



29.-31. May 2008., Pula, Croatia

## **Abstract Book**

“Small Fruits Production Systems”

COST 863 SGM WG 3

**29.-31. May 2008.  
Pula, CROATIA**

**Editors:**

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## **COST 863: Euroberry**

**Pula (Croatia)**

**Dates: 29.-31. May 2008.**

### **Program**

#### **Thursday May 29**

16.00h Welcome, registration and general remarks

17.00 Introduction to work methodologies

#### **Friday May 30**

8.30 – 09.30h Production systems in Northern Europe

- Berry production in Scandinavia – **Anita Sonsteby**
- Production systems and methods to extend the soft fruit season in Ireland – **Eamonn Kehoe**
- Soft fruit production systems in the UK – **Nikki Jenninngs**

09.30h General comments

10.00 – 10.40h Production systems in Eastern Europe

- Strawberry production systems in Poland – **Tomasz Jecz**
- Production systems of small fruits in Balkan countries – **Boris Duralija** and **Zoran Sindrak**

10.40h General comments

11.00h Coffee Break



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11.15 12.35h Production systems in Central Europe

- Historical milestones and current methods and strategies of strawberry culture in Belgium - **Els Desmet**
- Berry production in Germany - **Erika Krueger**
- Strawberry production in France - **Jean-Philippe Bosc**
- Strawberry in Italy - **Leonardo Placchi**

12.35h General comments

13.00h Lunch

15.00 – 16.20h Production systems in Southern Europe

- Soft fruit production in Portugal, a developing industry - **Pedro B. Oliveira**
- Small fruit production systems in south western Spain: Huelva - **José Lopes Medina**
- Cultural systems of strawberry in Greece - **Miltiadis Vasilakakis**
- Strawberry production and planting systems in Turkey - **Sedat Serce**
- Mulberry, raspberry, blackberry and blueberry production in Turkey - **Sezai Ercisli**

16.20h General comments

16.45h Coffee Break

17.00h Discussion and plan of activities (Publication and other problems).

19.30 Dinner

### **Saturday May 31**

Departure



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## BERRY PRODUCTION IN SCANDINAVIA

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<sup>1</sup>Bioforsk, No.; <sup>2</sup>Finnish Association of Fruit and Berry Growers, Fin.; <sup>3</sup>Swedish University of Agricultural Sciences, Swe.; <sup>4</sup>Danish Agricultural Advisory Service, Dk.

**Keywords:** *Berry production, cultivars, production systems, Scandinavia, yield*

Commercial **strawberry** production in Scandinavia started as early as the 1920s, with the cultivar 'Abundance'. Although the production area was about 1500 ha, the yield was very low (< 3 t ha<sup>-1</sup>). In the 1960s Scandinavia had a large increase in strawberry area and yield per hectare. The strong development of strawberry production came after the introduction of the cultivar 'Senga Sengana', new growing techniques (black polyethylene mulch) and the release of new and more efficient fungi- and herbicides. Over the past 30 years, the yield and growing area has stabilized, although the number of strawberry growers has decreased strongly. Today, Scandinavia has a strawberry production of about 8500 ha, yielding about 75 000 tons of berries in a very short summer-season. Almost all strawberry growing is perennial production with single-cropping (SD) cultivars in open field, and the fields are normally kept for 3-5 years. The main strawberry cultivars grown today are 'Korona', 'Polka', 'Honeoye', 'Jonsok' and 'Florence'. The area of 'Sonata' is increasing. While almost all strawberries up to the 1970s were picked and sold through a "pick-your-own" system, today, almost 95% is sold through wholesale dealers for fresh consumption, and only a small amount is frozen for processing.

Since the mid 1990s, there has been a slow decrease in the strawberry production area in Scandinavia. This is due to an over-production of strawberries in a short, hectic season, giving very low prices. To avoid this, attempts are being made to extend the season, especially with row cover, plastic tunnels, stored plants and new cultivars (including everbearing cvs.). The growing area covered with polyethylene tunnels are now increasing in all the Scandinavian countries.

