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CULTIVATION TECHNOLOGY OF ORGANIC ROSES FOR PETAL PRODUCTION

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Abstract

The aim of this paper is to present a technology for the cultivation of organic edible roses. The basic principle followed is the creation of an organic production ecosystem considering the natural and anthropogenic factors. To increase the soil biologic activity and for soil disinfection and disinsection, three ameliorative species: Sinapis alba L., Phacelia tanacetifolia L. and Tagetes patula L. were used before and after planting. Microbiological and agrochemical analyses were made to monitor the soil activity and the influence on the rose plants. On the row, the soil was mulched with wood chips and wool and for irrigation, a drip systems was used. The rose climbing plants were supported by wire trellis. For plant protection, a strategy to alternate copper and sulfur based products with alternative ones like sodium bicarbonate, pepper, garlic and propolis tincture and other products based on plant and animal extracts (Mimosa sp., chitosan) was followed. Different bio-stimulators and caw milk were used to increase the plant immunity system. The cultivation technology of organic roses can be implemented on large scale farms with good economical results.

Key words*: soil management, plant canopy, fertilization, plant protection, picking, storage.*

INTRODUCTION

Rose is one of the most mankind beloved plant specie since the ancient times. It is a symbol of love and victory, sign of nobility and refinement. Its therapeutic properties are usually forgotten in favor of the ornamental role (Lambraki, 2001; Milică et al., 2010; Vasilva Mozăceni, 2002). It is important to rediscover them and for an appropriate analyze an organic culture is needed.

The aim of this paper is to present a technology for the cultivation of organic roses for petal production.

The basic principle followed is the creation of an organic production ecosystem considering the natural and anthropogenic factors (Milică et al., 2010; Wagner, 2010).

The cultivation technology of organic roses for petal production detailed in this paper, can be implemented on large scale farms with good economical results.

MATERIALS AND METHODS

At the experimental field of the University of Agronomic Sciences and Veterinary Medicine of Bucharest, an organic rose culture with three climbing varieties: 'Falstaff', 'Brother Cadfael' and 'Crown Princess Margareta', was established (Austin, 2012).

The rose crop was protected by planting a poplar (*Populus balsamifera*) wind break.

At the beginning, to increase the soil biologic activity and for soil disinfection and disinsection, three ameliorative species: *Sinapis alba* L.*, Phacelia tanacetifolia* L. and *Tagetes patula* L. were used before and after planting.

Microbiological and agrochemical analyses were made to monitor the soil activity and the influence on the rose plants (Butcaru et al., 2016; Butcaru et al., 2017)

On the row, the soil was mulched with saw dust and wool and for irrigation, a drip systems was used (Matei et al., 2017; Butcaru et al., 2017). The inter-row was kept grassy through repeated mowing.

The rose climbing plants were supported by wire trellis and starting with the second growing year, a specific pruning scheme was applied. Each plant was formed with three parallel, vertical shoots (Trident). In the first year, from the beginning of flowering, the flower buds were eliminated until the principal shoots reached more than 1 m height. After that, the roses were left to flower.

The same organic crop management regarding fertilization and plant protection was applied for all experimental variants. Manure was applied at planting, while other organic fertilizers on different phenological stages. Wool mulch applied on plant rows proved to have high qualities as organic fertilizer too. (Butcaru et al., 2017)

For plant protection, a strategy to alternate copper and sulfur based products with alternative ones like sodium bicarbonate, pepper, garlic and propolis tincture and other products based on plant and animal extracts (*Mimosa* sp., chitosan) was followed. Different bio-stimulators and caw milk were used to increase the plant immunity system.

The petals were collected in plastic bags during the full flowering period (from May to October), in the morning (7.00 - 10.00 a.m.). After sorting and cleaning, petals were used for drying or processing as jam. The unprocessed petals were kept in cold storage at 1-2^{0}C and 85-95% humidity for 7-10 days. Diferent rose petal jam variants were tested for production (Butcaru et al., 2017).

RESULTS AND DISCUSSIONS

The technology for the cultivation of organic roses for petal production consists in several stages, presented below.

