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Original Research Article

Phenolic content, antioxidant capacity and price of some red wines sold in Cameroon

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Abstract: Consumption of red wine has been associated with low motility rate from cardiovascular diseases. This phenomenon has over the years provoked an increase in wine consumption and its cost price. The present study tests the hypothesis that the cost of red wine is related to its total phenolic content and antioxidant capacity. Sixty seven red wines were purchased from wineries in Yaoundé and Douala, Cameroon and their total phenolic content (TPC), Ferric antioxidant Power (FRAP) and 1,1-Diphenyl-2-Picrilhydrazyl (DPPH) radical scavenging activity were determined. The price, TPC, FRAP and DPPH of the wines studied varied considerably. A significant positive correlation was obtained between TPC and price of red wines while a significant negative was obtained between the FRAP and price of red wines. Positive correlations were also obtained between the antioxidant capacities determined by different methods as TPC and FRAP; TPC and DPPH; FRAP and DPPH. The price of red wine is related to its total phenolic content but not its antioxidant capacity.
Keywords: Antioxidant capacity, Total phenolic content, red wine, cost price.

INTRODUCTION

Regular and moderate amount of alcohol consumption has been reported to reduce the incidence of death from atherosclerosis and coronary heart disease [1-3]. This is because alcohol consumption increases high-density lipoprotein cholesterol [4-6]. Of the alcoholic beverages, other studies have indicated that red wine is more beneficiary in lowering mortality rates [7, 8]. This was demonstrated by Renaud and Lorgeril [7] that in contrast to most countries where a high saturated fat intake was positively correlated to coronary heart disease mortality, France coronary heart disease mortality was low despite a relatively high fat intake. Wine consumption was one dietary factor that could partly explain this low mortality from coronary heart disease hence accounting for the phenomenon known as the “French paradox”.

There are important research results that reveal the nutritional value of polyphenolic components as dietary antioxidants [9-14]. The antioxidant properties of wine have been attributed to its rich source of polyphenols which have been demonstrated to have multiple antioxidant characteristics and other biological activities [15-18]. Some of the polyphenolic compounds identified in wines include anthocyanidins, catechin, epicatechin, quercetin, hydroquinone, gallic acid and resveratrol [19].

The relationship between wine quality and a product’s price is vital from the consumer’s point of view, since there is always a concern if the price corresponds to the product’s quality [20]. The hedonic pricing states that the price of a good is a function of its characteristics. However, does this price-quality relationship holds for wines in the market? To consumers product's price serves to determine product affordability and as a measure of product's quality. Hence when a consumer has some uncertainty concerning a product's quality, he often turns to higher product price assuming it indicates a higher level of quality [21, 22]. Some authors suggest that the traditional economic treatments of price and consumer behavior are wrong and not applicable to wine [23-24]. This is because the quality of wine is being related to its sensory quality that is based on human judgement rather than its chemical composition based on experimental analysis [25-29]. A number of wines of varying prices are available in the markets today. Following the French paradox, most consumers turn to abuse wine consumption not mindful of the alcoholic content and chemical composition. However, based on the prices of

the wines low-income earning consumers often go for the cheap wines while the high income earning consumers will prefer the expensive wines with both groups of people aiming to same objective: polyphenol. The question here is do the less expensive wines contain same antioxidant capacity as the expensive wines? If the answer to this question is yes then there will be no need to spend more money for what can be obtained inexpensive. Thus the present study sets out to attempt an answer to this question by analyzing and comparing the antioxidant potential of less expensive and expensive wines in the Cameroon market. The outcome may serve as an important guide to wine consumers.

MATERIALS AND METHODS

Wines. Sixty seven different types of wines obtained from various commercial wineries in Yaoundé and Douala, Cameroon were assayed in this study. They were evaluated for Total Phenolic Content (TPC), Ferric Reducing Antioxidant Capacity (FRAP) and DPPH (1, 1-Diphenyl-2-Picrilhydrazyl) free radical scavenging activity. Prizes of the wines were sampled from 5 different wineries in Yaoundé and Douala.

Phenolic concentration

The phenolic concentrations of the wines were determined by using Folin-Ciocalteu (Sigma Chemical Co St Louis, MO) reagent as earlier described by [30]. Catechin was used as standard.

