

**The Influence of PittMoss in Spring Growth Trials on the  
Performance of ProMix HP**

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## TABLE OF CONTENTS

Introduction.....	page 3
Substrates Used.....	page 3
Crops Grown.....	page 3
Replications.....	page 3
Production.....	page 4
Data.....	page 4
Photos.....	page 5
Summary.....	page 5
Tomatoes.....	page 6
Marigolds.....	page 7
Basil.....	page 8
Kale.....	page 9
Petunias.....	page 10
Final Summary & graphs.....	page 11



## INTRODUCTION

This summary is presented to highlight the influence that the PittMoss® Grower Grade substrate amendment had on the crop growth. This specific report provides an overview of trial results from spring of 2019 focusing on the incorporation of PittMoss® Grower Grade substrate amendment into the ProMix HP blend. The trials were performed at the research facility of Dr. Charles L. Bethke in Williamston Michigan.

## REPLICATIONS

Rooted plugs were planted into the trial blends in replications of 6 for the tomatoes and kale, 10 for the marigolds and basil, and 4 in the hanging baskets with 5 plants in each basket of petunias.



## SUBSTRATES USED

1. HP = ProMix HP (100% from 3.8 compressed bale)
2. HPGG = 70% ProMix HP blended with 30% PittMoss® Grower Grade
3. PM1 = PittMoss blend containing 30% PittMoss Grower Grade, 65% Sphagnum and 5% Perlite
4. House = A greenhouse blend of 60% PittMoss® Grower Grade, 25% Sphagnum and 15% Perlite

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## CROPS GROWN

1. Tomatoes (cv: Roma) grown in 6" pots
2. Marigolds (cv: Hero Mix) grown in 4 ½" round pots
3. Kale (cv: Vates) grown in 3 quart nursery pots
4. Basil (cv: Genovese) grown in 4" round pots
5. Petunias (Easy Wave Pastel Mix) in 14" hanging baskets



## PRODUCTION

One-hundred and twenty-eight plugs were planted on April 6th and placed on benches in a double layer poly covered greenhouse. They were initially watered with clear tap water containing a pH of 7.2 with an alkalinity of about 285. The water also contained moderately high levels of sodium and boron. All watering was uniformly applied by overhead irrigation to each crop when any of the plants in the treatments showed water stress. After two weeks of watering with clear tap water, soluble 20-10-20 fertilizer was injected, applying an average rate of near 100 ppm N at every watering until late in May when clear water was alternated with the injected fertilizer pending the completion of the project.

## DATA

The plants were measured during the two weeks following the 10th of June. Observations for each species included various combinations of; visual plant vigor, leaf color, height, number of leaves, number of blooms, branching, and fresh weight. The data from the replications was statistically analyzed to provide treatment means and their variations. The treatment means were then compared as percentages of the overall mean. Summaries of the compiled mean comparisons are presented as variations above and below the treatment means for each crop. The crop treatment means for all substrates tested is set at 100% and the responses vary proportionately above and below the mean. The averages are for all crops combined and are summarized in the figures below. Note that they are presented as deviations from the treatment means and show the variations above and below the experimental averages. The error bars are for a 5% range of the average treatment means and can be used to estimate significant differences. They are for comparisons between treatment means and do not represent variations within specific treatments.



# The Influence of PittMoss in Spring Growth Trials on the Performance of ProMix HP

## PHOTOS

Photos of individual representative plants from each species, in each blend, were taken at 5 intervals during production: when planted, 10 days, 25 days, 48 days, and 70 days. Representative pictures are presented to help visualize the growth differences of the crops in the various substrates and do not represent exact statistically quantitative growth responses. Adjustments to size and cropping of the subjects presented are to aid in comparisons. The graphic figures are presented for statistical comparisons.

