Small Fruit Production

Research Trials

FOLHA DIVULGAÇÃO HEF -Nº 1
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Nº 1

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1. Portuguese berry production

Small fruit production (strawberry, raspberry, blueberry, blackberry and currants) has a reduced expression in Portugal. The aptitude for the production of these fruits differs from one region to another, especially the ability for off-season production. However, in some Portuguese regions small fruit production can be an excellent alternative to traditional fruit crops.

With new countries joining the UE, competitiveness in this and in other fruit crop markets has increased. Poland, for instance, is a large producer and exporter of small fruits but due to its geographic location only produces from the end of spring to summer. Thus, the market during autumn/winter and early spring, remains open to the Mediterranean countries, especially to Spain and Portugal. However, some countries of the southern hemisphere - Chile, South Africa and Nova Zealand - and of the Magreb can be important competitors. Spain remains as Portugal's main competitor, both in the domestic (imports) and the European market (exports).

In Portugal there are two types of farms – those dedicated to the domestic market and those orientated for exportation, which explains why the strawberry is sold in equal parts between the gross market and the retailers (75% of the total production). However, Portugal is not yet self-sufficient in strawberry production, importing a volume in excess of 7 000 tons per year (Figure 1).

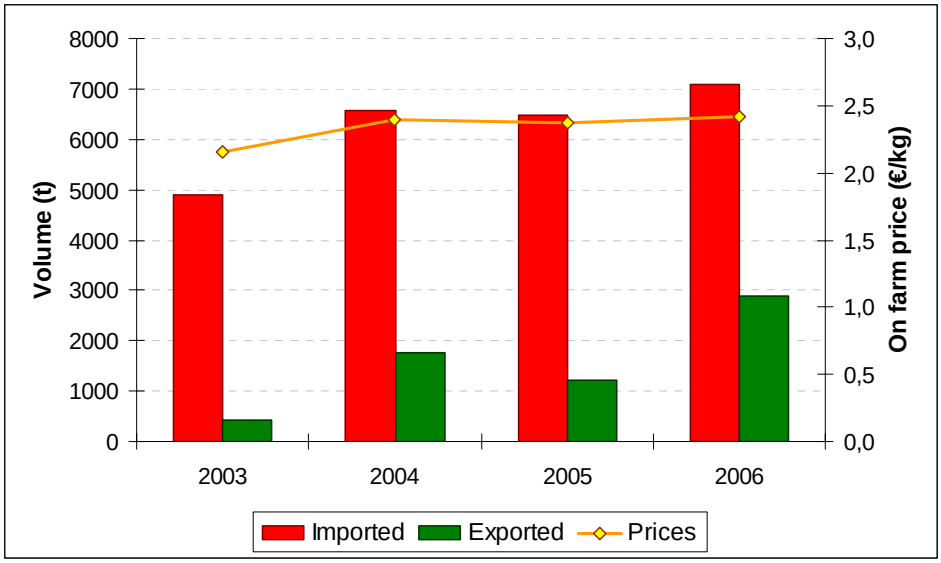

Figure 1. Strawberry volume imported and exported, and on farm average price from 2003 to 2006 (INE 2007).

In 1999 the cultivated area dedicated to other small fruits than strawberries did not exceed 82ha. However, the cultivated area for production of raspberry and blueberry has registered a great increase with the establishment of some foreign-capital companies in Portugal. In the particular case of those two types of small fruits, in 2006 the balance between importation/exportations was clearly favourable to the exportation (Blueberries 6.4 t/51.4 t - Raspberry 10.7 t/82.0 t; Source: GPPAA).

The increments in the small fruits cultivated area, (1989/1999) in an attempt to diversify fruit crops, was particularly visible in Beira Litoral (efforts by the producers' association Mirtilusa) and in the region of Alentejo Litoral (efforts by the National Institute for Biological Resources/Fataca Experimental Farm).

The production areas are still small compared to the potentiality of the markets. The production of strawberries is the one that stands out, representing more than 80% of the total small fruit cultivated area. From 2000 the area stabilized at around five hundred hectares, with maintenance of the productivity of the culture. The main production regions are in the south of Portugal, which includes the Ribatejo and Oeste, Alentejo and Algarve. These three regions produced 99% of the national production in 2001.

