

Vertmax Duo™

An advanced pigment with plant health benefits



VERTMAX DUO



VERTMAX

Vertmax Duo™ - Agenda

- Summary of Vertmax Duo™
- Modes of action
- Features
- Areas of use
- Trials
- Key selling points
- Summary

Vertmax Duo™ - Summary

- Vertmax Duo™ is a leap forward as a visual spraying aid and plant health additive
- Vertmax Duo™ is not just a pigment. Trials have been ongoing for over 5 years in its development.
- Vertmax Duo™ is manufactured in Australia being resistant to the effects of prolonged UV light exposure
- As the following trial data shows it also improves turf quality, increases root growth, increases the speed of seed germination and improves overall turf health.

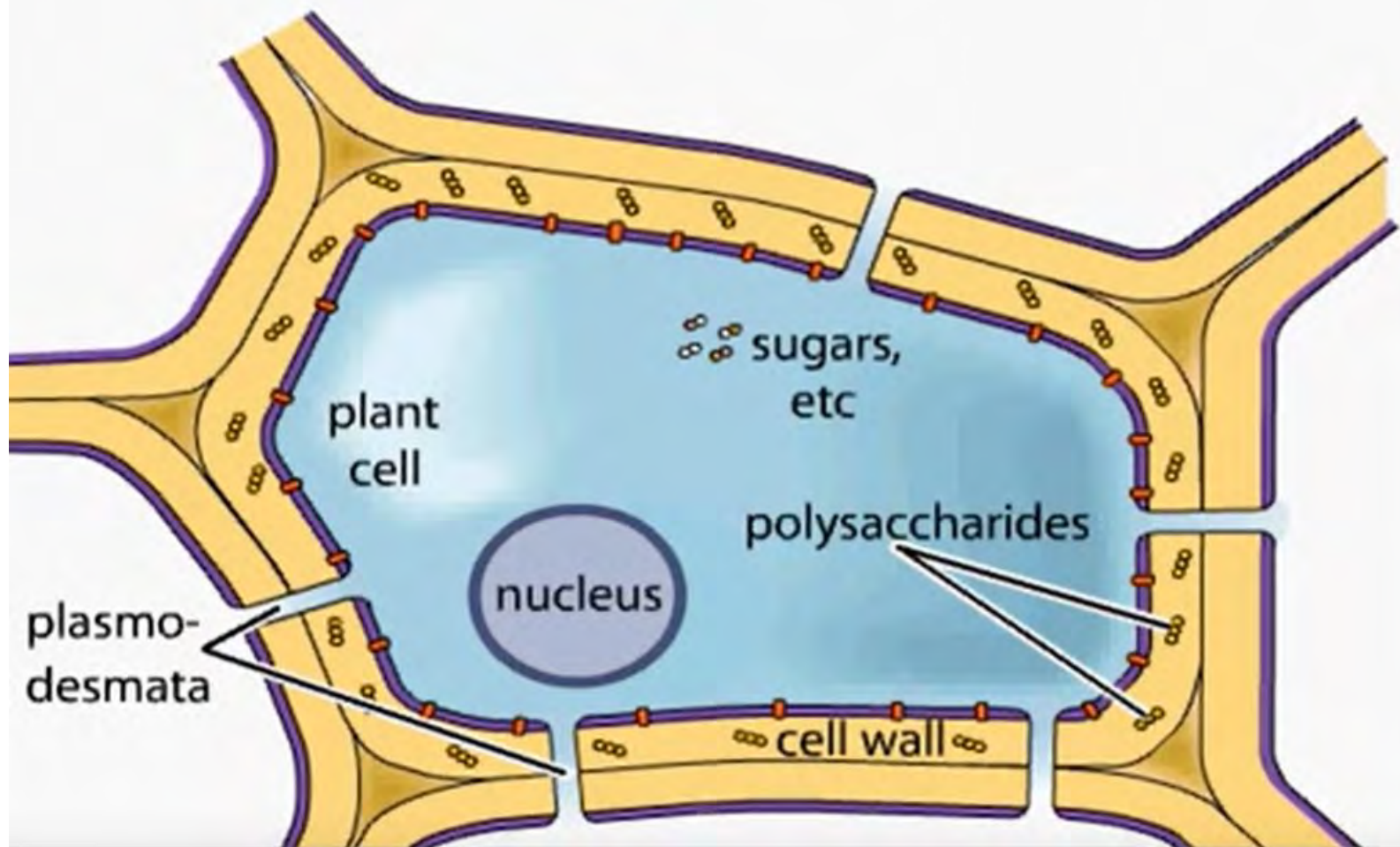
Vertmax Duo™ - Summary

- As well as being a pigment Vertmax Duo™ also comprises a root stimulant and salicylic acid.
- Salicylic acid helps in **systemic acquired resistance (SAR)** for turf in helping defend against pathogen attacks.
- Salicylic acid plays a role during the plant response to abiotic stresses such as drought, chilling, heavy metal toxicity, heat, and osmotic stress.

An aspirin tablet contains 325 mg of
acetylsalicylic acid.

