

Development and Sensory Evaluation of Vegan Honey as Nutraceutical Products

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Abstract: *People nowadays are conscious of the importance of maintaining their health in their hectic lives. People who live a healthy lifestyle exercise, eat healthy foods, and take nutraceuticals to replenish micronutrients and other essential elements, making them less deficient and disease-free. However, animal exploitation and cruelty for food, clothing, and other purposes has expanded dramatically in recent years. This is also exploiting nature by causing animal extinction and an unbalanced environment for nature, humans, and all living species on the planet. It has an impact on the ecosystem and is causing problems for humans, the environment, and other living things. Veganism is being practised to alleviate this problem and to stop the exploitation of animals for food. Veganism is a lifestyle that encourages the creation and usage of animal-free alternatives for the benefit of animals, people, and the environment. Vegan honey, a plant-based honey with health benefits similar to natural honey produced by honeybees, was developed to promote this practise. Vegan honey also has nutraceutical products for people who wish to improve their health but don't have time to prepare healthy diets.*

Keywords: Vegan, Honey, Nutraceutical, Fruit Juice, Jaggery, Lemon, Spices, Flavor, Sensory Evaluation, Veganism

1. Introduction

Honey is probably the most commonly mistook for a vegan foodstuff. A widespread misunderstanding is that honey bees produce honey specifically for humans, yet this couldn't be further from the truth. Honey is manufactured by bees for bees, and harvesting it by people puts their health at risk. Honey is a material generated by honey bees (*Apis mellifera*, *Apis cerana indica*, and *Apis mellipodae*) from nectar and sugary deposits collected from plants and animals, which is synthesised, refined, and stored in combs as jelly liquid in their natural scientific models. The technique by which bees produce honey is the same all around the world, but the physical and chemical qualities of honey vary depending on geographical and botanical sources. Honey is made from a variety of botanical compounds, mostly from plants, and has a wide range of taste, flavour, scent, and colour (1). Honey offers appealing chemical qualities for baking and a particular flavour that some people prefer to sugar and other sweeteners, and most microorganisms cannot grow in honey due to its low water activity of 0.6 percent(2). It is a natural product made by bees that consists mostly of a complex mixture of carbohydrates, particularly glucose and fructose, organic acids, amino acids, minerals, vitamins, enzymes, pollens, and colours (3,4). Thousands of people have been drawn to it because of its nutritional value, therapeutic capabilities, and sensory qualities (5). Vitamin C and the majority of the B complex vitamins are present in varying levels (6).

Veganism is both a practise of avoiding animal products, particularly in the diet, and a philosophy that rejects the use of animals as commodities (7, 8, 9). Vegans are people who follow a vegan diet and ideology. There are numerous types of vegetarianism that can be distinguished. Dietary vegans, often known as "strict vegetarians," abstain from eating meat, eggs, dairy products, and other goods derived from animals. An ethical vegan is someone who not only follows a plant-based diet but extends the idea into other parts of their lives, opposes the usage of animals for any purpose, and attempts to avoid any cruelty and exploitation of all creatures including humans. Another phrase is "environmental veganism," which refers to the avoidance of animal products based on the belief that industrial animal raising is unsustainable and harmful to the environment (10, 11, 12, 13, 14, 15,).

In 1944, Donald Watson and his future wife Dorothy Morgan coined the phrase "vegan" (16, 17). It was created from the names 'Allvega' and 'Allvegan,' which were previously used and promoted by George A. Henderson and his wife Fay (18), who published the first vegan recipe book. (19, 20, 21). Initially, it was used to refer to "non-dairy vegetarians," (22), but by May 1945, vegans were specifically abstaining from "eggs, honey; and animals' milk, butter, and cheese." It has been described as "the belief that man should exist without exploiting animals" by the Society since 1951. (23). Veganism became increasingly popular in the 2010s. Vegan honey is designed to substitute natural honey for vegans. It can be used as a nutraceutical product and offers health benefits. It is developed as a man-made honey with various flavours that may be utilised by ordinary people.

2. Materials and Methods

2.1 Collection of raw material- Fruits (Apple, Pineapple & Grapes), Jaggery, Lemon, Cinnamon, Arjuna tree bark (*Terminalia arjuna*) and Ginger were bought from local market of Lucknow, Uttar Pradesh, India.

