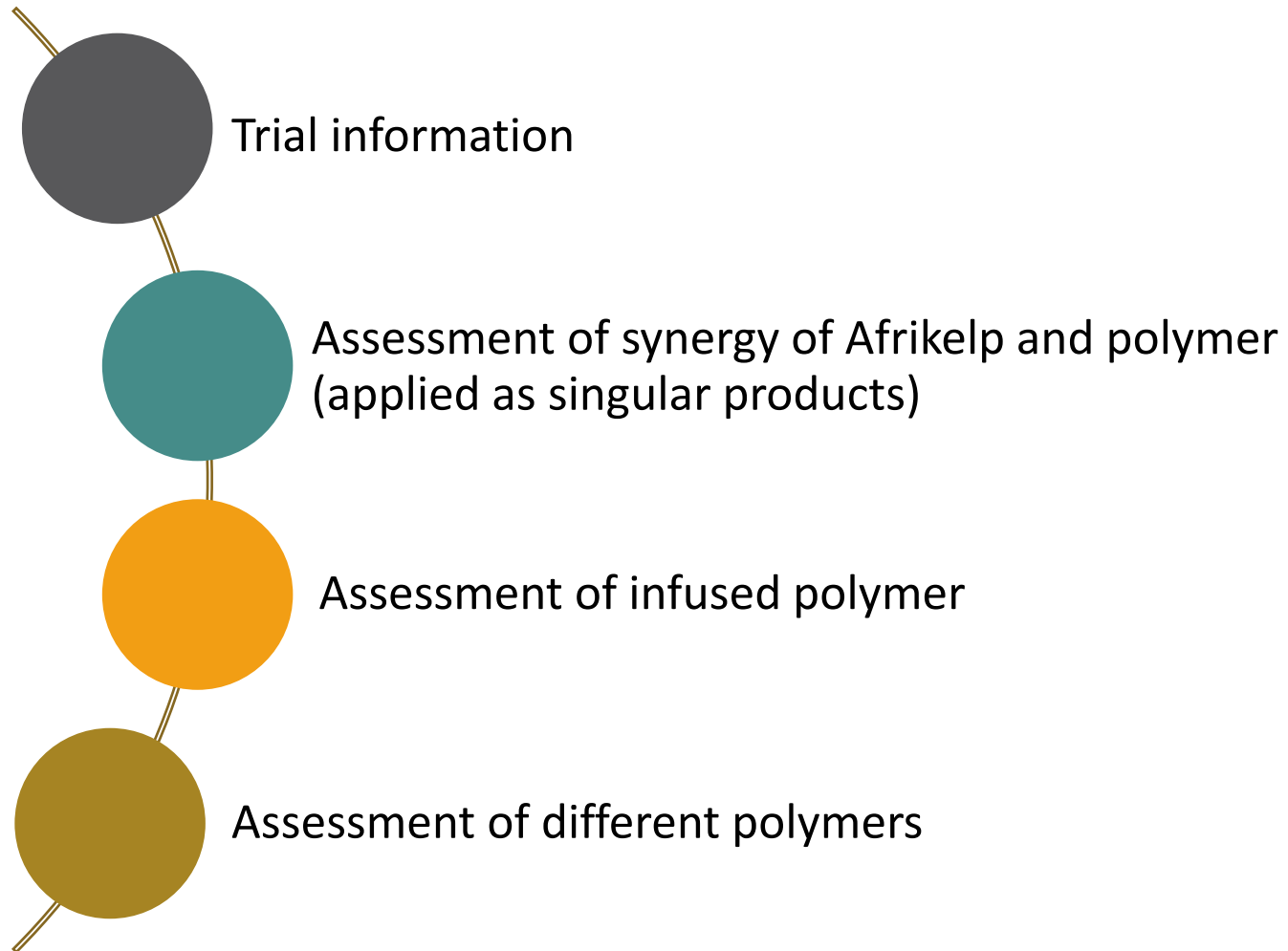




Research and Development: **EVER GREEN 2020**





- R&D tasked with determining if there is a synergistic effect between the two products:
 1. Investigate the effect of the polymer on its own
 2. Investigate the effect of the polymer with liquid application of Afrikelp LG-1
 3. Investigate the effect of the polymer that has Afrikelp LG-1 incorporated within it (complete single Water-Hope & Afrikelp offering)

Terms and Definitions:

- EGP
 - EVER GREEN polymer
 - Usually referred to as neutral polymer
- EGP + Afrikelp LG-1
 - EVER GREEN polymer drenched with Afrikelp LG-1
- EGP - I
 - Usually referred to as the infused polymer
 - EVER GREEN polymer that has Afrikelp LG-1 incorporated within in polymer

Application methods tested in Afrikelp Growing rooms

Most practical



Polymer mixed with soil



Polymer sprinkled on top of soil



Polymer hydrated then added to soil



Pot plants are filled to midpoint with soil and sprinkled with polymer. Seedlings are placed on top of the polymer and supported by topping up with additional soil. Pots are only $\frac{3}{4}$ filled to allow for expansion of the polymer and circumvent seedling popping out of the soil.

