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Preparation and Food Product Development From *Macrotyloma Uniflorum* (Horse Gram) Bovine Milk Blends

KEYWORDS: Horse gram extract, Macrotyloma uniflorum, Underutilized crops.

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ABSTRACT *Horse gram (Macrotyloma uniflorum) is one of the inexpensive sources of protein, calcium and iron. The present study, aimed at developing horse gram extract-bovine milk blends (HEBMB), encompassed three phases. The first phase involved preparation of horse gram extract (HGE) using household processing steps, the second phase comprised analysis of proximate, minerals (calcium and iron) and antinutrients (tannins and total phenol) of HGE. The final phase involved blending of HGE with bovine milk (BM) in different ratios (40:60, 50:50 and 60:40) and developing milk based products (kulfi, papaya shake and kadhi) from them. Results of the study revealed that HGE contained 91.99 g moisture, 3.64 g protein, 0.25 g fat, 0.80 g crude fibre, 0.13 g ash and 3.19 g carbohydrates per 100 ml. Sensory evaluation of products, on the basis of 9-point hedonic scale, revealed that all the variants of the various products prepared were acceptable.*

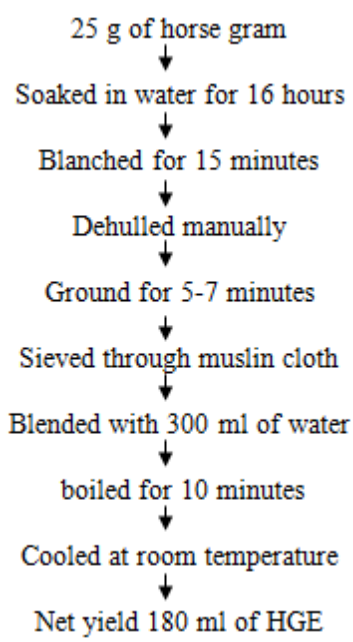
Introduction:

Recently the under-utilized legume seeds have received attention as an alternative protein source all around the world (Doss et al. 2010). Among underutilized legumes, horse gram (Macrotyloma uniflorum) is one of the lesser known legumes. It is also known Kulthi (Mishra and Pathan 2011). It is extensively cultivated in Australia, Burma, India and Sri Lanka. It is rich in protein (22%), calcium (289mg/100g), iron and molybdenum (Prakash et al. 2008). It also has high content of lysine, an essential amino acid (Virk et al. 2006). It is rich in vitamins such as carotenes, thiamine, riboflavin and niacin (Sodani et al. 2004). Horse gram is famous for its medicinal uses for the treatment of heart condition, asthma, bronchitis, leucoderma, tumor urinary discharge and treatment of kidney stones (Ghani, 2003). It also cures cough, leucorrhoea, menstrual disorder, indigestion and breathing problems. Nutritional value of horse gram may be adversely affected by the presence of antinutritional substances like protease inhibitors, hemagglutinins, tannins, flatulence causing factors and polyphenols. These substances reduce the nutritive value of foods. Processing like dehulling, soaking and cooking plays an important role in improving nutritive value of horsegram (Jain et al. 2009). In this research work, HGE was prepared using household processing methods. Thereafter proximate principle, mineral analysis (iron and calcium) and antinutrient (total phenol and tannins) analysis of HGE were carried out. HGE was blended with BM to prepared milk based products. Thus the challenge was to prepare acceptable products (kulfi, papaya shake and kadhi) from HEBMB.

Methodology:

Procurement of Horse gram: Certified variety (AK-21) of horse gram was procured from Indian Institute of Pulses Research Centre, Durgapura (Jaipur). The grains were sun-dried, cleaned manually and stored in airtight containers at ambient temperature until use.

Preparation of HGE: HGE was prepared according to the procedure for soybean milk described by Gesinde et al. (2008) with some modification.



Nutrient and antinutrient analysis: Moisture, ash and crude fibre of HGE were determined by AOAC (2000) method. Crude protein and crude fat were determined by the Micro-Kjeldahl and Soxhlet extraction method respectively. Total crude carbohydrates were obtained by difference method. Calcium and iron were estimated by following the AOAC (2000) method. Total phenols and condensed tannins were done following the procedure of Singleton and Slinkard (1977) and Xu and Chang (2007) with some modifications.

