NADALIÉ

OAK
ADD INS

OAK WOOD DERIVED PRODUCTS

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NADALIÉ TONNELLERIE

DERIVED PRODUCTS

1

European Community (CE 2165/2005 and CE 1507/2006)

chips, cubes, powder, shavings, dominoes, blocks

The reglementation authorised different oak wood sizes :

- Species *Querçus* : french sessile and pedonculate and american
- Toasting (should not reach the combustion)
- Diameter (minimum 2mm)

As regards wood treatment, only heating is allowed, any other treatment is prohibited (chemical, enzymatic, physics, additives: aromas or phenolic compounds).

Usual name		Use	Contact Time
Fine de chêne	≥ 2 mm	Tank, fermentation	During fermentation
Copeaux ou chips	4-40 mm	Tank, fermentation or aging	2 months
Cubes, Dominos, Blocks		Tank, short aging	4-6 months
Tank Staves		Tank, long aging	10 months
Winewood		Tank, long aging	12 months
Oak chain		Barrel	6 months 12 months

The only effect is to enrich the wine with tannins and flavors

→ Fast and important aromatization, after a few months in harmony with wine

OAK WOOD EXTRACTIBLE COMPOSITION

2

Wine maturation with oak wood modifies its smell its taste and its color

Volatile compounds and hydrosoluble tannins

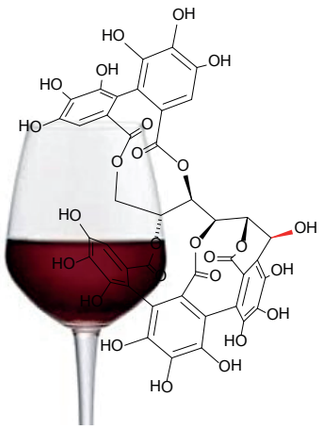
→ **Hydrosoluble tannins** (gallotannins and ellagitannins)

↓ **weak concentrations**

↓ **important concentrations**

Ellagitannins may represent 10% of the dry weight

High wood durability
Astringency, bitterness
Wine color



OAK WOOD EXTRACTIBLE COMPOSITION

2

Volatile compounds

- Oak lactone (*cis/trans*-Whisky lactone)
  Coconut woody note

- Phenolic aldehydes (vanillin…)
  Vanilla aroma

- Furanic compounds (furfural…)
  Grilled flavor

- Phenols (Eugenol, Guaiacol…)
  Spicy, Smoky flavor

Threshold perception for aromatic compounds in red wine

	Almond/Grilled Almond		Smokey/Toasted bread		Coconut/ Whisky		Spicy	Vanilla
	Furfural	Methyl-Furfural	Guaiacol	Methyl-Guaiacol	trans-Whisky lactone	Cis-Whisky	Eugenol + Isoeugenol	Vanillin
Perception threshold in wine (µg/L)	20000	45000	75	65	460	46	500	320

OBJECTIFS R&D

3

Oak chips

Staves

Chemical and sensory
Characteristics
Sensory analysis

Extraction Kinetic of aromas, tannins in wine/model solution

INITIAL OBJECTIFS

Oak wood characterization (chips, winewood)
Best contact time

EXPERIMENTAL DESIGN

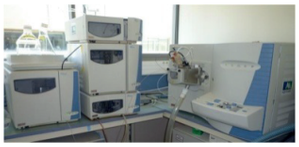
4

Chemical analysis

Barrels

Oak chips

Staves



Cis/trans-Whisky lactone
Vanillin, Eugenol,
Guaiacol, 4-methyl
Guaiacol, o-crésol, Syringol,
Furfural, 5-Methylfurfural…

Sensory analysis

20 judges (16 training sessions, according to ISO 8586-2:2008)

Aroma (vanilla, woody, spicy)
Taste and sensation (sweetness, astringency, bitterness)

Evaluation of descriptors in a point scale of 0 à 7

1	2	3	4	5	6	7

Absent — Intensive

Astringency	Bitterness
0 amorphous	0 nil
1 hollow	2 very weak
2 soft	2 weak
3 mellow	3 mean
4 slight astringency	4 barely strong
5 tannic	5 strong
6 hard	6 very strong
7 rough	7 depreciative