Q: Does external applications of Afrikelp LG-1 to plants growing in a medium containing the polymer result in improved plant growth (shoot and root mass)

Evaluate whether there is a synergistic effect between Afrikelp and Neutral EVER GREEN: Trial 1



Crop: Chillies (long slim)
Trial Type: 6 week pot trial
Location: Controlled growing rooms at Afrikelp

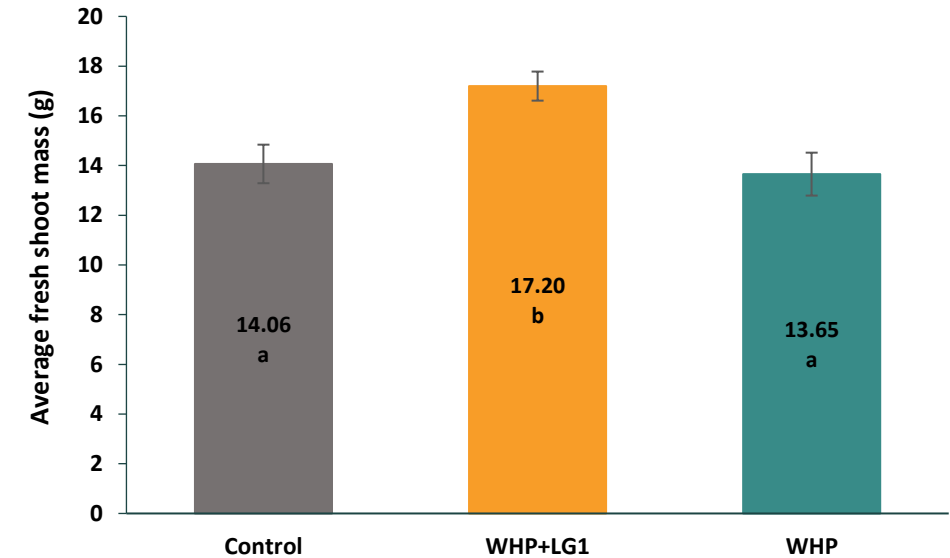
Treatments: UTC (untreated control), WHP + Afrikelp LG-1 (WHP+LG-1), WHP

Treatment protocol:

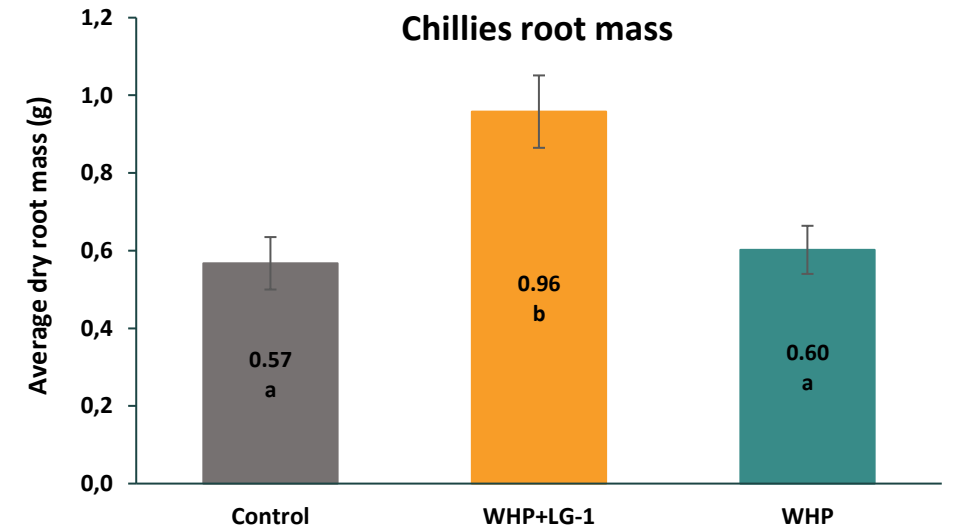
- Handling of polymer
 - a. Bulk preparation of soil: 20L of soil mixed with 40g polymer
 - b. Following bulk preparation, 1L of polymer mixed soil was compacted into 3L pot
 - c. Thereafter, polymer mixed soil was topped with and additional 6g of neutral WHP
 - d. Seedlings were placed on top and pots were filled with a further 1.6L of polymer mixed soil
 - e. plants received a drench of Afrikelp LG-1 (1%)
- Plants watered regularly following transplant (once a week) and nutrition applied every two weeks
- At 6 weeks plants were harvested and biomass (shoot growth) and dry root mass were recorded

Chillies planted in soil containing the polymer drenched with Afrikelp LG-1 resulted in a statistical increase in biomass and root mass compared to control and neutral EGP. Neutral EGP did not result in a statistical increase in root or biomass compared to the control.