The area of **raspberry** in Scandinavia was stable up to the 1990s, with a production of about 500 ha. The production was mainly for the processing industry with old Norwegian and Finnish cultivars. Since 1995, the raspberry area has doubled, and is still increasing. This came after introduction of the Scottish cultivar 'Glen Ample', which has shifted the production from mainly for the processing industry, over to mainly for fresh consumption. This development was started in Norway, and the other Scandinavian countries are following up. Introduction of 'Glen Ample' has given the growers new possibilities to increase their income, and the focus on extending the season and on berry quality, have increased. About half of the Norwegian raspberry production is now under polyethylene tunnels, and this leads again to new possibilities of extension of the season by growing long canes or primocane-fruiting varieties like 'Polka'.

Less than 120 ha of **blueberries** are produced in Scandinavia. The yields are low, and the picking cost too high. But, there is increasing interest, related to health benefits, from the market.

The main challenges for berry production in Scandinavia are access to and cost of labour, and how to meet the increased competition from imported berries. The Scandinavian countries have also strong restrictions in the number, and use of pesticides. Increased focus on taste and quality will be important in the future.



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## **PRODUCTION SYSTEMS AND METHODS TO EXTEND THE SOFT FRUIT SEASON IN IRELAND**

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**Keywords:** *Strawberry,raspberry, extension of season, new production methods*

The strawberry industry is currently expanding at a rapid rate and is currently valued at approximately €30 million. It is envisaged that the industry will be worth approximately €50 million by 2012. The Irish population is expanding rapidly and with this there is an ever demanding appetite for healthy eating, including soft fruit. The soft fruit industry is a highly viable sector of Irish commercial horticulture, leading to employment and investment in both urban and rural areas. The growers who are now involved in the industry are large scale producers and are investing heavily. They are highly commercial in nature.

The fruit growing season in Ireland has changed fundamentally over the last decade. In the past, the strawberry season lasted from June to July. Today through new technology the season has been extended from April to November. Outlined are the many production methods and systems which are now employed to grow high quality berry crops from early April to November in Ireland each year.



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## **SOFT FRUIT PRODUCTION SYSTEMS IN THE UK**

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**Keywords:** *Protected cropping, growing techniques, cultivars, strawberry, raspberry, blueberry, fresh market*

Soft fruit production in the UK is concentrated mainly in south-east England and Eastern Scotland, and is dominated by strawberries, raspberries and blackcurrants, although there are increasing areas of blackberry and blueberry.

The UK soft fruit market is a high value industry, exhibiting strong growth in recent years due to as increased marketing, with emphasis on health benefits, and rising consumer demand. UK multiple retailers have increased availability with a year- round supply, importing fruit from overseas outside of the UK season. UK growers have responded to the increased demand for high quality fruit by extending the season using a range of cultivars, protected cropping systems and new growing techniques. Polytunnels now cover around 80% of the strawberry and raspberry crop and are a key element in production, improving yield, quality and extending the season from the traditional six weeks to more than six months.

In Scotland, raspberries have declined sharply in area from the mid 1980s, but the overall crop value has increased, due to a dramatic switch in production from mechanical harvesting for processing to tunnel production for the fresh market.

Blueberries currently occupy a small area of the UK, but the cropping area is rapidly increasing, due to rising consumer demand, primarily driven by the perceived health benefits of this crop. There is considerable interest in season extension to supplant imports to the UK in late September.



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## **STRAWBERRY PRODUCTION SYSTEMS IN POLAND**

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*Keywords : Fragaria x ananassa, cultivation systems, fruit production*

Poland is one of the biggest strawberry producers in Europe. For the last 25 years total production of strawberries in Poland has been stable and recently reached the level of 180-200 thousand tons of fruit per year. Simultaneously, a structure of cultivated cultivars has been changing: the acreage of previously dominating 'Senga Sengana' cultivar has decreased substantially and was replaced with 'Elsanta', 'Honeoye', 'Kent', 'Darselect', 'Camarosa', 'Onebor®Marmolada' and 'Elkat' cvs.

