

Effect of Spices and Herbs on Alcohol Yield in Grape Vermouth (*Vitis vinifera* L.)

Shashank Shekhar Singh, Dr. Ram Rakha^{1*} Manoj Kumar Pracheta¹, Dr. Rana Pratap Singh¹

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Grape is a fruiting berry of the deciduous woody vines of the botanical genus *Vitis*. Grapes can be eaten raw or they can be used for making wine, jam, juice, jelly, grape seed extract, raisins, vinegar, and grapes seed oil. Findings of T3 showed 10.26 % alcohol content were highest among others. In which Nut Meg, Mace & Hop Leaves added hastened alcohol, Vit. C, Esters and Tannin etc. Data of research work and investigations reached to destination that often acetification of wine take place but in this experiment Spices / Herbs were used which played antimicrobial role against acetification, no mycodermal growth was observed during fermentation, clarification and maturation stage of grape vermouth.



Introduction

¹⁵ Grape is a fruiting berry of the deciduous woody vines of the botanical genus *Vitis*. Grapes can be eaten raw or they can be used for making wine, jam, juice, jelly, grape seed extract, raisins, vinegar, and grapes seed oil.

Grapes are a non-climacteric type of fruit, generally occurring in clusters. Grapes are a type of fruit that grow in clusters of 15 to 300, and can be crimson, black, dark blue, yellow, green, orange and pink. "White" grapes are actually green in color, and are evolutionarily derived from the purple grape. Mutations in two regulatory genes of white grapes turn off production of Anthocyanin, which are responsible for the colour of purple grapes [1]. Anthocyanin and other pigment chemicals of the larger family of polyphenol in purple grapes are responsible for the varying shades of purple in red wines [2] [3]. Grapes are typically an ellipsoid shape resembling a prolate spheroid.

³⁰ There are several plant of the order *Scitamineae* which produce spices known as cardamoms, and as such are, occasionally at least, known in trade. By far the most important, however, is the plant known as *Elettaria Cardamomum*, the Malabar and Ceylon cardamoms, and this plant will here be discussed first, as it supplies the greatest part of the cardamoms of commerce and is apparently the only one ever cultivated. It is the world's third most expensive spice by weight, outstripped in market value only by saffron and vanilla.

Cloves are the aromatic flower buds of a tree in the family ⁴⁰ Myrtaceae, *Syzygium aromaticum*, and native to the Maluku islands in Indonesia, commonly employed as spice. Cloves are harvested primarily in Indonesia, India, Madagascar, Zanzibar, Pakistan, Sri Lanka- and the largest producer, Pemba Island, just off the coast of Tanzania. Cloves are used in the cuisine of Asian, ⁴⁵ African, and the Near and Middle East, lending flavour to meats, curries, and marinades, as well as compliment to fruit such as apples, pears, or rhubarb.

White pepper consists of the seed of the pepper plant alone, with the darker-colored skin of the pepper fruit removed. This is ⁵⁰ usually accomplished by a process known as retting, where fully ripe red pepper berries are soaked in water for about a week,

during which the flesh of the pepper softens and decomposes. Rubbing then removes what remains of the fruit, and the naked seed is dried. Sometimes alternative processes are used for removing the outer pepper from the seed, including removing the outer layer through mechanical, chemical or biological methods.

Nutmeg and mace have similar sensory qualities, with nutmeg having a slightly sweeter and mace a more delicate flavour. Mace is often preferred in light dishes for the bright orange, saffron-like hue it imparts. Nutmeg is used for flavouring many dishes, usually in ground or grated form, and is best grated fresh in a nutmeg grater.

Nutmeg is the seed of the tree, roughly egg-shaped and about 20 to 30 mm (0.8 to 1.2 in) long and 15 to 18 mm (0.6 to 0.7 in) wide, and weighing between 5 and 10 g (0.2 and 0.4 oz) dried, while mace is the dried "lacy" reddish covering or aril of the seed.