2.2 Preparation of raw material- Fresh fruit juice, lemon juice and ginger juice was extracted for making honey. For different nutraceutical benefits in vegan honey powder is prepared from Cinnamon and Arjuna tree bark.

2.3 Preparation of product- Three Sample of vegan honey was prepared Apple-cinnamon honey (T1), Pineapple-arjuna tree bark honey (T2), Grapes-ginger honey (T3) with addition of jaggery and lemon juice and cooked at high temperature until the mixture is reached thread stage of consistency.

To give different types of flavor i.e. apple-cinnamon honey is in which apple juice and jaggery equal amount and cinnamon powder in small amount. Where as in pineapple-arjuna tree bark honey; pineapple juice and jaggery is in 2:1 ratio and small amount of arjuna bark. In grapes-ginger honey; grapes juice and jaggery is in 2:1 ratio similar to pineapple-arjuna tree bark honey and small amount of ginger juice.

2.4 Equipment- Equipment's such grinder, gas stove, hot air oven, muffle furnace, desiccator, refractometer and pH meter.

2.5 Packaging of product- After preparation of product .Its packed in a sterilized glass container and stored at room temperature.

2.6 Sensory Evaluation of product- Sensory Evaluation of product is done to know the consumer acceptability and similarity of natural honey with vegan honey with Composite Scoring test method.

2.7 Chemicals- Food grade chemicals were used from BBAU Department of Food and Nutrition of food science and technology laboratory.

Method-

1. Physico-chemical analysis

a. Determination of moisture

The moisture content was determined by oven drying method. The sample weighed accurately 2g of the material into the tared dish and dried in an oven at 100°C to constant weight. After cooling in the desiccators, the sample was weighed again. The loss in weight was recorded as moisture content (24).

$$\text{Moisture (\%)} = \frac{100(M_1 - M_2)}{M_1 - M}$$

Where,

M₁ is the mass of the dish's contents before drying;

M₂ is the mass of the dish's contents after drying;

M is the empty dish's mass in gram.

b. Determination of total ash

Total ash content of sample was estimated by using direct-heating method of muffle furnace.

In a silica or platinum dish, weigh 5 g of honey, add a few drops of pure olive oil to prevent spattering, and heat gently over a low flame until swelling stops. Ignited at 600 + 20°C in a muffle furnace till white ash is obtained. Cooled the dish in a desiccator and weighed. Incinerated to constant weight (24).

$$\text{Ash (\%)} = \frac{100(M_2 - M)}{M_1 - M}$$

Where, M₂ = mass, in g, of the dish with the ash;

M = mass, in g, of the empty dish; and

M₁ = mass, in g, of the dish with the material taken for the test.

c. Determination of Acidity

Reagents-

1. Standard Sodium Hydroxide Solution 0.05 N.

2. Phenolphthalein Indicator Solution Dissolve 0.5 g of phenolphthalein in 100 ml of 50 percent ethyl alcohol (v/v).

Procedure-

Taken 10 g of the sample in a suitable titration flask and dissolved it in 75 ml of carbon dioxide-free water. Mixed thoroughly. Titrated against standard sodium hydroxide solution using 4 to 6 drops of carefully neutralized phenolphthalein solution (pink colour of indicator should persist for at least 10 seconds).

Determined blank on water and indicator and correct the volume of standard sodium hydroxide solution used (24).

$$\text{Acidity (as formic acid), percent by mass} = \frac{0.23 \times V}{M}$$

Where,

V = corrected volume of 0.05 N sodium hydroxide solution required for titration; and

M = mass, in g, of the sample taken for the test.

d. Determination of Optical Density of Honey

Weighed accurately 2 g of honey in a small beaker and dissolved it in distilled water in a 10-ml measuring cylinder, dilute the solution to 10 mL. Using distilled water in a cuvet, set the colorimeter to '0' absorbance or 100% transmittance at 660 nm. Read the absorbance directly or as the % transmittance at the same wave length using the honey solution in the cuvet (24).