Stage 1. Preparing the land for planting

1.1. Land clearing of existing vegetation and clean the other existing rubbish

This operation consists in cleaning the land from the older vegetable debris of the last culture and in the same time eliminates stones, boulders, glass etc. (Figure 1).

Figure 1. Collecting debris (stones, boulders, glass)

1.2. Plotting the land

Depending on the size of the land taken in the crop, it can be divided into several plots for ease of maintenance. Usually the parcels are rectangular, the rows of roses being parallel to the small side of the plot. At the same time, roads and return areas are usually arranged, which are usually ground or sown.

1.3. Fencing the culture

Fencing the rose culture is intended to protect against wild animals. It is possible to use a galvanized net, stretched on concrete pillars, 2.5 m high, fixed at 2.0 m between them. From 50 to 50 m the pillars will be provided with oblique counter blades in order to stretch the corresponding net.

The net will have a height of 2.0 m. Its base has to be buried 10 to 15 cm in the ground to prevent the rabbits or other animals from entering under it.

1.4. Creating the windbreak

The organic edible rose culture is well suited to having a windbreak both in creating a microclimate where external influences are diminished (possibly polluting substances from neighboring crops) and to create a shelter for useful avifauna.

In the established culture within the Experimental Field of UASMV Bucharest, a poplar windbreak (*Populus balsamifera*) was planted (Figure 2). In March 2015, a grass band 2.0-2.5 m wide was sown on all four sides of the cultivated land (1,350 m^2). In December 2015, the boreholes were dug and planted poplar (*Populus balsamifera*) on each side, 1 m apart, respectively, in the center of the strip.

Figure 2. Leveling band with drainage slope; Poplar windbreak (*Populus balsamifera*)

1.5. The proper preparation of the land

1.5.1. Scarification of the land

Scarification of the land is done in two directions, with a scarifier with active organs at

a depth of 60-80 cm. It has the role of deflecting the land in depth and removing any roots from the ground. It is good to be done a few months ahead.

1.5.2. Ground leveling

It can be done either by plant soil intake or by leveling the existing one. In the land taken in culture, in March 2015, the small oscillation of level were leveled by moving a small amount of surface soil vegetation between different points.

1.5.3. Depth plowing 25-30 cm

It is usually done in autumn with specific machines.

1.5.4. Soil preparation with a rotary cutter

It has the role of creating a perfectly flat surface with well-grounded soil.

1.5.5. Natural soil disinfection and disinsection

An important stage in the soil preparation in an organic system consists in the actions carried out in order to increase the biological activity in the soil. One step in this direction is the sowing of ameliorative plants with a role in soil restructuring, the elimination of dangerous soil diseases and pests, the potentiation of fungi and favorable soil bacteria (Figure 3). It is recommended to use the herbaceous plant species: mustard (*Sinapis alba*) at 12 kg/ha, *Tagetes* sp., 6-8 kg/ha, *Phacelia tanacetifolia* in the amount of 8-10 kg/ha. They are sown early spring (March - early April). After blossoming (50 to 55 days for mustard and *Phacelia*; 70 days for *Tagetes* sp.) the plants are incorporated in the soil.

The best results on the potentiation of microbiological activity in soil were observed when plants were used in combinations of 2 or 3 species. Since they have different flowering periods, sowing is recommended in strips 1-3 meters wide.

After incorporation of the plants into the soil, the soil is kept free of weeds until the establishment of the crop, by mowing them and leaving them on the ground.

Figure 3. Ameliorative plants details with soil incorporation

Stage 2. Establishing the organic edible rose culture

2.1. Establishing the culture

2.1.1. Supply of seedlings

In order to establish an organic rose culture, seedlings must be procured in advance. In organic farming, these must be certified. If organic suppliers of organic planting material are not available, conventional seedlings can be used with the proving the absence of certified seedlings. If the plants arrive long before planting, they are stratified into ditch or containers.

2.1.2. Establishment of planting distances and land plotting

Depending on the varieties of roses to be planted, the distance between the rows and the row is then determined, followed by picketing on the field.