Black cardamom is often erroneously described as an inferior substitute for green cardamom by those unfamiliar with the spice; ⁷⁰ actually it is just not as well suited for the sweet/hot dishes which typically include cardamom, and that are more commonly prepared outside the plant's native range. Black cardamom, by contrast, is better for hearty meat stews and similar dishes. Although the flavour differs from the smaller green cardamom, ⁷⁵ black cardamom is sometimes used by large-scale commercial bakers because of its cheapness.

Hops are boiled with the wort in brewing beer and sometimes added post-ferment. They impart a bitterness, flavour, and aroma to the finished product.

⁸⁰ In pharmacy *lupulus* is the designation of hop. The dried catkins, commonly referred to as hop cones, of the female plant of *H. lupulus* are used to prepare infusion of hop, tincture of hop, and extract of hop. Plants in the genus *Humulus* also produce terpenophenolic metabolites.

⁸⁵ **Wine** is an alcoholic beverage made from fermented grapes or other fruits. The natural chemical balance of grapes lets them ferment without the addition of sugars, acids, enzymes, water, or other nutrients. Wine is grape juice which has, gone alcoholic fermentation added by yeast. Wine contains vitamins, amino acid, ⁹⁰ ester, sugar, tartaric acid and some other compounds derived

from grapes. This fermented product is also produced from the juice of citrus fruits (except lime and lemon) peach, cherry, apricot, prune, plum, pear, papaya, pineapple, cashew nut, banana etc. [4]. Generally wines made from fruits are named after particular fruits used in wine preparation Thus cider from apples, Perry from pears and orange wine from oranges. Starch and sugar also are fermented to get special types of liquors. In India such liquors are known as "Nira Juice" of palm tree, sake from rice, country Liquors from molasses etc.

The most satisfying definition is that "wine is a beverage resulting from the fermentation by yeast of the juice of grape with appropriate processing and additions". [5].

Aperitif wine known as 'Vermouth' is prepared from grape wine by adding mixture of herbs and spices or their extract. These type of wines are quite popular in many European countries and USA. Aperitif or aromatized fruit wines are produced commercially in USSR and Poland [6]. Method of preparation and quality characteristics of grape vermouth is well established [7];[8]. Vermouths having acceptable sensory qualities have also been made and evaluated from mango, plum and sand pear[9];[10]; [11]. The apple based alcoholic beverages, which can be prepared and are quite popular include cider, wine and brandy [8]; [12]; [13].

Methodology

Fresh mature Grapes were procured from local fruit market, Lucknow. Blemished and deformed Fruit were discarded before analysis & Recovery of the pulp after shorting, the Grapes widely, Reducing sugar non-reducing sugar Total sugar, and tannin parameters. Fruit of each lot were washed in running water thoroughly extract juice. Following treatments were given as per technical programme approved by research committee.

All the five lots were subjected to fermentation till sugar was consumed (to dryness). After clarification backed into clean glass bottles. After racking bottles were sealed and stored at room temperature (25-30^o C) for maturation for six months. Physical and Chemical observation were recorded as per described in research work accordingly ([14] & [15]).

The colour of fruit was visually observed light green, weight was found 4.80 gm, and length of grape fruit was measured 4.57 cm while circumference of fruit was found 3.74 cm. Specific gravity was observed 1.26. The flavor of the fruit was sensory evaluated was pleasant grape flavor.

Organoleptic evaluation of Vermouth prepared by different treatment was carried out by a panel of five judges. The evaluation was made on the score card (total 100) as suggested by [4]. This was based on the respect of color, aroma, bouquet, and freedom from acetic acid, odour, and total acid to the taste clarity, tannin, extract (body). Sugar general taste overall impression the mean value of all the judges was calculated for each treatment.

Experimental Finding

The data pertaining to chemical composition of Grape Vermouth after six month of maturation period. The pH of vermouth were recorded highest 3.90 in T₃ followed by 3.73, 3.70, 3.68 and 3.66 in T₂, T₄, T₅ and T₁. Total soluble solid (T.S.S) was estimated 5.00 ^oB minimum in T₅ while 5.50 ^oB in each (T₁, T₂, T₃ and T₄).

Acidity as citric acid were recorded 0.35 % maximum in T₁ while 0.28 %, 0.17 %, 0.14 % and 0.14 % in T₅, T₄, T₃ and T₂ respectively.

