between height and day than non-AMF treatments. This is exemplified by the commercial control (B) plot that demonstrates significantly higher correlation coefficient than other, peat-free treatments (R=0.88), this difference in growth can also be seen in Figure 48.

(a) (b)

Figure 48: Comparison of commercial control pots (peat / gray pot, right hand side) and peat-free (+AMF / black pot) at *ca.* 14 days growth with an mean increase of 1.91cm for peat based substrates against peat-free + AMF. Also seen here is the clear differences in growing media, in both colouration and texture.

6.4 Shelf-Life

Shelf-life of any consumable product is a large factor when viability and further development of alternative production methods such as Peat-Free growing media. For potted herbs, optimisation of conditions for quality control from shipping to storage and display is critical [Lange and Cameron (1994); Santos2014]. Potted herbs are left unattended when in storage and on display, with poor lighting and limited to no irrigation (see Figure 50, (a) and (c) for examples of shelf-life conditions). Assessing the impact of substrate composition and biological input is essential when designing new, innovative systems for potted herbs. The difference in pot moisture % was not statistically significant between either biological, fertilizer or substrate treatments (see Figure 49). However, the combination of Peat-Free, AMF and fertilizer created the highest mean moisture retention. The room luminosity (+600 Lux) was substantially more than those of previously recorded supermarkets (300-450 Lux) depending on placement of the Lux sensor. Light conditions may have therefore impacted growth media moisture to a greater extent than a typical supermarket environment.

