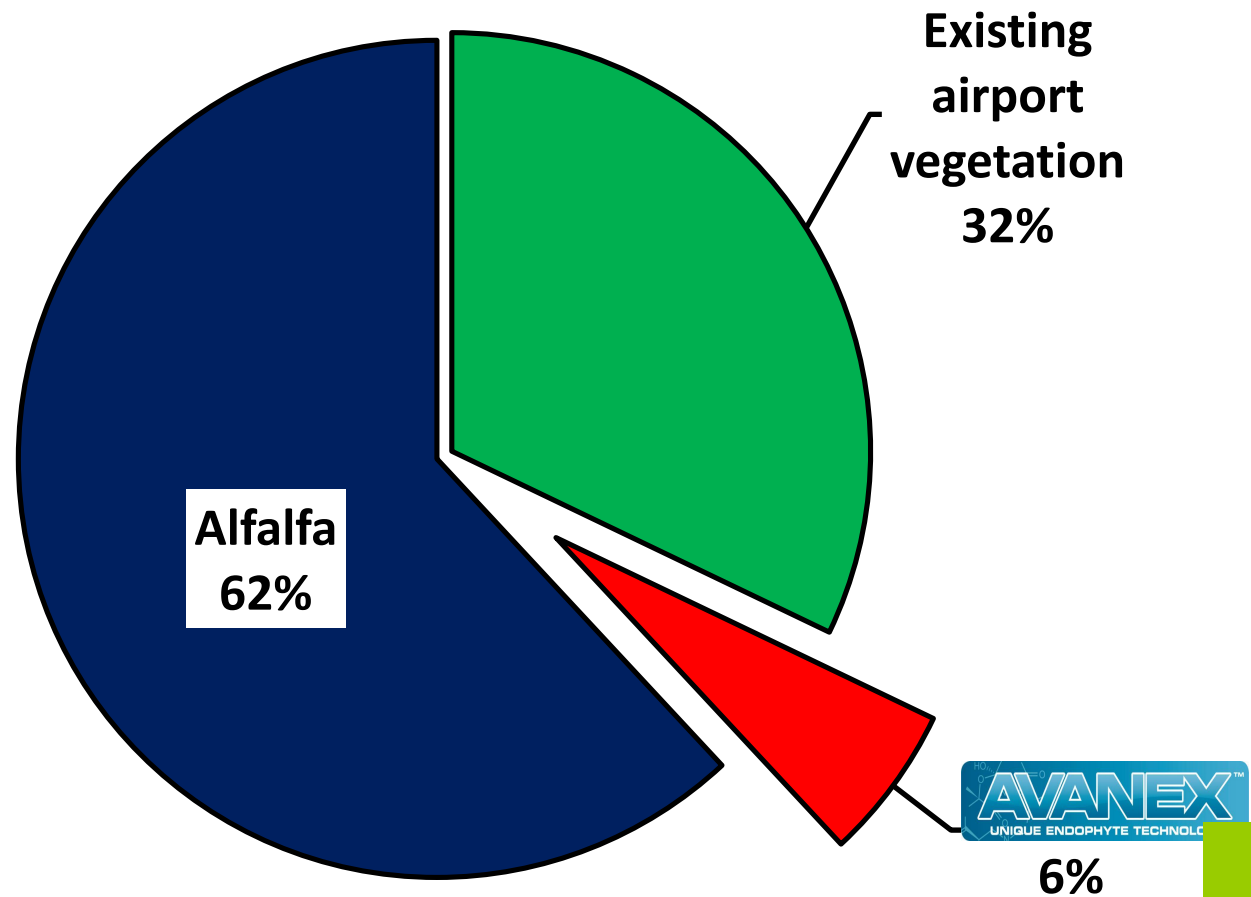


BEFORE





Hamilton Airport



Auckland International Airport

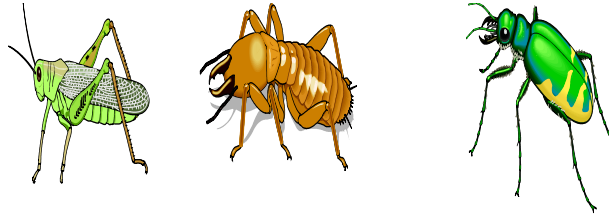


Why endophyte at airports?