Until now, in majority of farms a traditional open cultivation in field has been a main system of the strawberry production, in which fruits are picked from the beginning of June till the middle of July. It is a consequence of farms structure (on 50% of farms strawberry plantation acreage is below 0.1 ha; there are only 300 farms over 5ha with total acreage of strawberry plantations over 3000 ha).

During the last fifteen years more intensive production systems, such as: cultivation of strawberries under high and low covers (tunnels), cultivation for the delayed fruits harvest using late ripening or everbearing cultivars as well as delayed planting of frigo plants have been developing. The most popular method is the cultivation for the precipitated fruits harvest by covering the plants in early spring with perforated foil or needled cloth. This method of production allows to obtain ripe fruits 3-7 days earlier than from traditional plantations. High covers (mainly unheated plastic tunnels) are applied on a small scale, due to unfavourable sunlight and temperature conditions in winter and early spring, which increase the cost of production. In this cultivation system the first strawberry fruits can be obtained in the end of April. The cultivation for the delayed fruits' harvest is also getting more and more popular. Plantations are usually established on two- or four-row patches covered (mulched) with the black foil. For this system of production 'Selva' as well as 'Aromas', 'Diamante' and 'Albion' (in the smaller scale) are grown. However, for cultivation of these cultivars, covering with straw or agro-cover is needed as a protection against winter frosts. For delayed fruits' harvest, delayed planting of the frigo plants is applied - strawberry plants are planted on patches from the half of May till the first days of July and the fruits are picked from July till the middle of September.

Recently, the strawberry production using environment-friendly (pro-ecological) methods has been developing very intensively. Development of this production system is favoured by an availability of unpolluted fields (soils) used earlier exclusively for agricultural crops, relatively cheap labor and dispersed production (small family farms, small scale).



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## **PRODUCTION SYSTEMS OF SMALL FRUITS IN BALKAN COUNTRIES**

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*Keywords: Berry fruits, open field production, irrigation, fruit processing, yield*

One part of southeastern Europe is known by the historic and geographic name the Balkan. This region covers area of 550,000 km<sup>2</sup> and an approximate population of 55 million people. Balkan region include Bulgaria, FYR Macedonia, Albania, Bosnia and Herzegovina, Greece, Montenegro, as well as parts of Turkey, Serbia, Croatia and Slovenia

Three different climates exist in this region, Mediterranean near sea, Continental on the north and Mountain in area over 800 meters above sea level. In the nature on the Balkan are many different wild berry fruit species from the genus *Fragaria*, *Rubus*, *Vaccinium*, *Ribes* etc. This indicates that in Balkan region are favorable ecological conditions for growth of many different berry fruits.

More intensive production of strawberries, raspberries and other berry fruits occur not earlier than in second half of 20th century. In the beginning, technologies were imported from the western countries, and varieties from other parts of Europe or world were used. Plant breeding work and development of modern, intensive fruit production systems began to develop at the end of the 20th century and the beginning of the 21st century.

Today, strawberries are grown mainly in open field on raised beds mulched with black plastic mulch. Irrigation systems have been introduced in the recent past. Buildings of greenhouses for strawberry production have started near larger cities.

Raspberries and blackberries are grown with wooden stake and upper stake and support wires and adjustable training wires. Small amount of production areas are irrigated and greenhouses are not used now.

Intensive production of black and red currant, blueberries, cranberries and other berry fruits appeared just in last decade but also on relatively small production areas.

The most important are raspberries and blackberries with more than 20000 ha and average yield about 6 t/ha. Leader in production is Serbia with near 13000 ha of raspberries, mainly for export of frozen fruits. Strawberries are growing on more than 10000 ha, however average yield is relatively small – on average of less than 10 t/ha.

Nowadays, predominantly low cost production systems of berry fruits are used. It is still planted a large number of plantations without irrigation. Production in plastic greenhouses is still negligible because of relatively high prices for Balkan circumstances. The main amount of berry fruits is intended to be use for processing.