60 **Table 1.** Chemical Composition of fresh Grapes

S.No.	Characters	Mean value
1	pH	3.51
2	T.S.S. (^o Bx)	21.00
3	Acidity % (as citric acid)	0.42
4	Ascorbic acid (mg/100gm)	27.60
5	Reducing Sugar %	4.64
6	Non Reducing Sugar %	4.20
7	Total Sugar %	8.84
8	Tannin % (as gallotannic acid)	0.045

Table 2. Chemical Composition of Must

S.No.	Character	Treatment				
		T ₁	T ₂	T ₃	T ₄	T ₅
1	pH	3.50	3.60	3.50	3.75	3.60
2	T.S.S. (^o Bx)	21.00	21.00	21.00	21.00	21.00
3	Acidity% (as citric acid)	0.42	0.44	0.40	0.46	0.45
4	Ascorbic acid (mg/100gm)	24.50	24.60	25.50	23.60	23.25
5	Reducing sugar %	5.25	5.15	5.25	4.80	4.76
6	Non reducing sugar%	4.85	4.78	4.80	4.65	4.63
7	Total sugar %	10.10	9.93	10.15	9.45	9.19
8	Tannin % (As gallotannic acid)	0.049	0.048	0.055	0.046	0.047

The vitamin C content of vermouth was also in fluned by fermentation process. The maximum ascorbic acid content 192.00 mg/100ml was observed in T₅ where as it was minimum 38.40 mg/100ml in T₁ & T₂. Unfermented sugar that is residual sugar percent also analyzed 4.47 % highest in T₃ while 4.24 %, 3.86 %, 3.82 % and 2.75 % in T₄, T₅, T₂ and T₁ respectively. Volatile acid as acetic acid analyzed in wine. The data regulated that highest value 0.05 % was observed in T₁ whereas 0.04 %, 0.04 %, 0.03 and 0.03 % in T₂, T₅, T₃ and T₄ respectively.