RESULTS : CHIPS

5

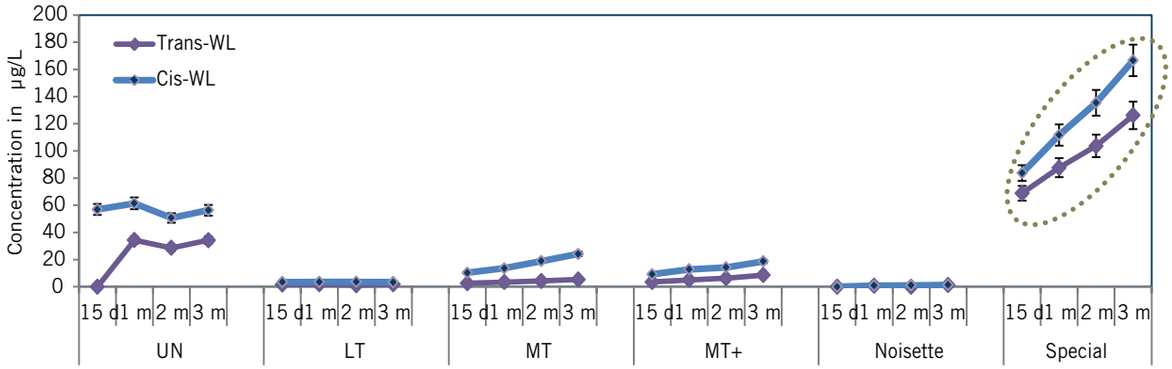
Oak Chips (3 gr/L in model wine solution)

UN (Untoasted)
LT(Light Toast)
MT (Medium Toast)
MT+ (Medium Plus Toast)
"NOISETTE"
SPECIAL (Medium toast with watering)

15 days, 1 month,
2 months, 3 months

RESULTS I : OAK CHIPS VOLATILE COMPOUNDS

Extraction Kinetic Of b methyl-γ-octalactone



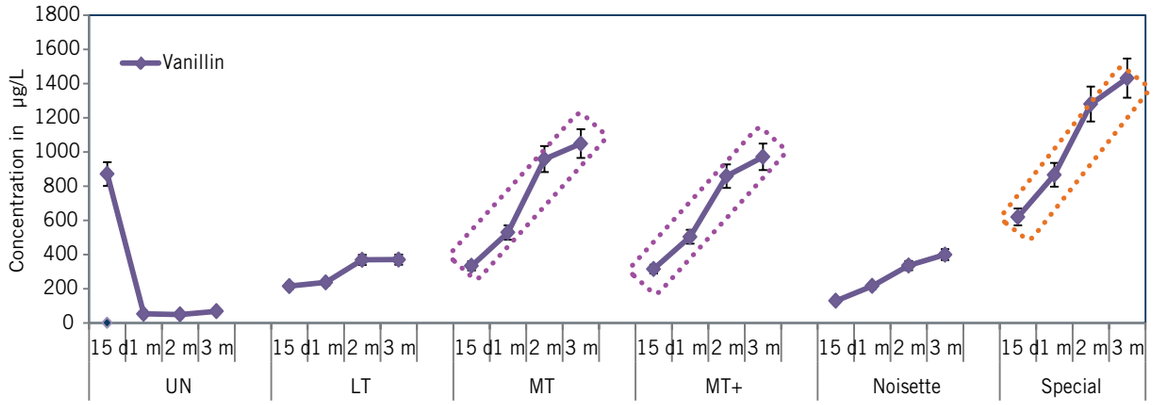
d=day
m=month

Threshold perception in µg/L

Trans-WL	Cis-WL
460	46

Oak chips (3gr/L)