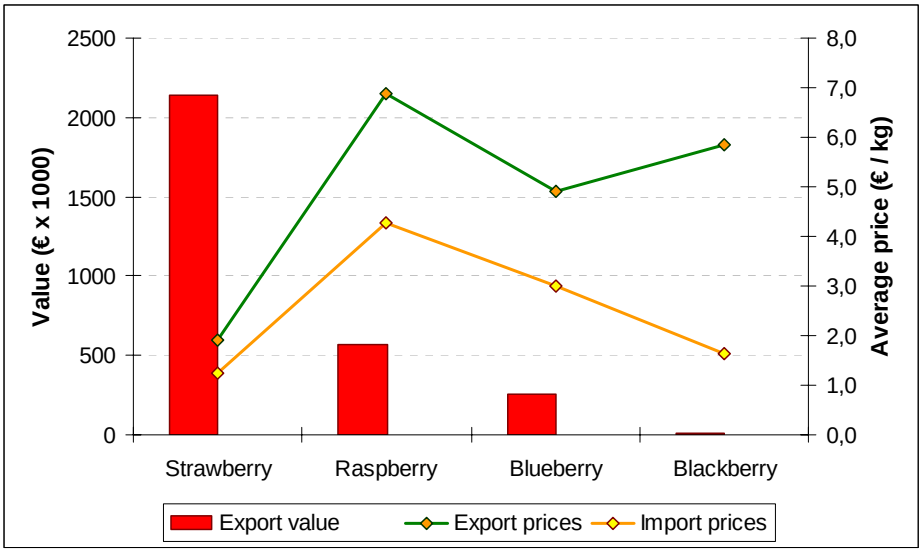

Figure 2. Small fruit export value and prices in 2006 (INE 2007).

Whilst the raspberry market is near the saturation level in the normal periods of production, the off-season market still presents perspectives for growth. The blackberry market is not yet exploited, and the blueberry market is still very favourable at any time of the year. Portugal is a small country, so cannot be an important competitor in volumes of production, but it can occupy an important band of market with high quality fruit, especially if the production costs are able to remain low (Figure 2).

The former Department of Agronomy (Departamento de Produção Agrícola) of the former National Agronomical Research Station (Estação Agronómica Nacional) has been developing and perfecting production technologies for many years, mainly off-season production technologies in strawberries (1998), raspberries (1996), blueberries (2001) and blackberries (1990). The extension work with growers has been done through the installation of demonstration fields. The Experimental Farm of Fataca (HEF) as been involved in technology development and transfer for about twenty years.

2. Strawberry production

Since the dawn of humankind strawberries have been appreciated and consumed as fresh fruit, being looked after for its pleasant aroma and flavour as well as taste. However, the strawberries are not anymore an early spring fruit as they are available in the market all year round. This change was due to the introduction of new cultivars, the development of new production technologies and better marketing.

Strawberry production used to be based on plants that remained in production three to five years. The production was obtained in early spring when other fruits were scarce, making the strawberry a much appreciated and very valued fruit. Strawberry plantation was done in the autumn, using stolons obtained in previous plantations. The vegetative material usually was not disease-free and the productivity decayed throughout the years.

Currently, the intensive systems allow the strawberry production throughout the year, in annual plantations or even in plantations that can last just some months. In these systems the production period must be chosen according to the demand of the market and the possibility to export. In Portugal, the production technologies are similar (soil plantation) to the big strawberry growing areas with Mediterranean climate (California, Spain, Morocco, Egypt, Turkey and Italy). The areas with soilless production systems have increased in Portugal based on the production technologies developed in central European countries. It is in the Algarve that substrate culture had the biggest development.

In the last trials carried with this crop, a production system that allows early production of strawberries and delayed raspberries production, using the same physical space of a battery of tunnels, was tested. In this cultural sequence the strawberries are planted in January for production from April to May (Figure 3). In June it is necessary to start the arrangements for the plantation of the raspberries in the following month, which have a cultural cycle that goes until December. Thus, the maintenance of workforce throughout the year becomes possible and the amortization of equipment and infrastructure is faster.

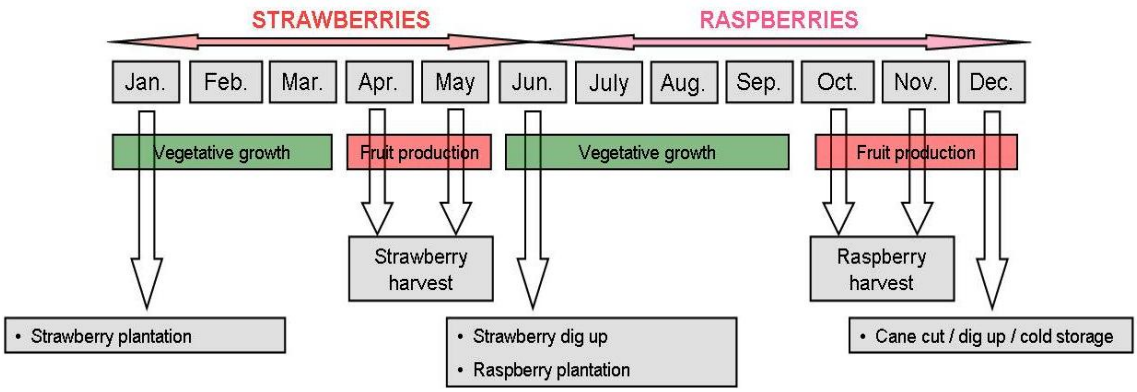

Figure 3. Schematic representation of the sequence of the cultural operations and strawberry and raspberry production cycles using the same structures (tunnels).

In this intensive production system, it is essential to fulfil adequately the calendar of cultural operations in the periods of transition between crops in order to not compromise the cultural cycle of the plants. Keeping in mind that they belong to the same botanical family the balance in terms of soil fertility and pests and diseases must be done with care. Thus, substrate production appears as an alternative to soil production, which leads to the trial of the cultural sequence strawberry/raspberry system (soil and substrate). In soil the system of raised beds with black polyethylene covering and two planting lines was used. In

substrate production system organic substrate bags (coconut fibre and pine bark) were used. During the two-year trial several cultivars of strawberry were planted in a density of 5 plants/m^2 in the soil and 10 plants/m^2 in substrate (Figure 4).

