***Original Research Article***

**Effect of Horse Gram on Sensory attributes of Functional Greek Yoghurt**

**Abstract:**

The recent research study highlighted to formulate value-added functional horse gram based Greek yoghurt. Three levels of horse gram 2, 4 and 6 % were added to optimize the functional Greek Yoghurt product. The Greek yoghurt was prepared according to standard protocol. After being heated to 90˚ C for 5 minutes, followed by addition of Freeze-dried DVS Yoghurt culture was added at concentrations of 0.20 per cent and the product was then incubated at 45˚C for 4 hours. The product was further de-wheyed and blended with different levels of horse gram @ 2, 4, 6 per cent .The result revealed that the developed functional horse gram based functional Greek yoghurt when given for judges to adjudge the sensory attribute of the product based on 9-point hedonic scale .It was found that the best optimized level was 4% which received highest sensory acceptance.

Keywords: Greek yoghurt, Horse gram, Sensory attributes.

**Introduction**

Legumes as good sources of proteins, carbohydrates, several water-soluble vitamins, and minerals, in general they make major contribution to human nutrition. Horse gram (*Macrotyloma uniflorum*) has been recognised as potential sources of protein and other nutrients. Horse gram is largely cultivated, especially in dry areas of Australia, Burma, India and Srilanka, mainly for animal feed. It is also used as a vegetable in India and is known as the poor man’s pulse crop in southern India. Recently, health-promoting and disease-preventing properties have been attributed to these photochemical with antinutrient effects, thus attracting more and more interest from both researchers and food manufacturer’s. Horse gram has been reported to have a lot of medicinal value. The rich fibre content of horse gram helps in reducing the body fat in fast mode. It is believed that consuming horse gram makes our body strong and is also good in treating kidney stones, menstrual problems, obesity, and curing cough and cold (Joshi and Awasthi, 2020; Haripriya et al., 2017; Jayapriya and Parameshwari, 2017).

The seeds and sprouts of horse gram are excellent examples of ‘functional food’ as it has role in lowering the risk of various diseases and exerting health promoting effects in addition to its nutritive value. Horse gram seed contains carbohydrate (57.2%), protein (22%), dietary fibre (5.3%), fat (0.50%), calcium (287mg), phosphorous (311mg), iron (6.77mg) and calories (321 Kcal) as well as vitamins like thiamine (0.4mg), riboflavin (0.2mg) and niacin (1.5mg) per 100g of dry matter .Horse gram has excellent therapeutic properties and traditionally used to cure kidney stones, asthma, bronchitis, leucoderma, urinary discharges, heart diseases, piles etc. Besides, it also possesses anti-diabetic, anti-ulcer activity and also helps in dietary management of obesity due to the presence of beneficial bioactive compounds (Bhartiya *et al*., 2015).

Greek Yoghurt is defined as a semi-solid product derived from regular yoghurt by draining away part of its water and water-soluble components, mainly lactose and salt. The industrial methods for Greek Yoghurt production involve whey removal by mechanical procedures to achieve the desired level of solidity. As outlined in the Greek Codex Alimentarius, strained yoghurt is produced from full-fat yoghurt by partially removing whey. When made from cow or goat milk, it must contain at least 5.6% protein, while sheep milk- based yoghurt requires a minimum of 8%. The production of Greek Yoghurt builds on the conventional yoghurt-making is notable for its white appearance, smooth texture, and mildly tangy taste. It is predominantly made from cow&#39;s milk and involves bacterial fermentation *(Lactobacillus bulgaricus and Streptococcus thermophilus)* followed by whey removal from regular yoghurt to produce a thicker, creamier product with high solids content and a pronounced tangy flavour. In contrast, traditional greek yoghurt, a set-style variety, thickens naturally during fermentation without whey removal and can be made with cow, goat, or sheep milk. (Terpiłowski *et al*.,2023).

**Materials and Methodology**

The following materials were used in this research study for the preparation of functional Greek yoghurt.

**Milk**

Fresh Cow milk was procured from Students Experimental Dairy Plant (SEDP) of Dairy Science College, Hebbal, Bengaluru.

**Whey Protein Concentrate**

Good quality Whey protein concentrate was procured from Nutrilac,DKSH India pvt ltd.

**Starter Culture**

Good quality of freeze dried starter culture was procured from Delvo DSL pvt Ltd, Netherlands.

**Sensory Test Analyzed By Panel of Judges Using 9-Point Hedonic Scale**

The panel of trained judges that was chosen assessed the generated study sample's sensory attributes, such as color and appearance, body and texture, flavor, and overall acceptability, using a 9-point hedonic scale. Statistical analysis was conducted using the output with the highest score .

**Statistical Analysis**

Using R software (R. version 4.0.3), the data collected for the research investigations was examined to evaluate the significant or non-significant effects of various treatments and trials obtained for the current study. The mean and critical difference was calculated.