Chillies shoot mass



Chillies root mass



Error bars represent standard error (SE). Differing letters represents a statistical significance

Evaluate whether there is a synergistic effect between Afrikelp and Neutral EVER GREEN: Trial 2



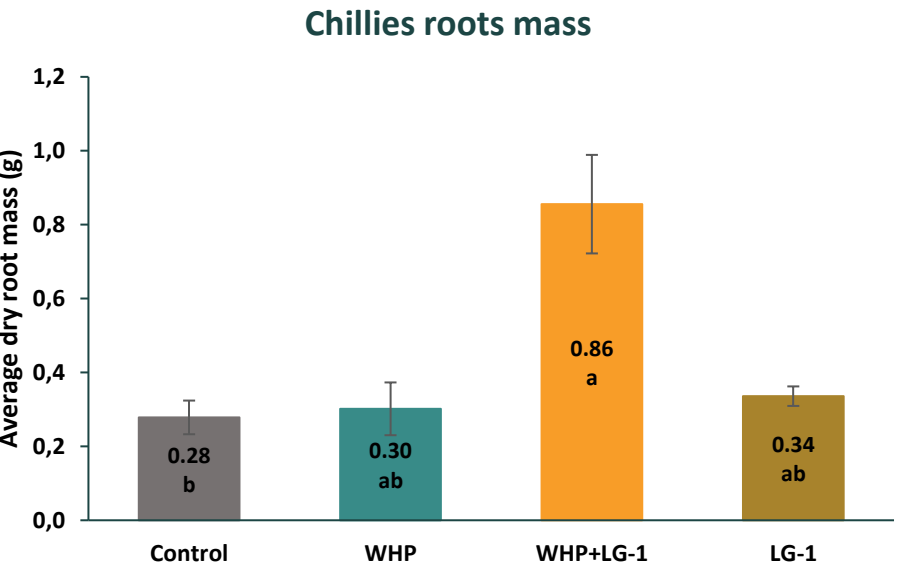
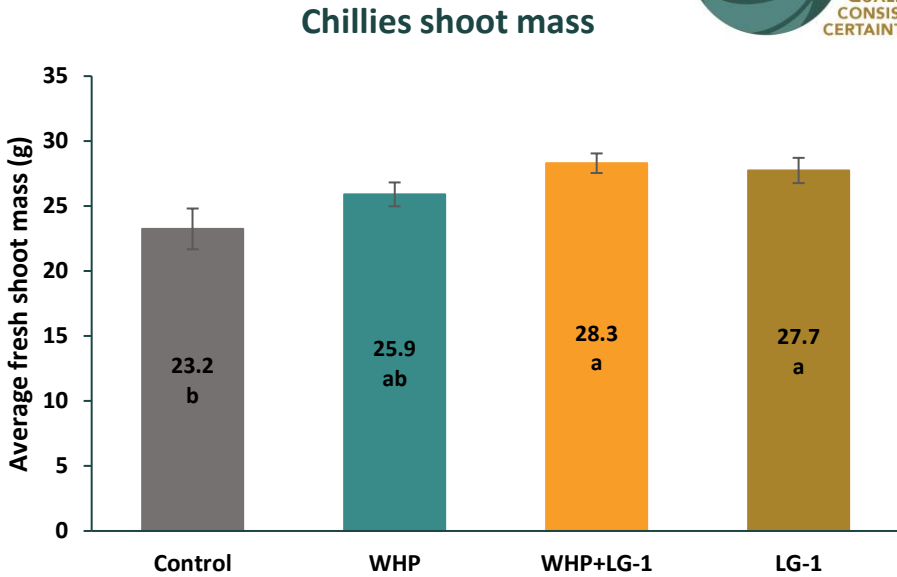
Crop: Chillies (long slim)
Trial Type: 6 week pot trial
Location: Controlled growing rooms at Afrikelp

Treatments: Control
EGP (neutral polymer)
EGP+ Afrikelp LG-1 (WHP+LG-1) – applied as drench
Afrikelp LG-1 - applied as drench

Treatment protocol:

- Seedlings were transplanted and drenched with treatments
- Handling of polymer
 - a. Bulk preparation of soil: 20L of soil mixed with 40g polymer
 - b. Following bulk preparation, 1L of polymer mixed soil was compacted into 3L pot
 - c. Thereafter, polymer mixed soil was topped with and additional 6g of neutral polymer
 - d. Seedlings were placed on top and pots were filled with a further 1.6L of polymer mixed soil
 - e. Following transplanted, treated plants received a drench of Afrikelp LG-1 (1%)
- Plants watered on a regular watering schedule as per plant needs
- At 6 weeks plants were harvested and biomass (shoot mass) weight and dry root mass were recorded

Trend observed in Trial 1 was also observed in Trial 2; WHP + LG- 1 results in a statistically significant increase in chillies biomass and root mass compared to the control. More replicates for root mass evaluations would have likely resulted in better statistical strength. Shoot and root masses did not differ between polymer treatments.



Error bars represent standard error (SE). Differing letters represents a statistical significance

Evaluate whether there is a synergistic effect between Afrikelp and Neutral EVER GREEN Trial 3: Testing phytotoxicity of WHP with and without the addition of Afrikelp LG-1



Crop: Broccoli
Trial Type: 6 week pot trial
Location: Controlled growing rooms at Afrikelp

- Treatments:** Control
EGPx,
EGP2x
EGPx + Afrikelp LG-1
EGP2x + Afrikelp LG-1,

where x = 2g of polymer and 2x = 4g of polymer. Afrikelp LG-1 applied as a drench at a concentration of 1%.

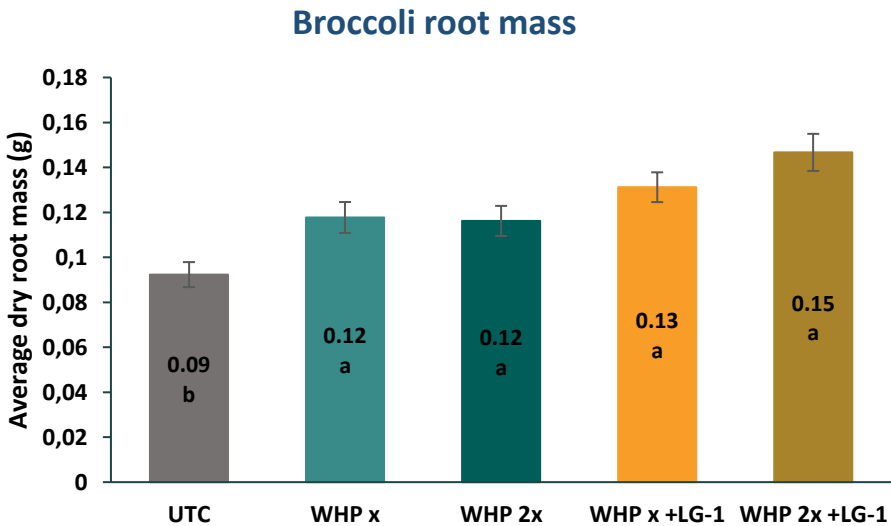
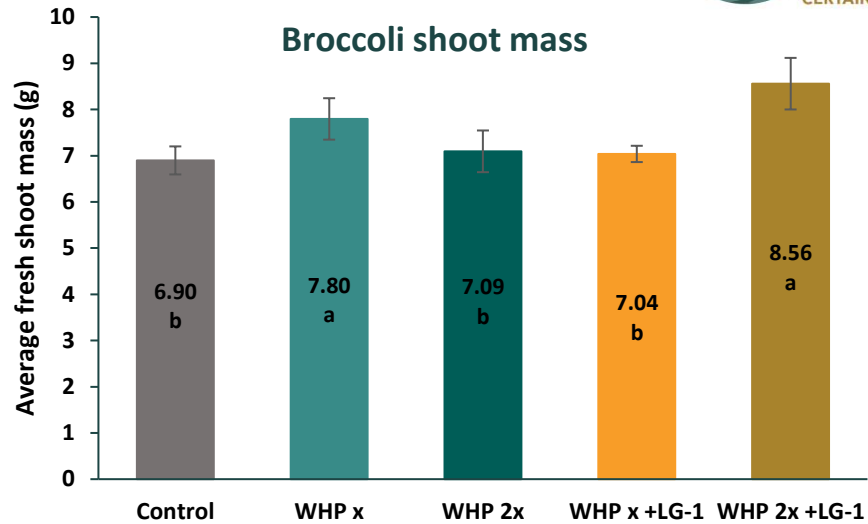
Additional Trial information:

General polymer recommendation of 2g/kg/L soil provided by Ever Green. It was decided that for future tests, this rate would be used as a means of standardising application.