Figure 4. Strawberry production on raised beds with black polyethylene covering and strawberry substrate culture on structures that will be also used for raspberry production.

Plantation under-tunnel was performed in January. The cultivars Candonga and Galéxia registered a higher number of inflorescences which led to a larger production per plant. High plant density in substrate production did not affect the vegetative development of the plants because there were no registered differences between the analyzed parameters of vegetative development, but allowed a bigger commercial production per unit of area. Thus, the best results in the substrate system show that this is the system to adopt because regardless the initial investment (in infrastructures and plant purchase) because

amortization costs can flow faster. Also, the better ergonomic conditions of the harvest work result in more efficient cultural operations, with lower labour costs. However, to produce strawberries integrated in the cultural sequence strawberry/raspberry, productivity was reduced both in soil and substrate when compared with the standard system.

To improve strawberry productivity in the period of January to June in this system, some adjustments have to be done:

- Use of fresh green plants. Considering that the strawberry culture alone begins in January, the plants must be well developed so that their establishment period is reduced and the beginning of the production is anticipated.
- To increase production per plant and improve earliness and fruit quality plant density must be reduced for 10 to 12 plants/m, in accordance with cultivar and climatic conditions of the region.

3. Raspberry production

Some Portuguese regions have excellent climatic conditions for off-season raspberry production with the possibility of early and delayed production, spring and autumn, respectively. In early production, with protected cultivation, growers use long canes of summer-fruiting cultivars from northern countries (cold winters) or alternatively, plants from cold storage. In the delayed production primocane-fruiting raspberries are used, given its capacity to produce a first harvest in the primocane. To optimize this production in function of the markets, especially in periods of high market price, and to assure the quality and productivity, it is necessary to optimize primocane cutting dates and intensities during summer, for each cultivar available.

This production technique was developed at Odemira region and it has been used for a long time in Portugal. Primocane pruning allows us to change the cropping period from July to November. Two different pruning intensities can be used, ground level (Figure 5) or 10 to 15 nodes (Figure 6). Cultivar earliness and harvest periods are the two main criteria for this protected cultivation system.

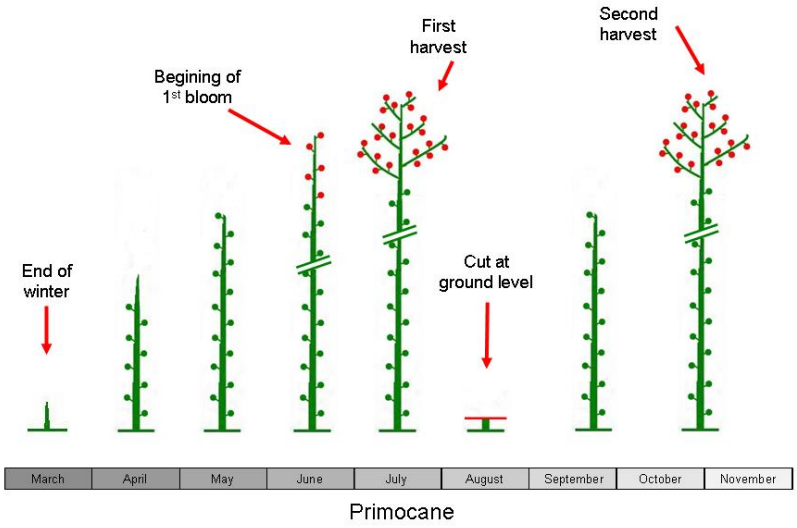

Figure 5. Primocane pruning at ground level (schematic representation). This technique is specially used for late cultivars and/or second year cane will be used for spring production.

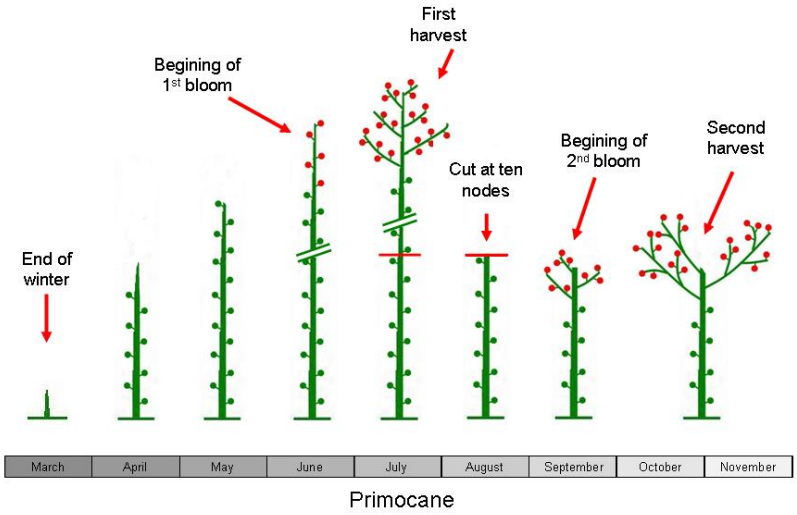

Figure 6. Primocane pruning at 10/15 nodes (schematic representation). This technique is specially used for early cultivars. Canes will be cut at ground level after harvest.