so 250g/L would require you to dissolve
770 aspirin/L

pathogen



plant cell

sugars, etc

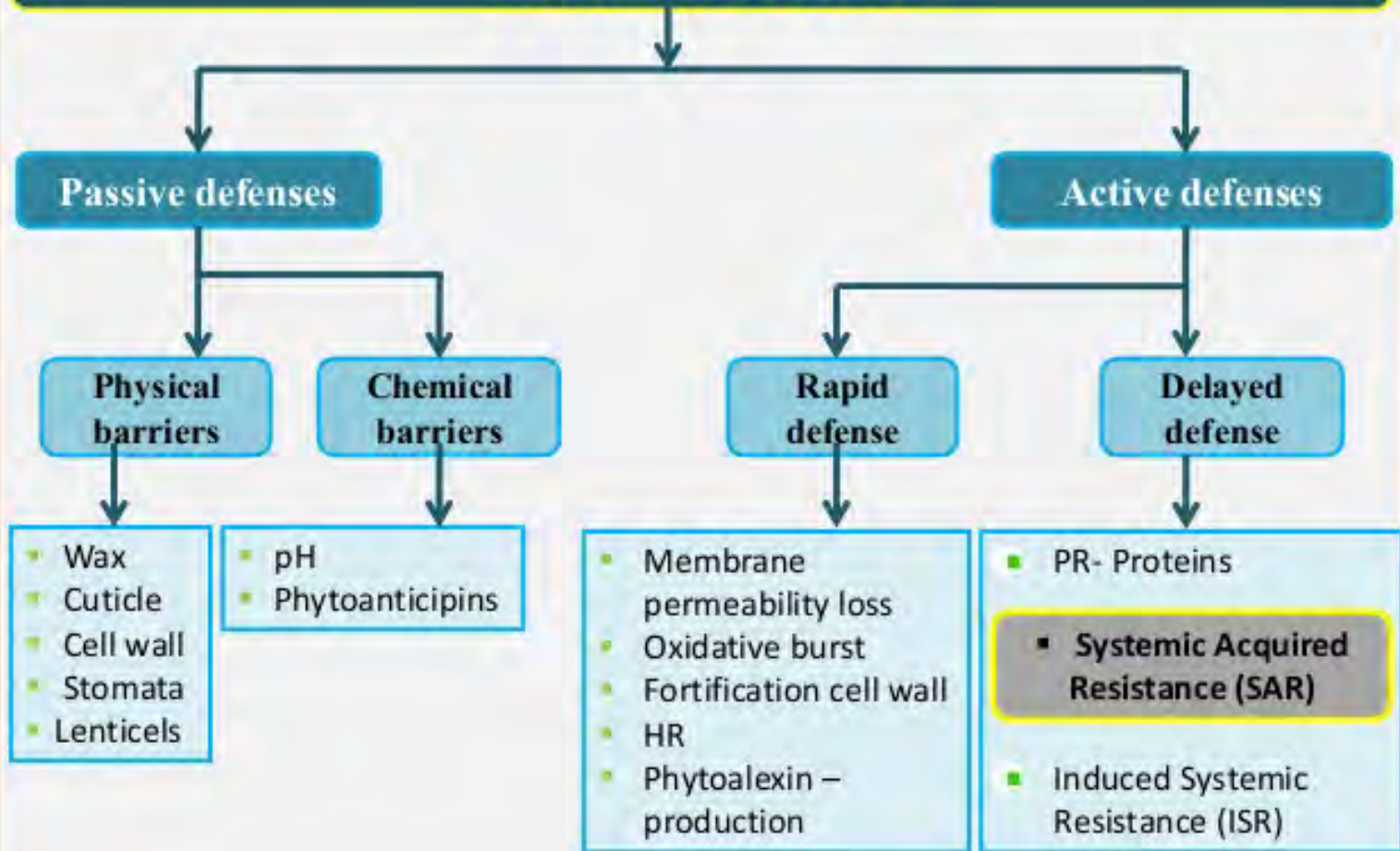
polysaccharides

nucleus

plasmodesmata

cell wall

Plant Defense



Induced defences

Short term defence response

- Synthesis of Reactive Oxygen Species (ROS)
- O^2 , H^2O^2 , NO
- Hypersensitive response (HR)
- Programmed cell death

Long-term resistance - Systemic Acquired Resistance (SAR)

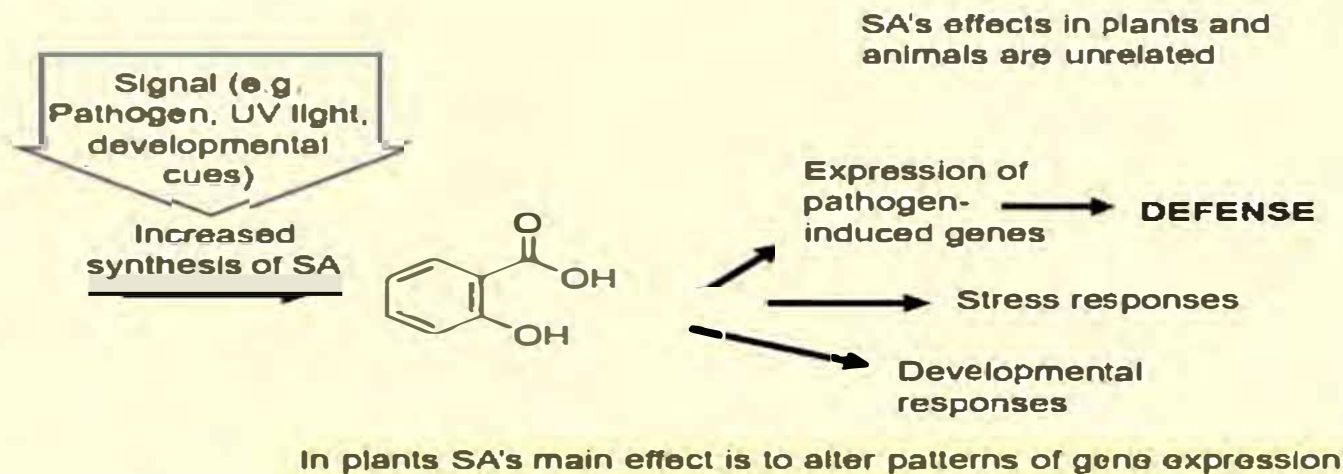
- Phenols
- Phytoalexins
- Salicylic acid

- **Elicitors**
- **Hypersensitive response**
- **Programmed Cell Death**
- **ROS**
- **Pathogenesis Related Proteins**
- **Phenolics**
- **Phytoalexins**
- **Systemic Acquired Resistance**
- **Induced Systemic Resistance**
- **Salicylic Acid**

Events involved in the coordination of defence responses in plants to challenge by Pathogen

Time	Event
Minutes	Membrane depolarisation and electrolyte leakage Reactive oxygen generation Expression of genes involved in phytoalexin biosynthesis
Hours	Oxidative burst Membrane lipid peroxidation Rise in salicylic acid levels Cytoplasmic aggregation, cell collapse and hypersensitive cell death Phytoalexin accumulation Cell wall reinforcements
Days	Accumulation of pathogenesis-related proteins Systemic acquired resistance

How do salicylates work in plants?