Based on all this information we can conclude that is great potential for improving existing condition in berry fruit production on Balkan. Also is possible to introduce the newest achievement in new plantations establishing.



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## **HISTORICAL MILESTONES AND CURRENT METHODS AND STRATEGIES OF STRAWBERRY CULTURE IN BELGIUM**

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**Keywords:** *Cultivation system, year round production, fragaria*

A brief review of the historical development of out-of-season production and current methods and strategies of strawberry culture in Belgium is presented. Following subjects are discussed: origin of strawberry concentration areas in Belgium, the evolution of the strawberry cultivars and milestones in cultivation techniques and commercial actions in Belgium. Strawberry culture evolved from a summer harvest crop cultivated in soil to an almost year round production crop cultivated in soil and on peat substrate. Advancing the harvest season with plastic and glass greenhouses was the first step in the prolongation of the harvest season. The development of substrate peat culture, the knowledge on long-term cold storage of plant material and the introduction of the cultivar Elsanta were three milestones for delaying the harvest period. Belgian strawberries are available from the beginning of March until the end of December or beginning of January. Strawberry cultivation is still carried out on family enterprises. Strawberry culture used to be combined with a second crop like tomato or gherkins and has developed into a specialisation culture where only strawberry are grown on family enterprises. Belgium produces about 38500 tonnes strawberry per year.



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## **BERRY PRODUCTION IN GERMANY**

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**Keywords:** *Strawberry, raspberry, blackberry, currant, blueberry*

The aim of the presentation will be to report the development of berry production in Germany during the last 10 years.

After a long period with more or less similar acreage and production of strawberry both increased slowly from 1996 to 2002 and then expanded rapidly until 2006, when strawberries were grown on 14214 ha and total production raised up to 169000 t. This represents an increase of 70 % for the acreage and of 118% for production in comparison to 1996. In 2006, the main areas for strawberry growing were the federal states of Lower Saxony with 3069 ha, North Rhine Westphalia with 2831 ha and Baden-Württemberg with 2627 ha, respectively. However, due to an over-production with reduced prices in 2005 and 2006 the strawberry acreage decreased to 12900 ha for Germany.

With increasing strawberry production in Germany the import from abroad decreased.

Earliness of fruit ripening is one of the main aims within strawberry production in the climate favoured regions of South Germany, mainly at the federal states of Baden-Württemberg and North Rhine Westphalia. This is achieved by covering the plants with double or single plastic cover from winter until flowering, growing strawberries on small dams or a combination of both. There is an increasing interest in growing strawberries under macro-tunnels to force the ripening of the fruits or in macro-tunnels and greenhouses for off-season production. However, the acreage is still limited.

For other berry fruits there are no official statistical data available with regards to a long term comparison of acreages and production amounts. But looking to the sales volumes at the producers market an increasing sales volume can be observed for red currant and blackberry since 1996 (120% and 46%) and for blueberries since 2001 (97%), respectively. This is an indication for an increasing production.

Sales volumes for raspberry were very unstable from year to year due to the weather conditions in the different years. They are highly appreciated by the consumer in the last years and the production area increased. Sales volume of black currants was varying from year representing their structural over-production in Europe.

Cultivation systems and price development for all berry fruits will be reported briefly.

Summarizing the sales volume for berries it could be assessed that berries are a remarkable economic factor in the German fruit growing sector.



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## STRAWBERRY PRODUCTION IN FRANCE

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**Keywords:** *Strawberry, France, production systems.*

Strawberry is a traditional crop, cultivated in every region, from small family gardens to multi-hectare farms. The annual consumption per capita is 1.9 kg (fresh strawberry, excluding consumption from family gardens) and concentrated in April, May and June. As labour costs increased and mechanising the harvest was not possible, French strawberry growers concentrated on the fresh market (only 3% goes to the industry).