In a trial with six primocane-fruiting raspberry cultivars, of which three were early bearing cultivars (Autumn Bliss, Joan Squire and Joan J), and three were late cultivars (Joan Irene, Galante and Heritage), the primocanes were cut in accordance with to the timings of each cultivar. Thus, cuts to the height of the tenth node (≈ 0.60 m height, depending on the cultivar) were applied to the early cultivars at the end of July, which allows a new productive cycle with fruit harvest during November. For the late cultivars there was no information. So primocanes were not cut in the first year of the trial, were cut back to the height of the first fruiting lateral at the end of August in the second year, and at 20 nodes in the beginning of August in the third year. In these raspberry cultivars the harvest period was during November and December (Figure 7).

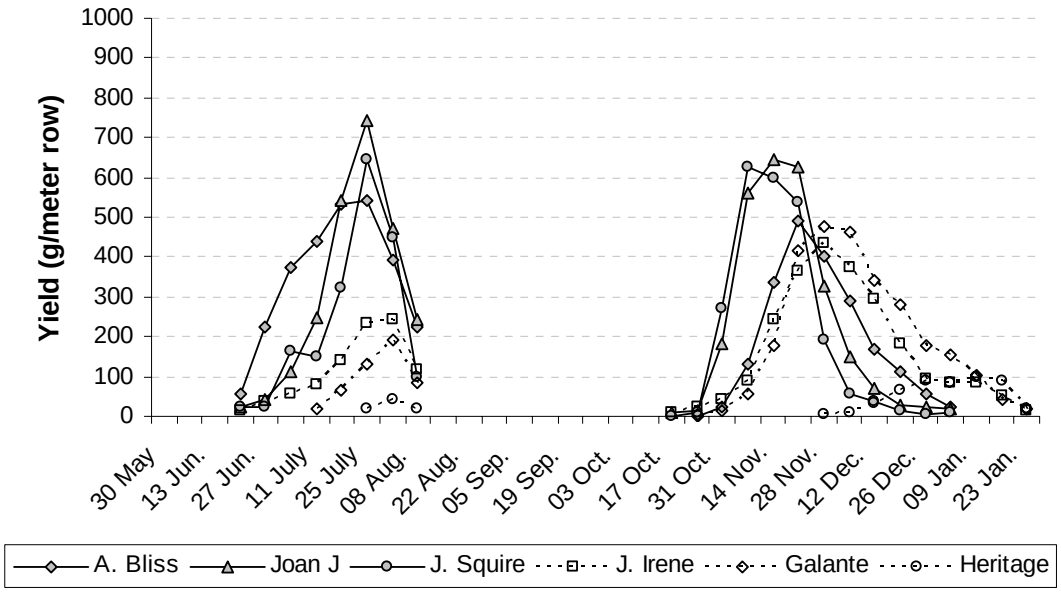

Figure 7. Harvest period for the six primocane-fruiting cultivars under trial (Data for 2003 trial).

The annual production of the three early cultivars was quite high, varying between 26.3 $t.ha^{-1}$ for Joan Squire cultivar and 35.0 $t.ha^{-1}$ for 'Autumn Bliss'. The latter cultivar always presented larger production during the spring/summer period compared to autumn/winter, in the three years of the trial. Whilst a larger average weight of the fruits was obtained in the spring/summer period, a small decrease in fruit size occurred when the 10 node cut was applied, in all cultivars.

The annual production of the late cultivars was different in the three years of the trial. However, the production during the period of autumn/winter was always superior to the spring period. The cultivar Joan Irene presented higher annual productions in all the trial years. The cut of the plants to the height of first lateral was the only treatment that presented similar productions, during the period of autumn/winter, to the early cultivars. Cutting at 20 nodes at the beginning of August, did not present satisfactory yields in none of the productive periods (Figure 8).

Figure 8. Primocane-fruiting red raspberry cultivars pruned at 20 nodes during summer.

Two new technologies were tested in recent trials. In the first one raspberry roots were maintained in cold storage, as an alternative to primocane cutting during summer. In this technique, the roots remain six months in cold storage,

being removed at the end of June for planting (Figure 9). This allows the reduction of the cultural cycle by six months with maintenance of the productivity in the autumn. The second technique uses especially prepared and cultivated plants in alveolar plates, fact that allows changing dramatically the form in which this culture is done today (Figure 10).

