COMPARATIVE STUDY OF BIOACTIVE COMPOUNDS IN CULTIVARS AND SPONTANEOUS PLANTS OF HOPS

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Introduction

Humulus lupulus L. is a species of the Cannabaceae family. Hop, as it is commonly known, is a perennial, dioecious and usually diploid (2n = 20) herbaceous plant [1]. It is in beer production that hops have their greatest economic value at the international level, gaining a recent projection due to the increase of the artisan beer industry. Due to the production of compounds with bactericidal action, particularly against Gram-negative bacteria, hops came to solve problems related to the conservation of beer [2]. However, in addition to this property, hops contain other compounds that confer sedative, diuretic and antiarthritic properties.

As an ethnobotanical use, the dried flowers were used in pillows called "hop pads", to fight insomnia. The use of dried and green hop inflorescences for diuretic uses and for disorders of the digestive tract, have been recorded in the Montesinho park area. In China, alcoholic extracts of hops were used in different dosages to treat different types of leprosy, tuberculosis and dysentery. In addition to its use in infusions as a tonic, this use has already occurred since the Middle Age where it was used and considered a medicinal herb.

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Fig.1 Inflorescência feminina de *Humulus lupulus L.*

Fig.2 Planta de *Humulus lupulus L.*

The demand for new aromas has increased, driven by the expansion of artisanal beer production in Portugal. There are spontaneous hops throughout the country and the collection and analysis of the aromas of these hops can lead to the development of new and more fragrant varieties. In addition, hops have bactericidal and bacteriostatic action, particularly against gram-negative bacteria. Volatiles extracted from spontaneous hops in the Bragança area (Trás-os-Montes), were analyzed and compared with commercial varieties (Nugget, Cascate and Chinouke)..

Material and Methods

The samples were collected in different areas of Bragança district. Volatiles were extracted from the female cones, using a Likens-Nickerson system, and analyzed by GC and GC-MS

Thanks to the partial funding from the Fundação para a Ciência e a Tecnologia, UID/AMB/50017/2013.

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Results and Conclusion

Nugget (bitter) and spontaneous clone showed similarities in the monoterpene component, with β myrcene as the major compound (75 and 64%, respectively in the Nugget and spontaneous cultivars respectively) and significant differences in the sesquiterpene component, in the cases of (12% cultivar, 0.2% spontaneous) and trans-β-farnesene (not detected in the cultivar Nugget, and 9% in the spontaneous). Noteworthy is the greater richness of the sesquiterpene fraction of the spontaneous clone, in particular in the oxygenated compounds. Comparing the tested Cultivars from the range of aromas with this spontaneous clone we found that the values of monoterpenes are maintained as well as the majority compound that remains the β myrcene (67.5% for Cascate and 61.3% for Chinouke), but in the sesquiterpénica component (8.5% in the spontaneous and 6.4% in Cascate and not detected in the Chinouke) and α humulene (12.5% in Chinouke, 4.9% in cascade and 0.2% in spontaneous), maintaining the great difference between the cultivars and the clone in the oxygenated sesquiterpene component (0.9% only in Chinouke, zero% in Cascate and 2.4 % in the clone).

Table 1. Composition of the volatile fraction from samples of *Humulus lupulus*

Compostos	RI	Nugget flower	Sample 3	Cascate	Chinouke
Isobutyl isobutyrate	909	0.1			
Methyl hexanoate	914		t		
α-Pinene	930	0.2	0.2		
Camphene	938	t	t		
β-Pinene	963	1,0	0.7	0.8	0.8
β-Myrcene	975	74.8	64.4	67.5	61.3
α-Phellandrene	995	t			
Isoamyl isobutyrate	999	0.2			
β-Phellandrene	1005	0.3	0.2	0.3	
Limoneno	1009	0.3	0.2	0.2	0.2
cis -β-Ocimene	1017	0.1			
trans -β-Ocimene	1027	0.3		0.1	
γ-Terpinene	1035	t			
2-Nonanone	1058		0.7		
Nonanal	1073	t	0.2		
Linalool	1074	0.3	0.7	0.5	0.3
Methyl octanoate	1105	0.2	0.2		0.1
Hexyl isobutyrate	1127	t			
α-Terpineol	1159	t			
2-Decanone	1166		0.5		
Methyl nonanoate	1205	0.1	0.1		
Heptyl isobutyrate	1233	t			
2-Undecanone	1275	0.2	2.2	1.3	
Methyl decanoate	1314	0.1	t		
α-Ylangene	1371	0.1			0.1
α-Copaene	1375	0.1	t		0.3
2-Dodecanone	1389	t	0.3		
β-Caryophyllene	1414	3.5	1.5	3,0	6.2
β-Copaene	1426	0.1		0.1	0.5
Aromadendrene	1428		0.4		
α-Humulene	1447	12.1	0.2	4.9	12.5
trans -β-Farnesene	1455		8.5	6.4	
trans -Cadina-1(6),4-diene	1469	0.1			
γ-Muurolene	1469	0.2	0.6	0.4	1.1
β-Selinene	1476		1.7		0.6
Valencene	1484		2.2		
Viridiflorene	1487		t		
γ-Cadinene	1500	0.3	0.2	0.4	1.1
7-epi-α-Selinene	1500		0.2		
δ-Cadinene	1505	0.5		0.3	1.6
α-Calacorene	1525	t			
α-Cadinene	1529	t			
Germacrene B	1533		1.1		0.7
β-Caryophyllene oxide	1561		0.2		0.1
Viridiflorol	1569		0.2		
γ-Eudesmol	1609		0.2		

Bibliografia

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