For the used varieties of roses, planting distances were 2 m between rows and 1 m per row. To make the plotting, pickets of 0.5 m length, 50 m long roulette and 0.5 m long knotted wire of about 50 m long are used.

When land is picked up, it is meant to mark the place where each rose will be grown. Direction of rows is recommended to be north - south.

Considering the 1 m distance between plants, it is recommended to open planting ditches.

2.1.3. Basic fertilization at planting

After opening the planting ditch, well fermented manure (10-15 t/ha) is applied. Other fertilizers in organic farming can also be applied.

In areas where it is difficult to purchase manure, it can be replaced by other types of fertilizer such as Organofert (based on poultry manure) (2 t/ha).

2.1.4. Installing trellis system

The trellis system is usually installed prior to planting. The variant chosen for the crop was made up of: acacia pillars and counter pillars of diameters 80-100 cm, height 300 cm and pillars for interior of diameter 60-80 cm, height 300 cm. The pits can be done with the help of the motor or manual drill 100 cm (Figure 4).

The pillars are fixed to the rows of roses at a distance of about 7 m between them and at a depth of 60 cm. It is first burned at the base with the burner at a length of 1 m.

Three galvanized wires of 2.5 mm are fastened with bows, the first one at 70 cm of soil, the second one at 130 cm and the third one at 200 cm of soil. The second wire is recommended to be doubled to direct the branches of roses inside the created space.

Figure 4. Trellis system details

2.1.5. Install fertigation system

The fertigation system consists of a main pipeline and several secondary pipes for each row of roses. The drip tubes were lifted on the first wire of the support system (Figure 5).

Figure 5. Fertigation system details

2.1.6. Rose planting

Planting period. The most suitable period for planting is autumn after the fall of the leaves.

Preparing plant material. The plants have to be hydrate 24 hours before the planting time. Check the condition of the roots, where dry or injured portions are eliminated until to the healthy portion. Then the roots are dipped in a mud made from fresh dung, to which the addition of bio stimulators for root formation (eg Rootip mix 2-3 l/ha) is recommended.

Planting. The plants are planted with the grafting point located 10-15 cm above ground level. Place it with its roots in the planting ditch on a loose soil mound. Draw soil from the soil fertile ground; rotate evenly around the plant from the outside to the inside.

An organic-mineral fertilizer can be applied at this time to stimulate the rapid growth of the roots or later to a few days application of Rootip mix through the fertilization system.

Then the rest amount of soil is added and wet with at least 15-20 liters of water/plant.

In the case of autumn plantings, the roses are then mussed by pulling the ground at the base of the roots, forming a 20-30 cm high hill. Early spring (end of February - beginning of March) breaks down to favor growing buds.

Figure 6. Planting details

2.1.7. Soil maintenance

It is recommended to mulch the roses. Wool, wood chips or different wraps can be used. Wool has the advantage of being a very good fertilizer. It is recommended to use it in a slightly processed form to avoid the holes that leave the weeds to grow (Figure 7).

Figure 7. Mulch details (wool and wood chips)

Between rows, the vegetation is regularly mowed, keeping it at low heights.

2.2. Training pruning

Year 1. Early spring pruning works are carried out, following the development of the bushes and the distribution of uniform branches. Remove the blooms until the bush reaches an average height of 1m, and then let it bloom.

As a form of branch leadership, it can be chosen three vigorous branches that make up the skeleton elements, the rest shortening.

Year 2. In the second year, the three branches of the previous year remain, springing down the anticipated branches. Shorten to the ring or very short the other branches of the bush (Figure 8).