## SUMMARY

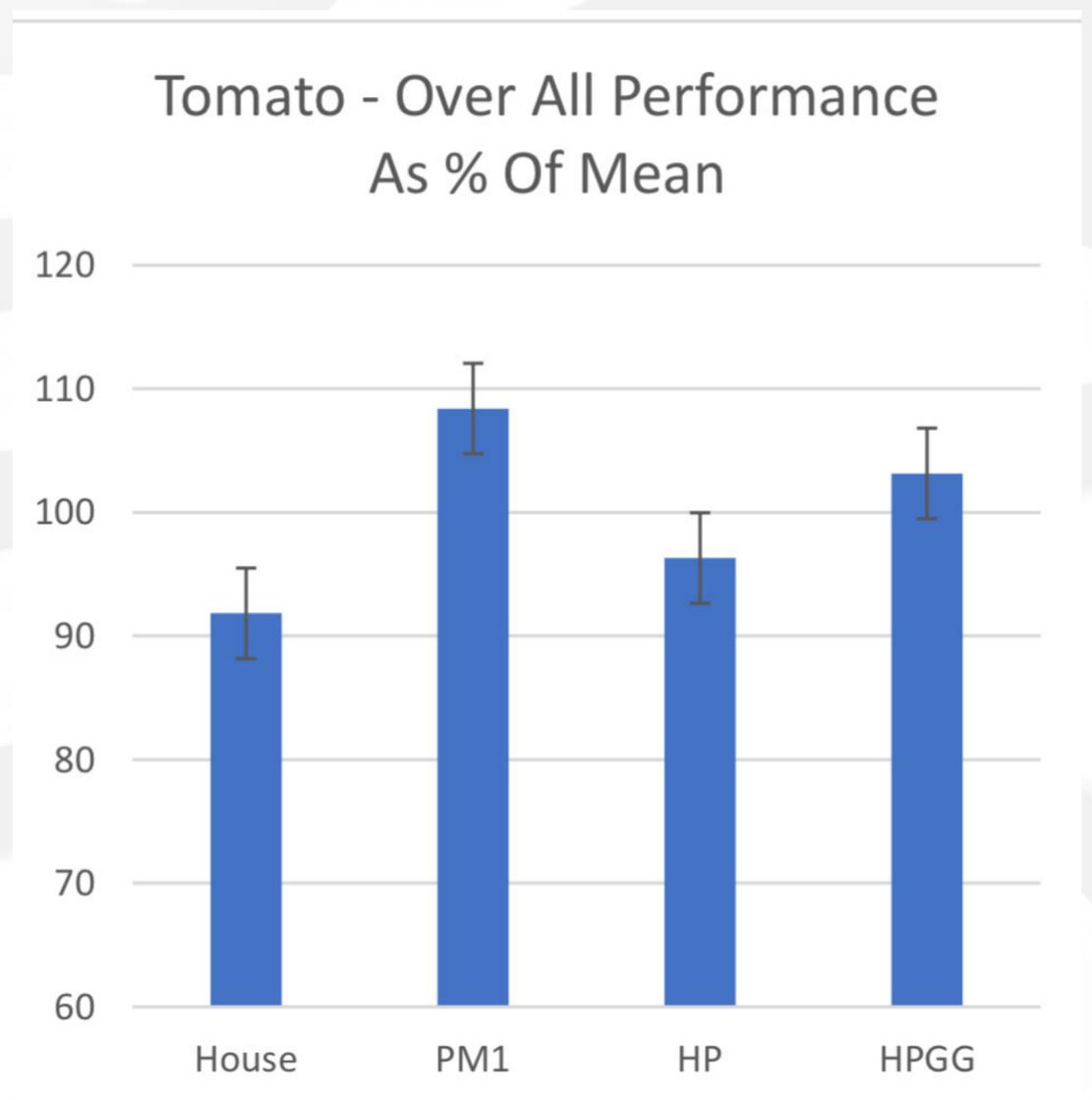
Treatment results for the specific crops are presented below. A final summary is presented graphically on page 11. In it, we see that most of the crops followed the same pattern, with the exception of the marigolds, which exhibited lower performance in PM1. Across all four other species, both the HPGG and the PM1 were the best performers, with the HP and House blends achieving lower scores. The HPGG blend with the 30% added PittMoss showed an average increase of 10.4 points, demonstrating the performance benefits of combining PittMoss with the HP. This result was most evident in the tomatoes, marigolds, and kale. Less significant were the responses in the basil and petunias. No significant improvements in the basil were observed from the addition of PittMoss. Since the variations in responses seem to develop later in the crop, it is suggested that the benefits are associated with the increased microbial activity, improved water delivery, and better nutrient utilization provided by the PittMoss. In lieu of these results, one can clearly see that the addition of PittMoss has increased the crop performance.

