EFFECT OF BUNCH ROT ON THE SENSORY CHARACTERISTICS OF THE GEWÜRZTRAMINER WINE

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Abstract

Aims: The aim of this work was to determine the effect of grapes infected by bunch rot on the sensory characteristics of the Brazilian Gewürztraminer wine.

Methods and results: The treatments consisted of wine made from bunch rot infected grapes containing 0, 2.5, 5, 10, 15 and 20 %, weight basis, of bunch rot. Variables evaluated were related to vision, smell and taste/flavor. Results show that the presence of increasing proportions of infected grapes had significant effect on the visual, smelling and tasting aspects of the Gewürztraminer wine. Results show that healthy grapes and treatment with 2.5 % of infected grapes produced better wines.

Conclusion: The results of this work show that wine quality is greatly dependent on the grape health arriving at the winery. Wines made from grapes having up to 2.5 % of grapes rot were the best ones in the visual, smelling and tasting aspects.

Significance and impact of the study: In viticultural regions characterized by rainy and hot summers many pathogens have appropriate conditions to develop. In this way, to make quality wines it is very important to control grape rot diseases in the vineyards and to avoid grapes infected with pathogens related to these diseases during vinification.

Key words: wine, grape, gray mold, sour rot, sensory analysis

Résumé

Objectif : L'objectif du travail a été d'étudier l'effet du raisin pourri sur les caractéristiques sensorielles du vin de Gewürztraminer du Brésil.

Méthodes et résultats : Les traitements ont été menés sur des vins élaborés avec des proportions croissantes de raisins pourris, c'est-à-dire 0 ; 2,5 ; 5 ; 10 ; 15 et 20 %, en poids, par rapport aux raisins sains. Les variables évaluées ont été par rapport à la vue, l'olfaction et le goût/saveur. Les résultats montrent que la présence croissante de raisins pourris a eu un effet significatif sur les aspects visuel, olfactif et gustatif du vin de Gewürztraminer. Les résultats montrent que les vins issus de raisins sains et élaborés avec jusqu'à 2,5 % de raisin pourri ont été les meilleurs.

Conclusion : Les résultats de ce travail montrent que la qualité du vin est très dépendante de l'état sanitaire des raisins qui arrivent aux chais. Les vins élaborés à partir de raisins atteints jusqu'à 2,5 % de raisins pourris ont été les meilleurs par rapport aux aspects visuel, olfactif et de goût/saveur.

Signification et impact de l'étude : Dans les régions vitivinicoles caractérisées par des étés pluvieux et chauds, plusieurs pathogènes ont des bonnes conditions pour se développer. Il est donc très important que les vignerons contrôlent ces maladies et que les œnologues n'utilisent pas des raisins atteints avec ces pathogènes pour l'élaboration du vin.

Mots clés : vin, raisin, pourriture grise, pourriture acide, analyse sensorielle, dégustation

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INTRODUCTION

The grape bunch rot can be caused by many pathogens. In the Serra Gaúcha viticultural region, Brazil, the most important diseases are the gray mold, ripe rot and sour rot. The development of the pathogens responsible for these diseases is affected by many factors which can cause berry infection. Among these factors it could be mentioned the Gewürztraminer susceptibility to these organisms; rain and air humidity, which are ideal microclimate conditions for berry infection; high levels of organic matter in the soils; and vigorous rootstocks used by growers.

Grape bunch rot decreases vineyard yield and affects grape and wine quality. This effect is mainly due to the decrease of the sugar concentration in the grape must, the transformation of some aromatic substances, like the terpenes, and the synthesis of off-aroma and off-flavor substances. These effects are transferred to wines which decrease their quality, what is mainly due to the volatile acidity and the must oxidation susceptibility (DUBOURDIEU, 1982; RIBÉREAU-GAYON, 1988; PEREZ *et al.*, 1991). In addition, grapes are harvested before their physiological maturity is completed, which leads to the chaptalization.

However, the most important effect seems to be on the wine sensory characteristics. There are some information about this aspect, nevertheless the literature is restricted specially when it refers to the Brazilian Gewürztraminer wine. Because of this, the work was carried out with the objective to determine the effect of increasing proportions of rot infected grapes on the Brazilian Gewürztraminer wine sensory characteristics.

MATERIAL AND METHODS

Gewürztraminer grapes were harvested in January from a vineyard located in the commune of Bento Gonçalves, State of Rio Grande do Sul, Brazil.

Grapevines were conducted in the pergola system and grafted on the 101-14 rootstock. The climatic factors, as temperature and air humidity, during the grapevine vegetative cycle were favorable to the grape bunch rot development.