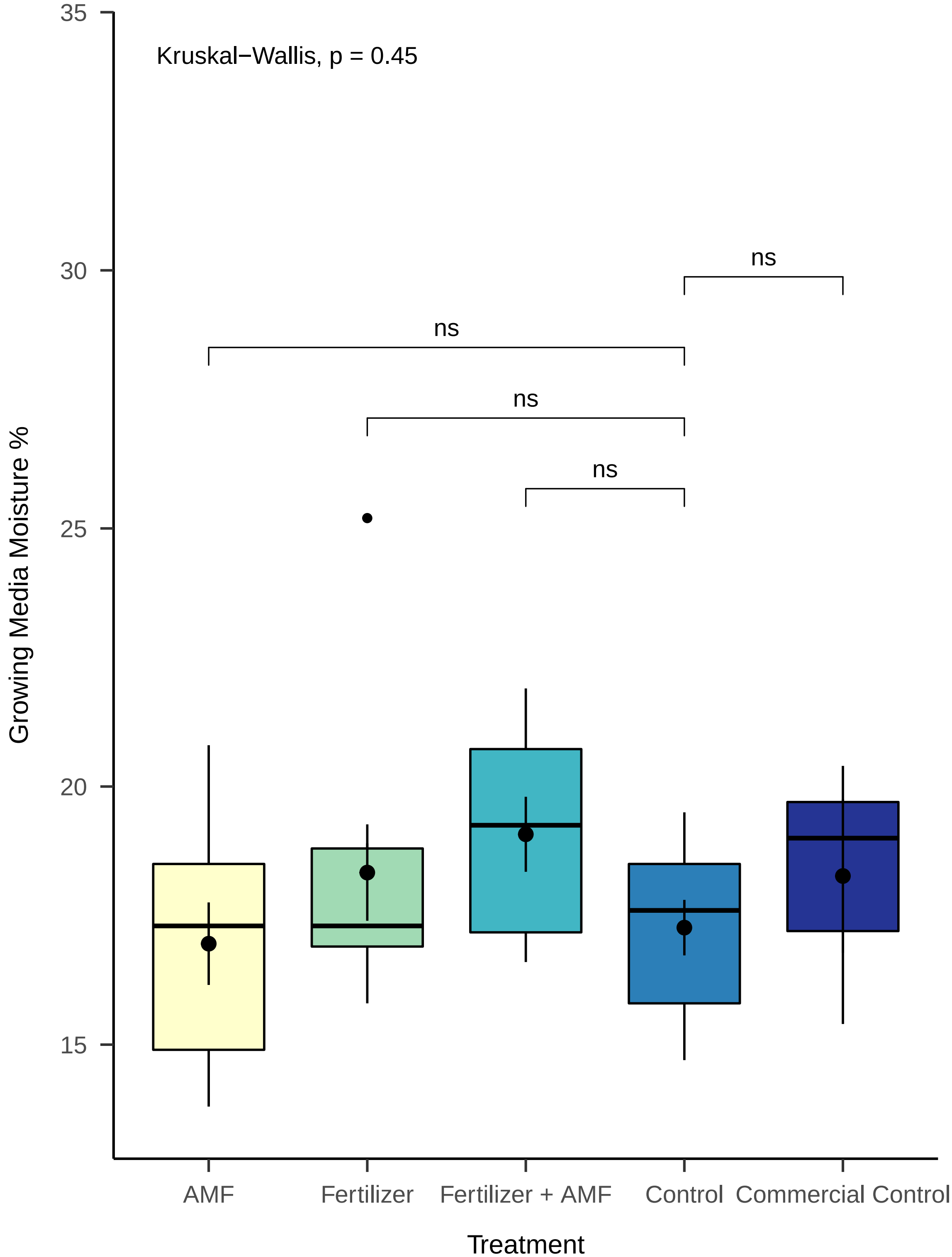

Figure 49: Pot moisture at + 5 days after removal from growing environment. The AMF treatment had the widest range of substrate moisture measurements whereas both the commercial control (peat) and the Fertilizer+AMF treatment demonstrate increased substrate moisture levels. This may suggest AMF+Fertilizer may have a role in maintaining substrate moisture, however this could also be an effect of placement/edge effects from trial setup.

(a) (b) (c)

Figure 50: Shelf life conditions of a randomised selection of treatments (a) including the commercial control (grey pot), also pictured the transportation method used to move pots (b) and the trial layout (c).

6.4.1 Yield

Yield was assessed as both Fresh (Figure 52) and Dry (Figure 51) for each treatment after a total of 33days growth, 5days of which after being exposed to a "shelf" like environment. Dry yield demonstrated the commercial control (Peat) as being the highest yielding treatment, with a $>100\%$ increase in yield against the Peat-Free Control. However, this was not reflected in fresh yield, with a similar yield of the Peat-Free control (25.2g and 25.37g, respectively). The highest yielding Peat-Free treatments were the fertilizer treated pots. The addition of AMF with fertilizer increased dry yields by 1.41g against that of the Peat-Free control, a 58% increase in dry yield. This result was not replicated in fresh yields, with only the fertilizer treatment significantly ($p > 0.05$) increasing yields against the Peat-Free control (29.17g and 25.37, respectively). AMF treated Peat-Free substrates were significantly lower yielding for Fresh yield against the control, with a reduced yield of 18.4%.