Treatment protocol:

- Plant pots are filled to midpoint with soil (750g) and sprinkled with polymer.
- Seedlings are placed on top of the polymer and supported by topping with additional soil (350g)
- Following transplant, treated plants received a drench of Afrikelp LG-1 (1%)
- Plants watered on a regular watering schedule as per plant needs
- At 6 weeks plants were harvested and biomass (shoot mass) and dry root mass were recorded

WHPx and WHP2x +LG-1 resulted in a statistically significant increase in shoot mass compared to the control. All polymer treatments, with or without the addition of Afrikelp, statistically increased root mass compared to the control.



Error bars represent standard error (SE). Differing letters represents a statistical significance

Evaluate whether there is a synergistic effect between Afrikelp and Neutral EVER GREEN Trial 4: Testing water retentive properties of WHP with and without the addition of Afrikelp LG-1

Crop: Broccoli
Trial Type: 6 week pot trial
Location: Controlled growing rooms at Afrikelp

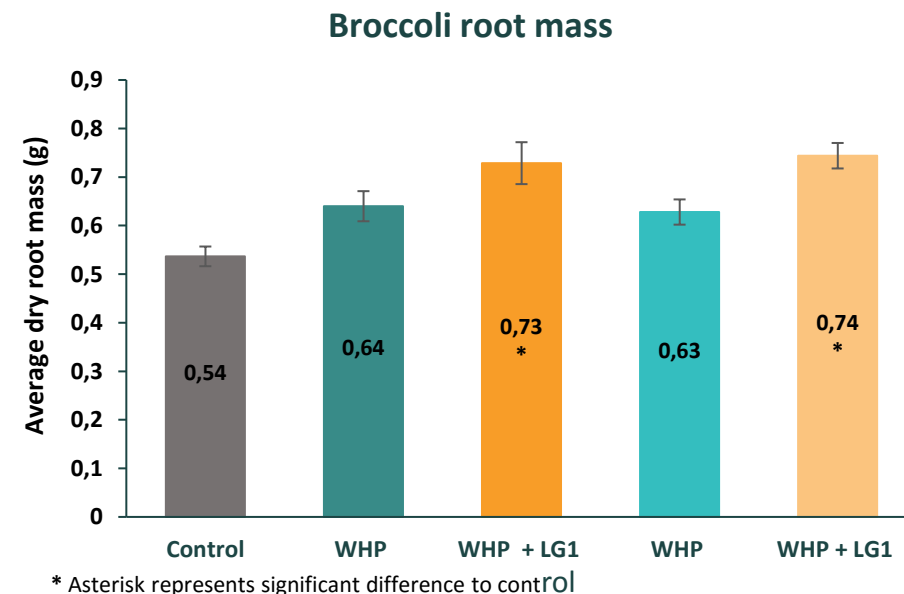
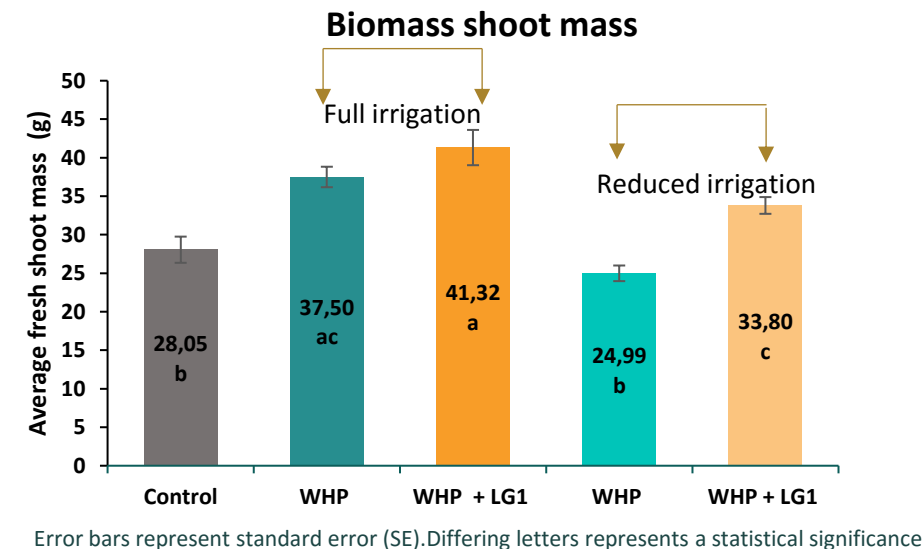
Treatments : Control; WHP; WHP + LG-1 where Afrikelp LG-1 applied as a drench at a concentration of 1%.