The production gradually increased to 100.000 t/year in 1987, decreased until the end of the '90s, and now seems to be stabilising around 50.000 t/year. The production area also decreased from 4.500 ha in 1997 to 3.400 ha in 2006. Four main and traditional areas produce 75% of the national production: South-West: (Lot-et-Garonne and Dordogne, 40% of national production), Central East (Rhône-Alps, 13%), South-East: (Mediterranean border, 12%), Central West (Loire Valley, 10%).

Over the past twenty years, the number of growers in the above areas decreased, and those remaining became more and more specialised. The aim in this period was to differentiate their product from the Spanish production, with improved taste and higher quality, as well as low production costs. Basic open field cultivation was no option, as quality, shelf life and yield are highly subjected to meteorological conditions, weed problems, etc. The first step of intensification in the '80s was the use low tunnels covered with polyethylene, combined with drip irrigation. Thus crops could be harvested earlier, and were protected from rain, sun burn, and autumn and spring frost. High and multispan tunnels provided the second step: better climate regulation, improved earliness, better quality, higher harvesting speed, foliar treatments independent from meteorological conditions, plastic mulch avoiding weed problems. Pollination is effected by bees or bumble bees, specifically placed inside the tunnels. In some cases, the crop could be heated with low temperature water pipes placed on the soil. Growers were then able to produce high quality fruits from end of March until end of October, using June-bearing and everbearing cultivars. Soilless cultures represent the third step: with high investments, they could provide earlier (heating), higher quality fruits, and June-bearing varieties could have a second bloom in spring. Estimates for the 2008 season are ca. 520 ha in open field, 660 ha under low tunnels, 1920 ha under high tunnels or glasshouses (including soilless crops: 365 ha).

Frigoplants are widely used, in open field or protected crops, and fresh bare root plants disappeared. Fresh potted plants are used for June-bearing varieties to have a more stable production, and to reduce labour for the removal of runners and flowers in autumn. Despite their cost, trayplants are under development, particularly for early production (soil or soilless crops).

Cultivars are the main tool used by growers to obtain high quality fruit. Gariguette is the most widely planted, because it is well known by French consumers. It is early (end of February to June) with very high flavour, but has low yield, poor shelf life, and is susceptible to climatic accidents. Darselect is a mid-season cultivar, produced from April to June: it has high flavour, high yield but are prone to misshapen fruits. It is now planted instead of Elsanta, except in the Central East (Rhône-Alps). Other June-bearing varieties are present to a lesser extent: Ciflorette (a competitor of Gariguette), Clery (South-West, South-East), Naïad (South-East), Cigaline and Cireine (Central West). The new trend is to replace late varieties (Daisy, Yamaska, Florence) with everbearing varieties such as Mara des Bois and Charlotte for a fruit production from June to mid July.



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## STRAWBERRY IN ITALY

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From 2000, Italian strawberry acreage decreased by 19% to nearly 3,400 hectares; fruit production decreased by 26% to less than 100,000 metric tons.

In Italy, there are two distinct strawberry production areas located in the North and in the South. The southern regions account for 60% of the production on 55% of the hectareage. Compared with the North, the higher production per hectare is due to a longer harvest period (3 months against 25-30 days) combined with varieties adapted to mild winter environmental conditions enhanced by tunnel-protection. In the South, strawberries are cultivated in Sicily, Calabria, Campania and Basilicata regions. In Sicily, Calabria and Campania (41% of the total area) is adopted principally to the autumn planting system; fresh dug plants (bare root) of Camarosa, Ventana, Candonga and Tudla from Spanish high elevation nurseries and East Europe Country (Poland) are planted from first decade of October to beginning of November. Harvest begins at the end of January and terminates in May-June. Plug plants are becoming popular replacing fresh dug plants. In Basilicata regions (12% of the total surface), summer planting (end of August to mid-September) with cold stored plants was predominant since last year but the growers are moving to winter planting also in this area. The principal varieties for the summer planting are Pajaro and Tethis; for the winter planting Candonga and ventana are predominant. Intensive annual cultural techniques are used, including preplant soil fumigation, drip irrigation, and high-density planting - 60,000 to 90,000 plants per hectare - with twin hill-rows on raised beds.