DPPH scavenging activity

Scavenging activity against the DPPH (1, 1-Diphenyl-2-Picrilhydrazyl) free radical was studied as follows: 20µl of wine was introduced into 2 ml of a methanolic solution of DPPH (0.3 mM) and kept in the dark for 30 minutes. The wine was replaced by methanol for the control and catechin for the standard. The absorbance was then spectrophotometrically read at 517 nm and the antioxidant potential and percentage inhibition of DPPH radical were calculated as earlier described [31].

Ferric reducing antioxidant power

The Ferric Reducing Antioxidant Power (FRAP) of wines was determined using the method of Benzie and Strain [32]. The FRAP reagent consisted of ten part acetate buffer (300 mM pH 3,6), one part of TPTZ (10mM in 400 mM of HCl, Sigma) and one part of ferric chloride (10 mM). 75 µl of wine sample was added to 2000 µl of freshly prepared FRAP reagent, then incubated at room temperature for 15minutes. Catechin was used as the reference sample.

Statistical Analysis

The results obtained were analyzed using GraphPad Prism 5. Correlation between Prices and antioxidant capacity parameters was analyzed using Spearman rho coefficient at 95% confidence interval. Relation between price and antioxidant capacity parameters was considered to be significant at P values less than or equals to 0.05. Analyses of samples were done in triplicates and results presented as mean ± Standard Deviation in tabular and figure forms.

RESULTS

Table 1 presents 67 different kinds of wines commonly found in the Cameroon market with prize ranging from less than 1000 FCFA to above 10000 FCFA studied for their antioxidant capacity. The prize range was sampled from 5 different wineries in Yaoundé and Douala and the results presented as mean ± standard deviation. Of the 67 wines studied there were 6 that cost less than a thousand francs CFA, 39 that cost between 1000 and 5000 FCFA, 14 that cost between 5000 and 10000FCFA and 8 that cost above 10000FCFA.

Of the six wine costing less than a thousand francs, Grand Château was the most expensive followed by Perlado and then Baron de la Valleé though there were no significant differences (P>0.05) between their cost prizes. Considering the concentration of TPC it was Baron de la Valleé that had the highest followed by Vinosol. The Grand Château that is the most expensive in this class came only third. Similar result pattern was observed in the Ferric Reducing Antioxidant Power (FRAP) of the six less expensive wines. However, when considering the radical scavenging activity as measured by scavenging of DPPH radical, it was the Grand Château (the most expensive amongst the six) that had the highest percentage.

Thirty-nine wines with prize range between 1000FCFA and 5000FCFA were registered. The most expensive in this range were Château Haut Rieuflaget and Cote du Roussilon each costing 5000FCFA. These two were followed by Château de Blassan, Châtelain des Riches, La Grande Chapelle and Le Cardinal which cost 4500FCFA and above. With respect to the TPC it was Château Londre that had the highest, followed by Château Garat Bel Air. Côte de Roussillon that was one of the most expensive in this batch of wines only came third in the TPC. Other wines with comparable TPC to the best three earlier mentioned include Château de Bocage, La Rose Tour Blanche, Château Haut Rieuflaget and Château les Grandes Vignes that had TPC above 9000 mM. The wines with the least TPC were Baron de Valls Rosé and Mont Valentino that had 640.43 mM and 469.39 mM TPC respectively although they were not the least expensive. With respect to the FRAP it was Château de Bocage that came first followed by Côte de Roussillon in the second place and Baron de Valls Rouge in the third position while Mont Valentino had the least.

Of the fourteen wines in price range 5000FCFA-10000FCFA analyzed, Châteaux Lafite was the most expensive followed by Châteaux Grand Monteil while Gaillac/Vignobles de la Chanade was the least expensive. Considering the antioxidant capacity, Châteaux Lafite was the best with highest TFC and FRAP. Châteaux Grand Monteil which was second in cost came third in TPC, second in FRAP and third in radical scavenging activity. Meanwhile Gaillac/Vignobles de la Chanade which was the least expensive in this category came last in TPC, twelfth in FRAP and thirteenth in radical scavenging activity. In this batch of wine a very strong correlation was obtained indicating that price depends on quality.

Eight wines analyzed were of price range 10000 – 15000 FCFA. In this category the most expensive was Le Haut-Médoc de Giscours followed by Château d'Arcins (Haut-Medoc). Considering the antioxidant capacity, Château Tour Prignac (Médoc-Bordeauxx) had the best TPC and radical scavenging activity and came second in the FRAP. Meanwhile Château d'Arcins (Haut-Medoc) which was the second most expensive in this batch had the highest FRAP but very poor in TPC and radical scavenging activity. The cheapest wine in this batch Châteaux Champs de Lalande was amongst those with the least TPC and radical scavenging activity though it appeared third in FRAP.