Fresh cow milk

(Fat-4.5 % & SNF- 9.0 %)

Heat treatment (90 ̊C/no hold)

Cooling to 45 ̊C

Addition of Whey Protein Concentrate (**5%**)

Addition of **0.30**% freeze dried DVS culture at 1:1

(*Streptococcus thermophilus* and *Lactobacillus bulgaricus*)

Incubation (45°C/ 4h)

De-wheying (cloth bag filtration at 4°C/overnight)

Addition of Horse gram Flour (2, 4 and **6%**)

Blending and Packaging in PET cups(100ml)

Cooling and storage (7±1°C)

Flow chart 1 : Study protocol

**Results and discussion**

**Effect of supplementation of Horse gram** (*Macrotyloma uniflorum*) **on sensory characteristics of Functional Greek Yoghurt**

The functional Greek Yoghurt was prepared which was further added with horse gram with supplementation rate at 2, 4, and 6 per cent. The effects of horse gram on sensory attributes of RTE food were evaluated and the results are reflected in Table 1. As the incorporation level of horse gram in the product increased, the product exhibited non-significant effect on colour appearance which ranged from 8.37 to 7.17 for 2-6 per cent levels of horse gram whereas the control possessed colour and appearance score of 8.33. The body and texture scores were also significantly decreased upon addition of horse gram and the scores awarded for 4 % were 8.40, and the control had 8.30 scores. The best body and texture score was awarded highest for 4 % horse gram which exhibited non-significant scores. The flavour scores too had an increasing score for formulated product. The scores allotted 8.28 for 4 per cent levels of horse gram, respectively. Thus, the results of the study inferred that the best product could be obtained by supplementing horse gram at 4 per cent.

As per the observations, there was no statistical difference for colour and appearance when horse gram was blended from 2 to 4 per cent product. However, body and texture, flavour and overall acceptability had the significant influence. Similar trend has also observed for flavour attribute as well. Highest score for flavour was observed for 4 per cent horse gram incorporated product which had a pleasant nutty flavour. The overall acceptability score for the formulated product was 8.27 which reflect that this suggests that horse gram which is neglected or under-utilized can be exploited in development of various food products formulations that could result in acceptable form. The findings correlates with Niharika and Verma, 2016 and Sawant *et al*., 2015 for developing value added products from horse gram which received overall acceptability scores of 8.5 and 8.10 respectively. Kanhed *et al* 2023 emphasized the same.

**Table 1: Effect of supplementation of Horse gram** (*Macrotyloma uniflorum*) **on sensory characteristics of Functional Greek Yoghurt**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Levels of Horse Gram (%)** | **Colour & Appearance** | **Body & Texture** | **Flavour** | **Overall  Acceptability** |
|  | **Scores on 9-point hedonic scale** | | | |
| Control | 8.33a | 8.30a | 8.32a | 8.33a |
| 2 | 8.37a | 8.30a | 8.31a | 8.31a |
| 4 | 8.80a | 8.40a | 8.28a | 8.27a |
| 6 | 7.17a | 7.67b | 7.09b | 7.90b |
| CD (*P =* .05) | 0.25 | 0.35 | 0.27 | 0.30 |

Note:

\* All values are average of three trails

Similar super scripts indicate non-significance at the corresponding critical difference (CD)

**Figure 1: Effect of supplementation of Horse gram** (*Macrotyloma uniflorum*) **on sensory characteristics of Functional Greek Yoghurt**

**Conclusion:** Greek Yoghurt is an excellent source of vital nutrients such as calcium, phosphorus, zinc, and magnesium moreover enriched yoghurt consist of vitamin A and D, riboflavin, folic acid, and vitamin B12 besides consists of plentiful nutritional components and also probiotics which help to balance gut bacteria and prevent stomach problems for the human body. The Nutririch legume horse gram was used to develop functional Greek Yoghurt. Such developed product was subjected to sensory tests. In concord to the result, 4 per cent horse was best suited for the formulations. The developed product not helps in utilizing the under-utilized legume but also adds value to the function Greek yoghurt.

**References:**

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**ANNEXURE**

**DAIRY SCIENCE COLLEGE, KVAFSU, BENGALURU-24**

**DEPARTMENT OF DAIRY TECHNOLOGY**

**Score card for Sensory Evaluation Using 9-Point Hedonic Scale**

**Name of the Judge: Date:**

You are requested to assess the product in terms of general acceptability on a 9-point hedonic scale score system.

**score system:**

Like extremely 9

Like very much 8

Like moderately 7

Like slightly 6

Neither like nor dislike 5

Dislike slightly 4

Dislike moderately 3

Dislike very much 2

Dislike extremely 1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sensory Characteristics** | **Sample Code** | | | | | |
|  |  |  |  |  |  |
| Color and Appearance |  |  |  |  |  |  |
| Body and Texture |  |  |  |  |  |  |
| Flavour |  |  |  |  |  |  |
| Overall Acceptability |  |  |  |  |  |  |

**Comments: Signature**