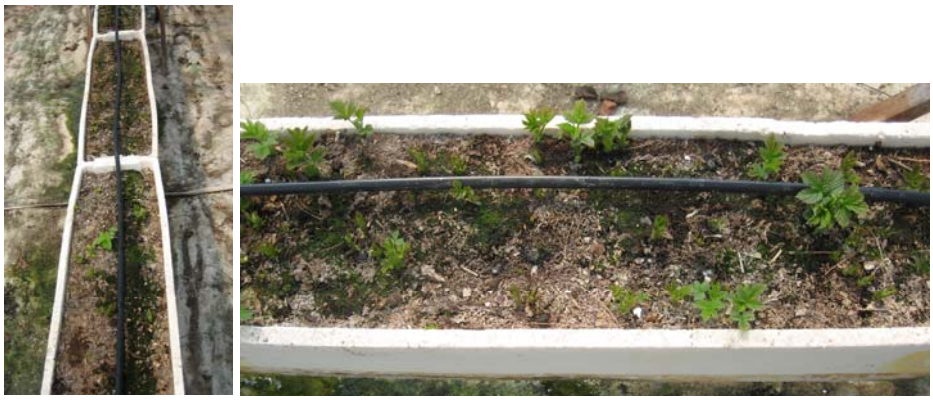

Figure 9. Primocane-fruiting red raspberry emerging canes come up from root buds, after six months in cold storage.

Figure 10. Fresh primocane-fruiting red raspberry plants.

With the objective of optimizing these two production techniques, two trials were carried out in protected cultivation. In the first trial, using cold-stored roots,

the roots were planted in tunnels, ground and substrate, at the end of June. In both cases plants of the cultivar Joan Squire, Joan Irene and Polka were used. In both ground and substrate plantations, we obtained similar productions in the same harvest periods for 'Joan Squire' and 'Polka' (19.0 and 15.4 $t.ha^{-1}$ in substrate culture and 17.4 and 17.2 $t.ha^{-1}$ in the ground, respectively). 'Joan Irene' is a late cultivar, so it did not complete the production cycle when cultivated in the ground, resulting in a lower yield (16.7 $t.ha^{-1}$ in substrate and 11.2 $t.ha^{-1}$ in soil) (Table 1).

Table 1. Yield, fruit weight and harvest period for 'Polka', 'Joan Squire' and 'Joan Irene' grown in soil and substrate.

	Yield ($g.m^{-2}$)		Unmarked	Fruit weight	Harvest period (% total yield)		
	Total	Commercial	(%)	(g)	5%	50%	95%
Soil							
Polka	2051	1717	16.9	4.5	19 Sep.	31 Oct.	12 Dec.
Joan Squire	1831	1745	4.8	4.0	09 Nov.	25 Nov.	27 Dec.
Joan Irene	1160	1117	3.4	5.3	21 Nov.	12 Dec.	02 Jan.
Substrate							
Polka	1874	1536	18.0	4.5	19 Sep.	26 Oct.	12 Dec.
Joan Squire	2135	1895	11.5	3.5	17 Oct.	11 Nov.	09 Dec.
Joan Irene	1815	1675	7.5	4.8	02 Nov.	28 Nov.	02 Jan.

In the production trial with raspberry fresh plants only 'Polka' was used. Different types of cut (with and without pinching) and densities applied (between 8 and 12 canes per meter) presented similar productivities (between 17.8 and 20.0 $t.ha^{-1}$) (Table 2).

Table 2. Yield, fruit weight and harvest period for Polka, grown in soil with three different densities. Plants were cut just after planting.

	Yield ($g.m^{-2}$)		Unmarked	Fruit weight	Harvest period (% of total yield)		
	Total	Commercial	(%)	(g)	5%	50%	95%
No cut							
8 plants	2002	1719	13.8	4.3	03 Oct.	02 Nov.	30 Nov.
10 plants	1833	1544	15.8	4.6	05 Oct.	31 Oct.	09 Dec.
12 plants	1944	1731	11.0	4.7	05 Oct.	31 Oct.	09 Dec.
With cut							
8 plants	1785	1477	17.3	4.3	10 Oct.	31 Oct.	29 Nov.

To test the adaptation of the raspberry production to substrate culture, a trial using fresh plants in hydroponics culture was installed in rock-wool (Figure 11). The plantation was done in the first week of July with a density of three canes per rock-wool bag. In these conditions, non-pinched plants got a production of 17 $t.ha^{-1}$ and pinched plants 13 $t.ha^{-1}$. The latter presented a more concentrated production. Fruit weight was very high during all harvest period, with an average weight of 5.0 g per fruit.

The results obtained with these production techniques were similar to those obtained in the trials with the cut of the primocanes. Thus, the number of techniques available to increase the production of raspberries in the autumn/winter period is now higher. It also become possible to have two productive cycles with different crops (e.g. early production of strawberry and delayed production of raspberry) in the same space and in the same campaign, fact that will allow a higher cultural intensification.

Figure 11. Fresh raspberry plants of cultivar Polka grown in rock-wool substrate.

The use of primocane-fruiting cultivars was essential to achieve these objectives, with productivities that easily reached twenty tons per hectare in the two production periods. Polka cultivar showed remarkable qualities: its capacity of resistance during transport and the good flavour of its fruits.

4. Blackberry production

Blackberries (*Rubus* sp.) were mainly harvested in the nature for immediate consumption. Under the name of blackberries we include fruits of different species and hybrids (blackberry x raspberry) that have extremely distinct organoleptic and flavour characteristics. The fruits of the Marionberry, Tayberry, Loganberry and Boysenberry, are very appreciated to mention just some of the most popular flavours. The flavours are in such a way characteristic that the consumer easily associates the name to the cultivar, factor that facilitates its commercial discrimination.