Figure 8. Pruning details (first and second year)

2.3. Organic treatment

Table 1. Scheme of organic treatments for edible roses

No.	Phenophase	Pathogen/pest	Recommended plant protection products
1	The beginning of vegetation	Aphids, mites (hibernate forms)	- vegetable oil (Ovipron 2000 - 0,5%) - Oleorgan – 0,3% - Laser 240 – 0,25% - Canelys – 0,3%
		Mildew, Black spot, Rust	- Bouille bordelaise – 0,5-1,0% - Microthiol – 0,3% - sodium bicarbonate – 0,5% - Mimox – 0,3% - Altosan – 0,3-0,8%
2	Growing shoots (April - May)	Diseases produced by fungi and bacteria (Black spot, mildew, rust)	- Bouille bordelaise – 0,5% - Microthiol – 0,3% - sodium bicarbonate – 0,5% - Mimox – 0,3% - Altosan – 0,3-0,8%
		Aphids, other pests	- Oleorgan – 0,3% - Laser 240 – 0,25% - Canelys – 0,3%
3	June - September	Diseases produced by fungi and bacteria (Black spot, mildew, rust)	- Bouille bordelaise – 0,5% - Microthiol – 0,3% - sodium bicarbonate – 0,5% - Mimox – 0,3% - Altosan – 0,3-0,8%
		Aphids	- Oleorgan – 0,3% - Laser 240 – 0,25% - Canelys – 0,3% - propolis tincture – 0,15% - hot pepper tincture – 0,3% -garlic tincture – 0,3%
4	Fall of the leaves (November - December)	Mycotic pathogens and bacteria	Bouille bordelaise – 0,5% - 1,0%
5	Winter period	Mycotic pathogens and bacteria, pest (hibernating forms)	- vegetable oil (Ovipron 2000 - 0,5%) - Bouille bordelaise – 1,0%

2.4. Fertilization

Table 2. Scheme of fertilization for the organic edible rose culture

No	Phenophase	Recommended plant protection products
1	Înfrunzit, creşterea lăstarilor (aprilie - mai)	Alga 0,3% (foliar or radicular) Magnetic fertilizer Cropmax 0,2% Caw milk 1,0%
2	June - September	Alga 0,3% (foliar or radicular) Cropmax 0,2% Caw milk 1,0%
3	At the fall of the leaves, during the winter period	Bentonite 1,5% (frost protection)

2.5. Rose petal harvest

In the first year, the harvesting of flowers begins in July, after the plants have reached an average height of 1 m. Since the second year, the flowers can be harvested since May (Figure 9).

Petals are harvested in the morning, after dew, in pots or baskets. It is sorted immediately, eliminating the various impurities.

They are packaged in vacuum bags of convenient size for the assigned destination (according to the specific quantities).

The vacuum bags are kept in a cold store at temperatures of 1-2°C when the petals are processed for the next 5-7 days or in the freezer at temperatures of -18 to -20°C for extended periods.

Figure 9. Flowering details (second year)

Table 3. Technology to establish an organic edible rose culture

No.	Operation	Period	Equipment / Supplies
1	Land clearing of existing vegetation and clean the other existing rubbish.	March- September, year I	Backhoe/bags / Containers/Tractor with trailer
2	Plotting	March- September, year I	Pickets, roulette
3	Fencing	March- September, year I	Drilling tractor/Concrete pillars (h = 2.5 m), galvanized mesh (h = 2 m)
4	Land scarification	March- September, year I	Scarifier
5	Ground leveling	March- September, year I	Backhoe
6	Depth plowing 25-30 cm	September – October, year I	Tractor
7	Soil preparation with a rotary cutter	February – March, year II	Tractor, rotary cutter
8	Creating the windbreak	March- September, year I	Drilling tractor/Poplars (*Populus balsamifera)* manure
9	Natural soil disinfection and disinsection	March– April, year II	Sowing equipment/ seeds: mustard (*Sinapis alba*) - 12 kg/ha, T*agetes* sp. - 6-8 kg/ha, phacelia (*Phacelia tanacetifolia*) - 8-10 kg/ha. Tractor
10	Supply of seedlings	September, year II	Seedlings
11	Establishment of planting distances and land plotting	October – November, year II	Pickets, roulette, string
12	Installing trellis system	October – November, year II	Drill 100 mm/ acacia pillars, burner, wire 2,5 mm, staples, wire tensioners
13	Install fertigation system	October – November, year II	Principal pipelines, drip, elements
14	Opening the planting ditch	October – November, year II	Tractor
15	Basic fertilization at planting	October – November, year II	Fertilization distribution equipment / manure (10-15 t/ha) or other (ex. Orgafert 2 t/ha)
16	Rose planting	October – November, year II	scissors/fresh dung mud/Rootip mix (2-3 l/ha)