Just after harvesting, two groups of grapes were separated: one, of healthy grapes and the other of infected ones. Then, parcels varying from 0 to 20 % of infected grapes were formed. Considering this magnitude, treatments consisted of increasing proportions of infected grapes, weight basis, i.e., 0, 2.5, 5, 10, 15 and 20 %. There were four replicates of each treatment. Following this procedure, berries were separated from their rachis and then they were crushed (MENEGUZZO, 1996; MENEGUZZO *et al.*, 2006).

Grape musts were poured out into glass recipients of 20 L where 50 mg L^{-1} of SO_2 were added. Then, they were transferred to a cool room with 5 ºC during 10 h. When musts were clarified and separated from lees they were placed in a controlled temperature room (20 ºC). In sequence, 0.20 g L^{-1} of yeast (*Sacharomyces cerevisiae*) was added. When the alcoholic fermentation was finished, wines were cooled at -3 ºC during 10 days and filtered. Before bottling, another dose of SO_2, 50 mg L^{-1}, was added.

Sensory analysis was performed during the same year of winemaking. It was performed by a group of panelists having knowledge and experience in wine sensory analysis. Tasting sessions were accomplished according to the specific methodology for the sensory analysis (MARTIN and de REVEL, 1998 ; SSHA, 1998; MEILGAARD *et al.*, 1999). Glasses used were ISO and wine samples were blindly evaluated in the one by one format. There were four tasting sessions, each one replicated. Non structured sensory sheets were used. Each descriptor was evaluated in a 90 mm long line, each mm corresponding to one point.

Variables evaluated were: 1) Vision - limpidity, color intensity and hue; 2) Smell - intensity, equilibrium, off-aroma and quality; 3) Taste/Flavor - intensity, body, acidity, equilibrium, persistence, typicity, off-flavor, acetic acid and quality.

Data from the Gewürztraminer sensory analysis were submitted to the analysis of variance and to the Tukey test with 5 % of probability.

RESULTS AND DISCUSSION

Results show that grape bunch rot had a significant effect on the sensory characteristic of the Gewürztraminer wine from the Serra Gaúcha viticultural region, Brazil (Tables 1, 2 and 3).

Visual aspects

Wine made from grapes having 20 % of bunch rot showed lower limpidity when compared with control and treatment 2.5 % (Table 1). Color intensity and yellowish hue were higher too. This was probably due to the polysaccharide release, such as glucans, from the solid to the liquid phase of grapes (DUBOURDIEU, 1982), making wine clarification difficult.

Wines made from healthy grapes and those from grapes having 2.5 % of bunch rot had lower color intensity because they were not negatively affected by the grape oxidative enzymes; those from treatment 5, 10 and 15 %

Table 1 - Effect of the grape bunch rot on the visual characteristics of the Gewürztraminer wine.

Infected grapes (%)	Limpidity	Color intensity	Hue
0	54.85 b	27,15 c	22,72 c
2.5	55.80 ab	31.12 c	26.10 c
5	56.25 ab	44.25 b	42.15 b
10	55.57 ab	41.75 b	40.20 b
15	58.07 a	45.02 b	43.82 b
20	58.35 a	52.07 a	49.85 a
Mean	56.48	40.3	37.47
C.V. (%)	8.72	17.62	15.6
P > F	0.02556	0.00001	0.00001

Means followed by different letters within collons differ by the Tukey test at the probability of 5 %.

Table 2 - Effect of the grape bunch rot on the smell characteristics of the Gewürztraminer wine.

Infected grapes (%)	Intensity	Equilibrium	Off-aroma	Quality
0	43.35 b	42.97 a	3.75 e	44.00 a
2.5	41.02 b	38.70 a	8.32 e	37.77 b
5	44.25 b	27.85 b	23.37 d	28.67 c
10	45.00 b	20.92 c	36.45 c	18.47 d
15	50.67 a	12.52 d	48.50 b	10.70 e
20	52.42 a	9.80 d	55.95 a	7.15 e
Mean	46.12	25.46	29.39	24.46
C.V. (%)	14.67	27.72	29.41	25.05
P > F	0.00004	0.00001	0.00001	0.00001

Means followed by different letters within collons differ by the Tukey test at the probability of 5 %.

had an intermediary color intensity; and those from treatment 20 % had the highest color intensity. High color intensity could be due to the oxidative enzymes, such as laccase synthesized by the fungus *Botrytis cinerea* and released during the vivification process. These results are in accordance with the results found by MENEGUZZO *et al.* (2006) who analyzed color intensity and total polyphenol concentrations of Gewürztraminer wines from healthy and bunch rot infected grapes.

The yellowish hue presented by wines made from the higher proportions of bunch rot grapes suggests an oxidative process of the substances responsible for the white wine color, as flavonoids, catechins and tyrosol (RIBÉREAU-GAYON *et al.*, 1998). Color intensity and hue modification in Cabernet-Sauvignon wine made from grapes infected by *B. cinerea* was also observed in Chile (PSZCZOLKOWSKI *et al.*, 2001).