If the colorimeter only has a transmittance scale, use the following formula to calculate the optical density:

Optical density = $2 - \log$ percent transmittance.

e. Determination of pH Value

pH is the measurement of H^+ ion activity; it measures active acidity. pH is determined by measuring the electrode potential between glass and reference electrodes; pH meter is standard pH buffers.

Used homogenized sample for the determination of pH.

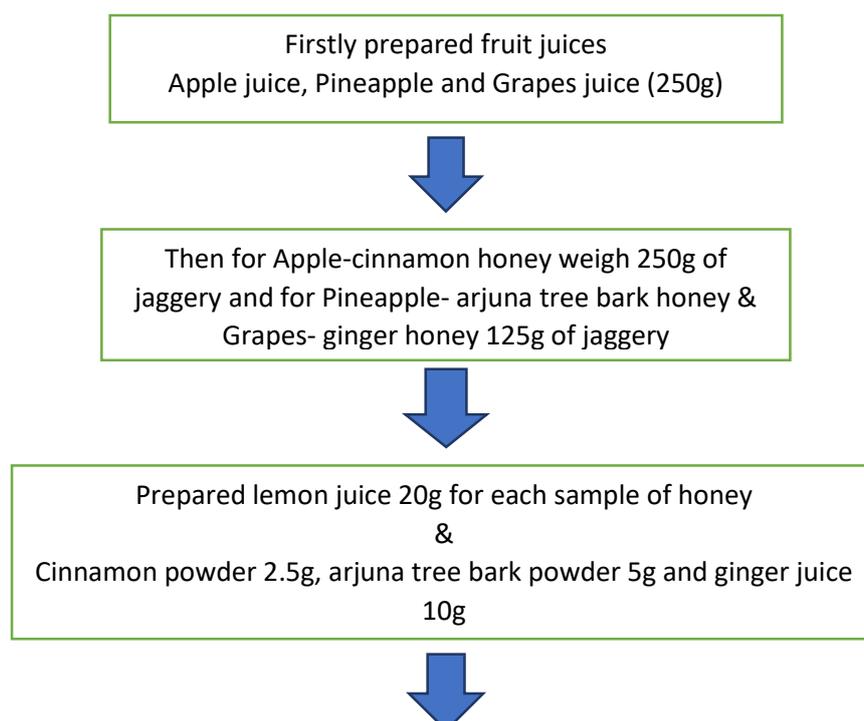
f. Determination of soluble solids (TSS)

Refractometer Brix was used to determine the soluble solid. Brix of Sugar used have range of 0 to 85% brix, 0 to 80°C (32 to 176°F), resolution: 0.1%Brix; 0.1°C(0.1°F), accuracy: $\pm 0.2\%$ Brix; $\pm 0.3^\circ C$ ($\pm 0.5^\circ F$).

2. Organoleptic evaluation

The organoleptic evaluation in respect of colour, flavour, consistency, taste, absence of defects & overall acceptability was evaluated by semi-trained judges using Composite Scoring Test.

3. Processing technology for Vegan honey



Taken fruit juice in cooking vessel and then added jaggery and lemon juice and cinnamon powder in apple juice ,arjuna tree bark powder in pineapple juice ,ginger juice in grapes juice cooked it till half volume and check it by thread stage test. Which indicate vegan honey is ready and stored in glass container.

3. Results

	<u>Control</u>	<u>Sample T1</u>	<u>Sample T2</u>	<u>Sample T3</u>
<u>Moisture content (%)</u>	19.59±0.3581	19.56±0.2101	22.11±0.1206	20.70±0.4000
<u>Ash content (%)</u>	1.463±0.04163	1.810±0.1513	2.963±0.09019	2.913±0.2421
<u>Absorbance/ Optical density</u>	0.3678±0.0008505	1.260±0.006760	2.964±0.008184	2.668±0.0006657
<u>Total Soluble Solids</u>	80.50±0.4000	84.53±0.4041	82.47±0.4163	80.70±0.3606
<u>pH</u>	3.937±0.03215	4.243±0.02517	3.950±0.05000	4.170±0.04000
<u>Titratable Acidity (%)</u>	0.5167±0.07638	4.200±0.2000	8.367±0.2517	6.233±0.2517

Table -1 Physico-chemical of vegan honey samples.