The blackberry production, in different periods of the year, is based on a large group of cultivars and a number of available technologies. In early spring production, very early cultivars, usually from the botanical group *Ursini*, have been used and grown in tunnels or greenhouses. The cultivars that have been used more often are Silvan, Olallie and Brazos, but they are currently to be replaced by the cultivars Tupi, Karaka Black and Ouachita given their better keeping qualities and flavour.

Early Production Using Cold Storage

Anticipation is a very important factor in the export market. In the first trials for early production the plants were dug in the beginning of October and kept in cold storage for three and half months (± 4ºC). In these trials we verified that the

cultural cycle of the cultivars being used had a significant change. Thus, the differences between harvest dates of the cultivars at open field and greenhouse faded, but the production in the greenhouse was one month earlier than in the open field. In these trials productions between 1.3 and 2.8 kg.m^{-2} for the cultivars Chester and Olallie, respectively, were obtained (Table 3).

Table 3. Growth cycle duration in the two environments, open field and greenhouse. Dob – date with 50 % of open buds; Dbh – beginning of harvest; Gcd – growth cycle duration (days).

	Dob	Dbh	Gcd
Open field			
Loch Ness	05 Apr.	02 July	123
Brazos	12 Mar.	04 Jun.	128
Triple Crown	24 Mar.	16 July	135
Silvan	03 Mar.	04 Jun.	136
Chester	12 Apr.	16 July	144
Olallie	22 Feb.	28 May	156
Greenhouse			
Triple Crown	25 Feb.	25 Jun.	162
Olallie	22 Feb.	21 May	165
Chester	11 Feb.	04 Jun.	176
Loch Ness	02 Feb.	21 May	185

These first results showed that the partial destruction of the blackberry root system, when the plants are dug to be placed in cold storage, must be prevented. Otherwise it will increase too much the period of reinstallation of the culture. Thus, new trials were delineated where the blackberry plants were cultivated in pots with substrate, during one year, and placed in cold storage on different dates during autumn. Production started on the 10th of May and continued until early July. Higher production per plant was obtained with the cultivar Loch Ness, and Apache yield was higher towards the end of the production period. Production values were sufficiently satisfactory, but the production obtained with this technique was not significantly early in the year. In the second year trials, the plants were moved out of cold storage on three different dates (beginning of October, beginning and end of November). Productions varied significantly and the cultivar Arapaho reached 1.3 kg.m^{-2}.

However, production did not occur significantly earlier than in the previous year trial (Table 4).

Table 4. Average yield of cultivar Arapaho during 2006 and 2007 trials

	Yield (kg)	Number of pots	Yield per pot (kg)
2006	136	162	0.839
2007	146	154	0.949

The south-western Alentejo region also has good climatic conditions for the open field production and most cultivars are suitable for the region. However, those with higher chilling requirements should not be planted. In the HEF, productions of 1.8 to 2.2 kg.m^{-2} were obtained with the cultivars Silvan, Kotata and Hull Thornless.

Late Blackberry Production

Late blackberry production is also possible under protected cultivation. In this case, and with the objective of postponing the beginning of production, laterals are cut in full bloom (Figure 12). This technique is used commercially in the south of England and was tested at HEF in 2002. In this trial the cultivar Triple Crown was used because it is a very vigorous cultivar, allowing the plants to recover vigour after being cut. Fruiting laterals were cut to the second and the forth node from the base of the lateral and several cutting dates were studied. Although this is a very demanding technique in terms of labour, it allows blackberry fruit production to occur during September and October.

Figure 12. Fruiting lateral pruning during summer in order to postponed harvest to autumn.

Yield obtained with cutting to the second and the forth node was not significantly different with the cut in April showing only a minor break in the production (1.5 $kg.m^{-2}$, which corresponded to 85% of the production of the non cut plants) (Table 5).

Table 5. The effect of date and intensity of lateral pruning on fruit number and weight, yield and total soluble solids (TSS) per plant and per floricane of 'Triple Crown' blackberry

Treatment	Fruit number per		Yield per		Fruit	TSS
Pruning date[Z]	Floricane	Plant	Floricane (g)	Plant (g)	weight (g)	
U	173	872	1499	7230	9.9	9.5
C_1	144	720	1352	6152	10.5	8.6
C_2	119	517	1100	4541	9.4	8.5
C_3	107	443	880	3664	8.7	8.5
Signif.						
Linear	**	***	**	***	**	**
Quadratic	NS	NS	NS	NS	*	**
Intensity[Y]						
I_{02}	107	443	880	3664	8.7	8.5
I_{04}	97	462	635	3106	8.0	8.5
Signif.						
t_{22}	NS	NS	NS	NS	NS	NS

[Z]Laterals pruned on 18 April, 02 May and 16 of May (C_1, C_2 and C_3, respectively) and U for untreated canes. [Y]Intensities adjusted to 2 and 4 nodes per lateral (I_{02} and I_{04}, respectively) on 16 May. [NS], *, **, *** Nonsignificant, significant at $P \leq 0.05$, 0.01 and 0.001, respectively.

