New generation substrates: use of coconut fibre (coir substrate) for the production of citrus and fruit trees in pots

The new requirements of modern fruit and citrus growing, as well as the continuous introduction of new varieties, impose technological innovation in the nursery production process. The grower requires new plant typology with rapid production systems.

New citrus plant using modern techniques

The nursery plants production with traditional systems in open fields beginning to be replaced with under cover and soil-less production systems, just because with the old methods the plants are not protected from the attack of injurious organisms and adverse atmospheric agents.

Nursery plants production using the traditional systems (in open fields)

Citrus and fruit trees equipped with well developed branches, produced in pot or plastic bag in approximately one year (10-12 month) and then transplanted in orchards in the spring, will be able to replace traditional trees product in open field within two-three years.

Citrus (left) and fruit (right) trees equipped with well developed branches, produced in pot or plastic bag.

Coir substrate, introduced in the citrus and fruit nursery production process, allows to obtain high quality trees at competitive costs. The nursery trees grows in pots very light weight and small dimension and in substrate free of organism pathogen and of easy agronomic management.

The plant growing in coir substrate shows an excellent harmony between the aerial and the radical part and it's ready for the transplant phase in open field without stress. However the fruit nursery farm before to use this new substrate needs structures like greenhouse, automated ferti-irrigation systems and acquire know-how about plant nutrition management in soilless and under cover condition.

For the nursery farm (photo: COVIL nursery farm), soilless production systems involve the realization of dedicated infrastructures.

Coconut fibre description
Coconut fibre or coir substrate is obtained from the crushing and processing of the external part of the coconut fruit (*Coccus nucifera*); it is a by-product of the extraction industry of the fibre and is composed exclusively of lignin and cellulose. This material is ecological and absolutely echo-compatible.

It is ecological because its production does not need of polluting processes. It is echo-compatible because it is obtained from vegetal fibres, totally renewable, and can be dispersed in the environment without pollution risks. Being of organic origin, the product has an excellent resistance to biodegradability.

Coconut fibre or coir substrate, it's obtained, in the Sri Lanka Island, from the crushing and processing (picture above) of the external part of the coconut fruit, Coccus nucifera (picture below). It is a by-product of the extraction industry of the fibre and is composed exclusively of lignin and cellulose.

The transformation in soluble humus in the ground can take several years (5 to 20years) depending on the biological activity of the soil. Coconut fibre is a recyclable also because, if adequately cleaned up, can be used till two-three times. It is characterized by a light material with a high draining power, stable pH. The coir fibre has a low water absorbing power. However, its water retention capacity in weight is 300% because the retained water is essentially capillary water that is easily available for plants.

Before its use in the nursery, coir substrate appears compressed and dehydrated. It's like a small fire-brick wrapped from a plastic covering that will be the container in which the roots will develop.

This material allows very high oxygen circulation in proximity of the roots because the fibre presence maintains excellent porosity and the structure unchanged. With respect to its nutritional properties, coconut fibre is neutral, it does not contain micro and macro elements and it requires the use of specific fertilizers for plant nutrition.

Coconut fibre is also phytosanitarily clean, containing no foreign bodies such as seeds, fungal plant parasites, insects, nematodes. In the coir substrate good level of oxygenation and insufficient attitude to the water stagnation prevents development of root pathogenic organisms.

Coconut fibre, to the dehydrated status, has a specific weight of around 100kg/m3. The emptiness percentage is around 500%. Its manage is very easy because the packing to transport are dry bales or pressed brick of different size. Given its characteristics and properties, coir substrate is used as an excellent growing medium intended for soilless culture in green houses. It is used by horticulturists

(tomatoes, cucumbers, strawberry etc.), market gardeners or truck farmers and as well as in the preparation of lawns (green areas, garden, golf course, football pitch) and lately by professional citrus and fruit nurseries also.

Tab 1. Coir substrate main physical and chemical characteristics

PARAMETER	VALUE
Total Organic matter - % dry basis	94-98
Organic Carbon - % dry basis	45-50
Lignin - % dry basis	65-70
Cellulose - % dry basis	20-30
Ash - % dry basis	3-6
General porosity - %volume	94-96
Air content at full water capacity - %volume	10-12
Water Retention Capacity - %volume	80-85
Specific Gravity kg/m3	65-110
Cation Exchange Capacity (CEC) - meq/100g	60-130
Total nitrogen - % dry basis	0,5-0,6
C/N ratio	Until to 220
pH in water	5,0-6,8
EC level (mS/cm)	0,25-0,50

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