In the Northern Po Valley (Emilia-Romagna and Veneto regions; 28% of the total area) strawberries are annually planted in the summer (from the last week of July to the first of August) using 40,000 - 50,000 cold stored plants per hectare on a hill-row planting system. In the Emilia-Romagna area, only 25-30% of the production comes from tunnel-protected culture. In Veneto (Verona area) nearly 100% of the surface is protected. In this last region, it has adapted the so-called “fall culture” for autumn and following spring production. Large cold stored plants (A+, Waiting Bed, Tray Plant) are planted during the last part of August. Density is usually between 70,000 and 80,000 plants per hectare. Fruiting starts in early October and ends around mid December. Fall yields fluctuate from 1 to 2 kg/m<sup>2</sup>. The plants are overwintered to obtain a second crop the following spring. Main varieties are Patty, Darselect, Eva and Irma. In Emilia Romagna region (Cesena area), fruit ripening starts near the middle of April under tunnel culture, and one month later in the open field, and ends the second decade of June. The Italian cultivars Alba, Onda, Clery, Dora and Queen Elisa are predominant.

In the north mountainous areas (Piemonte and Trentino regions), severe winters, with little snow cover often causes crown injury. In Piemonte (5% of Italian surface) both June-Bearing (Alba and Arosa) and everbearing (Seascape, Diamante and Irma) cultivars are used. Cold-stored plants of JB varieties are



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planted in June and fruit ripening starts one year later at the beginning of June depending on the altitude. Everbearing (day neutral) varieties are planted in the spring (April-May) for summer fruit production obtained under tunnel culture to avoid fruit-rot problems due to recurrent rainfall.

In Trentino (7% of the Italian area), programmed culture of Elsanta is attained using Waiting Bed or Try Plant. Peat bag culture is popular (more than 100 ha). On the basis of the planting date, harvest is programmed to start in July until the end of September.

Most cold-stored plants used in Italy are obtained from nurseries located in Emilia-Romagna region - near the Adriatic Sea, and Veneto region - on well-drained, sandy soils.



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## **SMALL FRUIT PRODUCTION IN PORTUGAL, A DEVELOPING INDUSTRY**

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*Keywords: production systems, protected cultivation, Strawberry, Raspberry, Blueberry*

Portugal has excellent climatic conditions for small fruit production. Strawberry was the first to be grown on large scale. On early 40's it was already a very important crop. All cultivars arrived from north European countries mainly France. Those cultivars had very poor shelf life, low yields and were very susceptible to pest and diseases. This led to an increase in acreage in the surroundings of Lisbon since it was near the main market. Strawberries were very popular and they represented a very important cash crop for growers. Other important small fruits were blackberries and blueberries but both were only collected on the wild with no commercial plantations. Raspberries were only grown on home gardens.

With the introduction of new growing technologies and cultivar better adapted to the Mediterranean climate we observed an increasing interest on strawberry production with a shift off production to the south of the country and the beginning of protected cultivation. In the late 80's Portugal achieved the high strawberry acreage with more than 1 500 ha and important high altitude nurseries. Today strawberries represent only 500 ha distributed in two main regions with different production systems. In the North of the country strawberries are produced at open field with day neutral cultivars, mainly Diamante and Albion, for local and export markets. This crop is done in an annual system where strawberries are planted in April and harvested throughout June to October. In the south of the country the crop is under protected cultivation with short day cultivars, Camarossa, Candonga, Festival e Ventana, and almost all production goes for export market. Currently there are no important nurseries so all plants are imported mainly from Spain.