Breeders are trying to introduce the primocane fruiting characteristic into blackberries. In cooperation with the University of Arkansas we have in trial at HEF two primocane-fruiting blackberry cultivars - Prime Jim and Prime Jan. In a 2006 trial, from August to the beginning of January, an yield of 1.7 kg/plant was obtained in plants cultivated in substrate, with high plant density (≈ 2800 plants per hectare) (Figure 13). These cultivars produced large fruits (12 g). However, they do not have flavour and have very low soluble solid contents (between 6.2 and 9.8 ºBrix) (Figure 14).

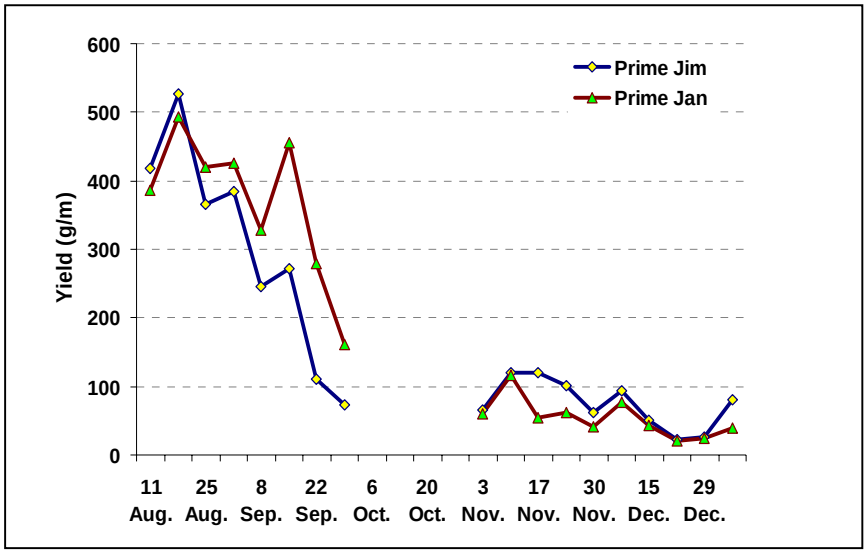

Figure 13. Yield per week of primocane-fruiting blackberry 'Prime Jim' and 'Prime Jan' grown at HEF.

Figure 14. Primocane-fruiting cultivar Prime Jim grown at HEF. Fruits are very large and appealing but SSC is very low.


5. Blueberry production

Blueberries belong to the *Vaccinium*, almost worldwide distributed genera, but most species come from the North American continent. Blueberries are bushy plants that can reach a height of four to six meters, with a relatively superficial root system (80% of its roots are distributed in the first 50 cm of depth). The fruit is a berry of colour ranging from dark blue to black, round or slightly flattened, that can have more than one cm of diameter and a weight of two to five grams.

For horticultural purposes they can be separate in diverse groups but, for the Portuguese soil-climatic conditions and the European market, substantially different from the North American, only two groups are of interest: the "Northern Highbush Blueberry" (NHB) and the "Southern Highbush Blueberry" (SHB). To cultivate the first group it is necessary 700 the 1200 hours of cold and soil pH varying between 4.5 and 5.0. To grow SHB group, hybrids developed from species of the south of the United States, few hours of cold temperatures are required - only 150 to 600 hours - and they are also more tolerant in terms of pH values, being able to tolerate values between 5.0 and 5.5. On the basis of this very generic characterization of the soil-climatic requirements of blueberry plants, the cultivars of the NHB group seem to be more adjusted to the conditions in the centre and north of Portugal, whilst the SHB group is better adjusted to the regions of the centre and south. Depending on specific local conditions (aspect and relief) some inland regions can be adequate to the culture of the SHB group. The harvest period of blueberries in open field is a function of

the group to which the plants belong and goes from May to August, depending also on the specific cultivars and the climatic characteristics of the region.

A high number of cultivars have already been tested outdoors mainly those from the NHB group (Berkeley, Bluecrop, Bluejay, Bluetta, Coville, Darrow, Duke, Earliblue, Elliot, Jersey, Northblue, Patriot, Sierra and Spartan) but also of the SHB group (Cape Fear, Georgiagem, Misty, O'Neal, Reveille, Sharpblue and Star) (Figure 15). For early blueberry production SHB plants are used and protected cultivation through the use of high tunnels covered with polyethylene.

Figure 15. Open field blueberry plantation at HEF, Odemira.

On an early trial done at HEF four blueberry cultivars were tested. In this trial production begin in the first fortnight of April with O'Neal, with 50% of the production being achieved by the beginning of May. In the third year after the plantation 0.9 kg, 1.1 kg, 1.5 kg and 1.7 kg per plant were obtained with the cultivars O'Neal, Reveille, Cape Fear and Georgiagem, respectively (Table 6).

Table 6. Number of days until harvest pick and dates of 5%, 50% and 95% of harvest. Number of picking days for the four cultivars under study

Cultivar	Nº days harvest pick	Harvest dates			Nº picking days
		5%	50%	95%	
Georgiagem	15	30 Apr.	14 May	28 May	29
Cape Fear	8	30 Apr.	07 May	24 May	25
Reveille	15	30 Apr.	14 May	28 May	29
O'Neal	11	19 Apr.	30 Apr.	17 May	17

In our climatic conditions a second crop is often observed during autumn. This behaviour is particularly strong on cultivar Sharpblue. We have developed a trial in order to evaluate the possibility to commercially explore this very early harvest. For this, plants of 'Sharpblue' were covered with polyethylene in January in one year and in October on the second year. With this technique it was possible to anticipate harvest in 20 days with the same yield (Table 7). Yield was consistently higher on the second year (Figure 16).