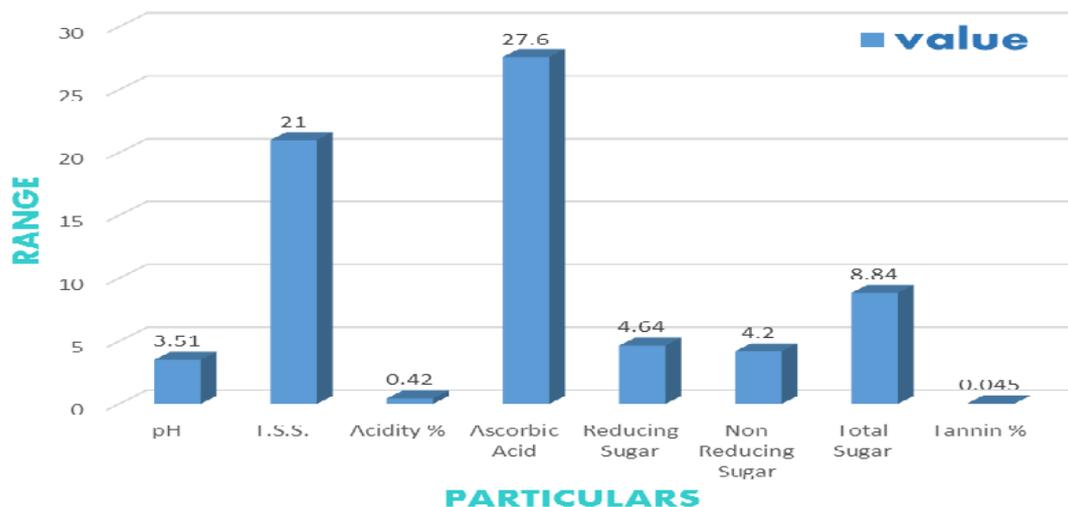


Fig. 1. Chemical Composition of fresh Grapes

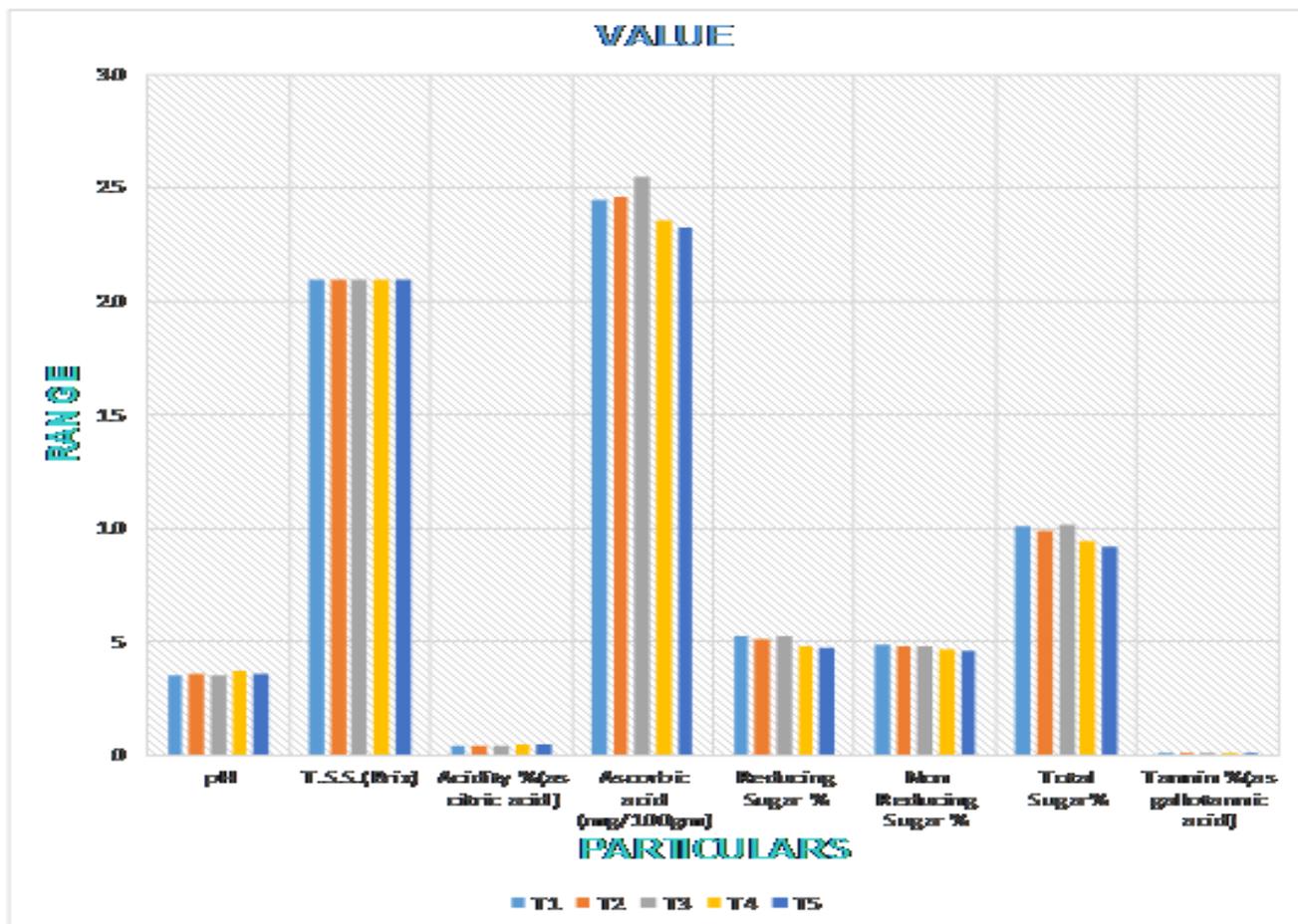


Fig. 2. Chemical Composition of Must

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Chief component of alcoholic beverage is alcohol it was also estimated highest content 10.26 % (v/v) in T₃ followed by 10.00 %, 9.90 %, 9.88 % and 9.85 % in T₄, T₅, T₁ and T₂ respectively. It clear from table esters were analyzed was estimated maximum 7.04

mg/100ml (as ethyl acetate) in T₃ while 7.00, 6.95, 6.90 and 6.85 mg/100ml in T₄, T₅, T₁ and T₂ respectively.

