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PRODUCTION OF WINE FROM INDIAN STAR GOOSE BERRY AND A COMPARATIVE STUDY OVER GRAPE WINE

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Abstract:

Wine is one of the functional fermented foods that have many health benefits. Commercially, wine is produced by the fermentation of yeast which involves the conversion of sugar to alcohol. Wine can act as a nutrient supplement for seasonal fruits and vegetables throughout the year. Using fruits and vegetables having medicinal and nutritional value as a substrate for wine production, the health benefits of them can be improved widely. Indian gooseberrywhich is known for their high medicinal and nutritional values are used as the substrate here. Fermentation is carried out with Saccharomyces cerevisiae commonly known as bakers yeast. Daily monitoring was done to study the composition and characteristics of the wine. The wine produced resembled the commercial wine in terms of its composition, taste and aroma. During the fermentation period the wines were analyzed for pH, titratable acidity, specific gravity, biomass content, alcohol and reducing sugar on a daily basis. pH show a decreased trend then attains minima and then increased. As the fermentation days proceed, the specific gravity increased and the alcohol percentage increased gradually. Batch 1 Amla (A1) showed a pH range of 3.79-3.56, specific gravity ranges from 1.09 -1.17 and alcohol content was 10.5%. Batch 2 Amla (A2) showed a pH range of 3.81-3.30, specific gravity ranges from 1.09 -1.167 and alcohol content was 10.35%. Batch 3 Amla (A3) showed a pH range of 3.83-3.34, specific gravity ranges from 1.032 -1.0967and alcohol content was 8.64%. Batch 1 ginger (G1) showed a pH range of 3.77 -3.59, specific gravity ranges from 1.11 -1.178 and alcohol content was 7.94%. Batch 2 ginger (G2) showed a pH range of 3.89 -3.94, specific gravity ranges from 1.116 -1.162 and alcohol content was 6.81 %. Batch 3 ginger (G3) showed a pH range of 4.42 -4.01, specific gravity ranges from 1.144 -1.188 and alcohol content was 5.81%.

Keywords: *Spinach, M-S medium, N-N medium,Shenk medium, callus, tissue culture.*

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INTRODUCTION:

Home winemaking is an enjoyable, educational and satisfying hobby. Winemaking recipes make the process easy and simple instructions ensure success. The basic steps are easy to learn and practice. The traditional homemade wine base ingredient is the grape because it naturally contains the correct mix of sugar, moisture, tannin, and nutrients required for fermentation and preservation, and it even carries its own yeast. But in truth, wine can be made from almost any non-toxic plant or plant part if additional ingredients are supplied in the correct amount. So the process of making wines from various types of fruits, vegetables and spices is no more complicated than making wine from grapes and it is a good preservation method. It needs extra preparation steps and some adjustments in sugar content, acid levels etc. Fermentation can extract valuable components from the raw materials used for production. Yeast is the magical ingredient that turns fruit juices into wine. In spontaneous fermentations, the 1st stages invariably being dominated by the alcohol-tolerant strains of Saccharomyces cerevisiae. This species is universally known as the `wine yeast' and is widely preferred for initiating wine fermentations. The alcohol content of home-made wines is only about 7-8% which makes it consumable for persons of any age group. Though ginger wine contains small amounts of alcohol, it is not harmful, but health-giving, digestible, and stimulates the release of the hormone gastrin, which in turns stimulates the release of enzymes in the stomach. Thus, wine stimulates the release of digestive enzymes, which digest not only the alcohol but the many other nutrients found in wine. The proper dosage, or a moderate intake of wine, in addition to affecting cholesterol levels favourably, decreases the tendency of blood to clot and assists in dissolving clots, all important factors in protecting against heart disease. Research also indicates that moderate wine drinking may reduce the tendency of arteries to constrict during stress, lower blood pressure, and increase coronary artery diameter and blood flow. More recently, wine has been identified as a dependable source of quercetin, a potent anti-carcinogen, and of many flavonoids and other polyphenolic antioxidants.

