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DEVELOPMENT OF AN HERBAL ENERGY DRINK USING MEDICINAL PLANT EXTRACTS AND FURTHER STATISTICALLY ANALYSING THE SENSORY PROPERTIES BY ANALYSIS OF VARIANCE (ANOVA)

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ABSTRACT: Energy drinks (EDs) are caffeine-based beverages that commonly contains large amount of carbohydrates, sugar, health supplements and various energy stimulants, such as ginseng and vitamin B, to name a few. These drinks are marketed for young people actively involved in sports or overworking hours, as natural alternatives that increases fun and improve physical and cognitive performances such as attention, concentration and alertness. There are commonly held false perceptions that the consumption of EDs can rectify the impairment to human physiology because of alcohol consumption including visual reaction time and motor coordination, which is highly required for sports and driving activities, to name a few. The sensory analysis was done in the form of survey. The statistical analysis was done using SPSS software and Analysis of Variance (ANOVA). The graph was obtained between feedbacks (given by the candidates) and number of people for different sensory properties like smell, taste, flavour, texture, and colour.

INTRODUCTION: The consumption of energy drinks has increased vigorously among the youth generation, even after knowing the fact that the energy drinks have adverse health effects [1]. The energy drinks available in the current market contains varying amounts of Caffeine but it has its own side effects and this leads to a constant increase in the search of alternatives for caffeine and efficient compounds to be used in the energy drinks. Herbal extracts used as flavouring and seasoning agents in food and beverages have been used for centuries to replace caffeine.

A mixture of herbal extracts has been used in the current research for the development of a novel and potent energy drink. Green tea extract containing natural caffeine and L-theanine which acts as memory enhancer, stimulant, anti- microbial and anti-depressant [2, 3], Indian ginseng (*Withania somnifera*) which possess anti-oxidant property [4], Glucose as a source of instant energy and the base solution [5], Tulsi (*Ocimum tenuiflorum*) having anti-microbial property [6], Ginger (*zingiber officinale*) having vitamin B6 for the treatment of morning sickness and having anti-microbial property [7, 8], Honey being acidic in nature and possess anti-oxidant property acts as a sweetener in the energy drink developed in the current research.

Hence, these amalgamations of constituent properties of ingredients make the drink as one of the herbal and multi nutritive drinks when compared to already available energy drinks in the

market. As the pH of the drink is approximately neutral so it will also help in efficient blood circulation. The ingredients present in the drink can easily be utilized at this pH.

MATERIALS AND METHODS:

Basic solution: 60 gm of glucose purchased from VIT Marketing complex in the campus of VIT University, Vellore, Tamilnadu, India, was completely dissolved in 1000ml of pure drinking water and this solution was used as the base solution for the Energy drink.

Ginger extract: 2 gm of ginger powder obtained from VIT Marketing complex in the campus of VIT University, Vellore, Tamil Nadu, India, was solubilised in 10 ml of drinking water and was stored for further usage.

Ashwagandha (Indian Ginseng) aqueous stock preparation: 2gm of Ashwagandha was mixed in 10 ml of sterile water and subjected to centrifugation at 8000 rpm for 5 minutes. The supernatant was transferred to a new falcon tube and was stored for further usage while the pellet was discarded.

Tulsi leaves extract: 2gm of Tulsi leaf were taken and grinded in 15 ml of distilled water using mortar and pestle. The homogenised content was subjected to centrifugation at 8000 rpm for 5 minutes. The supernatant was transferred to new falcon tube and was stored for further use while the pellet was discarded.

Green tea aqueous stock preparations: 3gm of green tea powder was taken and dissolved in 150 ml of cold sterilised water and was stirred well and stored for further use.

Standard preparation: 50 ml of glucose solution was added in a flask. 5ml of Tea extract was added. 1ml of Ashwagandha (Indian Ginseng) was added and stirred. 1ml of Tulsi Extract was added and stirred well. 0.8 ml of Ginger was added. 3ml of honey was added as the sweetening agent. The solution was filtered to remove the unwanted small foreign particles. The colour of the solution was light brown and the smell was the dominated by the green tea with the essence of honey and Tulsi.

The texture was good enough with an acceptable viscosity.

Sensory analysis: 50 candidates of the age ranging between 20-25 years were selected and the experiment was performed on them upon their acceptance to provide the feedback for the questionnaires regarding the drink. The questionnaires to be analysed by the candidates were; Q1- the smell of the drink, Q1- taste of the drink, Q3- the acceptance for the colour of the drink, Q4- the flavour of the drink, Q5- the texture of the drink experienced by the candidate. The feedback were numbered as; 1- Excellent, 2- very good, 3- average, 4- bad. The data generated was statistically analysed using the SPSS software. The survey of the sensory analysis conducted was evaluated on the basis of the overall reaction given by the experimental candidates. The feedback given for the questionnaires is tabulated in **Table 1**.