In order to evaluate water retention capacities of the polymer, plants were subjected to growth in differing irrigation conditions. All plants received 500 mL water once a week for 2 weeks. Thereafter, plants were irrigated on average once a week with either 500 mL (full) or 250 mL (half) of water.

Treatment protocol

- Broccoli seedlings were bought from a nursery Western Cape seedlings at 3-4 leaf stage
- Plant pots are filled with 750g soil and sprinkled with 2g polymer
- Seedlings are placed on top of the polymer and supported by topping with additional soil (350g)
- Following transplant, treated plants received a drench of Afrikelp LG-1 (1%)
- Plants were irrigated as described above
- At 6 weeks plants were harvested and biomass (shoot mass) and dry root mass were recorded

Following reduced irrigation , the addition of Afrikelp LG-1 to WHP resulted in a significant increase in shoot mass as compared to the control and the polymer on its own. Polymer on its own did however maintain plant growth compared to control plants in reduced irrigation conditions..



Conclusion

- EVER GREEN polymer short trial (6 weeks study)
 - Increased root and shoot mass
 - No phytotoxicity observed
 - Demonstrates water retentive properties
 - Synergistic effect observed between polymer and Afrikelp LG-1
 - Addition of Afrikelp LG-1 further improved root and shoot mass and water retentive capacity

Q. Does the infusion of Afrikelp LG-1 to EGP enhance biostimulant effect of Afrikelp's product?

Evaluating the improved biostimulant effect of Afrikelp LG-1 with the infused EGP Trial 1

Crop: Broccoli
Trial Type: 6 week pot trial
Location: Controlled growing rooms at Afrikelp

Treatments: EGP (neutral)
 Afrikelp LG-1 (positive control)
 EGP-I (infused polymer)

Treatment Protocol:

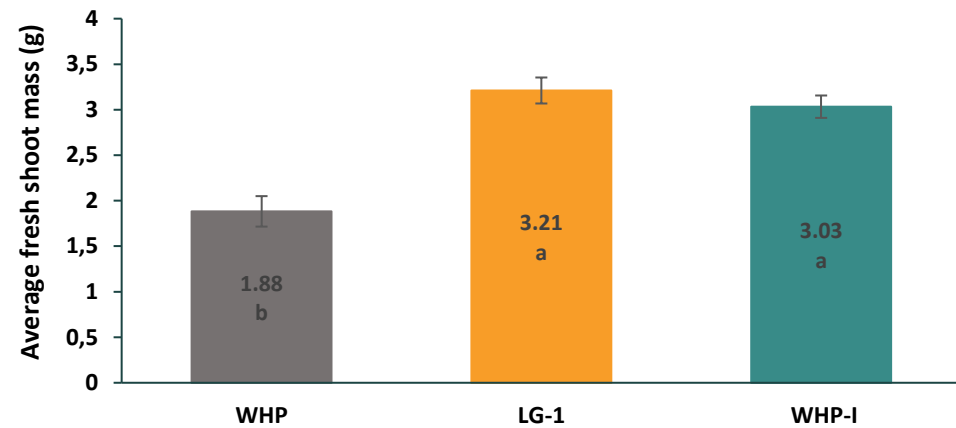
- Handling of polymer
 - a. Bulk preparation of soil: 20L of soil mixed with 40g of either EPG/EGP-1
 - b. Following bulk preparation, 1L of polymer mixed soil was compacted into 3L pot
 - c. Thereafter, polymer mixed soil was topped with and additional 6g of neutral WHP
 - d. Seedlings were placed on top and pots were filled with a further 1.6L of polymer mixed soil
 - e. Following transplant, treated plants received a drench of Afrikelp LG-1 (1%)
- Plants watered on a regular watering schedule as per plant needs
- At 6 weeks plants were harvested and biomass (shoot growth) and dry root mass were recorded

Additional trial information:

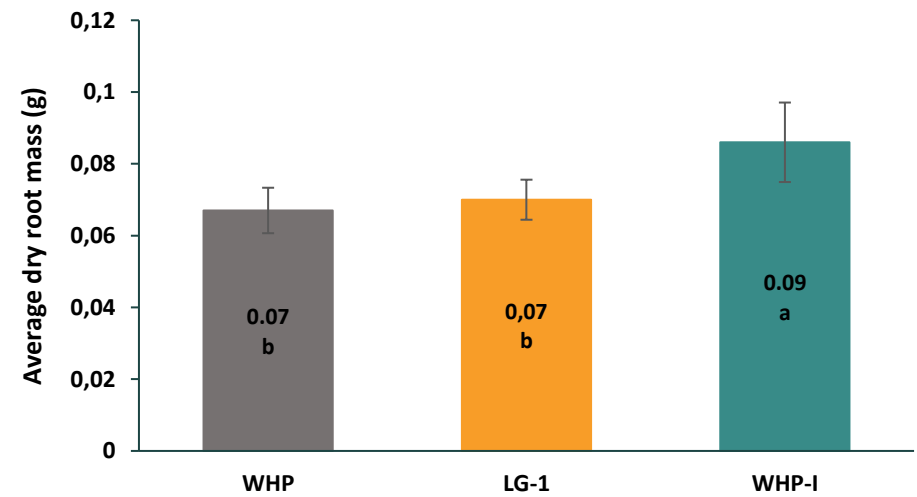
This was a small scale pilot test to evaluate whether the infused polymer would improve growth compared to the neutral WHP and Afrikelp LG-1 as a standalone application. Due to space limitation, *UTC* and *WHP+LG-1* were excluded.

No difference in shoot mass detected between infused polymer treatments and Afrikelp treatments. However, the infused polymer resulted in a statistically significant increase in broccoli root mass compared to *Afrikelp LG-1* and neutral *WHP*.

Broccoli shoot mass



Broccoli root mass



Error bars represent standard error (SE). Differing letters represents a statistical significance

Evaluating the improved biostimulant effect of Afrikelp LG-1 with the infused EGP Trial 2: Testing phytotoxicity of EGP with and without the infusion of Afrikelp LG-1



Crop: Broccoli
Trial Type: 6 week pot trial
Location: Controlled growing rooms at Afrikelp

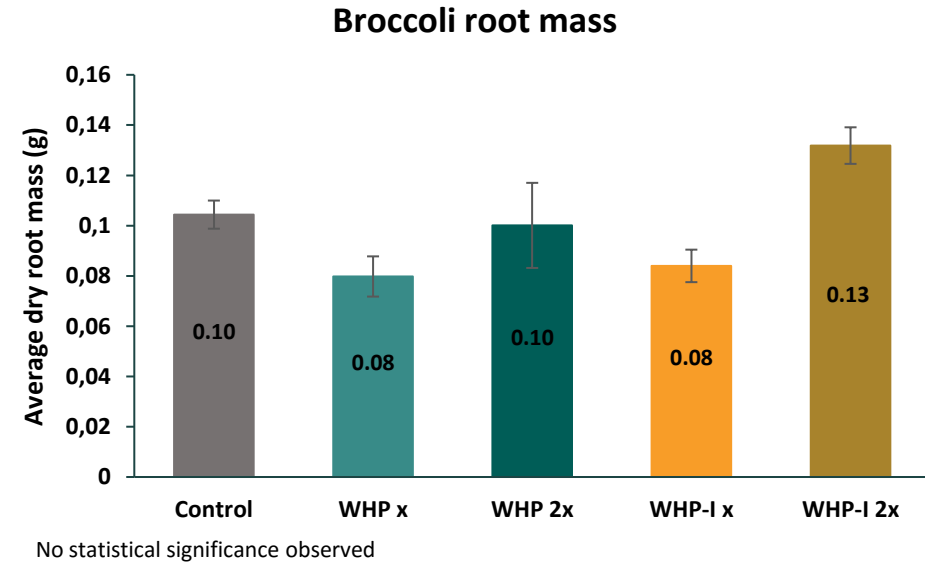
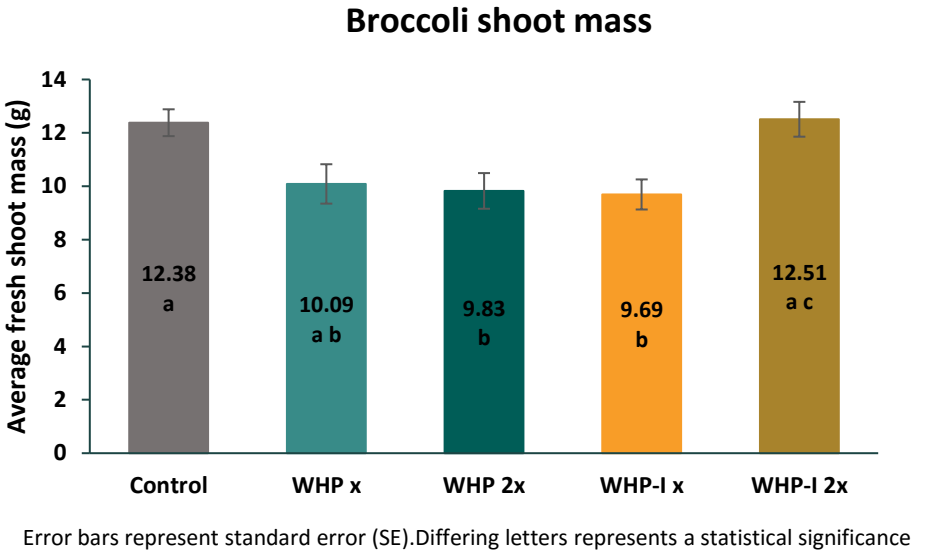
Treatment Solution: Control
EGPx
EGP2x
EGP-Ix,
EGP-I2x

where x = 2g of polymer and 2x = 4g of polymer. LG-1 applied as a drench at a concentration of 1%.