Considering the importance and medicinal value of wine from some special raw materials, it was very interesting to conduct the production of wine in a batch reactor setup in the laboratory. We selected Indian Gooseberry and Ginger for our study. Indian gooseberry (EmblicaofficinalisGaertn.), is one of the useful fruit. It is consumed as a fresh fruit or in the form of food products like preserve. The fruit also forms an important constituent of many Ayurvedic preparations such aschyvanprashandtriphala and is regarded as “one of the best rejuvenating” herbs preparation of wine using the fruits of amla would be useful for imparting healthful properties to the wine. Ginger which act as a useful food preservative is a tuber that is consumed whole as a delicacy, medicine, or spice. It is the rhizome of the plant Zingiberofficinale

MATERIALS AND METHODS:

Winemaking, or vinification, is the production of wine, starting with selection of different fruits and ending with bottling the finished wine. We had developed a batch reactor in our lab for wine production.

The picking of the fruits and spices is the first step in wine production. Crushing is the process of gently squeezing the fruits and spices and breaking the skins to start to liberate the contents. In our project, star goose berry is grinded and used it. To start primary fermentation yeast is added. During this fermentation, which often takes between one and two weeks, the yeast converts most of the sugars in the fruits into ethanol (alcohol) and carbon dioxide. In our case, star goose berry take about about 21 days. Filtration in winemaking is used to accomplish the objective of clarification. In clarification, large particles that affect the visual appearance of the wine are removed.


Fig 1: Fermentation of Indian Goose Berries

Fig 2: Indian Goose Berries Wine

Daily Monitoring pH was measured using digital pH meter. The total sugars were estimated in terms of glucose by Nelson Somogyi method. Estimation of titratable acids was done by titrimeteric method using 0.1N NaOH in terms of tartaric acid. Biomass was determined by dry weight method in g/ml. Alcohol percentage was calculated using specific gravity method. Specific gravity was also determined.

Final Analysis of Wine Tannin content was estimated by Folins – Denis method in mg/100ml. Phenol content was determined by Folins Lowry method in mg/100ml. Free and total SO2 was done by Ripper method in g/L. Total suspended solids was calculated in Degree Brix. Final analysis of all parameters such as pH, alcohol content specific gravity, sugar content, titratable acidity, and biomass were conducted using the methods described in daily analysis.

Analysis of Commercial Wine and Its Comparison : Estimate parameters such as pH, alcohol content specific gravity, sugar content, titratable acidity, Biomass, tannin content, phenol content, free and total SO2 and total suspended solids of the commercially available wine were conducted. The parameters of the homemade wine were compared with that of the commercially available wine.

Results and Discussion

Production of wine from Indian Star Gooseberry conducted in the lab in batch reactor set up. Process monitoring and final analysis of homemade wine has been conducted. Various parameters such as pH,

Titratable acidity, biomass concentration, etc of homemade wine was determined. Experiments were conducted and results are given in tables 1 to 2 and figures 3 to 6.. Final analysis of prepared wine and commercial wine was also conducted. Results are shown in Tables. The 1st batch Indian Star Gooseberry wine sample was denoted as G1 and similarly 2nd batch represented as G2.

Process of Monitoring (Daily) Daily analysis of homemade wine (fermented medium) has been conducted. Various parameters such as pH, Titratable acidity, specific gravity, alcohol content, sugar concentration, biomass concentration, etc of each batch were determined day by day during the course of fermentation. Results are shown in table.