Less insects

Reduced food and insecticide

Ground water



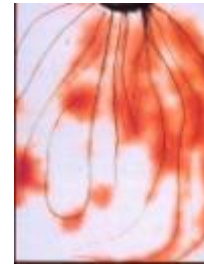
Drought tolerance

No irrigation available



Nutrient uptake

Poor compacted soils



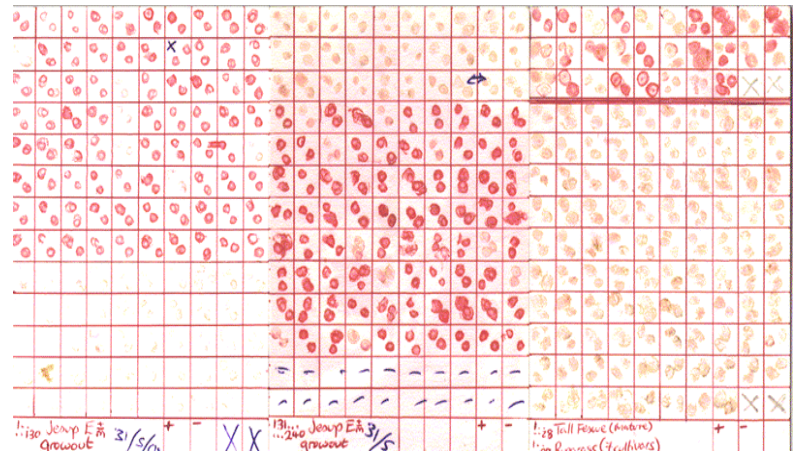