# The Influence of PittMoss in Spring Growth Trials on the Performance of ProMix HP



## TOMATOES

The highest performance in the “Roma” tomatoes was in the PM1 blend. It exceeded the others in height and fresh weight, but was equal to HPGG in branching, achieving a score of 108.4% of the mean comparison. Both the House blend and the HP had lower performance at 91.8% and 96.3% respectively. The addition of 30% PittMoss® Grower Grade produced a significant increase in the performance of HP, to score 103.2% of the mean compared to 96.3 % without the PittMoss. That increase was reflected in the higher fresh weight and more branching. The representative differences can be seen in the photos taken at 48 days of growth. Height, branching and fresh weight were greater in the PM1 and HPGG with the added PittMoss. The growth was about the same for the first three weeks in all blends, however, after that time the blends with the PittMoss advanced. That suggest that the primary benefits of the PittMoss relate to increased available water and nutrient reserves.





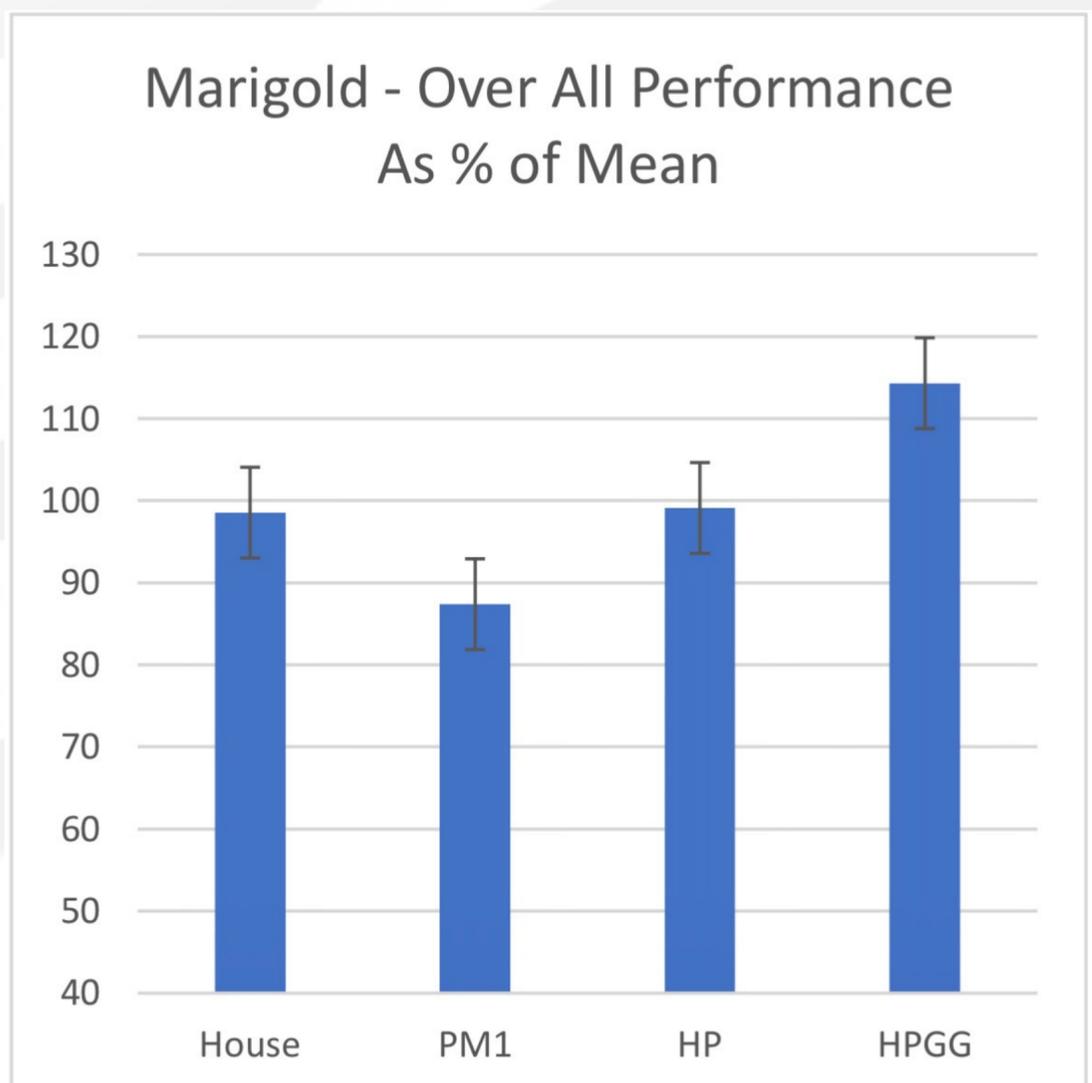
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## MARIGOLDS