Other small fruits took advantage from the growers experience with strawberry production and all commercial plantations started in the late 80's. Raspberry is the second large small fruit crop followed by blueberries. High tunnels are used in all raspberry plantations which are predominant in south of the country. The main primocane-fruiting cultivars are, Joan Squire, Heritage and Polka, which are pruned in order to produce a first crop in autumn / winter and a second crop in spring. Blueberries are well spread in the country with open field plantations in the north with Northern Highbush cultivars, mainly Bluecrop, Bluetta and Duke, and open field plantations in the south of the country with Southern Highbush cultivars like Sharpblue, Misty, O'Neil and Star. Blackberry culture is just starting and redcurrants represent less than five hectares under protection.

At the moment there are three berry growers associations in Portugal all dedicated to export. Small fruit production is rising again very fast in all Portuguese regions with an increasing interest from international enterprises to grow under our unique climatic conditions.



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## **SMALL FRUIT PRODUCTION SYSTEMS IN SOUTH WESTERN SPAIN: HUELVA.**

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**Keywords:** *Strawberry, Raspberry, Blueberry.*

The strawberry is one of the most important crops in the Province of Huelva, south western Spain, with more than 50% of the total PF and more than 4% of the total PF of Andalucía and counting for more than the 90% of the national production. Huelva is also the most important area of strawberry production in EU, with more than 35% of the total yield. During the 2007-2008 season, the acreage of this crop was over 6.000 ha, with an estimated production of 240.000 tons. The most widely used strawberry cultivar has been ‘Camarosa’ (70%) followed by ‘Candonga’ (12%) , with lower yields but better fruit quality, ‘Festival’ (12%), ‘Ventana’ (2%) and other minor varieties like ‘Chiflón’, ‘Aguedilla’ and ‘Coral’.

The raspberry crop acreage for the 2007-2008 season has been estimated around 1.330 ha, increasing more than 2.5% than the previous season. Most plants used to set the crop are multiplied in low elevation nurseries within the same area of the fruiting crop, and only a small amount of plants come from high elevation nurseries in the north of Spain. The most common cultivar used is ‘Glen-Lyon’, with more than 90% of the acreage devoted to the crop.

The development of the blueberry crop in Huelva has also been important for the area during the last five years. Currently more than 750 ha are devoted to the crop, 26 ha of them as ecological production, and more than 90% of this acreage is located in the village Almonte. 95% of the blueberry production is exported to Germany, United Kingdom, Belgium, the Netherlands and Switzerland. Early-season yield cultivars like ‘Misty’, ‘Sharpblue’ and ‘O`neal’ are widely used (70%) but also mid-season yield cultivars like ‘Star’ can be found in the area. The export marketing season starts in February and last until June, but market picks are usually found in April, May and June. Each cultivar presents a different harvest season and this can last for more than 45days.



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## **CULTURAL SYSTEMS OF STRAWBERRY IN GREECE**

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Two cultural systems of strawberry are applied in Greece; the extensive one in open fields and the very intensive one, culture under protection, for off season fruit production.

Open strawberry fields represent very limited area, mainly in N. Greece. Fruits are destined mainly for pastry and processing industry and for summer fresh market. Plantations last for 3 years, the first year is devoted to daughter plant establishment. Second and third years are the productive years of the plantation. 10,000 Plants / ha are needed to start the plantation. Production of fruits is very uncertain, it is very much depended on prevailing weather conditions during the harvesting period. Botrytis and weeds are the main problems.

Fresh market fruits come from strawberries cultivated on raised beds, covered with black polyethylene film, in walk in tolls made of iron bars, covered with transparent polyethylene film. Planting takes place either in late Autumn with fresh plants or in Summer, after July 15, with refrigerated plants ( -2° C)(elite plants). Autumn planting is applied mainly in S. Greece where winter is usually mild. Only a small portion of plant material is being produced in Greece, the rest of them are being imported. Plants are planted on beds in a single or double row (50,000plants/hectare, approximately). Plants are drip fertigated. Tolls are being covered with polyethylene film before planting (Autumn planting) or early winter (summer planting). The main varieties cultivated are: Camarosa, Fentana, Selva, and Fern. In summer plantations all stolons and flower trusses produced are being eliminated for a period of two months resulting in good plant growth and yield. Strawberry culture is generally one year culture. Two year culture usually is applied in fields where planting takes place in Autumn. Usually there are no insect or disease problems under the present cultural conditions. However, if the temperature inside the tolls gets very high then spider mites become a problem. The average strawberry yield is 25,000t/ha and the cost is very much increasing in the last two years. Strawberry culture is very much labor demanding, especially during harvesting.