Over all a significant positive correlation ($P < 0.0001$, $r = 0.4482$) was obtained between price and TPC which is an indication that price determine quality if the quality depended on TPC. However, the most expensive wine did not have the highest TPC. Figure 1 shows that Châteaux Lafite which costed 9663 FCFA had the highest TPC compared to the most expensive Le Haut-Médoc de Giscours that was 18th in the classification of TPC. From Figure 1 we can observe that the TPC of the expensive wines were just comparable to those of wines costing between 1000 – 5000 FCFA. Figure 2 presents the comparative study between price and FRAP of wine samples. From figure 2 it is observed that the expensive wines were very low in FRAP. The FRAP was led by the cheap wines and the wines costing between 5000 and 10000 FCFA. The leading wines with FRAP were in the order Châteaux Lafite > Châteaux de Bocage > Côte du Rousillion > Baron de la Vallée and the others follow. Though the expensive wines did not show relatively high FRAP compared to the less expensive wines, a significant negative ($P < 0.0164$, $r = -0.2921$) correlation was observed between price and FRAP. Considering DPPH radical scavenging activity, Penasol had the highest activity. However, a non-significant correlation ($P = 0.4071$, $r = 0.1029$) was observed between price and the DPPH radical scavenging activity. The results of Spearman rho correlation analysis showed a significant association between TPC and DPPH ($P < 0.0001$, $r = 0.5770$), TPC and FRAP ($P < 0.04$, $r = 0.2556$) and between FRAP and DPPH ($P < 0.006$, $r = 0.3294$)

Table 1: Antioxidant capacity of wines commonly consumed in Cameroon

S/N	Prizes range (FCFA)	Name of wine	% Alcohol	Price (FCFA)	TPC (mM)	FRAP (mM)	% DPPH
1.	Less than 1000	Casanova	14	700.00 ±0.00(67)	3076.64 ±280.37(61)	3700.29 ±62.91(13)	64.78 ±5.22(49)
2.		Baron de Madrid	11	700.00 ±0.00(66)	811.96 ±234.61(65)	577.1 ±58.39(17)	30.84 ±2.80(64)
3.		Viňosol	11	856.25 ±216.38(65)	5984.35 ±278.80(42)	6568.12 ±536.62(7)	54.84 ±8.32(55)
4.		Baron de la vallée	11	918.75 ±190.80(64)	6976.72 ±342.75(33)	9133.33 ±181.01(4)	67.99 ±8.07(46)
5.		Perlago	14	958.33 ±360.84(63)	2518.49 ±513.11(64)	4786.94 ±815.87(11)	69.7 ±1.59(43)
6.		Grand château		975.00 ±50.00(62)	4263.94 ±3188(56)	5944.93 ±362.02(8)	75.29 ±2.51(37)
7.	Between 1000 - 5000	Château la Petite Chapelle (Bordeauxx)	12.5	2675.00 ±95.74(51)	6988.68 ± 54.39(32)	441.11 ±4.17(29)	93.19 ±0.04(3)
8.		Château la Petite Chapelle (Bordeauxx), France	12.5	2537.50 ±47.87(52)	6785.59 ±85.57(35)	450.78 ±1.14(19)	90.44 ±0.26(15)
9.		Château Londre (Bordeauxx), France	13	4425.00 ±434.93(30)	9567.99 ±145.77(4)	446.24 ±1.16(26)	93.22 ±0.02(2)
10.		Château les Grandes vignes (Bordeauxx) France	13	3400.00 ±141.42(40)	9192.1 ±61.05(11)	447.14 ±2.36(22)	92.56 ±0.05(10)
11.		Château Lézin (Bordeauxx Supérieur) France	12.5	3400.00 ±81.64(41)	3221.36 ±84.71(60)	426.91 ±5.29(33)	68.29 ±1.99(45)

