The effect of various soil-less growth mediums on the development and production of plants in hydroponics systems

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Perlite special exemplars 100

Huge cluster in palm pith

In a trial conducted in South Africa (Camdeboo Farm near Fourways, Johannesburg) two basic questions were posed:

a) Are there any differences in the overall performance of plants grown in different growing mediums?

b) Does the re-use of the same medium affect new crop grown in a second growing cycle.

The reason for the trial is the general uncertainty (at least in South Africa) regarding growing mediums. Many growers are confused or reluctant to use certain mediums due to lack of experience working with a medium, lack of information and/or due to ignorance regarding the financial implications of using the medium in the short and long term. The main objective of a grower is to invest the minimum possible in the infrastructure, still achieving the maximum yield which in financial terms means increased profit.

Therefore in the short term investing in inferior growing medium is a reality.

The fact is that a larger initial investment will in the long run return an increased yield per growing cycle which warrants the investment and also yield a greater profit. In South Africa Sawdust as hydroponics medium is used extensively;

it is considerably inexpensive, readily available from a nearby mill and due to its low-cost can be discarded after each growing cycle.

The importance of understanding the characteristics of a growing medium and the long and short time effect on the plant is essential to the overall success or failure of a crop, therefore the trial targeted the most commonly used growing mediums in the country each on its own (to serve as a control batch) and also in combination with other growing mediums.

Without elaborating on the physical and chemical differences amongst the tested growing mediums, in brief each has characteristics which make it a usable medium, for example: Bulk density, porosity, aeration, ability to contract water with high holding capacity, highly hygroscopic, create capillary water and nutrients dynamics etc.

The mediums used for the purpose of this trial were:

1) Palm pith (Coir) - 100%
2) Perlite - 100%
3) Vermiculite - 100%
4) Sawdust - 100%
5) Palm Pith - 50% / Perlite - 50%
6) Palm Pith - 30% / Perlite - 30%
7) Palm Pith - 40%/ Perlite - 30% / Vermiculite - 30%
8) Perlite - 50% / Sawdust - 50%
9) A locally produced light compost Pot soil - 50% / Perlite - 50%

A standard tunnel sized 30m x 10m was selected for the purpose of the trial positioned North- South with excellent light cover during the day. A ground cover white/black plastic sheet is used to eliminate weed growth and increase light reflection at the tunnel floor level increasing plant photosynthesis.

The experiment principles of using one crop (Tomato) one cultivar (Malory - indeterminate variety produce by Mayford-Sakata seeds) under same climatic conditions and nutrient feed and irrigation cycle regime across the various mediums allowing a fair and unbiased evaluation of the plants' performance across the mediums during a complete growing cycle.

Same structure will be used to evaluate the long term performance of the mediums without replacing them with fresh mediums in a second growing cycle.

The hydroponics method used is quite revolutionary (in process of patent registration) which in essence uses growing colevel. This method allows routine irrigation (four ntainers with a slit on one side at all times daily) of approximately 800cc per plant on average which has enormous implications on cost in terms of saving of water and nutrients. Even so the system used is an open system (not re-circulated) the "waste" of excess irrigation is minimal.

The floor plan was organized to allow for 8 rows of 48 containers each, and one block of 48 served as control at the southern end of the tunnel (strong afternoon light) which represent each of the tested mediums), in total 432 containers, two plants per container, in total 864 plants.

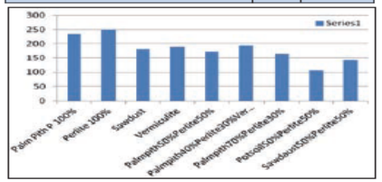
Each medium covered a block of 48 containers situated along the tunnel width to ensure fair distribution of light or shade across the 8 rows eliminating the possibility of false results due to uneven exposure to light which can be an issue if each medium placed along the tunnel length.

Seeds were sown on September 18th in a specific seedling medium (Promix), (1000 seeds). Germination between September 27-30th and seedlings were transplanted into the various mediums in the experimental tunnel by October 16-17th. Seedlings were irrigated 4 times a day at intervals that were changed as plants show vegetative growth and consideration of weather /seasonal changes during the growing phase.

Plants showed a strong vegetative growth during the first 30 days (15-20 cm per week) and first clusters appeared during the first and second week of November.

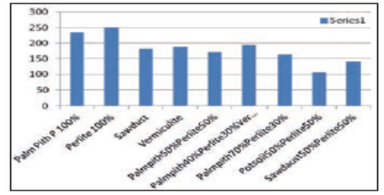
A. Categorized by total weight yield per medium in kg: (total= 1631 kg)

Perlite 100%	251	15.30%
Palm Pith 100%	234	14.30%
Palmpith 40% Perlite 30% Vermiculite 30%	194	11.90%
Vermiculite	188	11.50%
Sawdust	181	11.10%
Palmpith 50% Perlite 50%	172	10.50%
Palmpith 70% Perlite 30%	164	10.30%
Sawdaust 50% Perlite 50%	141	8.60%
Potsoil 50% Perlite 50%	106	6.50%
Total-	1631	100%



B. Average production in Kg per plant per medium:

Perlite 100 %	2.61
Palm Pith P 100 %	2.43
Palmpith 40% Perlite 30% Vermiculite 30%	2.02
Vermiculite	1.958
Sawdust	1.88
Palmpith 50% Perlite 50%	1.791
Palmpith 70% Perlite 30%	1.708
Sawdaust 50% Perlite 50%	1.468
Potsoil 50% Perlite 50%	1.104



Seedlings in Pot Soil 50% Perlite 50%.

Seedlings in Sawdust

Vermiculite 40%, Perlite 30%, Palm Pith 30%.

Left: Perlite special exemplars.