Post digestion malaise

Larger birds



When buying seed! Storage and age

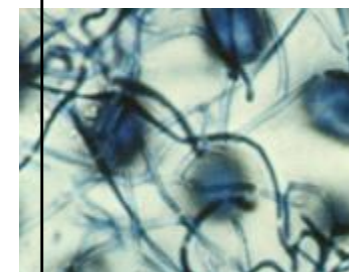
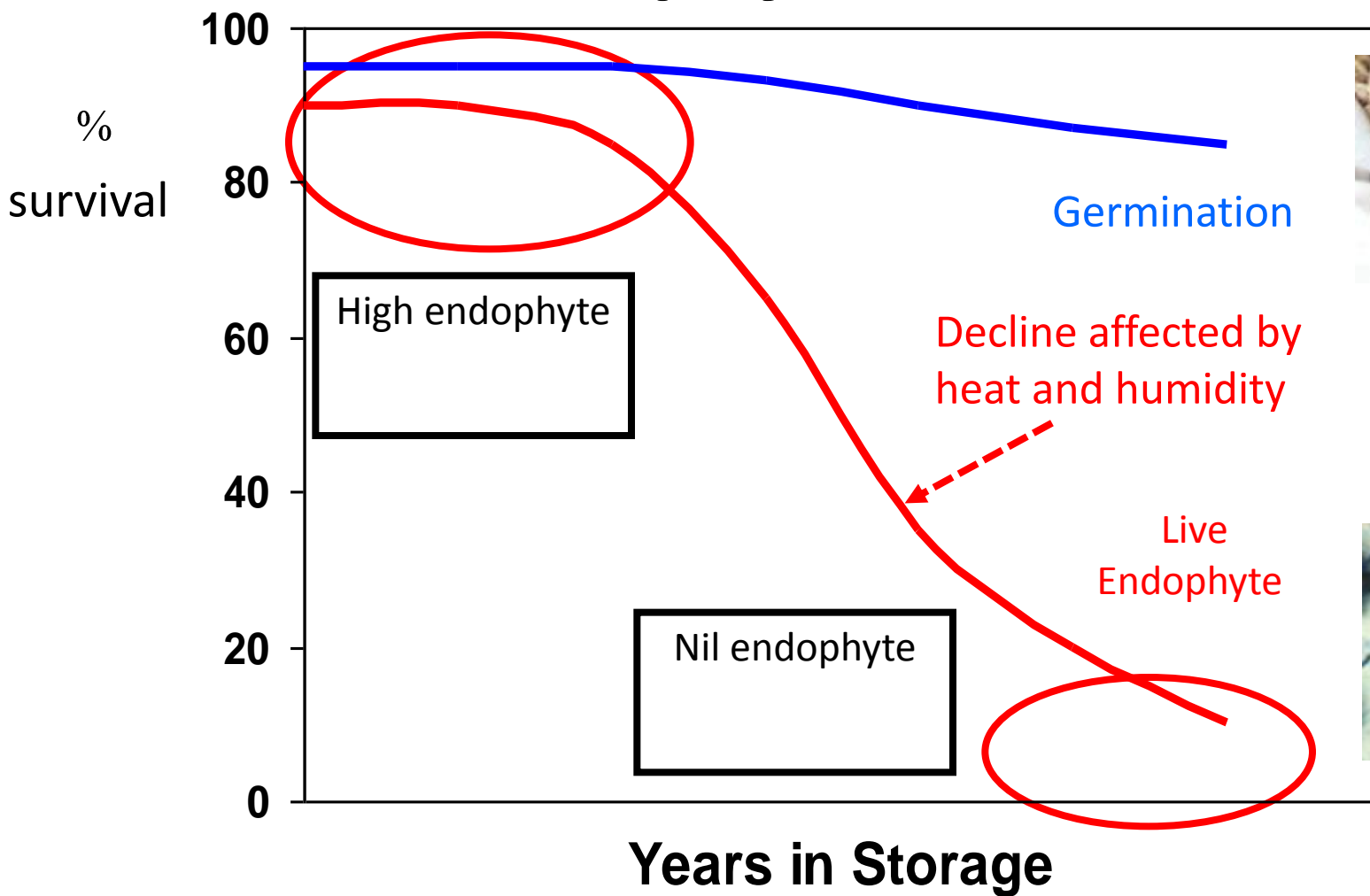
- Squash test ensure presence but not viability 😞