The marigolds (“Hero Mixed Colors”) showed more variability within the ten replications, which was attributed to the variation in the mixed colors used. However, the performance responses and averages were significantly different between treatments. The vigor, plant height, and number of blooms showed that the HPGG blend, which has a score at 114.3% of the mean. The HP scored 99.1 % of the mean, which means that an increase of 15.2% could be attributed to the added PittMoss®. The increased vigor was expressed in taller plants with better branching and more blooms demonstrating the variance in vigor due to the mixed colors. However, note that the HPGG blend was not as good a blend for the marigolds.

The added PittMoss® appears to have done three things:

1. Raised the pH
2. Increased microbial activity
3. Increased the available water.

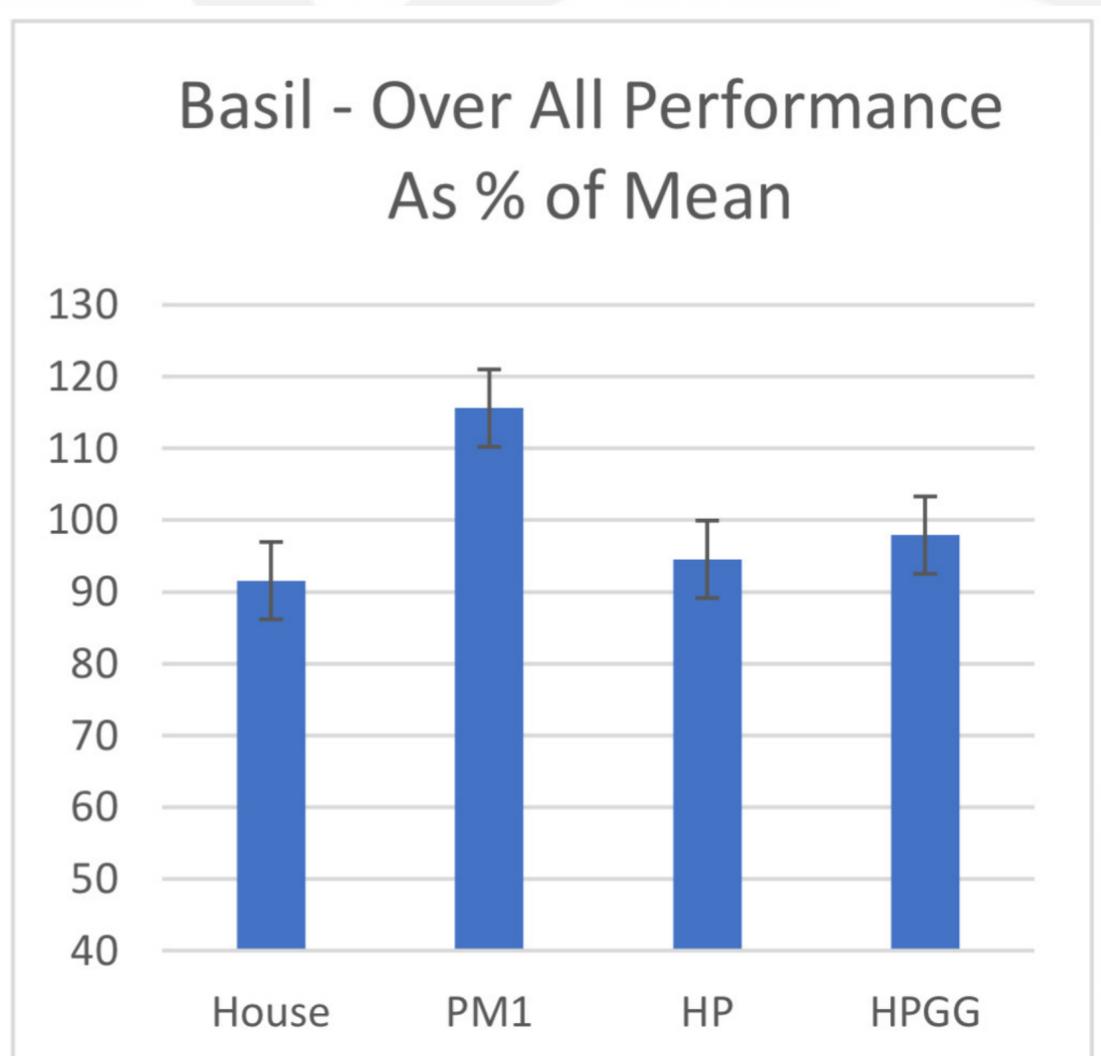


# The Influence of PittMoss in Spring Growth Trials on the Performance of ProMix HP



## BASIL

The differences attributed to the blends growing basil (cv. Genovese) were small in the