TABLE 1: SENSORY ANALYSIS

Candidates	Q1	Q2	Q3	Q4	Q5
01	2.00	2.00	3.00	3.00	2.00
02	3.00	3.00	2.00	2.00	2.00
03	2.00	3.00	2.00	3.00	3.00
04	2.00	1.00	3.00	1.00	1.00
05	2.00	3.00	3.00	3.00	3.00
06	2.00	2.00	2.00	1.00	1.00
07	2.00	1.00	2.00	1.00	1.00
08	2.00	2.00	3.00	2.00	2.00
09	2.00	3.00	3.00	2.00	3.00
10	4.00	4.00	2.00	4.00	2.00
11	1.00	1.00	1.00	1.00	1.00
12	3.00	3.00	3.00	3.00	1.00
13	2.00	2.00	2.00	2.00	2.00
14	1.00	1.00	1.00	1.00	1.00
15	3.00	3.00	3.00	3.00	1.00
16	2.00	1.00	2.00	1.00	1.00
17	1.00	2.00	3.00	1.00	2.00
18	3.00	2.00	2.00	3.00	3.00
19	3.00	3.00	2.00	2.00	3.00
20	3.00	2.00	3.00	2.00	3.00
21	2.00	3.00	2.00	3.00	2.00
22	3.00	2.00	2.00	2.00	2.00
23	2.00	1.00	2.00	1.00	1.00
24	4.00	2.00	2.00	3.00	1.00
25	2.00	3.00	2.00	3.00	2.00
26	2.00	2.00	1.00	3.00	1.00
27	1.00	2.00	2.00	2.00	2.00
28	2.00	3.00	2.00	3.00	3.00
29	3.00	3.00	3.00	3.00	3.00
30	3.00	4.00	3.00	2.00	3.00
31	3.00	2.00	3.00	2.00	3.00
32	3.00	4.00	4.00	2.00	3.00
33	3.00	2.00	3.00	3.00	2.00
34	3.00	3.00	4.00	4.00	2.00

35	2.00	3.00	2.00	3.00	3.00	43	3.00	2.00	3.00	2.00	3.00
36	2.00	2.00	4.00	3.00	3.00	44	2.00	3.00	3.00	2.00	3.00
37	3.00	2.00	3.00	2.00	3.00	45	2.00	2.00	3.00	1.00	2.00
38	3.00	4.00	4.00	4.00	3.00	46	1.00	2.00	2.00	3.00	2.00
39	3.00	2.00	3.00	3.00	2.00	47	3.00	2.00	3.00	1.00	1.00
40	3.00	3.00	4.00	3.00	3.00	48	2.00	2.00	1.00	2.00	2.00
41	4.00	3.00	3.00	4.00	3.00	49	2.00	3.00	3.00	2.00	3.00
42	2.00	3.00	2.00	3.00	2.00	50	3.00	2.00	3.00	2.00	3.00

TABLE 2: ONE WAY – ANALYSIS OF VARIANCE

|		Sum of Squares	Degree of freedom	Mean Square	F-ratio	Significance
Smell	Between Groups	6.360	3	2.120	4.470	.008
	Within Groups	21.820	46	.474		
	Total	28.180	49			
Taste	Between Groups	20.896	3	6.965	28.854	.000
	Within Groups	11.104	46	.241		
	Total	32.000	49			
Colour	Between Groups	10.016	3	3.339	7.564	.000
	Within Groups	20.304	46	.441		
	Total	30.320	49			
Flavour	Between Groups	17.961	3	5.987	12.775	.000
	Within Groups	21.559	46	.469		
	Total	39.520	49			
Texture	Between Groups	14.102	3	4.701	12.514	.000
	Within Groups	17.278	46	.376		
	Total	31.380	49			

