

Introduction

Wild cherry (*Prunus avium* L.) is a promising species for high quality wood production. Cherry wood is used especially in the veneer and furniture industry. Actually there is an increasing interest in the wood of this species which can attain high prices in the markets. In Portugal, until the nineteen nineties, the wild cherry was practically ignored in afforestations. Its existence was limited to some trees spread out in forests, generally growing in mixed stands.

After 1992, with the EU set-aside policies, the afforestation area with cherry trees was greatly increased due to the EU subventions. Currently, the oldest stands, mostly pure, are about fifteen years old and many of them are experiencing a high rate of mortality, gum pockets and low vigour. These problems are not generally observed in situations where wild cherry grows naturally in mixtures. So, we think the stand environment, the cultural practices and the genetic factors are major issues both for vigour of species and quality of timber.

Admixtures with nitrogen fixing species could be an attractive solution to improve the vigour and the stand environment. Kelly *et al.* (1992) state that an adequate mixture favours the ecological soil properties, the site fertility and the resistance to the biotic and abiotic factors.

Objectives

The aim of this study is to evaluate the behavior of cherry in mixed plantations with a fixing nitrogen species *Robinia pseudoacacia*. This is a study of a new management option for the production of quality timber in this region where the climatic changes were forecasted. We expect to improve the nutrition and the environmental conditions of cherry growth turning it more competitive and healthy.

Materials and Methods

In 2000, a field trial was established in Vimioso in the North of Portugal (41° 34' 12" N and 6° 30' 7" W, 700 m altitude) to evaluate the behaviour of four valuable broadleaves species, including cherry, in mixed plantations with a fixing nitrogen species *Robinia pseudoacacia*. The total annual rainfall is 554.7 mm. The mean annual temperature is 12 °C, the hottest month is July with a mean temperature of 21.1°C and the coldest is January with 4.2°C. The frost period goes from October to May averaging 41 days. The drought period goes from the middle of June to the middle of September. The soils derived from schists with silt loam texture.

The behaviour of cherry was evaluated considering the height growth and survival. Logistic regression was used to analyse the cherry's survival. The HSD Tukey test was used to compare the height growth of cherry in the different treatments.

This experiment consists on ten treatments and three replications in a total of 30 rectangular permanent plots with an area of 500 m². Each plot has 6 lines with 12 trees and a buffer strip line. The spacing is 3.5x2 m.

In this analysis we consider only the treatments where cherry is present:

- T2 – Pure cherry,
- T6 – A line of cherry x a line of robinia,
- T9 – Cherry x robinia alternately in the line.

Acknowledgements

This research was supported by the FCT - PTDC/68186/2006.

Treatments



Results

Surviving analysis

The application of Logistic Regression using Maximum Likelihood Estimation showed that the cherry was associated to a high surviving probability when consociated with robinia. This was observed either for mixtures of cherry x robinia in alternated lines (T6) or mixtures of cherry x robinia alternating in the line (T9). The pure cherry analysis wasn't conclusive because, according to the test of Maximum Likelihood Estimates, the results weren't statistically significant ($P > 0.05$).

Analysis of Maximum Likelihood Estimates

Treatment	Survival probability	Estimate	Standard Error	Chi-Square	Pr > Chi Sq
2	0.77	0.2371	0.1305	3.30	0.0692
6	0.87	0.6465	0.1357	22.69	<.0001
9	0.86	0.6260	0.1353	21.40	<.0001

Height growth

The height growth of the cherry was analysed by an ANOVA. No violations of ANOVA assumptions were verified.

The ANOVA results showed statistically significant differences between the treatments ($P < 0.0001$).

ANOVA

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	25.531	12.766	11.98	<.00001
Error	337	359.149	1.066		
Corrected Total	339	384.680			

HSD Tukey Test

The multiple comparison HSD Tukey test to the height growth of cherry showed:

- The height growth of pure cherry (T2) does not differ from the cherry growth when it is alternately mixed with robinia in the line (T9).
- The height growth of cherry when mixed with robinia in alternated lines (T6) is better than when it grows pure (T2).
- It was verified that cherry presents different height growth between the studied mixtures. The height growth of cherry is highest when it is in the mixtures line by line with robinia.

Results of means comparisons by HSD Tukey test

Treatments	Height means (m)	Mean comparisons
T2	3.12	
T9	3.24	
T6	3.79	
$\bar{X} = 3.32$		
$(s) = 1.03$		
$(CV) (\%) = 31.06$		

General conclusions

In Portugal the cherry experiences some problems related with the interaction of three factors: genetic provenance, inadequate management practices and environmental factors. In the north-east region of Trás-os-Montes the appearance of the pure cherry stands suggests lack of vigour, evidencing some mortality after a few years without any defined cause.

Our study suggests an apparent superior vigour of the cherry when it was consociated with robinia, suggesting that its presence directly benefits the objective species.

Logistic Regression analysis showed that the cherry was associated to a high surviving probability when consociated with robinia in both types of tested mixtures. In regards to the pure cherry, the analysis was not conclusive because the results were not statistically significant ($P > 0.05$).

The cherry height growth is better when this species is consociated with robinia, line by line. However, the pure cherry height growth does not differ from the cherry alternately mixed with robinia in the line. Even though the form and vigour of cherry, namely the freshness and colour of leaves and bark, consociated with robinia alternately in the line, is better than in pure cherry.

The cherry is an important and valuable broadleaf tree species but it must be managed correctly to produce quality timber. The recommended silviculture for the cherry is a tree silviculture (Boulet-Gercourt, 1997). Along this year, the cherries were submitted to a first pruning to improve the form of the stem and to allow for a production of wood quality in a stem extension of 6 m. This was done in June and, until now, the results have been very good because the cherry did not sprout in the cutting zones and the vigour did not seem to be affected.

References

- Boulet-Gercourt, B., 1997. Le merisier. Les guides du sylviculteur. IDF, Paris.
Kelly, M. J., Larson, B. C. and Oliver, C. D., 1992. The ecology and silviculture of mixed-species forests. Kluwer Academic Publishers. Dordrecht, 287 pp.