Parameters monitored during fermentation period:

a) Variation in pH
b) Sugar concentration
c) Specific gravity
d) Alcohol percentage

Table 1: Daily Monitoring of Indian Star Goose Berries

S.no	Days	pH	Alcohol percentage %	Specific gravity	Sugar concentration(mg/ml)
1	1	4.5	0	1.09	21.78
2	4	3.65	1.09	1.13	19.92
3	6	3.47	2.08	1.19	18.14
4	8	3.35	3.54	1.23	17.16
5	11	3.25	5.94	1.32	16.64
6	12	3.33	6.87	1.43	15.54
7	13	3.56	7.6	1.49	14.85
8	14	3.97	10.5	1.70	14.12

Table 2: Daily Monitoring of Red Wine

S.no	Days	Ph	Alcohol percentage %	Specific gravity	Sugar concentration(mg/ml)
1	1	5.4	0	1.92	19.92
2	15	4.5	2.81	1.64	18.14
3	16	3.75	3.6	1.48	17.10
4	18	3.3	4	1.30	16.64
5	20	3.6	5.8	1.25	15.54
6	21	3.41	6.4	1.109	14.28
7	22	3.20	8.1	1.09	14.12
8	23	2.91	9	1.09	9.29
9	24	2.1	12.3	1.09	5.42