Plant recognizes & responds to attacker

Cell wall modifications:

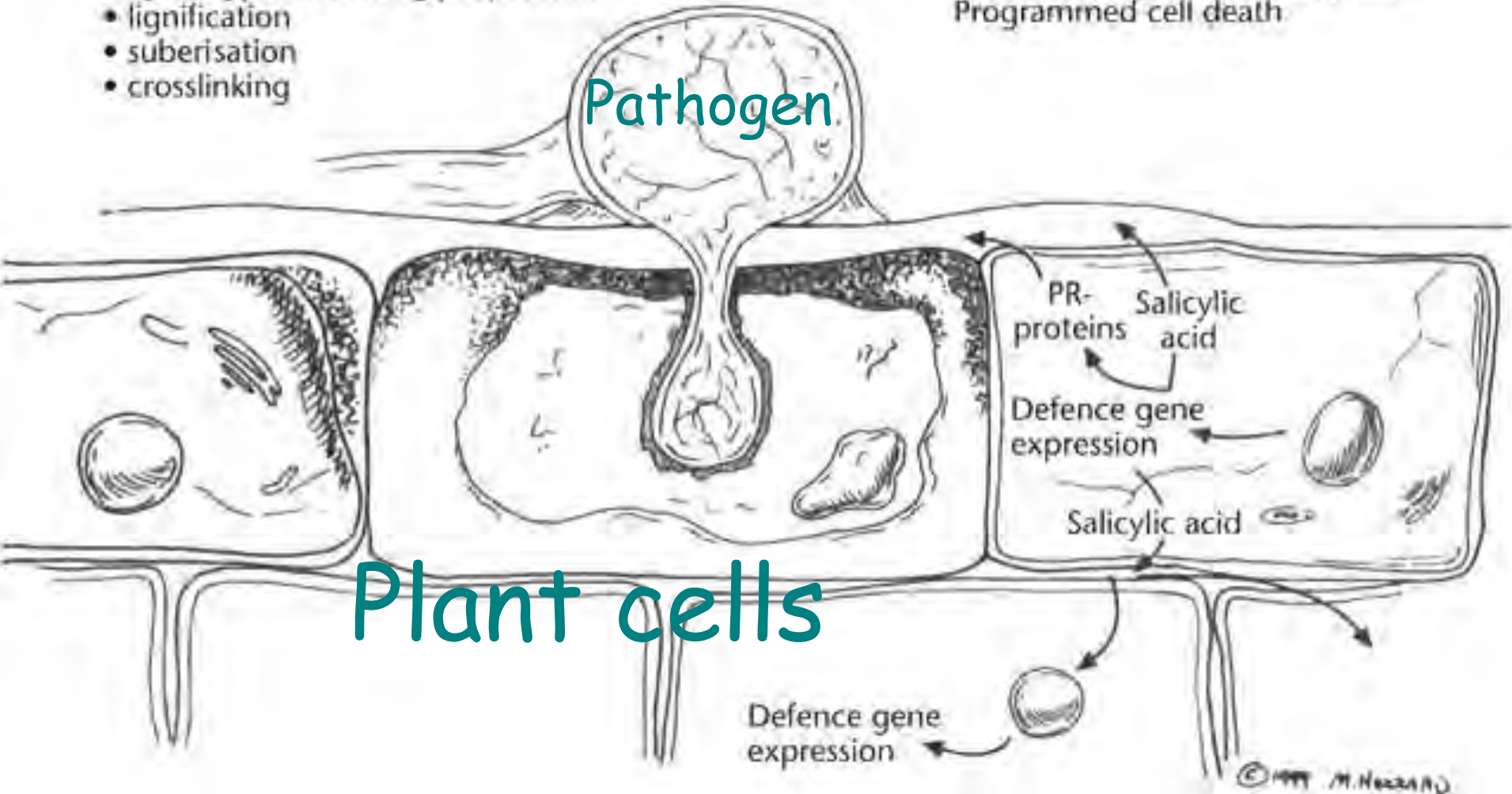
- hydroxyproline-rich glycoproteins
- lignification
- suberisation
- crosslinking

Phytoalexins

- Release of degradative enzymes
- Programmed cell death

Pathogen

Plant cells



Resistance activators

Phosphites

SAR **ISR**

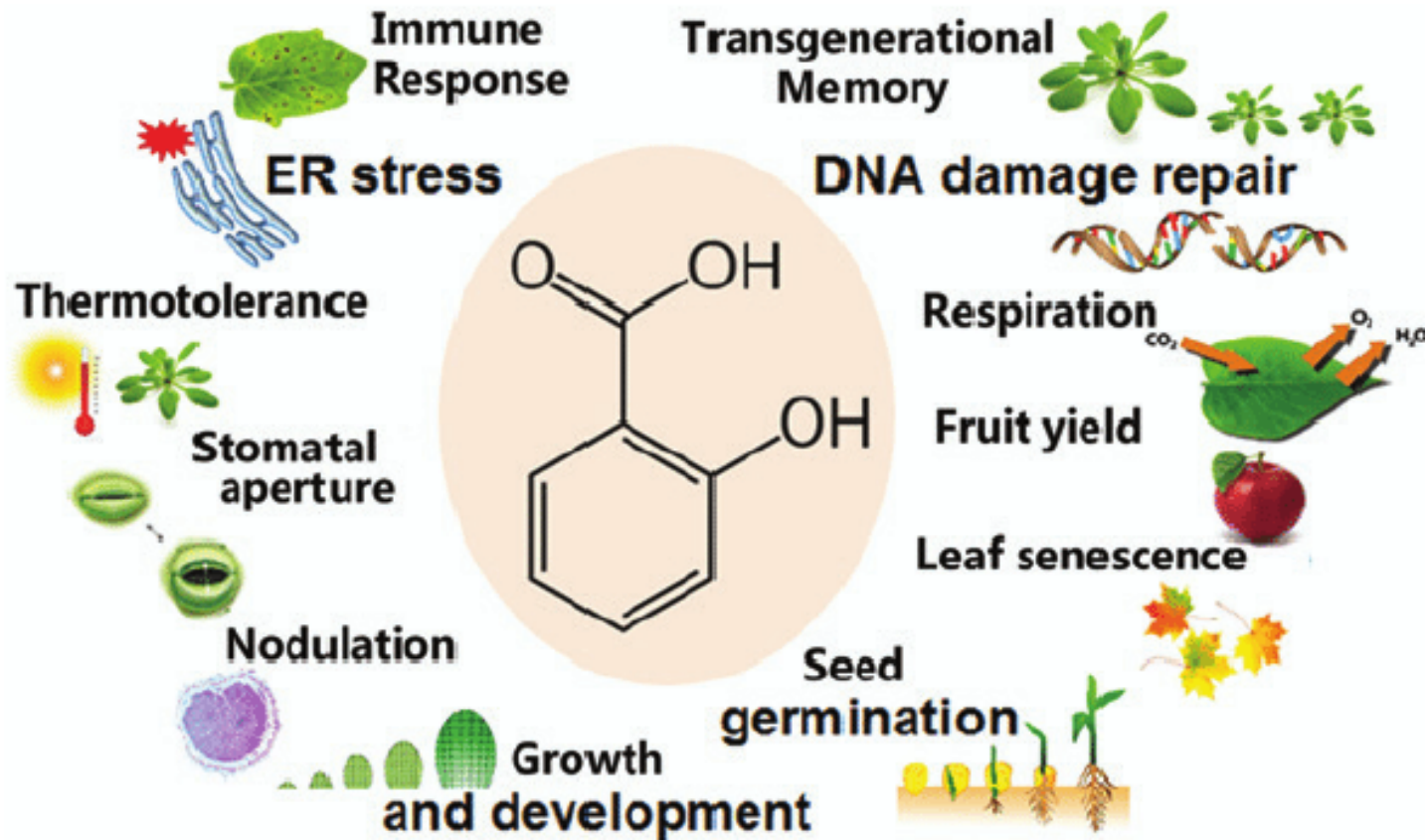
Grenadier/Aliette/phosphite

Benzothiadiazole/Acibenzolar

Actigard/salicylic acid

Civitas (mineral oil) + **Harmonizer**
(chelated copper)