Table 7. Number of days until harvest pick and dates of 5%, 50% and 95% of harvest. Number of picking days for the four cultivars under study

	Year	Nº days harvest pick	Harvest dates			Nº picking days
			5%	50%	95%	
Open field	2003	11	14 May	28 May	11 Jun.	27
	2004	14	07 May	21 May	11 Jun.	33
Protected cultivation	2003	11	07 May	14 May	28 May	22
	2004	37	16 Apr.	21 May	18 Jun.	44

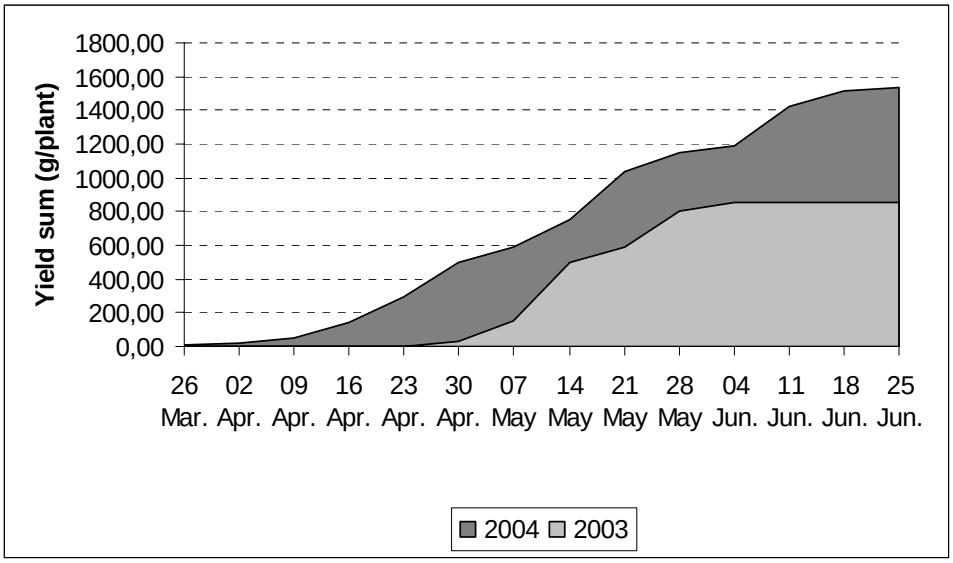

Figure 16. Yield of Sharpblue during the two years trial. Tunnels were covered in January in 2003 and October in 2004.

The price of blueberries is relatively high in the EU market and its consumption has increased consistently in recent years. The demand of the European market for these fruits and the insufficient offer has allowed regions of Portugal that do not show the earliness of the Alentejo coastal region to carry out the culture of blueberries using some excellent cultivars of the NHB group.

6. Red currant production

Red currant early production for the fresh market is already being carried out in Portugal by three agricultural companies. This small fruit presents at this moment the highest production values. Junifer is the main cultivar used due to its earliness and low chilling requirements.

Given its complementarities in the export markets, several companies have started to produce different varieties of small fruits. This strategy is justified by the added value obtained when exporting the fruits. The export value of raspberries and blueberries is already quite significant, regardless of the small production area. In the framework of this strategy, Lusomorango, a producer's organization, is currently operating in the southwest of Alentejo and in Ribatejo. Given that it is possible to separate the productive cycles and the harvest of the different small fruits other companies have followed the same strategy as a means of maintaining constant labour levels.

We can safely conclude that Portugal has excellent conditions to be a leader in the European market in the offer of high quality berries. The companies operating in the country have fought for the production of high quality fruits, based on good technical support, using integrated plant production and systematized analysis of residues.

The consumption of these fruits constitutes an important source of vitamins, minerals and staple fibres. Small fruits also have a remarkable high antioxidant capacity and other biofactors, currently considered very important in the

prevention of some pathologies, eventually contributing to an increase in longevity and general welfare, and therefore improving the quality of life.

For the European consumer small fruits are still associated with scattered fruits harvested in the wild, free of pesticides and therefore clean. It is highly important to preserve this positive image given its impact in the volumes of trade. The popularity of the blueberries is mainly due to the excellent organoleptic characteristics of the fruits, associated with an extraordinary high content in antioxidants substances. The beneficial power of antioxidant substances in the retardation of cellular aging is well know.

The path of small fruit research and production industry since the first Colloquium in Santarém (1994), until last year meeting in Sever of the Vouga is already long. The first colloquium was organized by the Portuguese Horticultural Association (APH) and had more than a hundred participants. Fortunately, meetings did continue and we have now established a four years cycle of events with invited speakers from different parts of the world. The meetings gained its own dynamics and always with a high number of technical presentations on all different agronomic aspects of berry production.