12.	Château Garat Bel air (Bordeauxx), France	13	3400.00 ±141.42(42)	9416.18 ±98.03(6)	448.25 ±1.68(20)	92.67 ±0.04(9)
13.	Château Saint Martin (Bordeauxx), France	12	3125.00 ±250.00(47)	5019.6 ±80.51(54)	244.77 ±11.48(54)	63.35 ±5.00(51)
14.	Château de Gourd/vin de Bordeauxx, Bordeauxx	12.5	3400.00 ±81.64(43)	6225.42 ±38.77(40)	245.37 ±3.85(53)	42.59 ±9.27(62)
15.	Château de la Gorge/Bordeauxx	12	3400.00 ±81.64(44)	3641.52 ±34.15(58)	238.23 ±1.31(66)	47.8 ±7.72(60)
16.	Château la rose tour blanche/Bordeauxx	12	3850.00 ±129.09(33)	7140.39 ±49.02(30)	305.48 ±1.93(51)	86.46 ±0.56(19)
17.	Château Haut Rieuflaget/Bordeauxx supérieur,	13	5000.00 ±244.94(23)	9021.71 ±56.60(13)	322.66 ±1.39(43)	73.82 ±1.33(40)
18.	Bordeauxx/Château le Sabley	12	3575.00 ±95.74(35)	5581.18 ±99.36(49)	331.21 ±1.23(40)	81.93 ±0.66(24)
19.	Le cardinal Bordeaux "Châteaux fleur"	14.5	4500.00 ±163.29(28)	7614.98 ±419.25(22)	5944.93 ±181.01(9)	66.19 ±6.58(47)
20.	Château de bocage	13.5	4475.00 ±50.00(29)	9291.29 ±517.27(9)	10756.52 ±115.03(2)	89.23 ±1.85(17)
21.	Château de Blassan	13.5	4825.00 ±236.29(25)	5593.8 ±73.978(48)	240.69 ±2.45(59)	75.67 ±1.45(35)
22.	La Rose Tour Blanche (Bordeauxx), France,	12.5	3875.00 ±125.83(32)	9234.11 ±59.83(10)	438.36 ±16.98(30)	92.55 ±0.15(11)
23.	J.B Orcel/Bordeauxx,	12	2887.50 ±500.62(50)	5331.31 ±20.64(53)	243.73 ±1.02(65)	50.18 ±6.26(58)
24.	Cœur de Vernet/Bordeaux,	12.5	3950.00 ±100.00(31)	6421.47 ±119.32(38)	306.37 ±2.41(49)	80.57 ±0.23(29)
25.	Lestissas/Bordeaux,	12.5	3475.00 ±50.00(38)	5609.19 ±87.55(46)	329.79 ±2.53(41)	83.11 ±0.33(23)
26.	La grande chapelle /Bordeaux/Merlot-cabernet sauvignon,	13.5	4537.50 ±110.86(27)	6059.68 ±34.54(41)	342.21 ±1.49(37)	79.79 ±0.42(31)
27.	Châtelain des Roches/Bordeaux,	13	4625.00 ±478.71(26)	5688.55 ±29.15(44)	335.37 ±1.16(38)	75.42 ±9.19(36)
28.	Federico Paternina (Banda Azul), Espagne,	13	3500.00 ±163.29(36)	7593.21 ±33.09(23)	447.51 ±0.52(21)	92.52 ±0.09(12)
29.	Mont Valentino (Blanc Moelleux), Esapgne	13	1900.00 ±81.64(56)	469.39 ±22.51(67)	227.55 ±17.25(67)	18.26 ±0.27
30.	Frontera (Concha y Toro), Chile, 1888	12.5	3849.75 ±506.85(34)	6916.31 ±86.05(34)	442.75 ±0.72(28)	92.68 ±0.13(8)
31.	Duc de Barsac, Espagne,	12.5	2018.75 ±134.43(54)	7450.83 ±22.51(25)	446.39 ±1.31(24)	93.13 ±0.05(4)
32.	Brise de France (Cabernet sauvignon) France,	12	3475.00 ±50.00(39)	7483.51 ±66.79(24)	446.91 ±1.61(23)	92.49 ±0.08(13)
33.	Penasol (de la vina a la mesa), Espagne	12	3075.00 ±150.00(48)	8286.45 ±110.79(16)	445.72 ±1.05(27)	93.63 ±0.08(1)
34.	Vino Tinto/Tio de la Bota	12	1425.00 ±298.60(60)	3597.77 ±49.89(59)	238.9 ±2.96(65)	41.52 ±1.35(63)
35.	Merlot/Valle central	12.5	3350.00 ±173.20(46)	5557.84 ±66.79(51)	302.58 ±0.39(52)	74.82 ±1.56(39)
36.	Réserve de France/Merlot/Pays D'OC,	12.5	3000.00 ±408.24(49)	7077.37 ±73.78(31)	315.96 ±2.85(46)	79.69 ±0.65(32)
37.	Noble cru/Merlot,	12.5	3493.75 ±733.81(37)	5417.79 ±101.72(52)	305.85 ±1.10(50)	80.93 ±0.43(27)
38.	Charles de Castille	12	1950.00 ±57.73(55)	4204.03 ±44.47(57)	317.75 ±0.97(44)	83.65 ±0.10(21)
39.	Gandia	12	1175.00 ±28.87(61)	8239.39 ±443.37(17)	4022.22 ±277.56(12)	3.46 ±2.78(67)
40.	JP Chenet	13	2475.00 ±50.00(53)	2931.44 ±138.94(62)	2543.768 ±78.90(14)	53.19 ±17.44(56)
41.	Baron de valls rouge	11.5	1475.00	7720.19	8060.87	81.06