Silicon/butanediol/ humic acid



SYSTEMIC ACQUIRED RESISTANCE REPRESENTS A PLANT IMMUNE RESPONSE

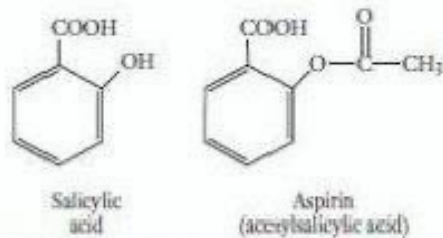
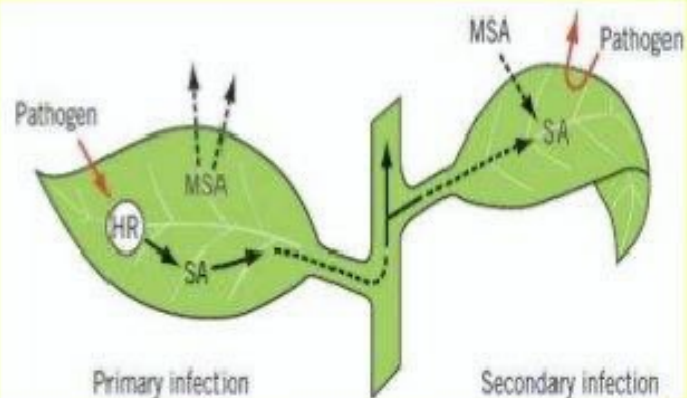


FIGURE 13.14 The chemical structure of salicylic acid and its commercial derivative acetylsalicylic acid. Salicylic acid has been implicated in the immune strategies of plants.



The first pathogens to infect the plant (primary infection) stimulate a localized hypersensitive reaction (HR) and the synthesis of salicylic acid (SA). Salicylic acid is translocated through the phloem to other regions of the plant where it prevents secondary infection by other pathogens. Alternatively, salicylic acid may be converted to methylsalicylic acid (MSA). MSA is moderately volatile and may function as an airborne signal.

First exposure

Dehydration

Rehydration



Second exposure

Dehydration

Stress memory



Vertmax Duo™ - Mode of action

- Increases soil and surface temperatures, creating a more desirable microclimate for growth and product uptake
- Increases the plants photosynthetic rate
- Increases the plants metabolism in slow periods of growth
- Salicylic acid helps counter negative impacts of stress such as heat and improves root growth and overall plant health.

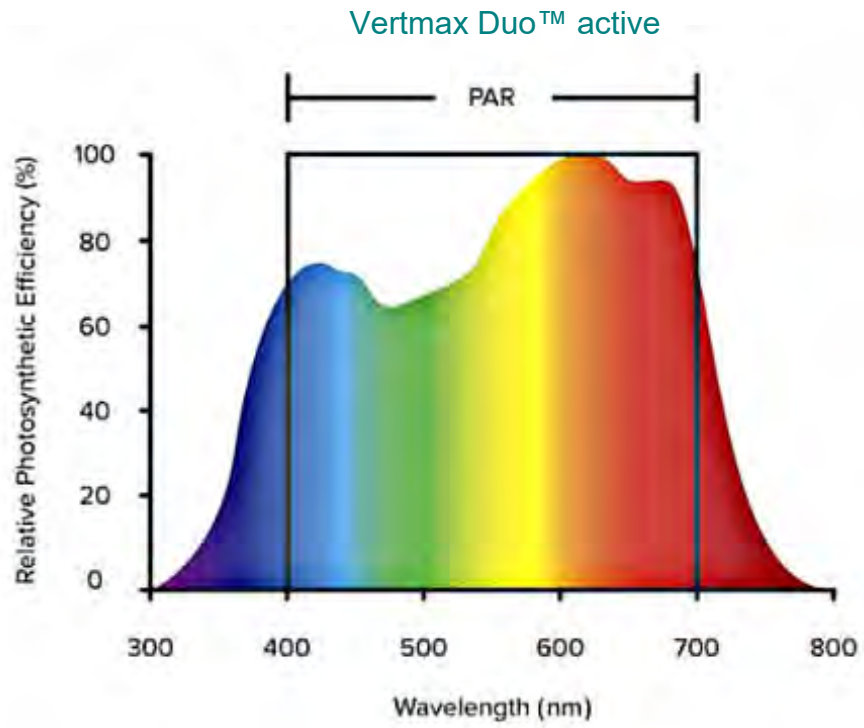
Vertmax Duo™ - Mode of action

- Light coming into contact with objects (including grass) can either be reflected, transmitted, or absorbed.
- Not all energy emitted by the sun is useful for turfgrass growth and much like sunburn it can actually be harmful to the plant.

Photosynthetically Active Radiation

- Radiation in the 400 to 700 nm range is most useful for photosynthesis
- Wavelengths below 400 nm are filtered out in the ozone (Which is a good thing because they can be very damaging to cells and tissue.)
- Wavelengths much above 700 nm don't carry enough energy for photosynthesis.

Vertmax Duo™ - Mode of action



Vertmax Duo™ - Mode of action

Turf can only absorb so much light. High levels of light can be stressful to plants and result in photo-inhibition – decreasing the plant's photosynthetic capability.

UV rays and excessive light causes the formulation of free radicals in the plant. Resulting in:

- Compact growth with short internodes and small, thick leaves.
- Negative effects on DNA and plant membranes.
- Photosynthesis can be hampered by too much UV light. Research shows that this happens at UV-values higher than 4kJ/m²/day.

Vertmax Duo™ - Mode of action

When plants are stressed they evolved Mechanisms to Control what are termed Reactive Oxygen Species.