Table 4. Maintenance of an organic rooting plant

No.	Operation	Period	Equipment/Supplies
1	Winter treatment	January- February	- vegetable oil (Ovipron 2000 - 0,5%) - Bouille bordelaise – 1,0% - bentonite 1,5% (frost protection)
2	Eliminate the winter soil hills	February - March	- dig/ dibble
3	Pruning and trellising branches	February - March	- Scissors/trellis elements
4	Eliminate dried leaves, branches (cultural hygiene)	March	- Scissors
5	Spring treatment	March	***Insecticides:*** - Oleorgan – 0,3% - Laser 240 – 0,25% - Canelys – 0,3% ***Fungicide/Bio-stimulators:*** -Bouille bordelaise – 0,5-1,0% - Microthiol – 0,3% - Sodium Bicarbonate – 0,5% - Mimox – 0,3% - Altosan – 0,3-0,8%
6	Soil maintenance	March	- Wool/twood chips/ processed wool - trimer/ mowing equipment
7	Ameliorative plants sowing	March – April	-Sowing equipment/ ameliorative plants seeds
8	Treatment sprout growing and fertilization	April – May	***Fungicide/Bio-stimulators*** - Bouille bordelaise – 0,5% - Microthiol – 0,3% - sodium bicarbonate – 0,5% - Mimox – 0,3% - Altosan – 0,3-0,8% ***Insecticides*** - Oleorgan – 0,3% - Laser 240 – 0,25% - Canelys – 0,3% ***Fertilizers*** - Alga 0,3% (foliar or radicular) - Magnetic fertilizer - Cropmax 0,2% - Cow milk 1,0%
9	Remove the blooms (year I)	May – June	
10	Soil maintenance	May – October	- trimer/ mowing equipment
11	Irrigation	May – September	Irrigation system
12	Trellising new sprouts	June – September	- trellising elements
13	Protection and fertilization treatments	June – September	***Fungicide/Bio-stimulators*** - Bouille bordelaise – 0,5% - Microthiol – 0,3% - sodium bicarbonate – 0,5% - Mimox – 0,3% - Altosan – 0,3-0,8% ***Insecticides*** - Oleorgan – 0,3% - Laser 240 – 0,25% - Canelys – 0,3% - propolis tincture – 0,15% - hot pepper tincture – 0,3% -garlic tincture – 0,3% ***Fertilizers*** - Alga 0,3% (foliar or radicular) - Cropmax 0,2% - Caw milk 1,0% - Bombardier 0,25%
14	Rose petals harvesting	July - October	- Boxes/baskets/scissors
15	Complete plants	October - December	- drill, scissors/manure/fresh dung/ seedlings/Rootip mix
16	Falling leaves treatments	November - December	- Bouille bordelaise – 0,5% - 1,0%

CONCLUSIONS

The study aimed to present the technology for an organic edible rose crop. It had, as basic principle, the creation and maintenence of an organic production ecosystem considering the natural and anthropogenic factors.

The technology focus in the first stages of establishment of the organic edible rose crop on the increase of soil biological activity.

Using three ameliorative species (*Sinapis alba*, *Phacelia tanacetifolia* and *Tagetes patula*) the soil bacteria and fungi increased at important levels.

Climbing rose varieties used proved several advantages towards the classical edible rose: trellising on the vertical position, repeated flowering since May to October and fragrance varieties with multiple way of valorisation.

An innovative pruning system refer to a 2 year rotation scheme of branches, giving the possibility to have a constant production every year.

The average quantity of petals per hectare was 9.44 t/ha at 'Crown Princess Margareta' variety, 7.54 t/ha at 'Falstaff' variety and 5.62 t/ha at 'Brother Cadfael' variety.

The best variant of mulch used was wool, which proved to have special qualities as a fertiliser too.

The best temperature for maintain the harvested petals were 1-2°C when the petals are processed in the next 7-10 days.

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