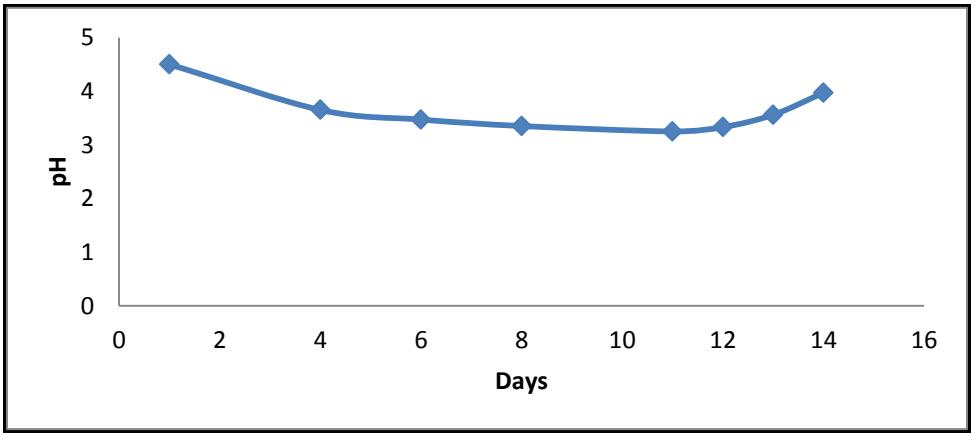

Fig 3: Daily Monitoring pH of G1

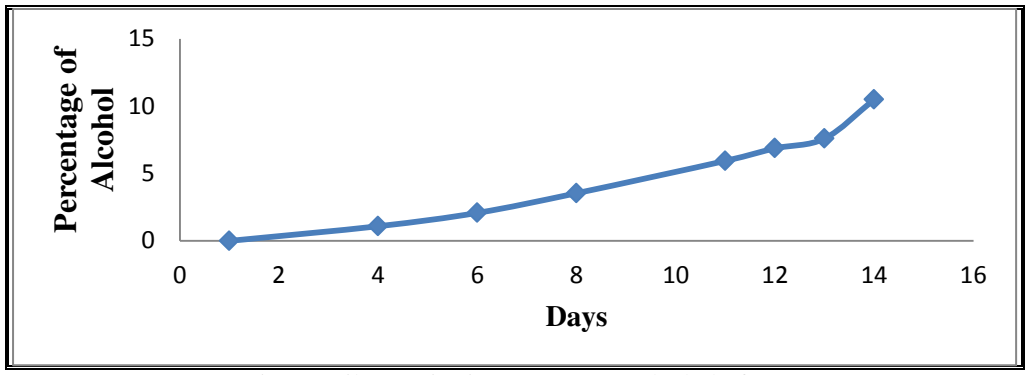

Fig 4: Daily Monitoring Percentage Alcohol of G2

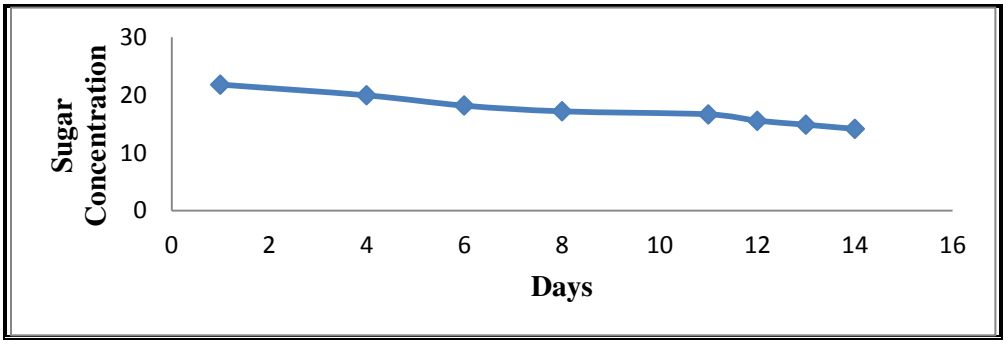

Fig 5: Daily Monitoring Sugar Concentration of G2

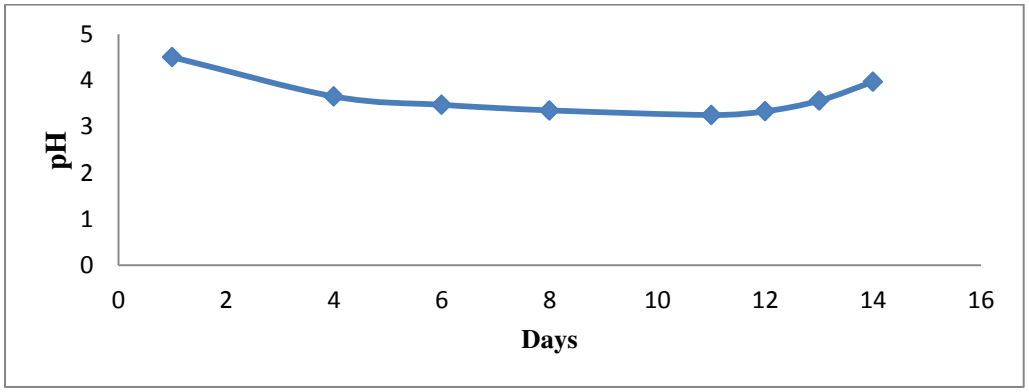

Fig 6: Daily Monitoring pH of G2

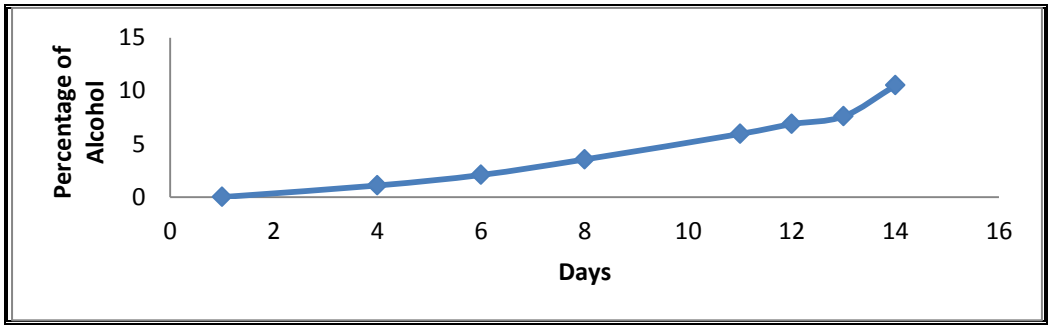

Fig 7: Daily Monitoring Percentage Alcohol of G2

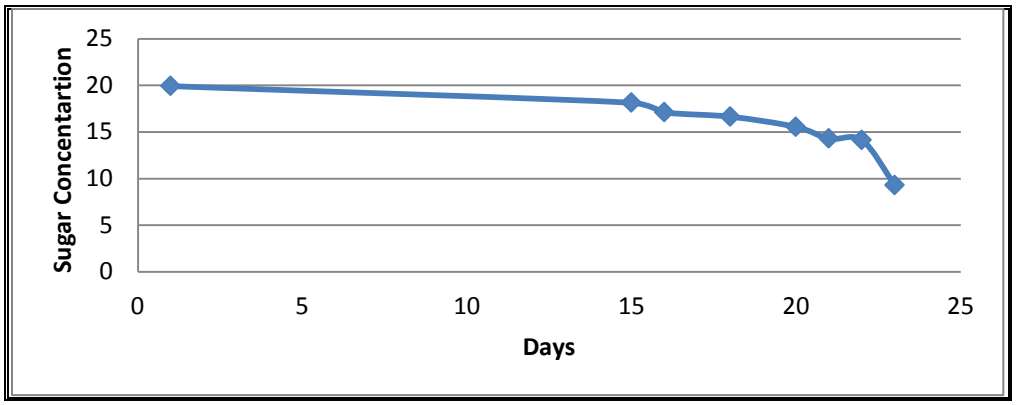

Fig 8: Daily Monitoring Sugar Concentration of G2

Table 3: Analysis of Commercial Wine

Commercial Wine		
1	pH	3.56
2	Specific gravity	1.2407
3	Titratable Acidity (g/L Tartaric Acid)	4.2
4	% Alcohol	18
5	Tannin Content (mg/ml)	0.28
6	Phenol Content	0.23
7	Total Suspended Solids	32.23

pH: Variation in pH in the fermentation medium during the course of process was as shown in the figure. PH showed a decrease trend then attains minima then increases. The initial pH of SG1 was 4.5 which decrease to 3.47 on the 8th day and increased to 3.56 on 14th day. In case of G1, pH was 5.4 on 1st day which decreased to 3.6 on 12th day and showed an increment to 2.51 on 24th day.

Substrate (Sugar) concentration: The sugar concentration of different wine samples – SG ,and G, has been obtained. As the figure shows, the sugar concentration of wine decreases as the fermentation days passed because of the utilization of substrate. The sugar concentration lies between 25 mg/100ml to 10mg/100ml. In case of SG, the initial sugar concentration was 21.7.8mg/100ml which decreased to 19.92mg/100ml on 14th day. Initial sugar concentration of G was 21.78mg/100ml which decreased to 9.29 on the 24th day. For G, the sugar concentration started from 19.92mg/100ml and decreased to 9.29mg/100ml on 24nd day.

Specific gravity: Estimation of specific gravity of SG, and G, has been conducted. It has been studied that as the number of day's increases, the specific gravity also increases gradually. Specific gravity ranges from 1.092 to 1.9. Specific gravity for S G on 1st day was 1.092 and shows a trend to increase to 1.49on 14th day. For G1, the specific gravity starts from 1.92 and increased to 1.09 on 24th day.