Production of ROS always occurs

Vertmax Duo™ - Mode of action

Different sources of stress generate damaging ROS

Antioxidants counter these

pigments

vitamins

proteins

Vertmax Duo™ - Mode of action

When Vertmax Duo™ is applied?

- Radiation absorbance increases
- Reflectance decreases
- supplementary anti-oxidants become available to counter these free radicals

= leading to an Increase photosynthesis.

Vertmax Duo™ - Features

- Long lasting formulation, up to 6 – 8 weeks.
- Tank mixable with all plant protection products
- Independently evaluated
- Formulated in Australia for the high levels of UV light found here.
- Proven plant health benefits.
- Rainfast in 1 hour
- Can be used all year round

Vertmax Duo™ - Benefits

- Increases turf quality and aesthetics during stress/dormancy periods
- Increases turf colour immediately following application
- Creates a instant natural look to the turf
- Improves root health and growth

Vertmax Duo™



Untreated

Recommended rate

Vertmax Duo™

2014/11/19



Vertmax™

A photograph showing a green tractor in the foreground on a well-maintained green golf course. In the background, there are several trees, a set of white bleachers, and a modern building with a glass facade. The sky is overcast.

Vertmax™ 1.2L/Ha

Vertmax™ 4L/Ha - high load means low rate!



Vertmax Duo™ - Application

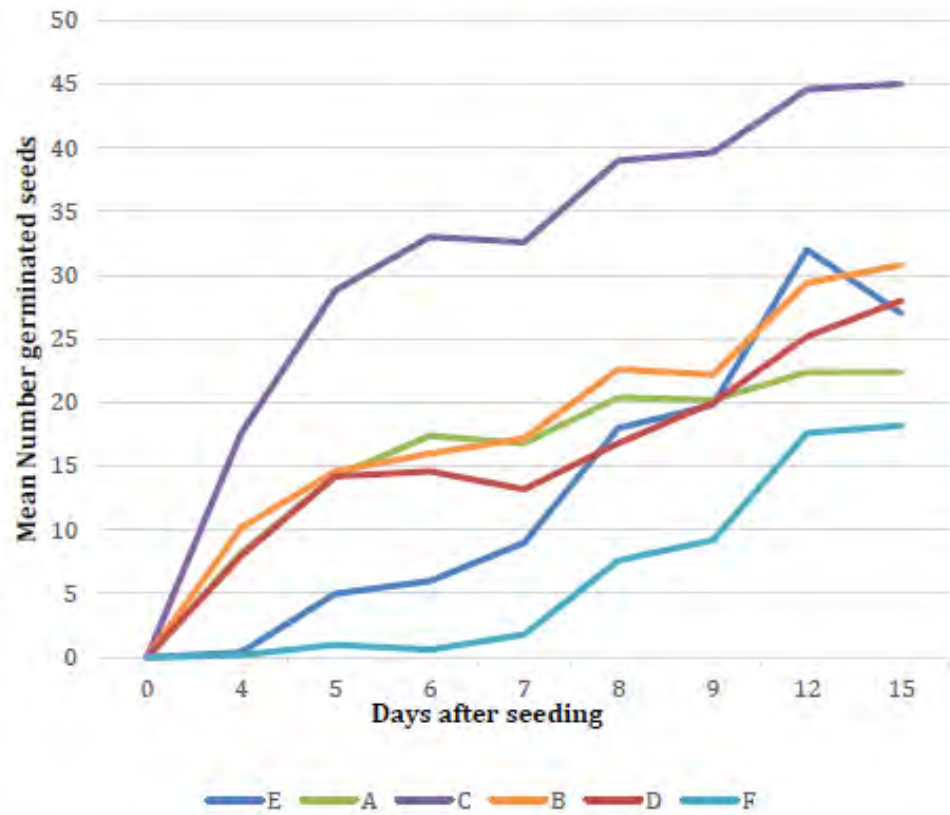
- Apply at 1.0 Litre per Ha
- Minimum 300 – 600 Litres of water per Ha
- Fill the sprayer tank 1/2 to 2/3 the total volume of water and begin agitation.
- Allow Vertmax Duo™ to fully disperse into mix solution before adding additional products.
- Fill remainder of the sprayer tank with water to the desired volume.

