

SENSORY EVALUATION OF HORSE GRAM (*MACROTYLOMA UNIFLORUM*) FORTIFIED COW MILK

G.M. Sivakumar*

*Associate Professor, Department of Livestock Farm Complex
Veterinary College and Research Institute, Tirunelveli- 627 358
Tamil Nadu Veterinary and Animal Sciences University
E-mail: drshiva06@gmail.com (*Corresponding author)

Abstract: A study was conducted to develop horse gram fortified cow milk using horse gram extract. Horse gram (*Macrotyloma uniflorum*) occupies an important place in human nutrition and has rich source of protein, minerals, and vitamins. Besides nutritional importance, it has been linked to reduced risk of various diseases due to presence of non-nutritive bioactive substances. Proximate composition of horse gram extract was found to be fat 0.25 grams %, fibre 0.80 grams %, protein 3.64 grams % and carbohydrate 3.19 grams %. Pasteurised cow milk was blended with horse gram extract at 30,40,50,60, 70 percent levels and subjected to sensory evaluation. On sensory evaluation it was found that milk with horse gram extract at 40 percent level was found to be acceptable based on colour and appearance, flavour, taste and consistency scores.

Keywords: Horse gram, fortified milk, sensory evaluation.

Introduction

Horse gram is an underutilized pulse crop grown in wide range of adverse climatic conditions. It occupies an important place in human nutrition and has rich source of protein, minerals, and vitamins. Besides nutritional importance, it has been linked to reduced risk of various diseases due to presence of non-nutritive bioactive substances. Raw horse gram seeds have been used by economically disadvantaged people in tropical countries as cheap source of protein. Raw horse gram seed is a rich source of polyphenols, flavonoids and protein. It also possesses potent properties to scavenge free radicals and the ability to reduce starch-induced postprandial glycaemic excursions by virtue of potent intestinal α -glucosidase inhibitory activity (Ashok kumar *et al.*,2013). Furthermore, consumption of raw horse gram seeds can also reduce insulin resistance by inhibiting protein-tyrosine phosphatase 1 beta enzyme. The antioxidant activities were found to be concentrated more in the seed coat of the seeds. In addition, sprouting significantly decreased intestinal α -glucosidase and protein-tyrosine phosphatase 1 beta inhibitory activities. These observations suggest that consumption of food items prepared with unprocessed raw horse gram seeds may have more

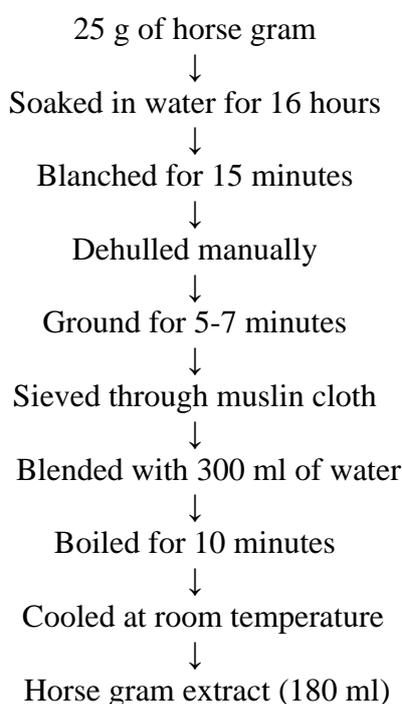
health benefits than their sprouts for hyperglycaemic individuals. Some research have proven horse gram extracts has a antiobesity ability (Bhuvneshwari *et al.*, 2014).

Milk is the largest consumed liquid dairy product all over the world due to its palatability, nutritious value and easy availability (Praveen Kumar and Shakeel, 2017). Fortification of milk with horse gram extracts increase the nutritional value and has more health benefits. Horse gram fortified milk will have more commercial reach to people all over the world. In the present study cow milk was fortified with horse gram extract and sensory analysis carried out.

Materials and methods

The present work was carried out in the Model Dairy Plant, Department of Livestock Products Technology (Dairy Science), Madras Veterinary College, Tamil Nadu Veterinary and Animal Sciences University, Chennai - 600 007. Pasteurized cow milk was obtained from the Model Dairy Plant, Department of Dairy Science, Madras Veterinary College. The milk from dairy plant was used for the preparation of horse gram (*Macrotyloma uniflorum*) extract fortified milk. Fresh and clean horse gram (*Macrotyloma uniflorum*) seeds were purchased from local market; Chennai was used as a source of horse gram extract in this study. Horse gram extract was prepared according to the procedure described by Preeti verma *et al.*, (2014) as shown in Fig.-1

Figure -1 Schematic representation of steps in preparation of Horse gram extract



The horse gram extract was analysed for moisture, fat, protein, carbohydrate, ash, crude fibre and tannin. Carbohydrate was determined by the difference. All determination was carried out using standard procedures (AOAC, 2000). The analytical values were evaluated from the mean of three determination of the sample.