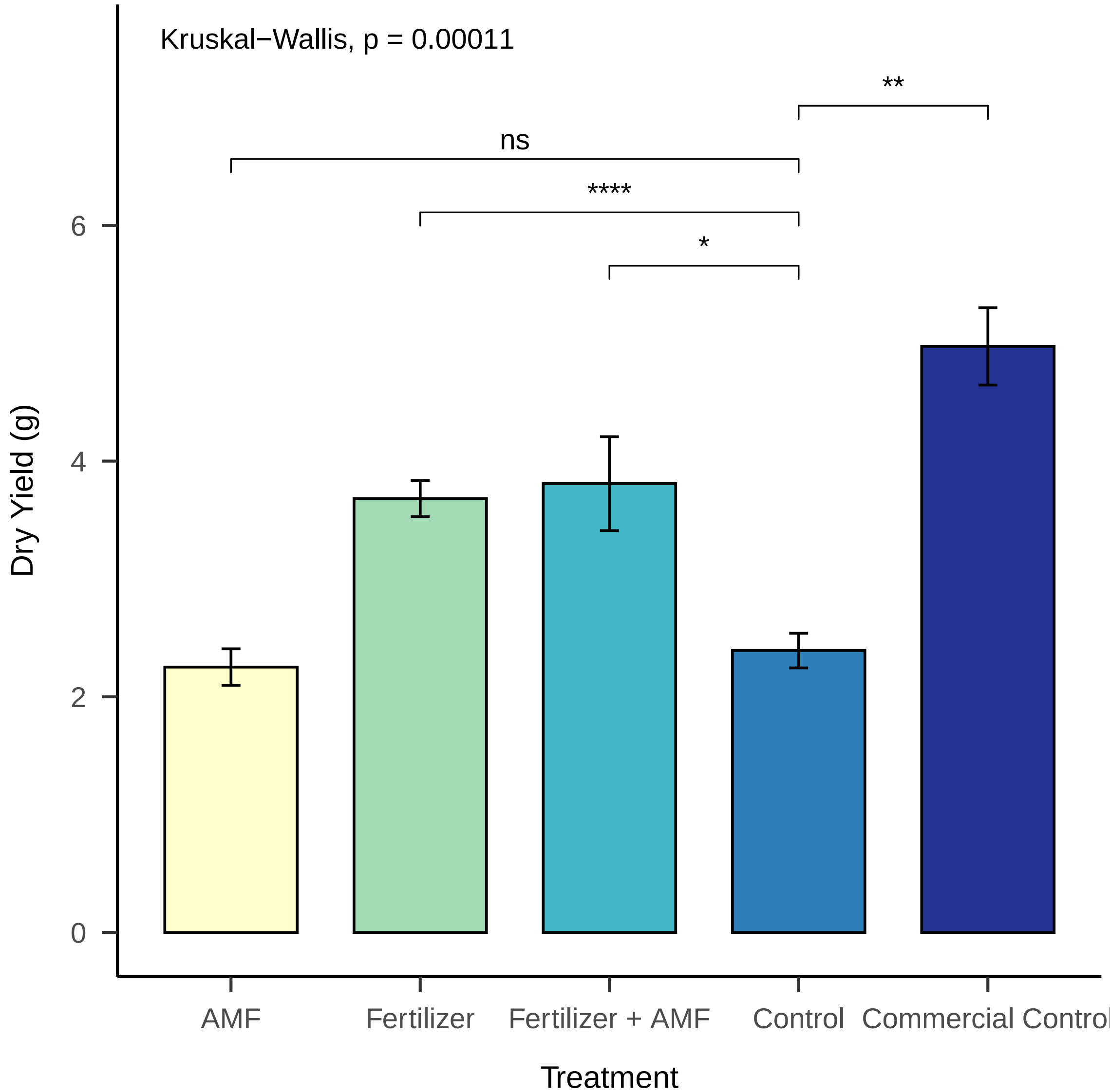

Figure 51: Dry yield bar plot with one-way ANOVA between control and other treatments (*ns*= not significant). The highest yeilding treatment was the peat based commerical control, producing almost x2 the weight in dry matter yield than that of the Peat-Free control. The best performing peat-free treatment was that of the AMF+Fertilizer treatment. This treatment also had a higher data range/variability as indicated by the error bar, unlike the Fertilizer only treatment. This may suggest AMF in tandem with Fertilizer potentially decreases homogenity in dry matter yield.

Table 21: Dry Yield. Mean at *ca.* 30 days growth (after drying).

AMF	**Fertilizer**	**Fertilizer + AMF**	**Control**	**Commercial Control**
2.25	3.68	3.8	2.39	4.97