beginning. HP performed better after some development in the 4" pots. When some moisture stress developed, greater variations began to appear. Comparative average performances from height and fresh weight measurements at 70 day's growth are presented in the figure below. The HP blend performed at 5.5% below the mean and 21.1% below the PM1 blend. Adding 30% PittMoss (HPGG) increased the performance by only 3.4% of the mean. Note once more that any increased performance is attributable to the improved water availability, increased nutrient availability, and increased microbial activity. **This was especially significant in the 4" pots and is made apparent in the House blend, which has a lower initial nutrient supply and remained smaller.** The photos show representative differences at 48 day's growth. Note the increased branching in the PM1. Also note that the measured data showed no significant improvements from the added PittMoss. The pictures show some differences.





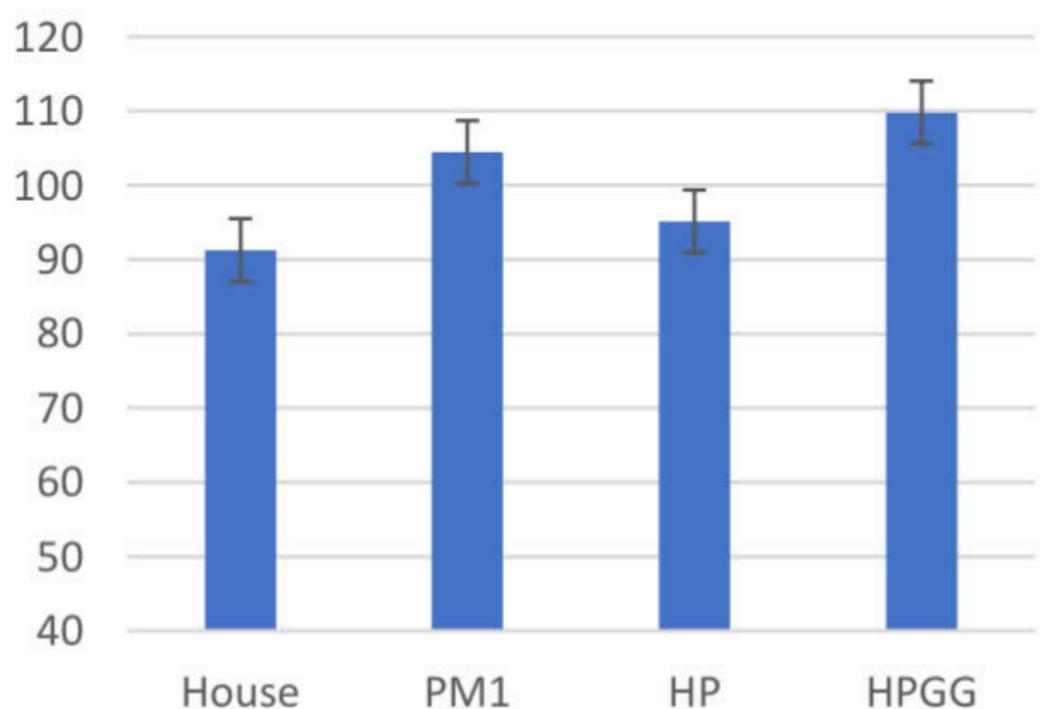
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## KALE