Treatment protocol:

- Plant pots are filled to midpoint with soil (750g) and sprinkled with polymer
- Seedlings are placed on top of the polymer and supported by topping with additional soil (350g)
- Following transplant, treated plants received a drench of Afrikelp LG-1 (1%)
- Plants watered on a regular watering schedule as per plant needs
- At 6 weeks plants were harvested and biomass (shoot mass) and dry root mass were recorded

Only a double dosage of infused polymer (EGP2x) resulted in the increase in root and shoot mass of Broccoli compared to the control (although not statistically significant)



Conclusions for neutral EGP and infused EGP-I screening



- Insufficient evidence to prove that infusion improves biostimulant action of Afrikelp LG-1
 - Caution
 - Only single concise trial
 - Questions stated below should be addressed first before further testing as we are essentially testing blind
- Questions
 - How much Afrikelp LG-1 is incorporated into polymer?
 - Are active ingredients compromised in process of infusion?
 - Kelp extract is a mixture, no data to support which components are actively infused into the polymer

Q. How different are differing polymer/ water absorbent products?

Evaluate the effect of various water absorbents material on blueberry



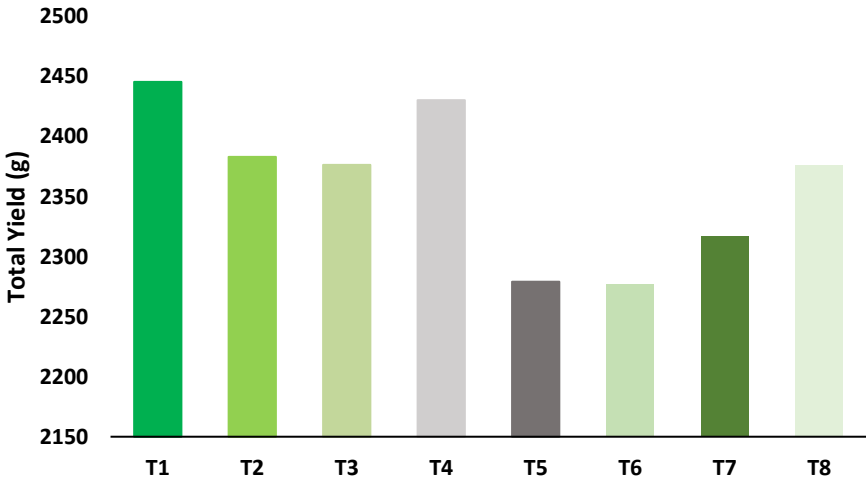
Crop: Blueberry (1 year old)
Trial Type: Commercial scale trial
Location: Rawsonville Farm

Treatment Solution: T1 –Neutral EGP
T2 – Infused Polymer (WHP-I)
T3 – Polymer A
T4 - Polymer B
T5 – Polymer C
T6 – Polymer D
T7 - Polymer E
T8 - Control

Treatment schedule :

- Blueberries are cultured in pot under shade net
- Pot plants filled half way with soil was sprinkled with 15g of water absorbents material.
- Plants received normal fertilization programme and watering during according to farmer practice (automated system)

Blueberry Yield



Unfortunately caution must be given when comparing results to control as control plants were border plants and these are generally not ideal for comparison. However, neutral polymer and polymer B resulted in positive increases in blueberry yield.

Appendices

Appendix 1: Requirements for registrations in SA - DAFF

9. WATER ABSORBENT PRODUCTS.

Applications for registration of water absorbent or retention products shall follow the normal application process and provide the following information:

9.1 Identification of the product.

9.2 Certificate of analysis from a reputable laboratory indicating the chemical composition of the product.

9.3 Analysis certificate for potentially harmful elements as prescribed in table 12.

9.4 Proof of efficacy in retention of water in a suitable study (water pressure plates, infiltration columns, saturation point).

9.5 Proof of release of water to plants in growth studies under water stress conditions.

9.6 Proof of non-phyto-toxicity.