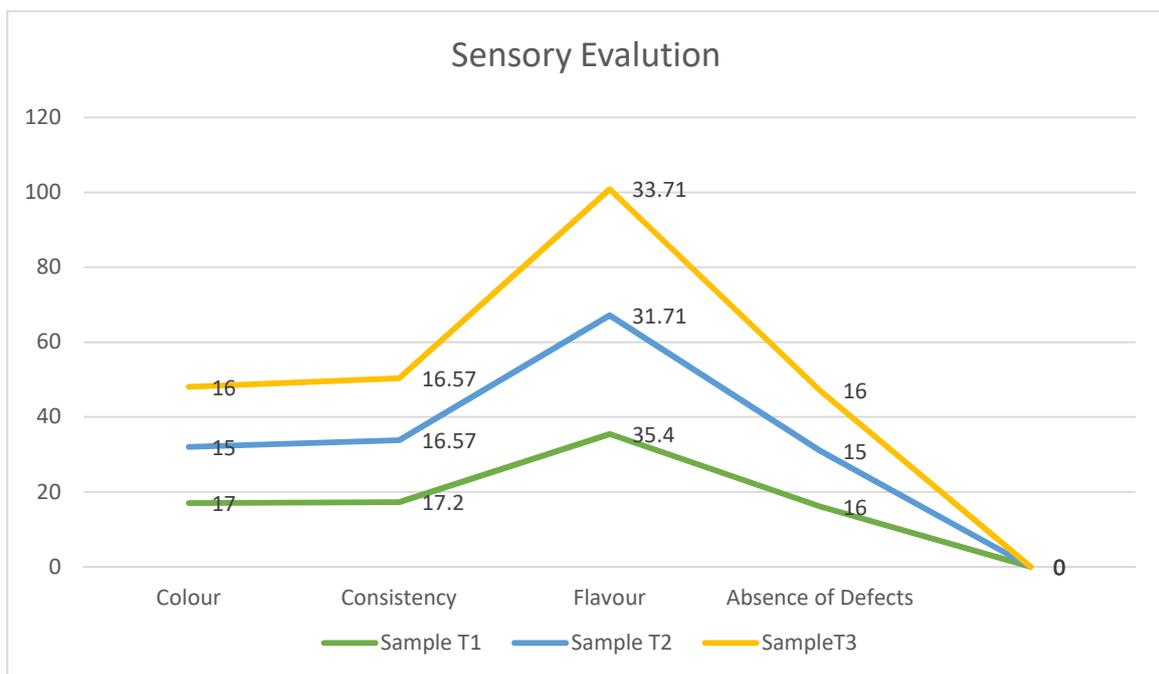
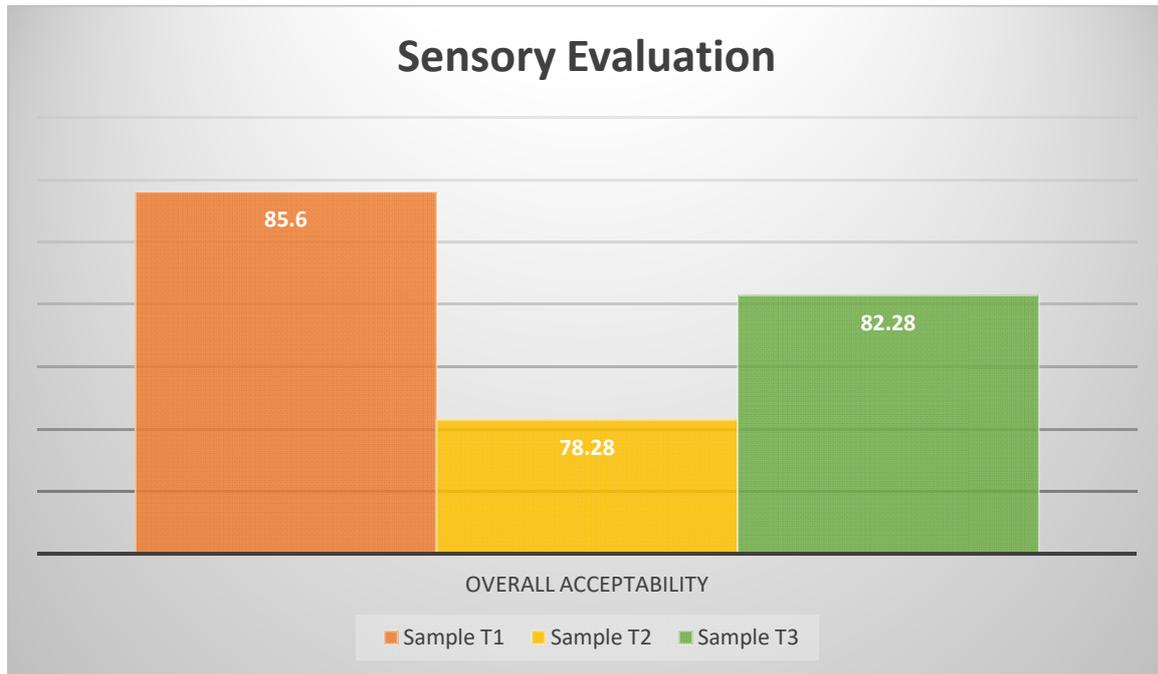