In the “gallon” (3 liters) pots, the kale (cv. Vates) grew to a large size and provided a good evaluation of the blend's ability to supply water and nutrients. The crops started out about the same in all blends. A slight lag lasting 10 days was observed in the blends with the added PittMoss® Grower Grade, after which they began to surpass the others. With the evaluations of vigor, height, and number of leaves, the HPGG with the 30% added PittMoss® scored about 14.7% above the HP and 13.4% above the House blend. It performed slightly better than the PM1, which scored 104.5% of the mean. The increase from the added PittMoss was statistically significant in this experiment. **This trend did appear to be real and some benefit from the added PittMoss is apparent.** It appeared that the House blend did not supply enough nutrients for the aggressive growth in the kale. The representative photos at 70 days growth as presented below show some of the differences. However, the plants were too dense on the bench and tended to elongate.



Kale - Over All Performance  
As % of Mean

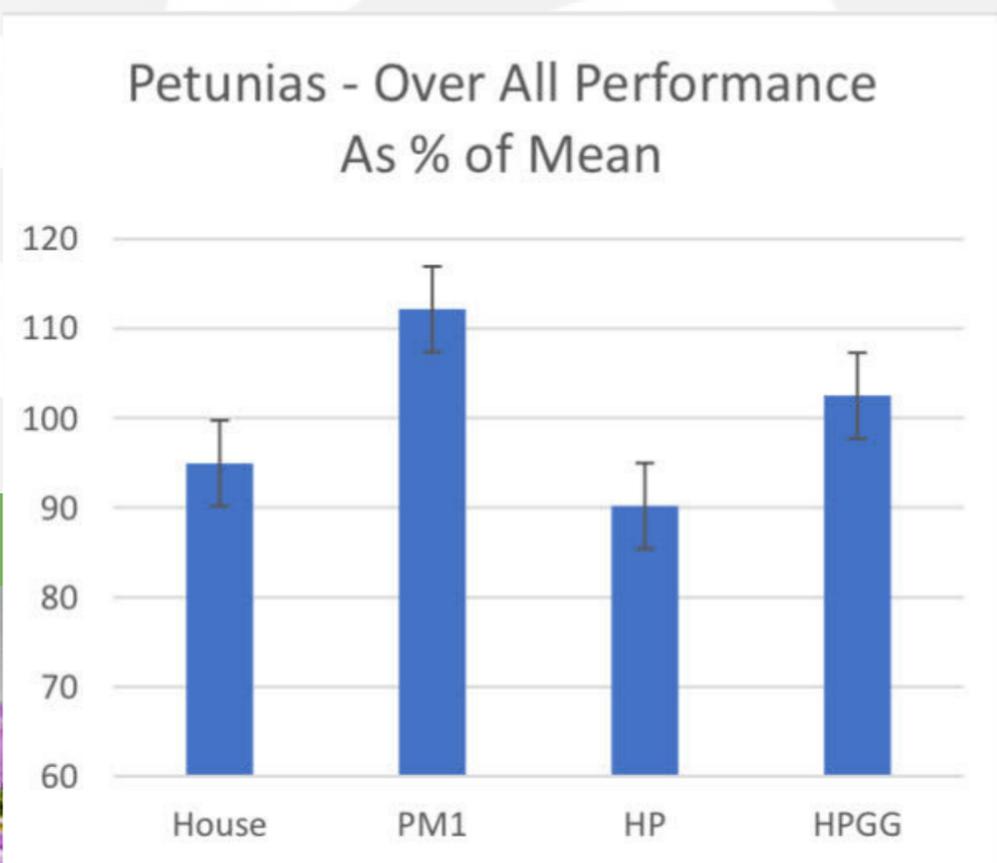
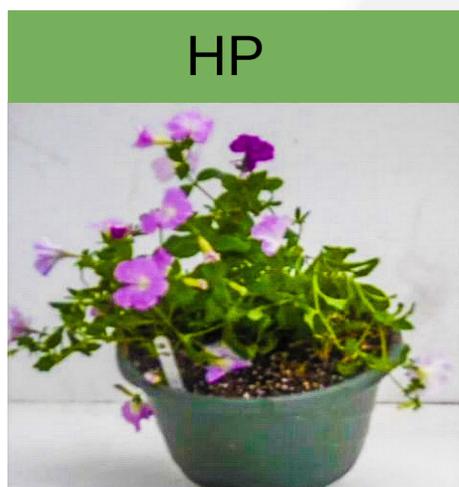
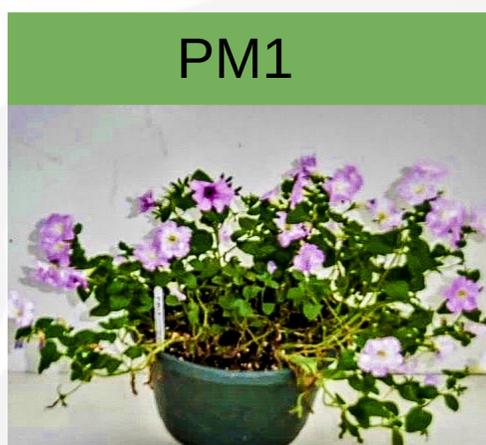
