



# Protocol for organic berry production

Raspberry production is very profitable, especially if plants are cultivated in a protected environment and different cultivation systems. Exploiting, different primocane varieties (no chilling units required), with double crop system in spring and autumn a raspberry production can expand to a time-lapse of 8 months. However, organic berry production is a very challenging, especially for Cyprus edaphoclimatic conditions. Firstly, it is very difficult to find sandy, acidic soil, rich in organic content and as well as mild summer temperatures for production of primocanes. Moreover, raspberries have gradual productivity and quality degradation over the years, due to virus build-up within their DNA. Therefore, a renew of plant material is required every 2-3 years.

## Growth & Physiology

Depending on the cultivar, plants can be erect or semi-erect and have different flowering patterns or growth cycle. Varieties are distinguished in two different groups according to their flowering habit. **Primocane or remontant** varieties can produce flowers and berries on primocanes (canes emerging from crown buds) in the fall and can also produce flowers on floricanes (overwintering primocanes). **Florican varieties or non-remontant**, can only produce flowers on floricanes after the effect of low temperatures and small photoperiod. Physiologically, plants are very sensitive to high temperatures and are not able to flower when average daily temperatures exceed 30 °C, therefore low elevations zones with extreme summer temperatures are not suitable for a permanent culture of either floricanes or primocanes. Florican varieties are most suitable for zones with mild summers and chilly winters, like semi-mountainous and mountainous areas . However, Cyprus's high summer temperatures and solar radiation can be managed with either shading system. Therefore, plants and rows should can be positioned closely to create shading conditions in the summer, provided that cover cloths are applied for sucker management. Replanting primocane varieties every year for off-season production from October until May is also a good alternative in Cyprus, provided with high startup cost.

According to our research there are some key steps for successful organic raspberry production:

### 1. Site selection

This is the most important step. Choosing slightly acidic sandy soils with the potential is very important to produce berries of high quality. Make sure soil does not have toxic amounts of Magnesium or Calcium. Try to avoid regions where the temperature exceeds 35°C, because plants will not be able to survive more than 2 years. If you can find sandy soil then it's easier to low the ph, but it's expensive to do so in organic agriculture. If you are not interested in organic agriculture, then it is more suitable to use 30lt pots.

### 2. Soil and trellis preparations

Make a two-year pre-preparation scheme by applying organic compost, sowing cover crops in Fall and tilling them in spring to enrich soil for late summer planting. Make sure you have all training posts and/or protecting covers built before you plant, to avoid bad management. In case of pot production, you will need more time to fill the pots, or you can buy ready to use open-top pots.

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## 3. Variety selection

Make sure you choose 2 or 3 varieties, so that you can cover 2 months period for each cropping system. For example, an early primocane variety can bear fruit during April and by mowing down the canes, a new fall fruiting production will be set again in August and September. A mid-season variety can offer production in May and then again in September-October. A late season variety is suitable for harvesting from mid-May to mid-June and again from October-November. Plastic covers can also extend or bring production earlier in any given variety. Lastly, if you want to fill in the gap of June-July as well as December-February you will have to use floricanes varieties with green protecting nets for summer production as well as expensive winter varieties with loyalities.

## 4. Cultivation system

With proper management of primocanes the producer start harvest in spring and in the fall. By planting in late summer, you will have a production window October-December. Thereafter, the plants will go into dormancy for January-February. By combining, greenhouse the plants will be able to have first production from April until mid -June. Not to mention the primocane harvest in from August- November. New varieties require training using metal or wooden posts, with plastic strings to whole the lateral growth of the plants. If you are an organic producer and intend to plant in the soil, make sure to use plastic mulch to control suckers. One of the most important quality parameters is sucker control, if you don't control suckers in the summers, you will end up having low volumes and quality of fruits.

## 5. Protecting nets/covers

Depending on the climatic conditions, protecting nets or plastics are essential in over a greenhouse of a polytunnel to ensure anti-hail system as well extension of the season. Moreover, shading cloths are required for production the hot parts of the island.

## 6. Soil moisture, EC and pH

The best soil moisture is an average daily 15-20% of available water, to ensure adequate water potential. If you choose a sandy soil, the water is usually leached faster, therefore you may need to re-water. Additionally, optimum prices of EC and pH, are 1,5 $\mu$ S/cm and 6 respectively. According to the environmental conditions (temperature, RH and solar radiation) these three parameters need to be monitor and regulated weekly, to ensure maximum productivity. The amount of water required can be calculated according to the evapotranspiration rate of the terroir.

## 7. Bio-stimulants

Biostimulants as well as bio-fertilizers are also essential for maximum profitability depending on the season. What most bio-stimulants are effective for is the increased efficiency of nutrient uptake, frost protection, flower induction, increased yields as well as vigorous plants. According to our, study some biostimulants are better applied and especially for soil moisture retention, perfect root growth and resilience in drought or cold conditions. Specifically, bio-stimulants with organic content and microbes are most suited to maintain a healthy root system and increase nutrient uptake at extreme soil conditions. However, osmoconditioning products with plant hormones as well as algal extracts prove very resourceful for drought conditions but seem to confuse plant growth promotion system. To be more specific, Osmo-conditioning product can increase stomatal conductance in case of drought stress, subsequently increase rate of transpiration, causing plants to lose water. This type of osmo-conditioning products should be avoided at drought conditions, but should be used during floral induction and colder weather, or at the beginning of the cultivation. Raspberries are not nitrogen intensive and usually excessive nitrogen will promote growth but will not increase production.

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## 8. Pest and disease management

Increased relative humidity is not always a problem in Cyprus, due to lack of rain. But if a farmer is cultivating in a rainy season and area, they should consider either plastic cover or anti-rain protection to minimize botrytis rot of fruits as well as crown diseases. New raspberry cultivars are very resistant to powdery mildew, virus diseases and aphids. However, in Cyprus most plants suffer from sting bugs, drosophila, Mediterranean fruit fly, leafhoppers and thrips infestation. Most of these pests are easily manageable with cheap organic products as well as natural enemies. The most ominous thread to the cultivation is sting bugs, which can't be managed with organic products.

## 9. Fertilizers

For soil production apart from organic cover crops during the winters, a farmer can also use organic compost of manure to be applied at the end of the winter. Moreover, organic fertilizers such as pellets are also advisable for the beginning of spring. The most useful products for summer and fall are potassium sulfate (registered as organic) as well as liquid organic fertilizers with low ph.

## Phenological growth of raspberries in the Mt. Troodos

### Plant material & Site Selection – 1<sup>st</sup> year 2018



18<sup>th</sup> April



20<sup>th</sup> July



25<sup>th</sup> August



10<sup>th</sup> October



25<sup>th</sup> October



28<sup>th</sup> December



29<sup>th</sup> June-75d



6<sup>th</sup> July-82d



24<sup>th</sup> July-96d



5<sup>th</sup>-August-108d



31<sup>th</sup> July-103d

### Plant material & Site Selection: 2<sup>nd</sup> year 2019



15<sup>th</sup> April- 0 d



1<sup>st</sup> May -15d



15<sup>th</sup> May-30d



1<sup>st</sup> June-46d



30<sup>th</sup> May-45d



25<sup>th</sup> May-40d

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