Table 3. Chemical Composition of Grape Vermouth after 6 Month of Maturation

S.No.	Characters	Treatments				
		T ₁	T ₂	T ₃	T ₄	T ₅
1	pH	3.66	3.73	3.90	3.70	3.68
2	T.S.S. (⁰ B)	5.50	5.50	5.50	5.50	5.00
3	Acidity % (as citric acid)	0.35	0.14	0.14	0.17	0.28
4	Ascorbic acid (mg/100gm)	38.40	38.40	26.50	128.0	192.0
5	Residual sugar %	3.75	3.82	4.47	4.24	3.86
6	Volatile acidity % (acetic acid)	0.05	0.04	0.03	0.03	0.04
7	Alcohol % (v/v)	9.88	9.85	10.26	10.00	9.90
8	Esters (mg/100 ml as ethyl acetate)	6.90	6.85	7.04	7.00	6.95
9	Tannin % (as Gallotannic acid)	0.052	0.052	0.060	0.052	0.052

Discussion

The experiment based on fermentation of sugars in to C₂H₅OH and CO₂ [16].

The must and wine samples were analysed for different constituents according to the procedure of [15] and [8]. In present study *Saccharomyces cervivissae* var. *ellepsoides* was inoculated in must for fermentations.[17] also found to be the best Yeast strain producing wine with the highest acceptable score 7.41 from orange volatile component of wine eg. Alcohol and esters were found must abundant volatile compound. [18].

The different parameters are resemble with requirement of base wine to be made has been reported by Shukla, [19].

Chemical analysis of fresh fruit as well as final products estimated accordingly methods described by [14] and [20].

Ascorbic acid showed decreases in wine than fresh Grapes. [21] found negligible vitamin-C in wine because it is consumed during fermentation by flora. Phenolic compound was also found decrease in wine due to combination with aldehyde to precipitate with added or natural proteins and to the other reactions. [4].

Volatile acidity was detected very low quantity. [9] reported lower volatile acidity is desirable, indicating soundness of alcoholic fermentation and absence of any acetification. The sum of scores of different attribute for each treatment clearly reveals that the highest score has been awarded to the product with 10.26 percent alcoholic content. In an earlier findings sweet product with 15% alcohol were considered the best for plum and sand pear vermouth.. [10]and [22].

Grape vermouth is based on wine aromatization as per European council regulation and subsequent amendments.

This regulation applies to the “definition description and preservation of aromatized wines, aromatized wine based drinks and aromatized wine product cocktails.”

Vermouth itself is further defined in article 2 (2) (a) as an Aromatized wine. The characteristic taste of which is obtained by the use of appropriate derived substances, in particular of the aromatized spices, which have most always be used, this drinks may be sweetened only by means of caramelized sugar, sucrose, grape must, rectified concentrated grape must and concentrated grape must . In this experiments also applied the method of preparation and quality characteristics of grape vermouth established by [23], [8].

It to be quite comparable to preparation of vermouth addition of spices/herbs extract increased the total phenols, acetaldehyde and ester content in plum vermouth [8]; [10], addition of spices/herbs have increased the tannin and ester content. It has been reported.

Volatile acidity was estimated less than the legal limits for wine [8]. Lower volatile acidity is desirable, indicating soundness of alcoholic fermentation and absence of any acetification.

Ester content of grape vermouth in the similar manner as reported for plum vermouth [10] and is desirable from sensory quality point of view. Beside this also indicate satisfactory maturation process which product has undergone.

It is clear that the increase in organic compound content in grape vermouth like, esters, tannin took place due to the addition of spices/herbs. [8].

