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Evaluation of almond cultivar adaptation in Trás-os-Montes region (Portugal)

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SUMMARY – In the nineties some new almond cultivars were introduced in Portugal but their characteristics were only described in the literature. In 1998 a field trial was established at "Centro Experimental da Terra Quente" (Quinta do Valongo, Trás-os-Montes) using some of the introduced cultivars: 'Francolí', 'Masbovera', 'Glorieta', 'Lauranne' and 'Ferragnès', grafted on GF-677 rootstock. The goals of this work were: (i) to evaluate the behaviour of foreign cultivars in comparison with 'Ferragnès', currently growing in Trás-os-Montes region; (ii) to determine the relative bloom and harvest dates; and (iii) to evaluate the kernel characteristics of the new cultivars. The results obtained from data collected in 2002 indicated that 'Lauranne' was the most productive with 5 kg/plant of nuts. Regarding vigour, recorded by measuring trunk diameter 20 cm above ground level, 'Francolí' was the most vigorous, with 81 mm. No differences were found for the blooming time among cultivars, except for 'Lauranne' that flowers 4 days after the others.

Key words: Almond, cultivars, productivity, evaluation.

RESUME – "Evaluation de l'adaptation de cultivars d'amandier dans la région de Trás-os-Montes (Portugal)". Dans les années 90 ont été introduites au Portugal de nouvelles variétés d'amandier sans connaître leur adaptation à notre pays. En 1998 a été planté un verger dans le "Centro Experimental da Terra Quente" (Quinta do Valongo, Trás-os-Montes) avec cinq de ces nouvelles variétés 'Francolí', 'Masbovera', 'Glorieta', 'Lauranne' et 'Ferragnès' greffées sur le porte-greffe GF-677. Les objectifs de ce travail ont été : (i) évaluer la conduite des variétés introduites récemment en comparaison avec la variété 'Ferragnès'; (ii) déterminer la date de floraison et la récolte; (iii) évaluer les caractéristiques de l'amande. Les résultats obtenus en 2002 ont indiqué que la variété 'Lauranne' a été la plus productive avec 5 kg d'amandes par plante. La variété 'Francolí' a été la plus vigoureuse avec une moyenne de 81 mm de diamètre du tronc mesuré à 20 cm au-dessus du niveau du sol. On n'a pas trouvé de différences entre les variétés quant à la date de floraison, à l'exception de la variété 'Lauranne' qui fleurit 4 jours après les autres.

Mots-clés : Amandier, variétés, productivité, évaluation.

Introduction

Almond cultivation in Portugal is still based on many different cultivars of local origin, characterized in generally by an early blooming time that limits the almond's productivity in old orchards. In the last 20 years and in the new plantations one cultivar, 'Ferragnès', became to be preeminent due to its suitability to the Portuguese environmental conditions. 'Ferragnès' was obtained in France in 1960 by crossing the local 'Aí' with the Apulian 'Cristomorto' (Grasselly and Crossa-Raynaud, 1980). The positive traits of 'Ferragnès' are its late blooming, vigour, productivity, low alternance, plasticity and good kernel features (Grasselly and Duval, 1997). Recently, other cultivars were introduced like 'Masbovera', 'Francolí' and 'Glorieta' resulting from IRTA (Mas Bové) breeding programme and the cultivar 'Lauranne' obtained by INRA (France). The main characteristics of the Spanish cultivars are late flowering, fruit quality (almost absence of double kernel, good kernel appearance, hard shell, etc.), productivity, high vigour and easy training productivity (Vargas and Romero, 1994). The French cultivar 'Lauranne' being a self-fertile cultivar, gives the possibility of monovarietal orchards, which have several advantages. Duval and Grasselly (1994) recommended in the orchard planning that 'Lauranne' row alternate with a 'Ferragnès' row. Nevertheless, growers must continue to plant principally 'Ferragnès' cultivar because they don't have enough data comparing this cultivar and the new cultivars in the same conditions. A trial was established aiming to evaluate the behaviour of foreign cultivars in comparison with 'Ferragnès', currently growing in Trás-os-Montes region, to

determine the relative bloom and harvest dates, and to evaluate the kernel characteristics of the new cultivars.

Materials and methods

In 1998 a field trial was established at "Centro Experimental da Terra Quente" (Quinta do Valongo, Trás-os-Montes) using the cultivars: 'Francolí', 'Masbovera', 'Lauranne' and 'Ferragnès', grafted on GF-677 rootstock, spaced at 6 x 4 m. 'Glorieta' cultivar was planted one year later. Trees were regularly cultivated and irrigated. Irrigation system consisted in two micro-sprinklers per tree, each one 50 cm far from trunk. Plants were irrigated since the first week of May to the last week of August three times a week during one hour, complementing the 550 mm precipitated per year.

The experiment was set up in a randomized block design with five replicates and four trees per cultivar. In 2002, the harvest was weighted and some fruit characters were measured. Tree vigour (trunk diameter) and dates of flowering and harvest were observed too. Data were analysed by Superanova.