Vertmax Duo™

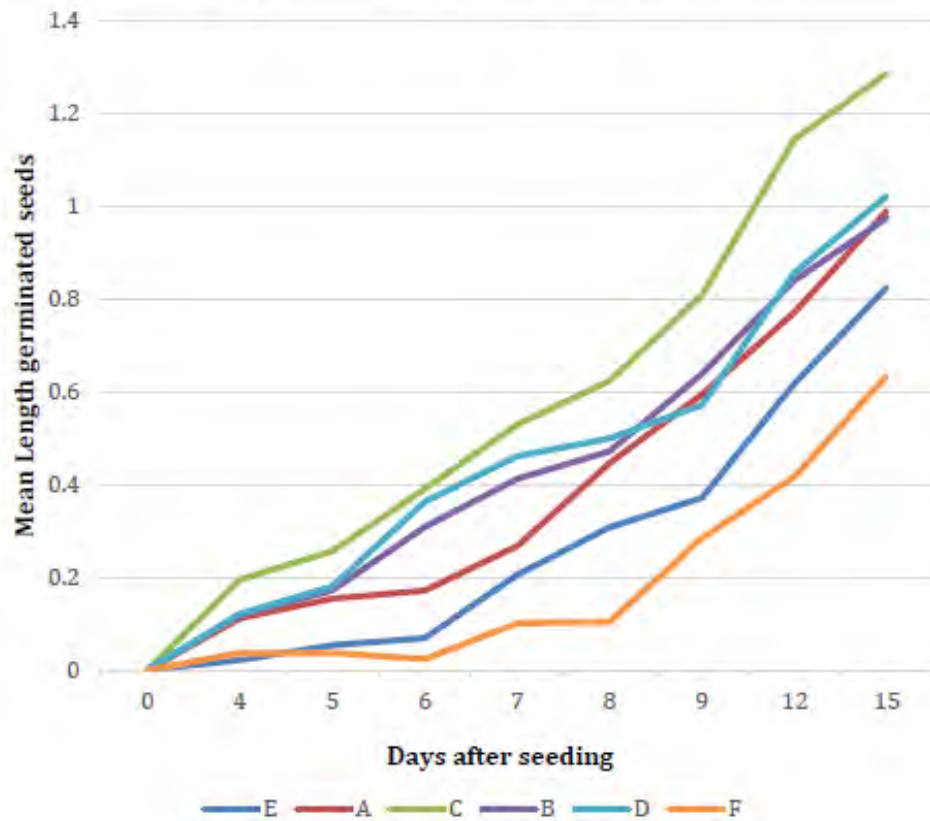
Trial Data 2014-2020

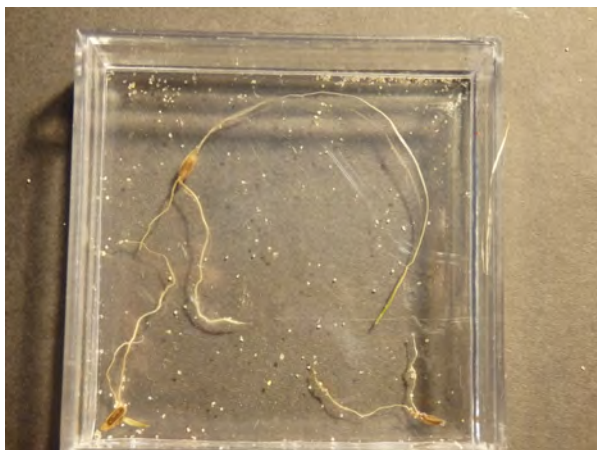


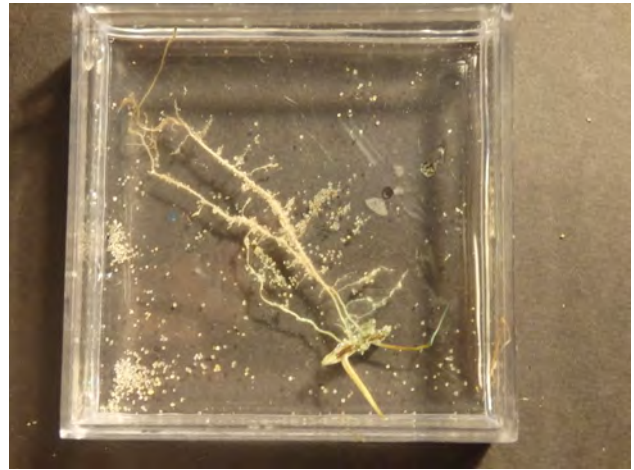
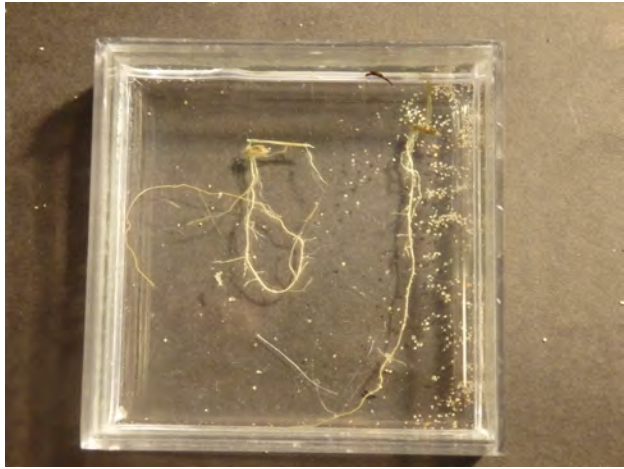
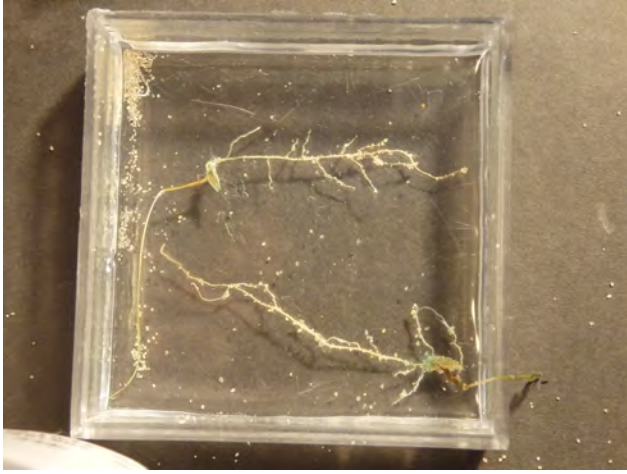
Graph of mean number of germinated seeds over time



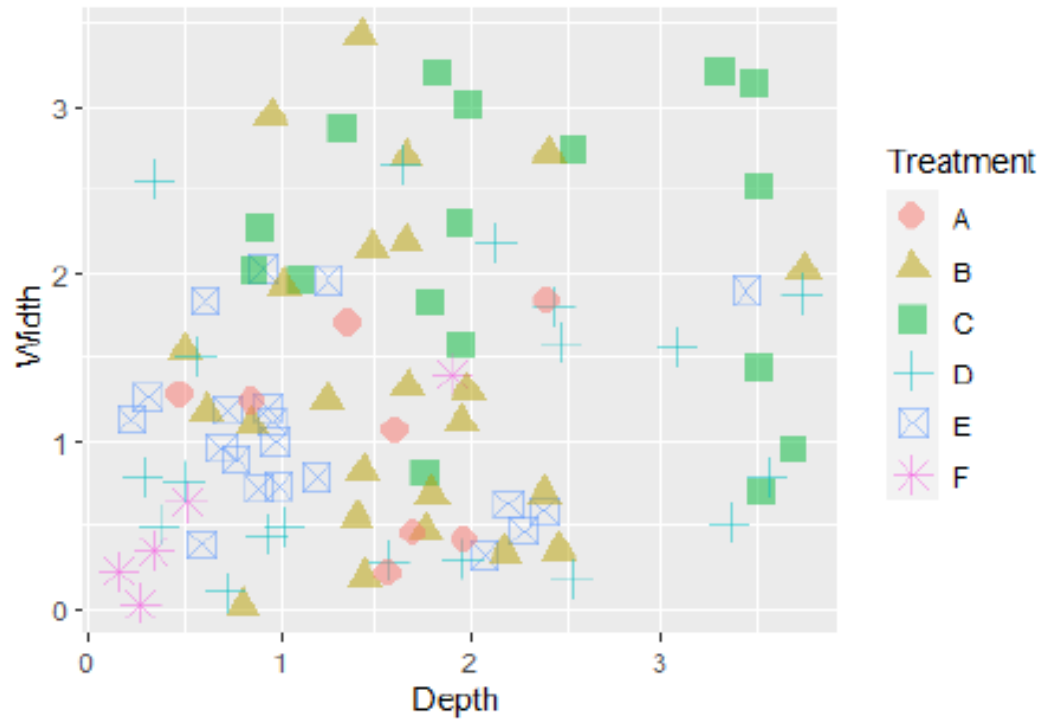
Graph of mean Shoot length cm of germinated seeds over time