				±50.00(58)	±227.60(21)	±627.05(5)	±2.91(26)
42.		Baron de valls blanc	11.5	1531.25 ±98.68(57)	4479.15 ±218.87(55)	5582.61 ±189.52(10)	81.66 ±1.51(25)
43.		Baron de valls rosé	11.5	1475.00 ±50.00(59)	640.43 ±62.31(66)	678.55 ±38.97(16)	22.62 ±2.51(65)
44.		Cote du roussillon	13.5	5000.00 ±163.29(24)	9340.39 ±147.29(8)	10640.58 ±392.11(3)	86.58 ±4.36(18)
45.		Grand Sud Merlot, France	13	3356.25 ±225.81(45)	7999.35 ± 77.13(19)	434.94 ±9.62(31)	93.02 ±0.12(6)
46.	5000 - 10000	Château Grand Monteil (Bordeaux Sup.)	12.5	8750.00 ±177.95(10)	10013.89 ±861.81(3)	7888.89 ±867.81(6)	89.46 ±0.91(16)
47.		Château Lafite Monteil Bordeaux Sup.	13	9662.50 ±137.68(9)	17948.33 ±612.59(1)	11740.74 ±780.42(1)	84.49 ±0.89(20)
48.		Château Lafond/ Cnon*Fronsac	13.5	7393.75 ±339.34(14)	7882.65 ±42.02(20)	362.74 ±2.91(34)	73.58 ±0.58(41)
49.		Cru Bourgeois/Château Barbier/Haut Médoc	13	8462.50 ±47.87(12)	8715.94 ±70.02(14)	334.11 ±16.73(39)	72.13 ±0.62(42)
50.		Château le Pirouette/Cru bourgeois/Médoc	13	6950.00 ±100.00(16)	7187.07 ±24.59(28)	317.75 ±3.69(45)	75.74 ±4.14(34)
51.		Château Cap L'ousteau/Haut Médoc	13	7925.00 ±788.98(13)	7171.49 ±45.18(29)	242.25 ±1.949(57)	75.78 ±5.89(33)
52.		Baron de lestac (Bordeaux), élevé en futs de chêne, France,	12.5	6525.00 ±95.74(19)	9362.49 ±68.01(7)	446.32 ±0.93(25)	93.06 ±0.12(5)
53.		Calvet/Grande réserve/ Bordeaux supérieur,	13	6587.50 ±728.44(17)	7439.16 ±108.78(26)	311.21 ±2.90(47)	80.89 ±0.19(28)
54.		Marquis de Rothberg /Médoc,	13	6568.75 ±209.53(18)	8456.59 ±170.76(5)	240.69 ±3.46(60)	69.23 ±2.29(44)
55.		Merlot, 2012 (Pays D'OC)	12.5	5325.00 ±206.15(21)	5667.63 ±20.64(45)	239.04 ±2.41(64)	53.01 ±11.40(57)
56.		Marques Cassa Concha,	14.5	7375.00 ±150.00(15)	8430.62 ±14.40(15)	239.12 ±2.88(63)	65.29 ±8.29(48)
57.		Gaillac/Vignobles de la chanade	13	5140.00 ±280.00(22)	5571.93 ±151.59(50)	240.09 ±3.134(61)	64.03 ±3.58(50)
58.		Château Mirefleurs (Bordeaux supérieur) France	14.5	8675.00 ±236.29(11)	11439.88 ±28.01(2)	452.04 ±1.18(18)	90.48 ±0.32(14)
59.		Oratoire Saint-Pierre	12	5850.00 ±191.48(20)	5606.85 ±109.16(47)	323.11 ±2.01(42)	83.62 ±0.36(22)
60.	10000 and above	Château Tour Prignac (Médoc-Bordeaux) France	13	11125.00 ±250.00(5)	9049.72 ±106.04(12)	434.05 ±11.56(32)	92.83 ±0.09(7)
61.		Cru Bourgeois/Château Tour Prignac/Médoc	13	10875.00 ±250.00(6)	6295.42 ±108.56(39)	306.89 ±1.81(48)	80.13 ±0.32(30)
62.		Château d'Arcins (Haut-Medoc)	13.5	12262.50 ±843.97(2)	2872.59 ±157.23(63)	2040.56 ±489.43(15)	56.82 ±2.61(54)
63.		Château Balaurin/Graves	12	11525.00 ±411.29(4)	6528.93 ±61.57(37)	241.13 ±2.07(58)	44.12 ±4.59(61)
64.		Château Barreyres/Haut Médoc,	13	10500.00 ±408.24(7)	6561.74 ±47.36(36)	242.99 ±2.07(56)	62.79 ±7.78(52)
65.		Duc de Ongraviere,	12.5	12250.00 ±288.67(3)	7248.1 ±71.51(27)	239.27 ±3.46(62)	48.88 ±8.10(59)
66.		Châteaux Champs de Lalande/Lalande de Pomerol	13	10075.00 ±298.61(8)	5707.22 ±83.54(43)	353.387 ±1.79(35)	62.18 ±3.99(55)
67.		Le haut-Médoc de Giscours/Haut Médoc,	13.5	12906.25 ±346.63(1)	8029.69 ±56.02(18)	346.89 ±0.64(36)	75.11 ±0.69(38)