Observations:
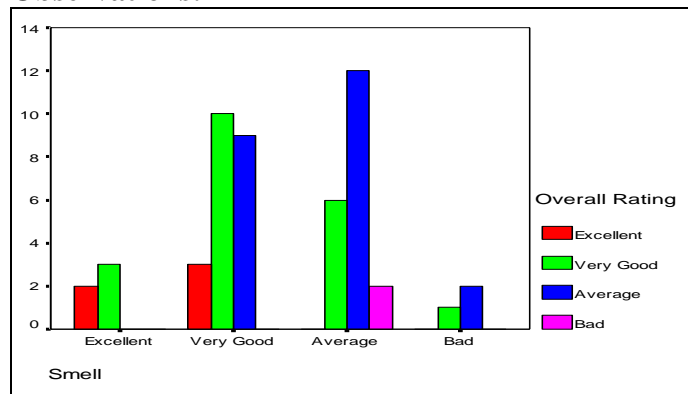
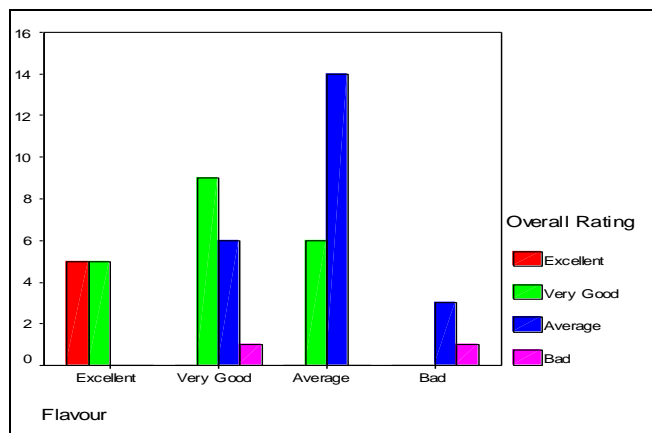FIGURE 1: SENSORY PROPERTY OF SMELL
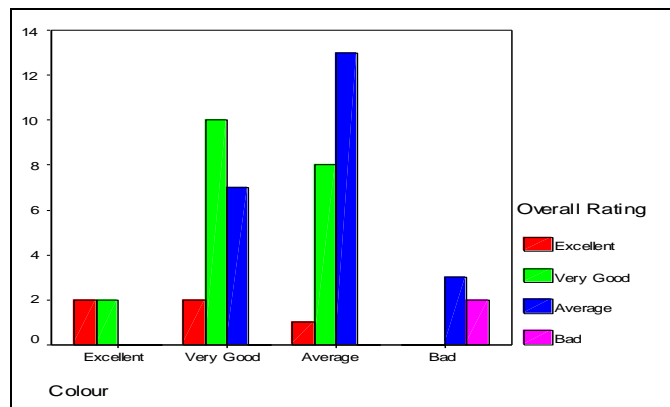

FIGURE 2: SENSORY PROPERTY OF FLAVOR
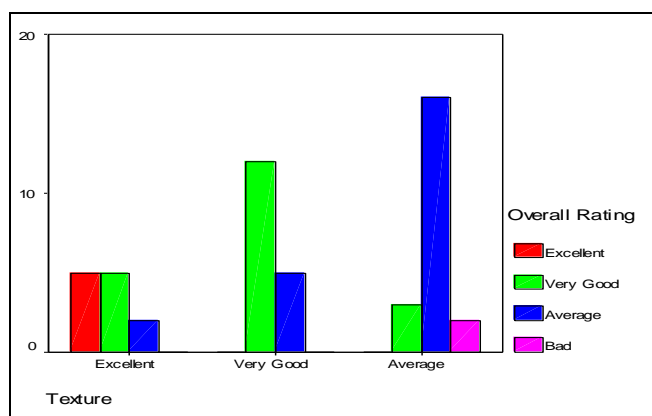

FIGURE 2: SENSORY PROPERTY OF SMELL

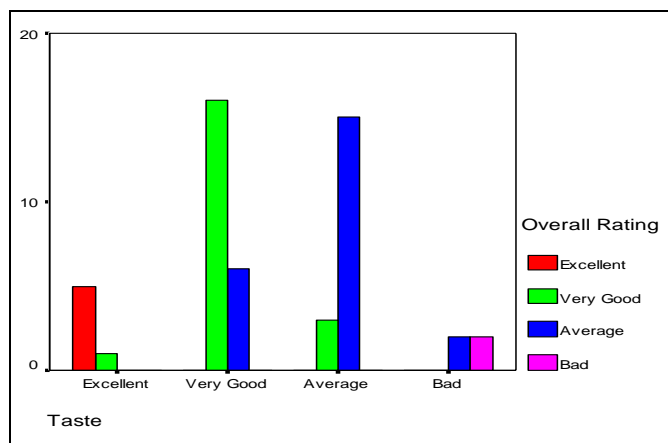FIGURE 3: SENSORY PROPERTY OF TEXTURE

FIGURE 4: SENSORY PROPERTY OF TASTE

RESULTS & DISCUSSIONS: The result of the statistical analysis was obtained in the form of multiple bar diagrams formed between overall ratings (given by the candidates) and the Number of Candidates. Different graphs were obtained for different sensory property like Smell (**Fig. 1**), Colour (**Fig. 2**), Flavour (**Fig. 3**) Texture (**Fig. 4**), and Taste (**Fig. 5**). There were different ratings given by the candidates for each and every sensory property, which was later been evaluated and analysed using SPSS software. The likings of each and every individual towards the drink were different. Maximum number of candidates has rated the drink as Average. A further enhancement of sensory properties is demanded by the results obtained to develop a better energy drink.

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