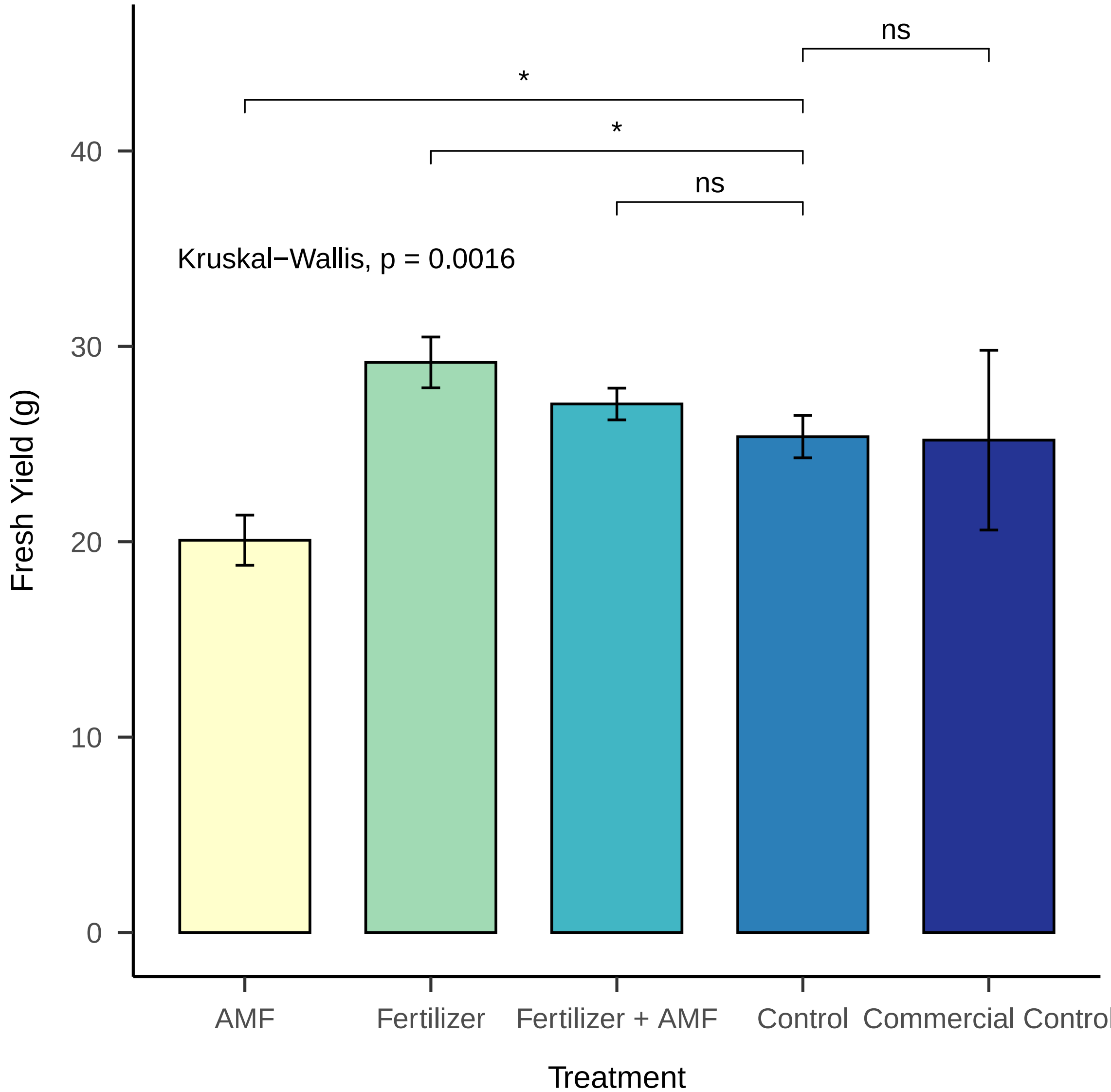

Figure 52: Fresh Yield with between treatment significance levels and global significance (*ns*= not significant, *=significant). Fresh yield demonstrated very little correlation to dry yield results. This is unlike other examples in this study. This may be due to transport conditions or last irrigation timing. The wide variability demonstrated by the commercial control error bar, and a comparitively low fresh weight compared to high dry weight suggests this treatment was affected by drought or stress.

Table 22: Fresh yield. Mean and SD at *ca.* 30 days growth

AMF	**Fertilizer**	**Fertilizer + AMF**	**Control**	**Commercial Control**
20.7	29.17	27.05	25.37	25.2

6.5 Mycorrhizal Colonisation

Mycorrhizal Colonisation was assessed post harvest using root staining methods discussed in the general methodology. The results were vague (see Figure 53) with a decrease in arbuscular colonisation in roots compared to previous assessments (AMF treatment achieved a mean of 10.2% colonisation). There was no colonisation found in the Commercial Control (Peat) or in the fertilizer in Peat-Free treatment. Some colonisation was found in the Control pots but may have been the result of cross-contamination.