Extraction Kinetic Of Aldeyde phenols



Threshold perception in µg/L

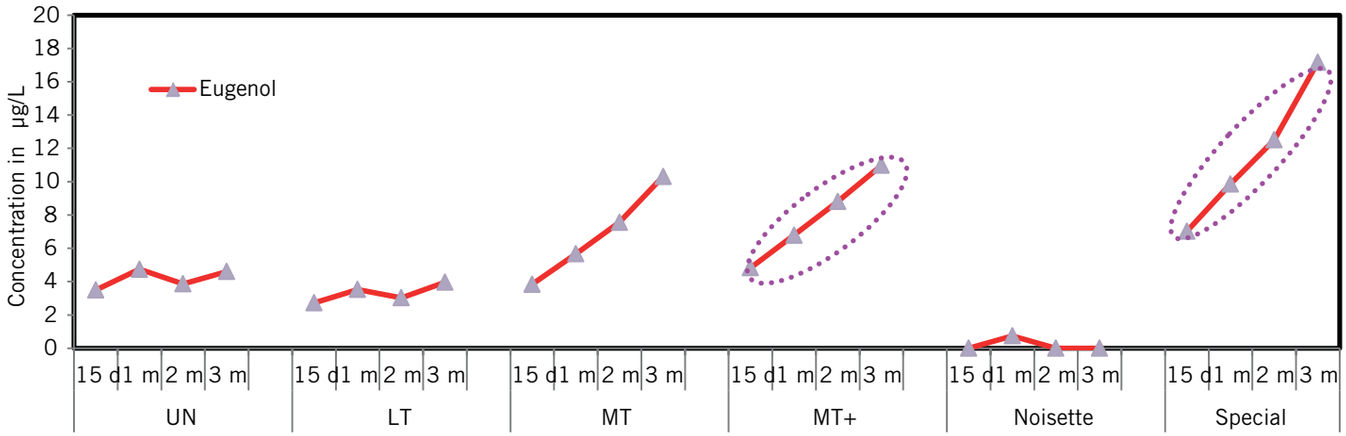
Vanillin
320

RESULTS : CHIPS

5

RESULTS I : OAK CHIPS VOLATILE COMPOUNDS

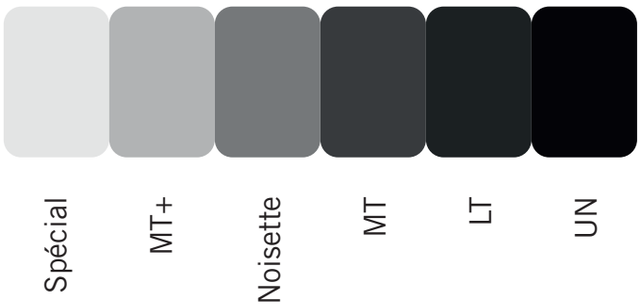
Extraction Kinetic Of Eugenol



The toasting method influences ellagitannin concentration

Less concentrated

More concentrated



Stabilization and maximum extraction after two months

Chira, K.; Teissedre, P. L., Relation between volatile composition, ellagitannin content and sensory perception of oak wood chips representing different toasting processes. European Food Research and Technology 2013, 1-12.

RESULTS : CHIPS

5

RESULTS I : OAK CHIPS VOLATILE COMPOUNDS

OLFACTORY

VANILLA

UN LT MT+ MT Special Noisette

Less intense → More intense

SPICY

UN
LT MT MT+ Noisette Special

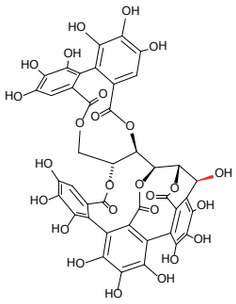
Less intense → More intense

OVERALL WOODY

UN LT Special Noisette MT MT+

Less intense → More intense

GUSTATIVE



ASTRINGENCY

MT+ MT Noisette/Special LT UN

Less intense → More intense

BITTERNESS

MT+ Noisette/Special MT LT UN

Less intense → More intense

SWEETNESS

MT+ MT
Noisette
Special
LT
UN

Less intense → More intense

RESULTS : WINEWOODS

5

2. WINEWOODS (STAVES)

CONTROL
LT (Light Toast)
MT (Medium Toast)
MT+ (Medium Plus toast)
"NOISETTE "
SPECIAL(Medium toast with watering)