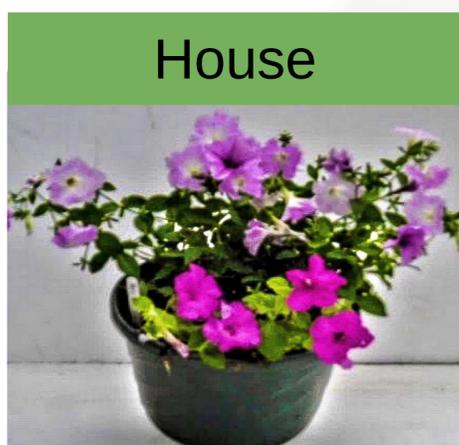




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## PETUNIAS

The responses of the petunias, growing in 12" hanging baskets, were similar to those observed in the other crops. The petunia baskets were grown on a bench to uniformly control the watering and fertilizer applications. The PM1 once again showed the best performance with an overall score at 12.3% above the mean, presenting as stronger vigor and brighter leaf color with an above average plant size. The PM1 rating was better than the HPGG. Both the House blend and HP were below the average. The HPGG that contains 30% PittMoss® increased the score by 12.3% over the HP without PittMoss. Again, the nutrient supply using the House blend and watering with only about 100 ppm N was not adequate with the low starter charge. That was demonstrated in lighter leaf color and smaller plants. The photos below, taken at 48 days, show some of the differences that were measured later in the crop.



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## SUMMARY

The relative performance of each crop in each blend is presented as a variation from the crop mean. The average over all crops for each substrate is presented in the lower figure.