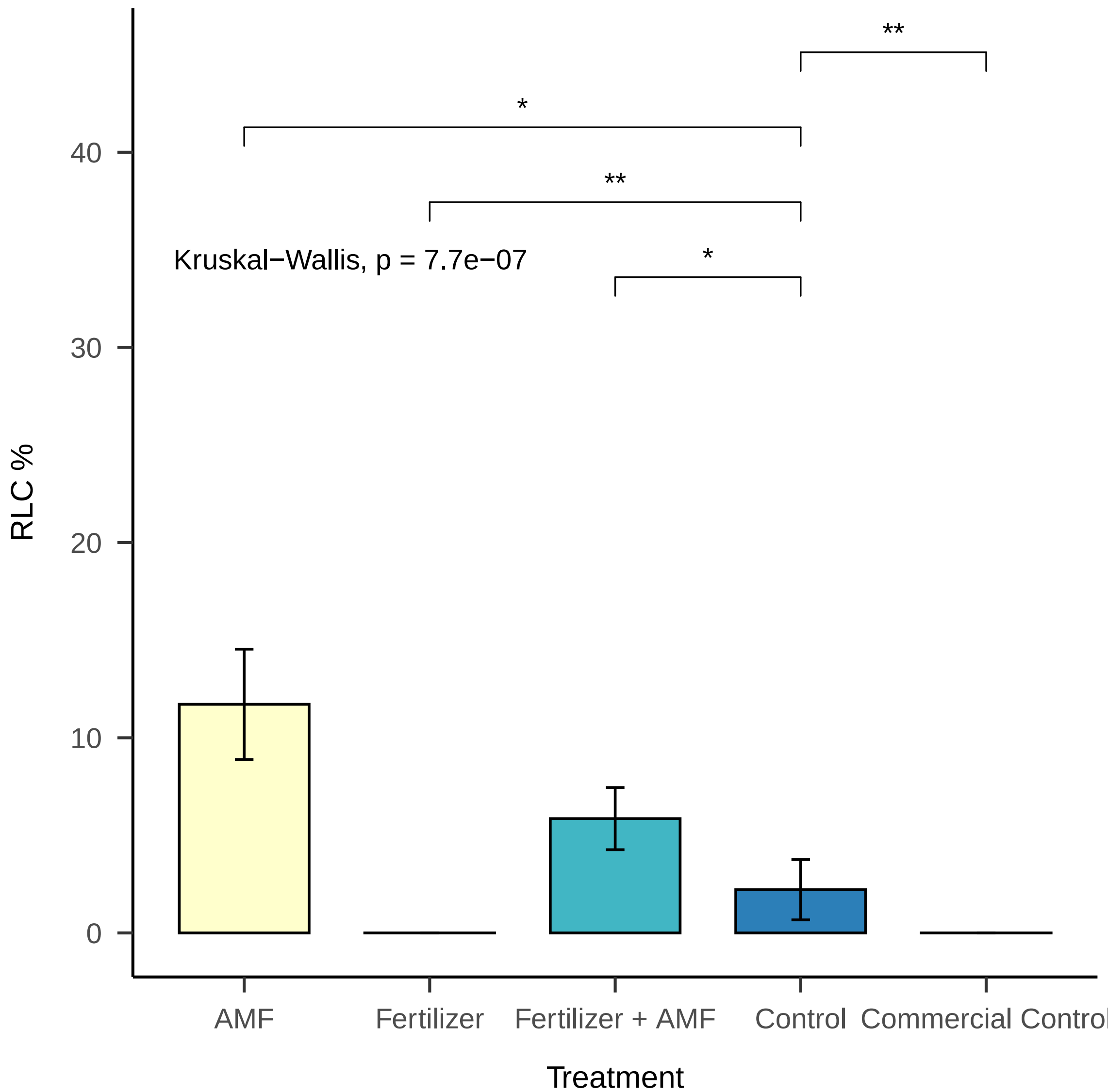

Figure 53: Root Length Colonisation (RLC) between treatments. Highest rates of colonisation demonstrated in AMF treated pots. (*ns*= not significant, *, **=significant). The peat-free control demonstrated some level of colonisation which may have occured due to contamination whislt potting.

6.6 Discussion

A series of observations were made to assess the potential for Peat-Free growing media through the life cycle of commercially produced, typically Peat based potted herbs. The treatments for Peat-Free pots included AMF and Fertilizer amendments. Overall, the strongest growing crops were that of the commercially grown Peat pots. The Peat-Free best treatment was a co-treated mix of AMF + Fertilizer. This treatment did *not* produce statistically significantly poorer growth results than the Peat pots with the exception of dry yield, which was significantly reduced when compared the commercial pots (3.8g, 4.97g, respectively.)

The addition of AMF reflected a stronger correlation of emergence rate to days grown. This trend however was not amplified in the continued growth and yield of the croppings. Only Fertilzer + AMF treatments continued as a significantly improved treatment over the Peat-Free control, with increased height and yields. The Peat commercial control treatment performed significantly better than all Peat-Free treated pots baring Fertilizer + AMF treated pots.

The shelf life assessment of pot moisture did not offer significant results, however a reduction in pot weight (not shown here) compared to Peat-Free treatments may have resulted in significantly reduced fresh yields through water-stress.

Mycorrhizal colonisation also yielded little of interest. A low RLC% in all AMF treated pots may have been the result of stressed/poor root quality as a result from 5 days on the "shelf".

The potential for Peat-Free growing media as a viable replacement for Peat in commercial horticulture is strong however. The treatment potential of microbial inoculation and sufficient fertilizing agents demonstrate significant gains in both growth and yield against Peat-Free control values.

This potential however does have draw backs. Additional costs associated with AMF inoculum, potential changes in fertigation regimes, sourcing new growing media (Peat-Free) may make future current pot grown herb production economically unsustainable (Jackson and Wright 2007) . Only with the consumer backing for increased product sustainability may this change be achieved, an issue when purchasing behavior does not match adoption of 'Greener' products (Wong, Turner, and Stoneman 1996).