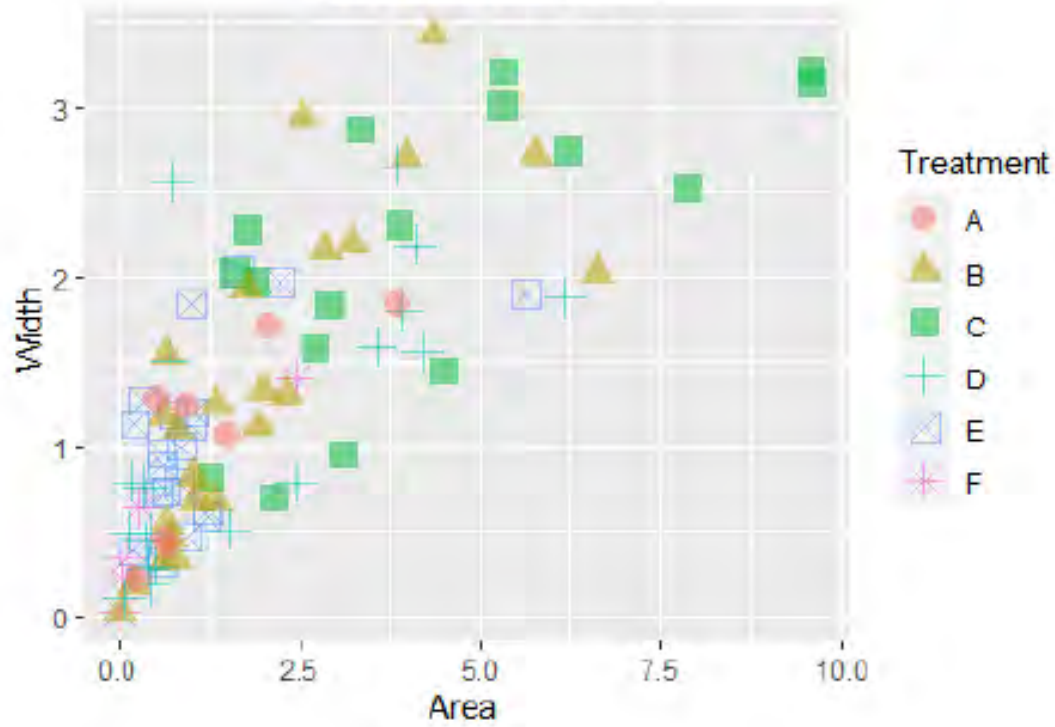




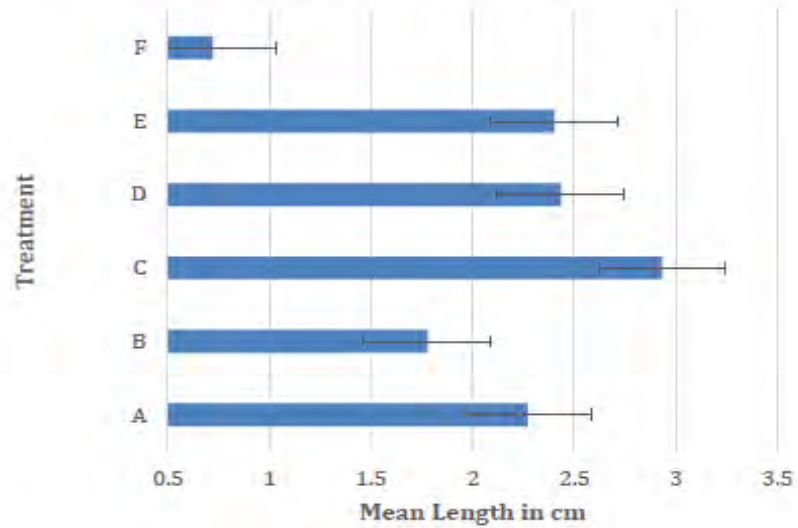
Scatterplot showing Root Depth vs Root Width



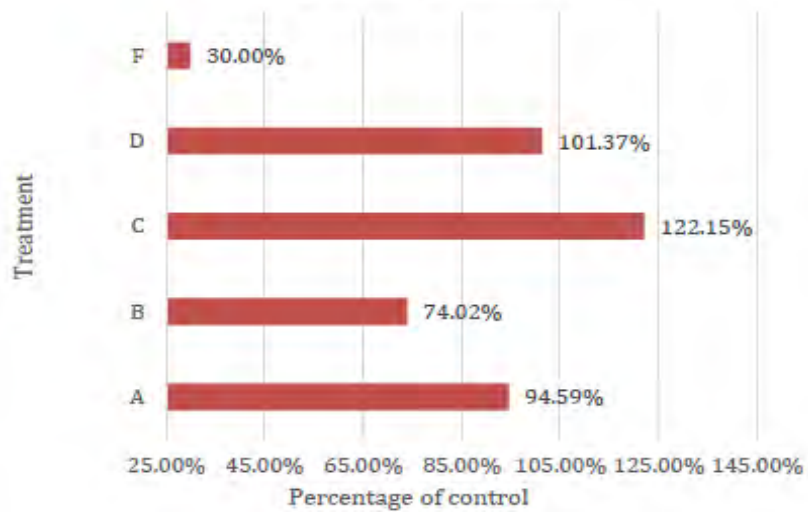
Scatterplot showing Root Width vs Root Area