Fruit harvest starts early Spring (February) in S. Greece and April in N. Greece. The fruit quality produced in toll is considered very good. In N. Greece sometimes there are problems with subfreezing temperatures resulting in flower damage and reduced yield. Low temperatures in Spring usually result in malformed fruits even in S. Greece. Fruits are being harvested and marketed in plastic cups of 500g, 10 cups/wooden or hard paper boxes. Only one enterprise has introduced recently the plastic cups with cover and barcode stickers for a large super market chain. Most of the strawberries produced are being used in the Greek market and only few quantities are being exported. The trend is strawberry exports to be increased.



29.-31. May 2008., Pula, Croatia

## **STRAWBERRY PRODUCTION AND PLANTING SYSTEMS IN TURKEY**

SEDAT SERÇE

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**Keywords:** *Camarosa, fresh plant, frigo, summer planting, planting systems, production*

Turkey is an important strawberry producing country with the 160,000 tonnes production harvested from area of 10,500 ha. There is an increasing trend in production, area and yields in last 20 years. Strawberry cultures can be carried out in many diverse ecological conditions in Turkey although the production is concentrated on Mediterranean, Marmara and Aegean Regions (with the percentages productions of 62, 20 and 12, respectively. In Mediterranean Regions, Silifke and Anamur are the most important places while Aydın is important for Aegean regions.

In all of these major production areas, strawberry production is carried out by annual, raised-bed systems with drip irrigation and black plastic mulch applications. The soil solarisation is more commonly used as compared to soil fumigation. The major planting material is frigo plants which are planted during summer months (usually between July 15 –August 15). The early harvest can be started on late-fall to early winter in greenhouses, and January and February on unheated plastic houses, high tunnels and open-field productions. Regardless of differences in first harvest dates, the harvest pick are similar in all these production system (April). The production continues until middle of May in these areas.

Besides these most commonly used production schemes, open field production is conducted in Central and Eastern Anatolian Regions where fresh plants are planted during summer months and plantings are kept for multi-years. In the greenhouses of Mediterranean regions fall planting (September) is being experienced by fresh-dug plants grown in nearby highland. It is possible to produce berries in late fall in this system. Plug plants can be ideal for this production scheme; however, they are not being widely used in Turkey. Greater detail regarding Turkish strawberry production and planting systems will be provided during presentation.



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## MULBERRY, RASPBERRY, BLACKBERRY AND BLUEBERRY PRODUCTION IN TURKEY

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**Keywords:** *Mulberry, raspberry, blackberry, production systems, production*

Turkey is one of the important fruit production countries in the world. Over 100 fruit species, mostly temperate zone fruits are grown well in Turkey. The country has very old mulberry cultivation and the production amount around 70.000 tons per year. There are three main mulberry species in Turkey namely, *Morus alba*, *Morus nigra* and *Morus rubra*. The percent cultivation of *Morus alba*, *Morus nigra* and *Morus rubra* in Turkey were 96%, 3%, and 2%, respectively. Although Turkey is the one of the main diversity centres of *Rubus* species, the cultivation just started 1990s years with a national project including eight universities and eight agricultural research institutes. With this project, number plantations with different raspberry and blackberry cultivars were established in different parts of the country. After these adaptation studies with over 20 raspberry and blackberry cultivars, the better-adapted cultivars in different agro-climatic conditions were determined. The blueberry cultivation in Turkey just started in 2000s year. In particular, East Black Sea region a number of plantations were established. During the presentation, more detailed information regarding Turkish mulberry, raspberry, blackberry and blueberry cultivation systems, production and planting systems will be provided.



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