Fortification of cow milk with horse gram extract

The cow milk was fortified with horse gram extract at 30,40,50,60, 70 percent levels as shown in Table -1, therefore the best proportion was selected from based on the sensory test. The cow milk was kept as control whose fat content was 3.5 percent and Solids not fat was 8.5 percent.

Table -1 Fortification of cow milk with horse gram extract

Samples	Milk %	Horse gram extract %
Control	100	-
S1	70	30
S2	60	40
S3	50	50
S4	40	60
S5	30	70

The sensory evaluation for the different proportions of the horse gram extract fortified milk were carried out by a semi trained panel of judges using 9 point hedonic scale as described by (Hue,1993). The values were then tabulated and the results were interpreted accordingly. Based on the sensory evaluation, the best proportion of horse gram extract fortified milk was selected for the analysis.

Results and Discussion

Table -1 shows the proximate composition of horse gram extract in which the fat percent was 0.25 grams percent, fibre 0.80 grams percent and protein and carbohydrate was 3.64 and 3.19 grams percent respectively.

Table -2 shows the sensory evaluation scores of the control and horse gram fortified milk samples (S1, S2, S3, S4, S5) using 9 – point hedonic scale

COLOUR AND APPEARANCE

The colour and appearance of Control, S2, S3 and S4 was almost similar and they gained a score of 8.08 ± 0.27 , 8.33 ± 0.17 , 8.33 ± 0.17 and 8.08 ± 0.27 of which S2 and S3 were ranked

highest among the variations. S1 and S5 gained a score of 7.08 ± 0.27 and 7.00 ± 0.37 for colour and appearance which was ranked lowest among the variations. Highly significant difference ($P \leq 0.01$) was found between the treatments. The colour and appearance of the samples S2 and S3 was more liked by the panellists.

TASTE

The control and sample S2 had gained a similar score of 8.58 ± 0.20 and 8.58 ± 0.15 for its taste which was ranked the highest among the variations. This was due to addition of 40 percent horse gram extract to the milk which blended completely with the milk.

FLAVOUR

The flavour score of S2 was 8.50 ± 0.18 and it was ranked the highest among the variations. Highly significant difference ($P \leq 0.01$) was found between the treatments. The flavor of sample S2 was more liked than the flavours of other samples among the panelists because of the light odour and taste of horse gram. Jothylingam and Pugazhenthii (2013) reported that low calorie herbal flavoured milk with 5 percent of aloe vera extract was most acceptable based on sensory evaluation.

CONSISTENCY

The consistency score of the samples S1, S2, S3, S4 was almost similar and obtained a score of 7 and above among the variations. The control sample has a score of 8.00 ± 0.29 . The consistency scores of 70 percent horse gram extract fortified milk was lowest at 6.42 ± 0.20 . This shows that higher level of addition of horse gram extract in milk showed a lower consistency score. This is in accordance with the observations made by Riberio et al 2014 that mango and papaya flavour formulation containing 62.7 percent soy extract based beverage was found to be good at consistency. Hence sample S2 of 40 percent addition of horse gram extract was found to be acceptable.

OVERALL ACCEPTABILITY

The overall acceptability score for control and sample S2 was similar when compared to the other variations. The score for other samples were lower when compared to control and S2. This showed horse gram extract fortified milk with 40 percent level was liked by the panelist than the other samples

Conclusion

In this study cow milk was fortified with the horse gram extract and subjected to sensory evaluation. Based on the sensory evaluation it was found that horse gram fortified milk with 40 percent horse gram extract (S2) was found to be more acceptable by the panellist than the

other samples. The milk developed can be used as diet for obese and fat conscious people because horse gram exerts antiobesity properties.

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Table -2 Proximate composition of HGE:

Constituents	Level
Moisture (g%)	91.99
Ash (g%)	0.13
Fat (g%)	0.25
Fibre (g%)	0.80
Protein (g%)	3.64
Carbohydrates (g%)	3.19
Tannins (mg%)	0.05

Table -3 Sensory evaluation of Horse gram extract fortified cow milk

Samples	Colour & Appearance	Taste	Flavour	Consistency	Overall Acceptability
Control	8.08±0.27	8.58±0.20	8.00 ±0.22	8.00±0.29	8.17±0.28
S ₁	7.08±0.27	7.58±0.20	8.08±0.20	7.00±0.37	7.58±0.27
S ₂	8.33±0.17	8.58±0.15	8.50±0.18	7.33±0.17	8.17±0.31
S ₃	8.33±0.17	6.50±0.22	8.00±0.26	7.20±0.21	7.20±0.31
S ₄	8.08±0.27	7.40±0.20	6.91±0.24	7.17±0.28	7.16±0.38
S ₅	7.00±0.37	6.35±0.21	8.00±0.34	6.42±0.20	6.50±0.18
F value	9.79**	23.72**	4.58**	3.87**	4.88**