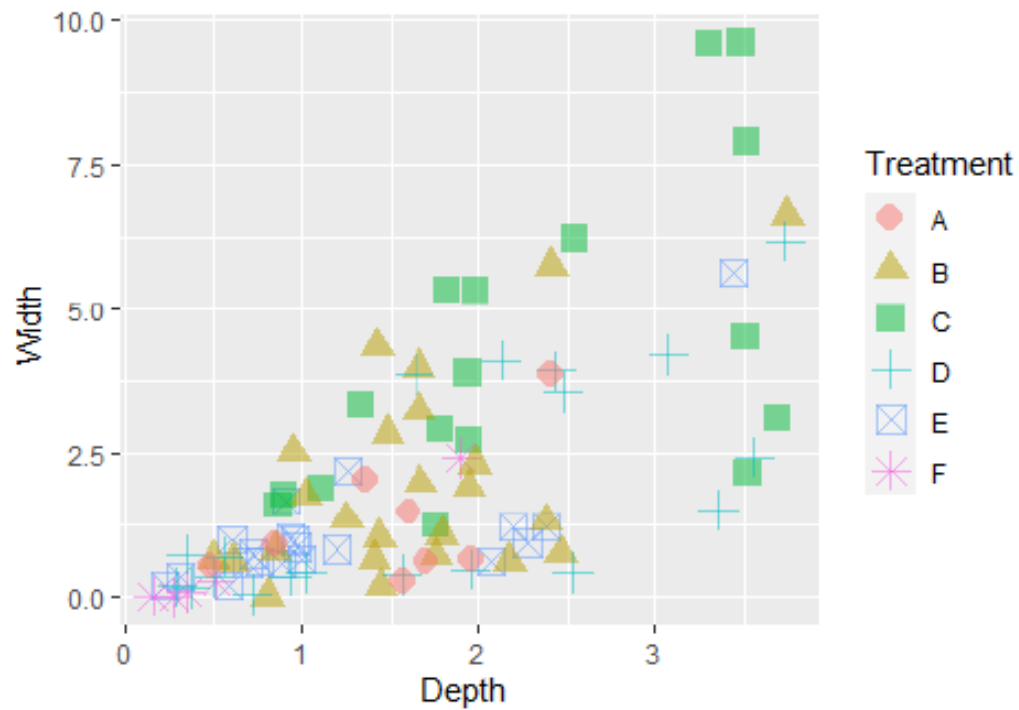
Mean Root Length after 26 Days



Percentage change in root Growth compared to Control



Scatterplot showing Root Depth vs Root Area



Vertmax Duo™ - Field Trials

Field Site :Bonnie Doon Golf Club, Sydney. The rootzone was sandy loam, pH 6.6

Layout: Replicated block with four replicates

Timing: Initial treatments were applied on Tuesday 19th May 2020

Duration of Trial: Assessments were made at regular intervals for a period of 4 weeks following initial application. Repeat applications were made at two weekly intervals.

Vertmax Duo™ - Products tested

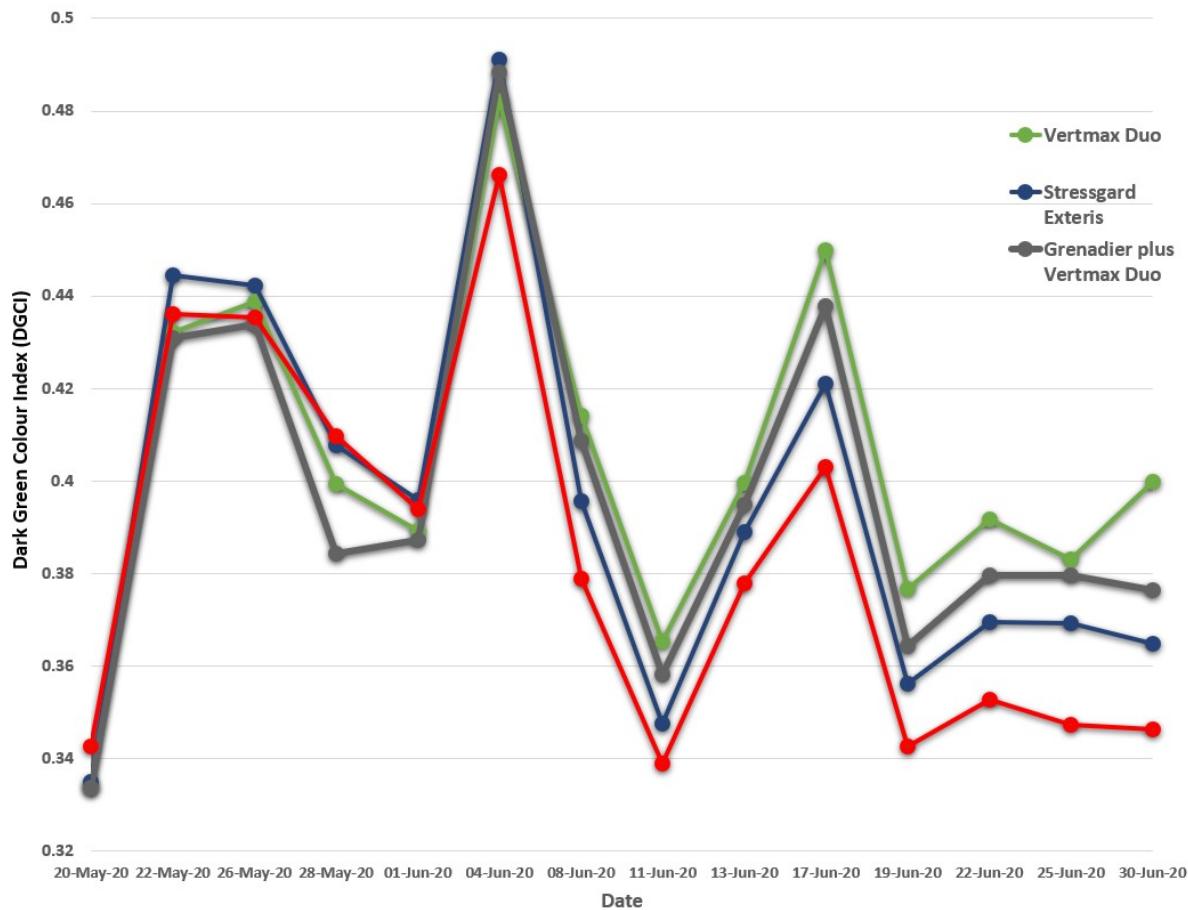
Product	Active Ingredient	Application Rate/Ha
Signature® XTRA Stressgard	fosetyl aluminium	10 kg
Grenadier™ + Vertmax Duo™	fosetyl aluminium	12.5kg + 1L
Vertmax Duo™	Pigment plus beneficials	1 L
Salicylic acid	Salicylic acid	1L
Salicylic acid +	Salicylic acid plus BAP	0.5Kg
Exteris Stressgard™	Chlorothalonil	10L
Granular gypsum	calcium sulphate	1000kg
TX10	N/A	400kg

Vertmax Duo™ - Assessment

Treatment	Plot
Untreated	14
Yeast Extract 1	2
Yeast Extract 2	3
Gel Fertiliser - Amber	4
Gravital Force- liquid calcium	5
Vertmax Duo	6
Exteris Stressgard	8
Signature EXTRA Stressgard	9
Grenadier® plus Vertmax® Duo	10
TX 10	11
Granular Gypsum	6

Vertmax Duo™ – Exteris® Stressgard™

Mean Dark Green Colour Index (DGCI) Readings after Treatment



Vertmax Duo™ - Grenadier™