Smell aspects

Wines from treatments 15 % and 20 % presented a more intense aroma (Table 2); those made from healthy grapes and with grapes having 2.5 % of bunch rot had more equilibrium, which was due to the absence of off-flavors. Still, the best quality wines were those made from healthy grapes. Indeed, they presented fine aromas, with descriptors like honey and caramel, and higher typicity. Increasing proportions of bunch rot grapes transmitted less fine aromas which were blended. In these wines, the acetic and oxidative character predominates. The presence of benzaldehyde was registered by other authors (DELFINI *et al.*, 1991; BRAVO-PLASENCIA et BRAVO-ABAD, 1996).

The pathogen *B. cinerea* produces reactions having important effects on the wine composition and quality. In this way, the fruity descriptor disappears, which is one of the most important descriptors of young wines. Instead of this agreeable character, off-flavors develop in the wine, like phenol and iodine. The terpenes, responsible for the muscat flavor, are oxidized (RIBÉREAU-GAYON, 1988; DUGO *et al.*,1994).

Taste and flavor aspects

Tasting aspects were considered as all characteristics perceived by mouth, i.e., taste, flavor and other perceptions. Grapes infected by grape bunch rot had a significant effect on variables related to the tasting aspects of the Gewürztraminer wine, exception made to its body. It is necessary emphasize, however, that the data were not clear considering the intensity and persistence of taste/flavor (Table 3).

Table 3 - Effect of the grape bunch rot on the tasting characteristics of the Gewürztraminer wine.

Infected grapes (%)	Intensity	Body	Acidity	Equilibrium	Persistence	Typicity	Off-flavor	Acetic acid	Quality
0	42.32 cd	34.85 a	49.95 c	37.85 a	37.35 ab	37.62 a	4.67 e	5.57 f	38.35 a
2.5	44.22 bc	35.22 a	47.95 c	34.20 a	35.15 b	33.57 a	9.15 e	11.22 e	34.97 a
5	40.02 d	36.15 a	50.80 bc	24.32 b	35.75 b	20.50 b	26.87 d	28.55 d	23.65 b
10	43.55 cd	35.42 a	52.22 abc	17.02 c	38.27 ab	13.62 c	41.17 c	42.77 c	16.02 c
15	48.20 a	34.87 a	55.22 ab	8.02 d	41.55 a	9.07 cd	52.30 b	53.90 b	9.17 d
20	48.15 ab	35.47 a	56.42 a	5.07 d	41.15 a	5.42 d	58.20 a	59.40 a	5.87 d
Mean	44.41	35.33	52.09	21.08	38.2	19.97	32.06	33.57	21.34
C.V. (%)	24.3	24.27	15.21	31.04	18.1	36.23	22.83	20.84	27.34
P > F	0.000043	0.71733	0.00082	0.00001	0.00096	0.00001	0.00001	0.00001	0.00001

Means followed by different letters within collons differ by the Tukey test at the probability of 5 %.

Wines from treatments 15 % and 20 % of grapes with bunch rot were more acid than those from control and 2.5 % treatments. This effect was mainly due to the development of the volatile acidity in infected grapes, because the values of all treatments were higher and significantly different than the control wine.

The effect of volatile acidity was somewhat remarkable on the negative quality of wines made from grapes having from 5 % to 20 % of grape bunch rot. On the other hand, wine made from healthy grapes and that one from the 2.5 % of infected grapes had small values of volatile acidity (MENEGUZZO, 1996; MENEGUZZO *et al.*, 2006). The synthesis of acetic acid and its release to the grape must was probably due to some pathogens, such as bacterias, fungus and yeasts. Among the bacteria group, *Gluconobacter* and *Acetobacter genus* are common and develop after gray mold infection.

In addition, it was registered that all wines did not present the mould flavor. On the contrary, the sensory panel detected a light sweetish flavor, like honey and caramel, already mentioned when smell was discussed. Detection of off-flavors caused significant differences on wine quality, equilibrium and typicity. If quality is considered alone, all treatments comprised between 5 % and 20 % were significantly different from control and the 2.5 % treatment.

CONCLUSIONS

Grapes infected by the bunch rot disease had a significant effect on the Brazilian Gewürztraminer wine sensory characteristics, i.e., on the visual, smell and tasting aspects. Considering the visual aspects, increasing proportions of grape bunch rot gave origin to wines with lower limpidity, higher color intensity and yellowish hue. In the smell, the intensity of off-aroma increased and wine equilibrium and quality decreased. When the taste/flavor was considered, the effect of bunch rot was especially observed on the volatile acidity character, which affected wine equilibrium, typicity and the general wine quality.

Results of this work show that wine quality is dependent on the proportions of bunch rot during grape crushing. Best wines were produced with healthy grapes and that one having up to 2.5 % of infected grapes. If this parameter is greater than 2.5 %, the acetic character predominates, off-flavor develops and finally the wine quality decreases.

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