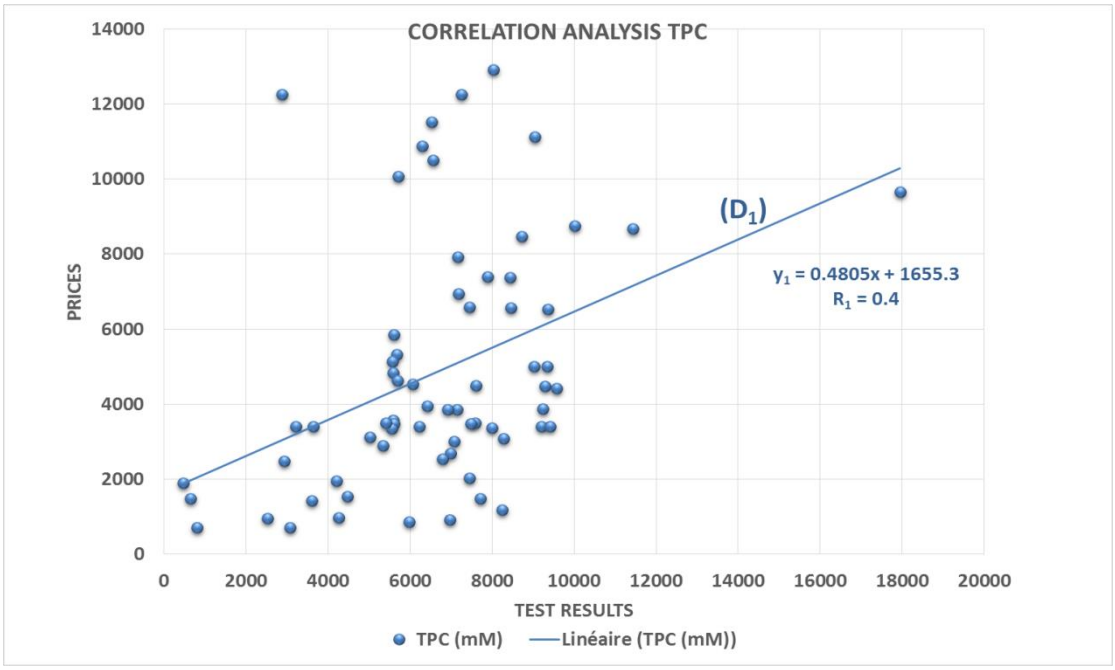

Fig 1: Relationship between price and TPC of wine samples

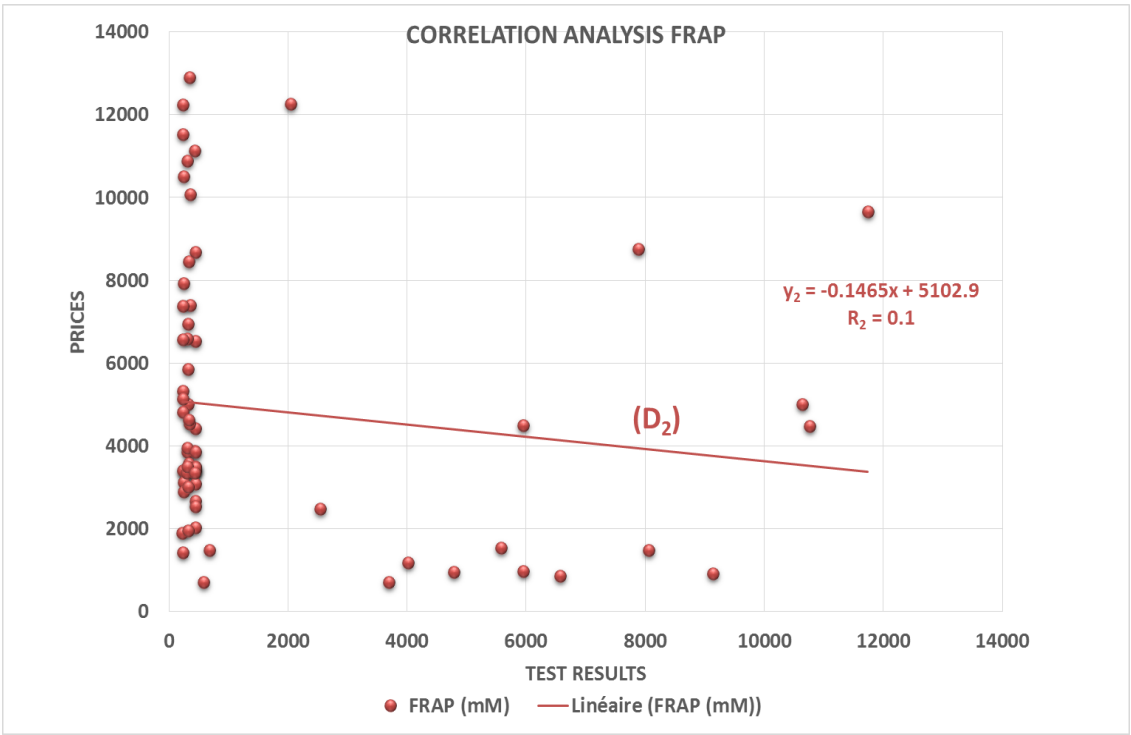

Fig 2: Relationship between price and FRAP of wine samples

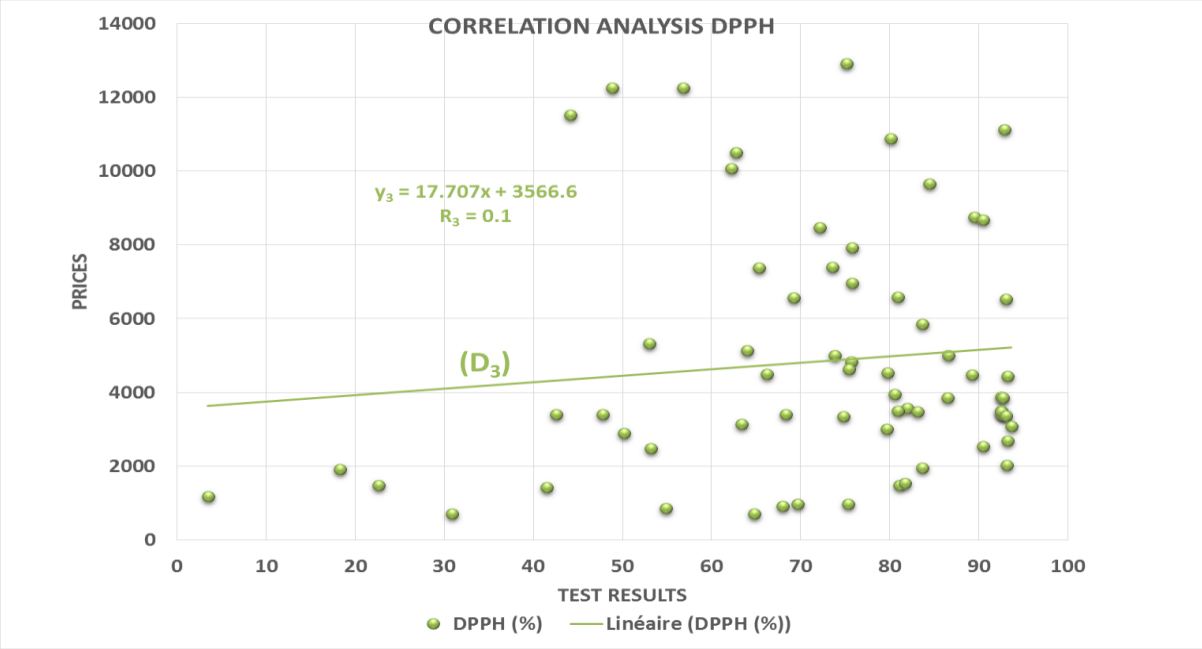

Fig 3: Relationship between price and DPPH of wine samples

DISCUSSION

A major worry about consumers' behavior is that they consistently use price as a surrogate measure of quality. Today most consumers have tagged price to quality and earlier researchers have found some positive relationships between product quality ratings given by consumer union publications and the actual brand prices [33-35]. Quality of experimental wines has been evaluated by blind comparative sensory tests from well-trained tasters based on objective criteria and further statistical analysis [36, 37]. The blind estimation is dependent only on sensory evaluation and not on other factors. Based on earlier research results, wine quality does not depend on sensory quality alone but also include extrinsic factors such as reputation, region, "appellation d'origine", and advertising, and on intrinsic factors such as age, harvest, alcohol content, variety, taste, aroma, and color [38, 39]. Wine quality even depends on price and awards assigned [40]. Several reports have clearly shown that individuals seem to highly appreciate a wine when it is believed to be of high cost [41, 42]. Unfortunately none of these factors directly address the French Paradox which has stimulated much interest in wine consumption and research.