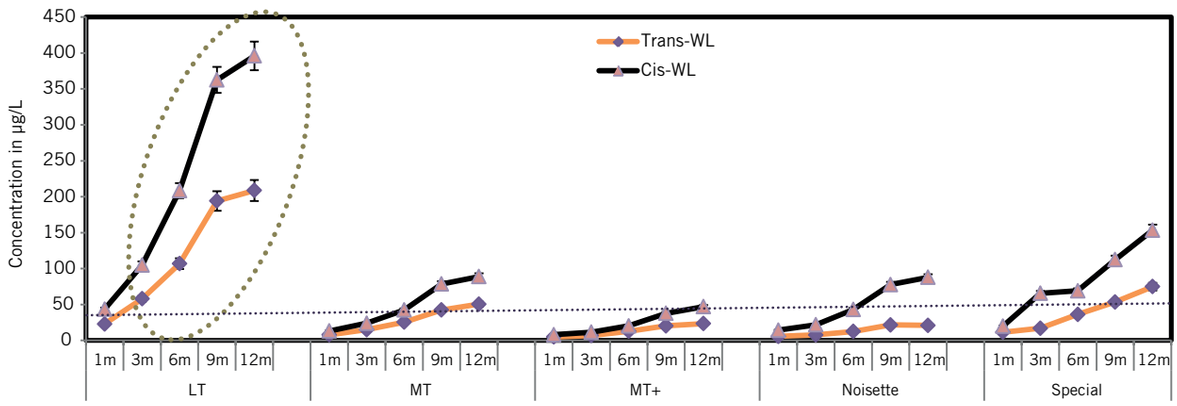
2 winewood per hl

Wine
100% Merlot

1 month, 2 months,
3 months, 6 months,
9 months and 12 months

RESULTS II : WINEWOODS VOLATILE COMPOUNDS

Extraction Kinetic Of b methyl-γ-octalactone



m= month

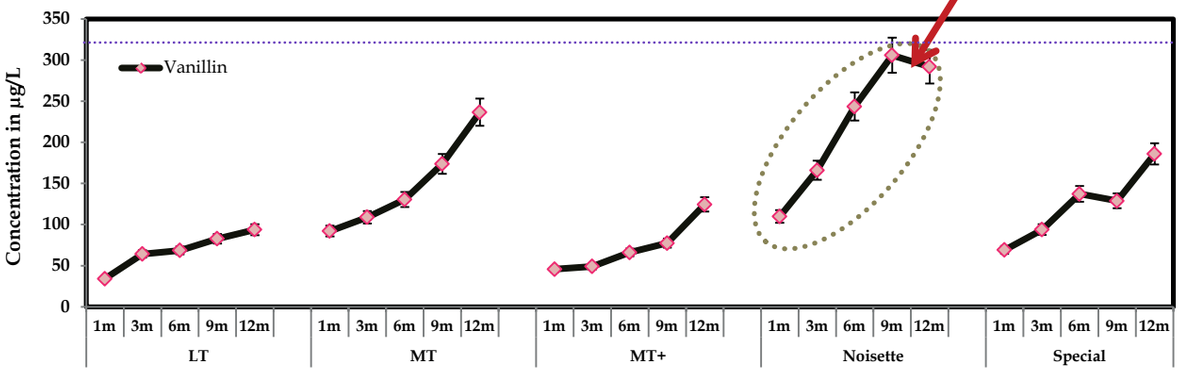
Threshold perception in µg/L

Trans-WL	Cis-WL
460	46

Wine
100% Merlot

2 winewood per hl

Extraction Kinetic Of Aldeyde phenols



Threshold perception in µg/L

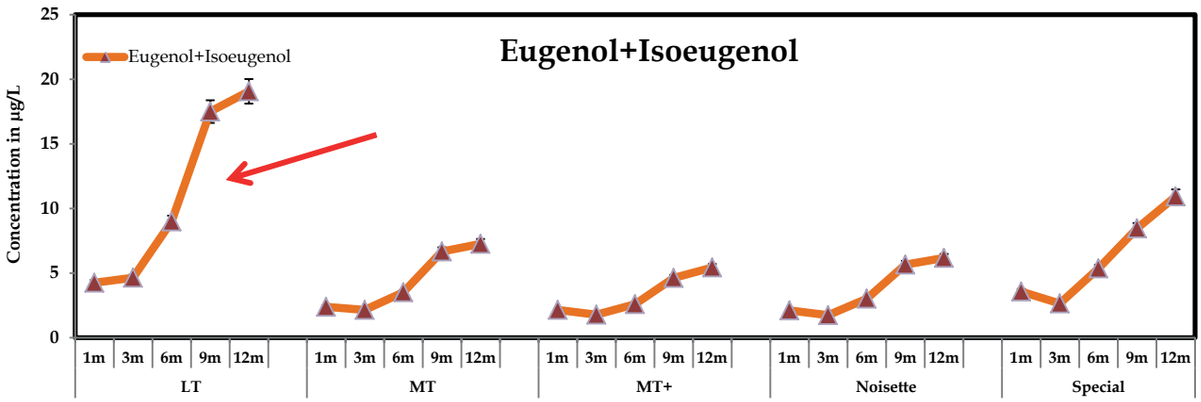
Vanillin
320

RESULTS : WINEWOODS

5

RESULTS II : WINEWOODS VOLATILE COMPOUNDS

Extraction Kinetic Of Volatile Phenols



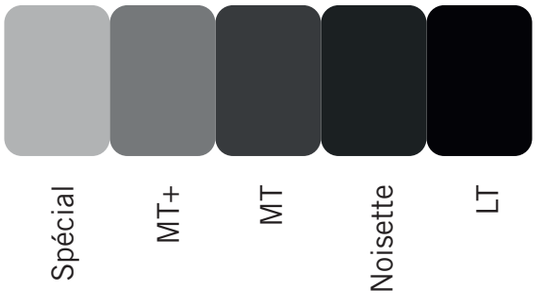
Threshold perception in µg/L

Vanillin
500

The toasting method influences ellagitannin concentration

Less concentrated

More concentrated



Maximum extraction
after two or three months

Chira, K.; Teissedre, P. L., Extraction of oak volatiles and ellagitannins compounds and sensory profile of wine aged with French winewoods subjected to different toasting methods: Behaviour during storage. Food Chemistry 2013, 140, (1), 168-177

RESULTS : WINEWOODS

5

RESULTS II : WINEWOODS VOLATILE COMPOUNDS

OLFACTORY

VANILLA

LT Special Noisette
MT
MT+

Less intense → More intense

SPICY

Special Noisette LT MT MT+

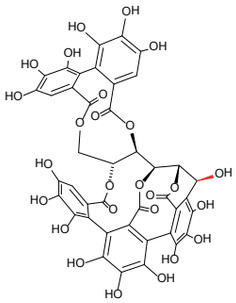
Less intense → More intense

OVERALL WOODY

LT Noisette Special MT
MT+

Less intense → More intense

GUSTATIVE



ASTRINGENCY

MT MT+ LT
Special Noisette

Less intense → More intense

BITTERNESS

Noisette MT+ LT
Special MT

Less intense → More intense

SWEETNESS

MT+ MT Special LT Noisette

Less intense → More intense

6 CONCLUSION : CHIPS AND WINEWOODS

Oak woods from different toasting treatments differed in terms of their chemical composition, and these differences were reflected by perceived sensory differences (Oak Chips And Staves).

- Independently of toasting, a two month time is required to extract the maximum of furfural and ellagitannin compounds (Oak Chips).
- Noisette oak wood extracts more volatile compounds following by MT, MT+ and special oak wood extracts (oak chips).
- Concerning sensory analysis, vanilla, grilled characters along with sweetness build up during the maceration time (oak chips).
- Eugenol along with vanillin and lactones, showed an increasing tendency with increasing maceration time (staves).
- Ellagitannins are extracted faster during the first three months, and after six months an important decrease is observed (staves).
- Wine storage with winewoods has a sweetening effect and in parallel decreases the astringency and bitterness sensation (staves).

NOTES

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