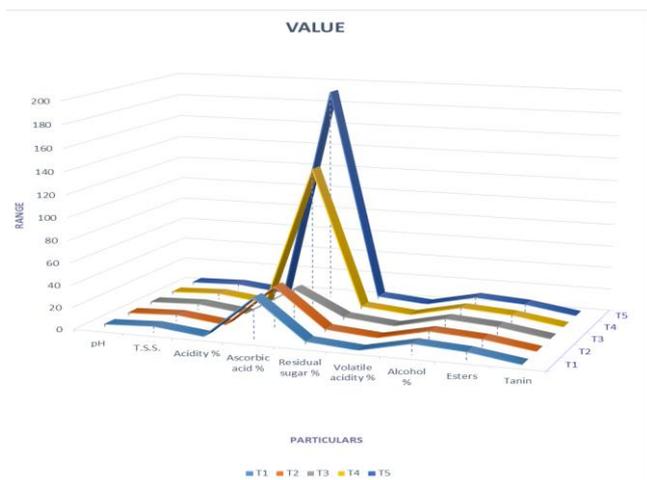


Fig. 3. Chemical Composition of Grape Vermouth after 6 Month of Maturation

The phenolic compound as gallotannic acid was observed 0.060 % in T₃ while 0.052 % (as gallotannic acid) in T₁, T₂, T₄ and T₅ respectively.

Average total marks cut of 100 for above sensory characters highest score achieved by T₃, 87.25 marks followed by 82.75, 81.25, 81.00 and 81.00 by T₄, T₁, T₂ and T₅ respectively.

Conclusion

Findings of T3 showed 10.26 % alcohol content were highest among others. In which Nut Meg, Mace & Hop Leaves added hasten alcohol, Vit. C, Esters and Tannin etc.

5 Data of research work and investigations reached to destination

that often acetification of wine take place but in this experiment Spices / Herbs were used which played antimicrobial role against acetification, no mycodermal growth was observed during fermentation, clarification and maturation stage of grape 10 vermouth.

Table 4. Organoleptic evaluation of Vermouth

Characters											
Treatment	Clarity & Freedom From Sediment	Colour	Aroma & Bouquet	Freedom from Acetic Odour	Total Acid to Taste	Astringency	Extract Body	Sugar	General Taste	Overall Impression	Total
Marks	10	10	20	10	10	10	5	5	10	10	100
T ₁	8.00	8.00	18.00	8.00	8.00	8.00	3.25	3.00	8.50	8.50	81.25
T ₂	8.00	8.00	18.00	8.50	7.75	7.75	3.25	3.25	8.25	8.25	81.00
T ₃	8.50	9.00	19.00	8.00	8.25	8.50	4.00	4.00	9.00	9.00	87.25
T ₄	8.00	8.00	18.00	8.75	7.75	8.00	3.00	3.25	9.00	9.00	82.75
T ₅	8.00	7.75	19.00	8.00	7.75	8.00	3.00	3.50	8.00	8.00	81.00

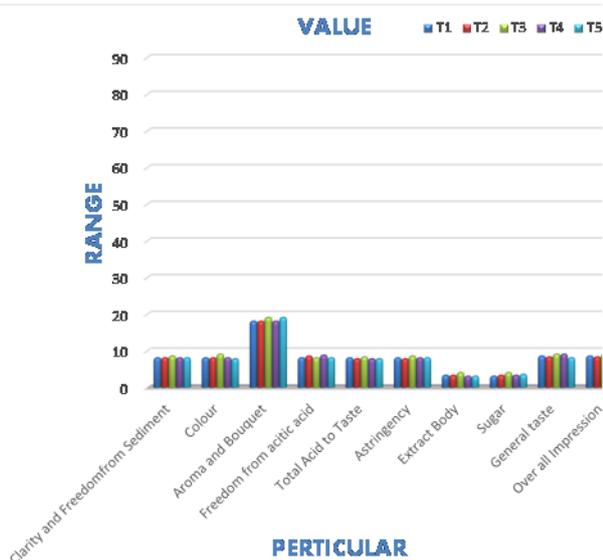


Fig. 4. Organoleptic evaluation of Vermouth

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Experimental findings and results is concluded that present study will create opportunity to promote farming of Grape in the country which will be raise the socioeconomic status of the 20 farmers through getting better prices. Study will provide a platform to Research scholar to get better achievement in Grape Vermouth. Wine industry will get an innovative product for market which will have both nutritive as well as pharmaceutical property.

25 Notes and References

State Institute of Food Processing Technology, 18- B, Ashok Marg, Lucknow-226001. (India).
Email: ramrakha1971@gmail.com,

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