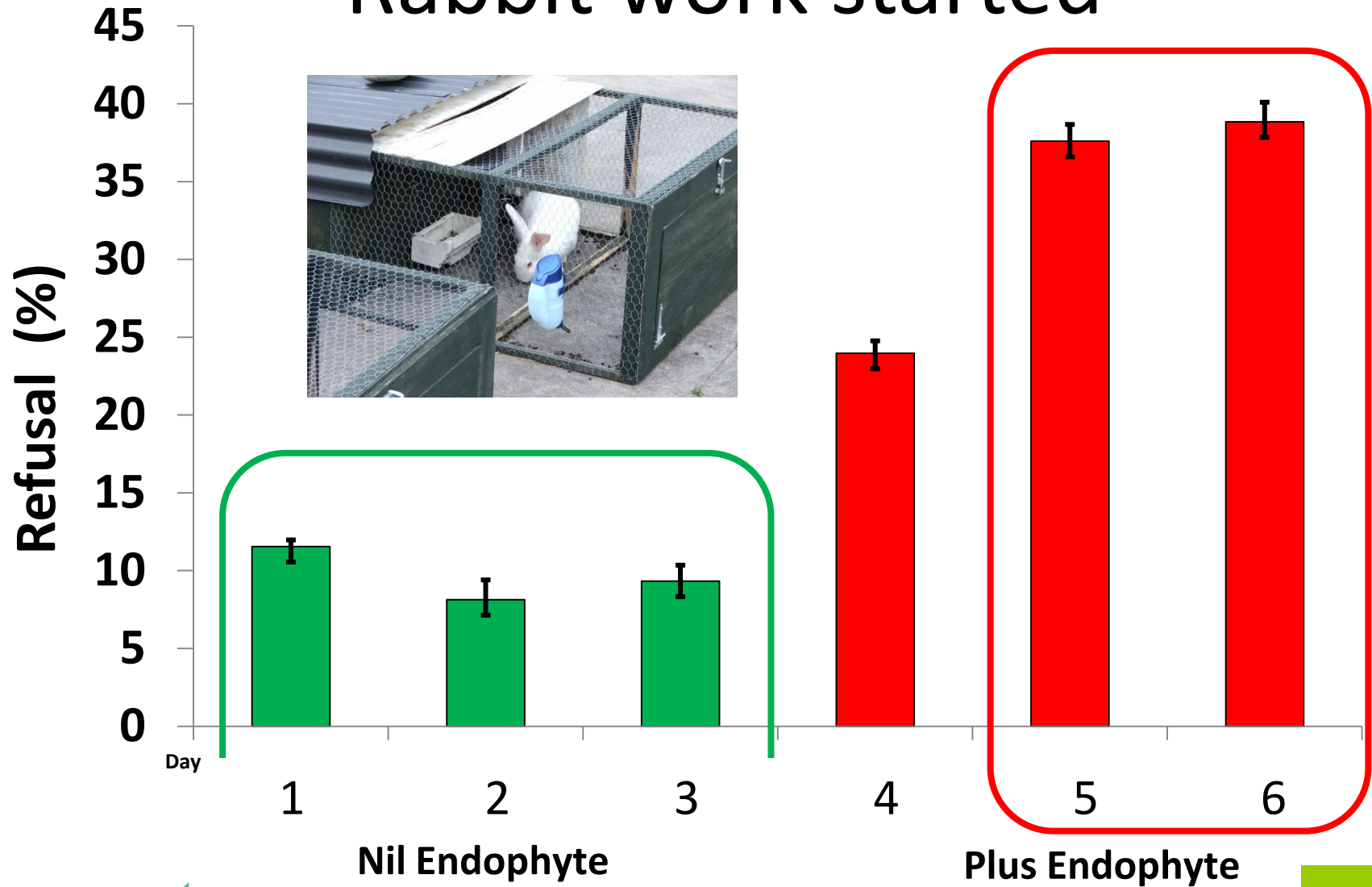
- Grow out test defines viable living endophyte 😊



Endophyte and seed



Rabbit work started



AVANEX™

UNIQUE ENDOPHYTE TECHNOLOGY

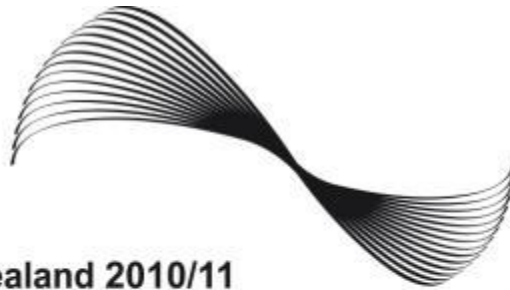
- Natural endophyte selected to increase alkaloid expression
- Not the same as **wild-type!!!**
- Put in a **turf type** showing less insects and birds
- Tested at 3 airports reducing on airfield bird numbers by average of 85 to 90%

DON'T JUST BUY ENDOPHYTE SEED

THEY ARE **NOT** THE SAME

AVANEX™

UNIQUE ENDOPHYTE TECHNOLOGY



Australia & New Zealand 2010/11

INNOVATION
A W A R D S

WINNER: PERFORMANCE MATERIALS
A BIRD DETERRENT TECHNOLOGY