Alcohol percentage: By studying the alcohol content in volume percentage of SG and G it can be concluded that the alcohol volume percentage increased as the number of day's increases. The figure indicates that the % alcohol was between zeros to 8 during the fermentation . The initial alcohol percentage was zero for all wine samples – SG and G. Final alcohol content for G was 14.06% G was 10.3% on 24th day.

CONCLUSION:

Study mainly focused on the process monitoring of homemade wine during its fermentation period. The experimental investigation was aimed to study the variation in each parameter during the fermentation period. The final analyses of wine of various parameters – alcohol content, pH, specific gravity were conducted. These studies were compared with that of commercially available wine. The study concludes that pH showed a decreasing trend and then attains minima then increases. The sugar concentration of wine decreases with increase in the number of days. It has been studied that as the number of day's passes, the specific gravity and volume percentage of alcohol also increases gradually. The titrable acidity of wine showed a fluctuating trend as the number of days passes. Goose beery showed a pH range of 4.5to3.97, specific gravity ranges from 1.09 -1.17 and alcohol content was 14.5. Homemade wines have relatively low alcohol content than the commercially available

wine and there is no usage of either any preservative or any additives, so homemade wines are not harmful for health and are acceptable for daily usage. The results of process monitoring and final analysis will help a small scale wine industry or can refer the results to develop a small scale wine industry. so determined.

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