10 Summary

This study presented several investigations into potted plants, substrate and amendments applied (biological or otherwise) in order to demonstrate the ability to improve Peat-Free growing media, and to bring in-line the potential for Peat-Free growing media to compete with traditionally used Peat growing media for container grown potted herbs. The difficulty of out-performing a material (peat) that is the product of extensive biological and environmental inputs over the course of thousands of years was apparent in the out-performing of peat based potted herbs against peat-free alternatives. However, the potential of biological amendments such as fungi and bacteria to improve the effeicacy of alternative growing medias was demonstrated throughout this research, and formed the basis of the entire investigation.

The introduction of AMF for peat-free and peat substrates demonstrated increased crop quality and growth for potted herbs. The addition of inoculum increased both crop height and crop quality as measured through alternative parameters such as leaf diameter. The use of AMF inoculum presents a realistic solution for increasing peat-free growing media efficacy. Although colonisation was confirmed via root staining and estimation of RLC, DNA isolation and amplification was not successful. Higher target DNA after application of primers and PCR was present in inoculated roots however (data not included). Further work on DNA isolation and amplification would benefit the confirmation of AMF symbiosis but is not necessary when treatment effect can be observed through phytometric observations (i.e. height gain). PGPR's demonstrated efficacy for both peat and peat-free substrates, but specifically for co-inoculation (i.e. multi species mixes of organisms) showed potential for increased peat-free substrate efficacy. The results for PGPR trials were generally poor however, with little influence on crop growth for both peat and peat-free substrates in either croppings (Basil, Coriander). Further work in confirming the presence of PGPR's throughout key growth stages would benefit further work in optimising the proficiency of PGPR use in potted herbs.

Commercial use of Peat-Free substrates showed Peat substrates as superior, but a clear indication that AMF inoculation with Peat-Free growing media hugely improves the growth rate of container potted herbs with minimal growing time loss in perspective of required height (for point of sale). The commercial growth study benefitted massively from the fertigation regime in place. Replication of this fertigation proved difficult in the research facility but may

benefit continued research.

The use of phosphate buffering compounds (i.e. comaplox) created an inverse reaction regarding crop growth for peat-free substrates with increased application rates. This result was unexpected due to the hypothesis that AMF would perform well in an P-deficient environment, thereby necessitating their well established function of solubilising P from the substrate, consequently improving crop quality and growth.

Research observing the differences in homogeneity regarding crop emergence illustrated several important, and imperative findings: The introduction of AMF appeared to increase homogeneity in crop emergence in peat-free growing media. This was assessed utilising the Gini index of inequality. These results suggested the presence of AMF have a direct, positive influence on seed germination in peat-free growing media. The results also demonstrate large batch mixing of peat-free substrates has little effect on crop homogeneity.

The assessment of gas emissions from both Peat and peat-free growing media under various biological treatments (i.e. AMF) suggest the presence of AMF may have a larger impact on the development of cropping's outside of otherwise conventional assessment methodologies (i.e. phytometric). Higher levels of TVOC emissions from AMF treated croppings may reflect higher plant stress. This methodology of monitoring gas emissions may have significant applications in real-time plant assessments, by indicating inefficient growth conditions prior to physical conditions appearing in the crops. Further work regarding optimisation of methodology may prove fruitful.

The conclusion of this research is therefore to highlight the positive influence of AMF had on crop development in both Research and Commercial settings, and demonstrate the indeterminate effect of PGPR's on crop quality and growth in a limited setting (i.e. container grown herbs). Peat-free growing media, although out-performed by Peat in most parameters (height, yield etc.) demonstrated increased efficacy as a growing media when inoculated with AMF, this result was more apparent in Coriander than Basil.