Results and discussion

The results obtained from data collected in 2002 indicated that 'Lauranne' and 'Francolí' were the most productive cultivars (Fig. 1), but the higher yield was obtained with 'Lauranne', because it showed a higher shelling percentage than 'Francolí' (Fig. 2). However, Vargas and Romero (1994) consider that the cultivars 'Masbovera' and 'Glorieta' globally present better characteristics than 'Francolí', being this last cultivar a good pollinator of the previous ones. The good yield of 'Lauranne' have been confirmed by Duval and Grasselly (1994), where it produced 4.83 kg kernels per tree in a 8 years old orchard. Significant differences between varieties cultivars 'Masbovera', 'Glorieta' and 'Ferragnès' for the productivity had not been found.

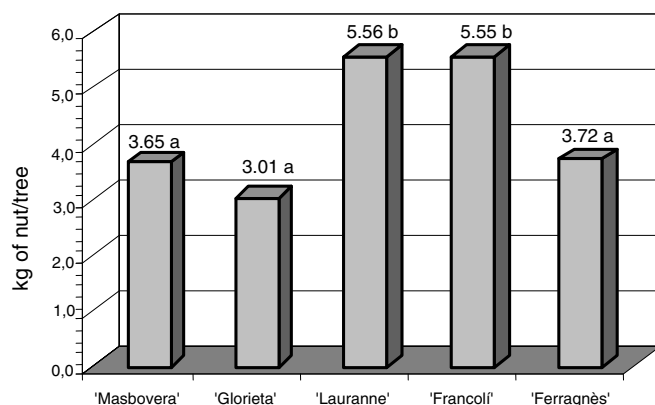


Fig. 1. Productivity (kg of fruit/tree) of the five cultivars.

Regarding vigour, 'Francolí' was the most vigorous, but no differences were found from the Anova analysis among the other cultivars (Fig 3), except for 'Glorieta' but this cultivar was planted one year later than the others.

Table 1 shows the significant differences for the fruit and kernel characteristics among cultivars. Kernel weight of the studied cultivars ranged between 1.3 g in 'Ferragnès' and 0.9 g in 'Lauranne', inferiors to that Grasselly and Duval (1997) presents, where the weight for 'Ferragnès' ranged from 1.4 g to 1.7 g, and 'Francolí', 'Glorieta' and 'Masbovera' have 1.4 g. The higher fruit weight was obtained in 'Glorieta' cultivar statistically different from the others, perhaps because it had the lowest productivity.

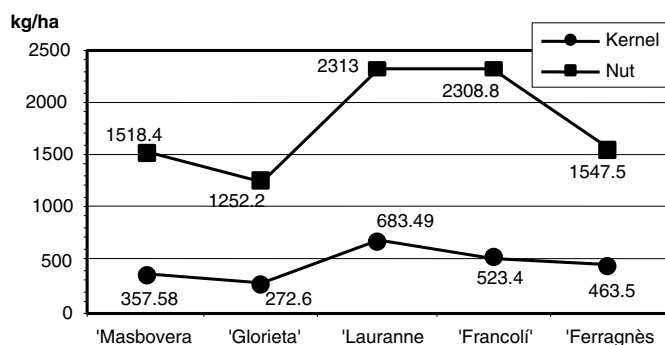


Fig. 2. Productivity (kg/ha) of the five cultivars.

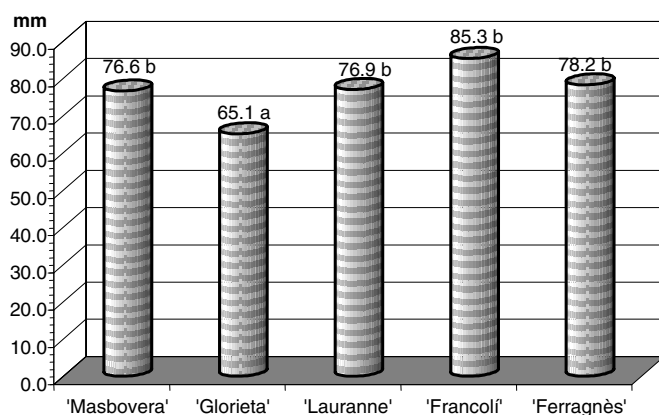


Fig. 3. Trunk diameter of the five cultivars.

Table 1. Some fruit and kernel characters

Cultivars	Fruit			Kernel		
	Weight (g)	Length (mm)	Width (mm)	Weight (g)	Length (mm)	Width (mm)
'Glorieta'	5.6 c	37.5 b	24.5 c	1.2 bc	24.7 bc	13.3 c
'Francoli'	5.2 bc	36.7 b	21.4 b	1.2 bc	23.7 b	12.3 b
'Masbovera'	4.6 b	37.1 b	23.5 c	1.1 ab	24.4 bc	12.4 b
'Lauranne'	3.0 a	32.6 a	19.5 a	0.9 a	22.1 a	11.4 a
'Ferragnès'	4.4 b	35.7 b	21.9 b	1.3 c	25.7 c	12.9 bc

Values with same letter(s) are not significantly different according to Fisher's LSD test ($P = 0.05$).

No differences were found for the blooming time among cultivars, except for 'Lauranne' that flowers 4 days after the others. In 2002 the blooming time occurred in the first week of March for all the cultivars, which is an advantage comparing with the Portuguese cultivars that blossom 3 weeks before.

To conclude, the published results about the cultivars studied here, in general report characteristics different from those we obtained in this work. This may be due to specific climatic and soil conditions. For the moment, with the presented results, we can recommend the new cultivars in alternative to 'Ferragnès'.

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