To address the French Paradox, the quality of wine should be measured in its antioxidant potency to prevent the development of cardiovascular diseases even in a population that consumes high fat diet (French paradox) [7]. This can be explained by the phenolic contents of red wine manifested in ferric reducing antioxidant power, and radical scavenging activity as indicated in the present study. This is because cardiovascular diseases and certain age-related diseases occur due to oxidation of cell components caused by free radicals. Hence antioxidant quality is in protecting the body by scavenging these reactive species [43, 44]. The reactive oxygen species if allowed will destabilize biological membranes leading to lipid peroxidation, DNA damage, and protein degradation [45,46]. Endogenous antioxidant system may not be adequate to buffer the reactive oxygen species. Hence, the need for fortification from the exogenous source which may just be provided by a glass of red wine after a meal [47].

In the present study, all the wines studied possess antioxidant capacity as measured by TPC, FRAP and DPPH radical scavenging activity and they were of different prices. However, antioxidant capacities in the wines were not the same. The difference in the antioxidant capacity may be due to the grape ripeness, pressing regimen, the extent and temperature of maceration, the temperature of fermentation, the use of enzymes, the type of oak used during ageing and the extent to which the wine was aged [48,49]. Hence it is important for consumers to note that though the French Paradox supports wine consumption, the contents of wines are not the same. In the present study Spearman rho correlation shows a significant relationship between price, TPC and FRAP. Some other researcher found a positive relationship between retail price, ORAC and DPPH which was not observed in this study [50].

CONCLUSION

Although a correlation was observed between price and quality of wine as determined by its antioxidant capacity, the most expensive wines did not possess the best antioxidant capacity. The wines with

best antioxidant capacity were those costing between 5000 and 10000 FCFA. However for every price range there is an advice for the choice of wine. For those costing less than 1000 FCFA consumers can afford Viñosol and Baron de la vallée; those costing between 1000 – 5000 FCFA there are Châteaux de Bocage and Cote de Roussillon; those between 5000 – 10000 FCFA you have Châteaux de Grand Monteil (Bardeaux Superieur) and Châteaux Lafite Monteil Bordeauxx Superieur; those between 10000 – 15000 FCFA you have Châteaux Tour Prignac (Médoc-Bordeauxx) and Le Haut-Médoc de Giscours. Hence everyone can benefit from the French Paradox irrespective of how much you spend for a 75 cl bottle of wine.

Disclosure

The author reports no conflicts of interest in this work.

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