Fig-1 Sensory profile of vegan honey samplesFig-2 Sensory profile of vegan honey samples for overall acceptability

4. Discussion

The vegan honey samples T1-T3 for values of moisture content, ash content, titratable acidity, optical density, pH value and TSS are shown in Table1. Moisture content is ranging from 19-22 %. The control sample of honey is 19.59%, T1 sample is 19.56%, T2 sample is 22.11%, and T3 sample is 20.70% of moisture content.

Ash content of control sample is 1.463%, T1 sample is 1.81%, T2 sample is 2.963% and T3 sample is 2.913%. It's ranging from 1to3%.

Titratable acidity of honey is from 0 to 8.5 %. Where control sample is 0.51%, T1 sample is 4.200%, T2 sample is 8.36% and T3 sample is 6.233 %.

Optical Density of vegan honey is ranging from 0.36 to 3 in which control sample is 0.36, T1 sample is 1.260, T2 sample is 2.964 and T3 sample is 2.668

pH value of vegan honey sample is ranging from 3 to 4.5 pH where, control sample is 3.937, T1 sample is 4.243, T2 sample is 3.950 and T4 sample is 4.170 Ph.

TSS of vegan honey sample is between 80 to 85 % or °BRIX where, control sample is 80.50°Brix, T1 sample is 84.53°Brix, T2 sample is 82.47°Brix and T3 sample is 80.70°Brix.

Sensory evaluation of vegan honey samples –

The organoleptic evaluation of developed vegan honey samples were assessed by a panel of 20 semi- trained judge. The scores for sensory properties (colour, consistency, flavor, absence of defects and overall acceptability) by composite scoring test method of sensory evaluation .Its represented by Fig 1&2.

In composite scoring test method scoring is given out of 20 in colour, consistency and absence of defects whereas flavor is an important aspects in which scoring is given out of 40. By all this scoring evaluation overall acceptability is shown out of 100.

Its observed in Fig-1 colour score out of 20 for T1 sample is 17, T2 sample is 15, T3 sample is 16, score of consistency out of 20 for T1 sample is 17.2, T2 sample is 16.57, T3 sample is 16.75, score of flavor out of 40 for T1 sample is 35.4, T2 sample is 31.71, T3 sample is 33.71, score of absence of defects out of 20 for T1 sample is 16, T2 sample is 15, T3 sample is 16.

In Fig -2 overall acceptability for T1 sample is 85.6%, T2 sample is 78.28%, T3 sample is 82.28%.Which interprets that sample T1 (Apple-cinnamon honey) is having acceptability after that T3 (Grapes-ginger honey) sample is acceptable and at last T2 (Pineapple-arjuna tree bark honey) sample is having low acceptability than other two.

5. Conclusion

The development of vegan honey and its sensory evaluation is done to see overall acceptability as vegan and nutraceutical product. Vegan honey helps for normal people (non-vegan) as a nutraceutical product .The physico-chemical parameters analyzed were within the range of standard provided by FSSAI rules and regulation specification for honey and International Standard provided by Codex. Which represents that vegan honey has also similar properties of natural honey. Vegan honey is present in different flavor as per choice consumer can consume. Its nutraceutical health benefits can also help to select right types of vegan honey.

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