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HEBMB, Food Product Development and statistical analysis: This phase involved blending of HGE with BM at different ratio (HGE: BM, 40:60, 50:50 and 60:40) (table 1) and developing milk based products (kulfi, papaya shake and kadhi) from them; prepared three variants of each recipe i.e., standard, variant A, variant B and variant C. Food products were developed after laboratory standardization and their composition is shown in table no 2, 3 and 4. Standard, the traditional recipe, and three variants A, B, C were prepared by incorporating HEBMB at the ratios 40:60, 50:50 and 60:40 respectively. The sensory evaluation of recipes was carried out by using 9-point Hedonic rating scale through 15 semi-trained panel members selected by triangle difference test. In statistical analysis mean and standard deviation were calculated.

Results and discussion:

Nutrient and antinutrient analysis of HGE: Protein content of HGE was found to be 3.64/100ml while carbohydrate content was 3.19/100ml. Moisture, fat, fibre, ash, calcium and iron have been found to be 91.99g/100ml, 0.25g/100ml, 0.80 g/100ml, 0.13g/100ml, 6.68mg/100ml and 3.72mg/100ml respectively as shown in the table (5). Yadav et al. (2003) prepared soybean milk using household processing steps and gave the value as moisture (90.5%), ash (0.48%), fat (2.0%), protein (3.12%) and carbohydrates (3.90%) which are near to HGE except fat. This is because soybean has higher amount of fat than horse gram.

Sensory evaluation of products (kulfi, papaya shake and kadhi): Sensory evaluation of kulfi revealed that all the variants were found to be highly acceptable (figure 1). Overall acceptability analysis of papaya shake variants revealed that all the variants (variant A, variant B as well as standard) were liked very much whereas variant C was liked moderately (figure 2). When all the variants of kadhi were analyzed in comparison with standard, variant A was found near to standard followed by variant B and variant C respectively (figure 3). Bhokre et al. (2012) prepared buns fortified with germinated horse gram flour (HGF). Their results revealed that incorporation up to 15% of germinated HGF in buns was found to be acceptable. Thirukkumar and Sindumathi (2014) prepared chappathi incorporated with processed HGF; the results revealed that chappathi prepared from wheat flour incorporated with 10 % soaked and dried or 15% roasted HGF was highly acceptable.

Conclusions:

The whole seed of horse gram has been utilized as a cattle feed mainly due to lack of processing. Being a cheap source of protein, minerals, polyphenols and flavonoids, it has a potential to can serve a health augmenting effect. On the basis of products developed it becomes pertinent that HGE can be used for preparing HEBMB for milk based products.

Table no. 1 Percentage of HEBMB

Variants	HGE (%)	BM (%)
S	-	100
A	40	60
B	50	50
C	60	40

Table no. 2 Composition of kulfi

Ingredients	Standard (g)/100g	Variant A (g)/100g	Variant B (g)/100g	Variant C (g)/100g
Milk	350 ml	350 ml	350 ml	350 ml
Sugar	20	20	20	20
Custard powder	15	15	15	15
Cardamom powder	1 pinch	1 pinch	1 pinch	1 pinch

Table no. 3 Composition of papaya shake

Ingredients	Standard (g)/100g	Variant A (g)/100g	Variant B (g)/100g	Variant C (g)/100g
Milk	150 ml	150 ml	150 ml	150 ml
Papaya	30	30	30	30
Sugar	15	15	15	15

Table no. 4 Composition of kadhi

Ingredients	Standard (g)/100g	Variant A (g)/100g	Variant B (g)/100g	Variant C (g)/100g
Curd	100	100	100	100
Besan	30	30	30	30
Salt	To taste	To taste	To taste	To taste
Turmeric powder	¼ teaspoon	¼ teaspoon	¼ teaspoon	¼ teaspoon
Water	400 ml	400 ml	400 ml	400 ml

Table no. 5 Nutrient and antinutrient analysis of HGE

Moisture (g%)	91.99
Ash (g%)	0.13
Fat (g%)	0.25
Fibre (g%)	0.80
Protein (g%)	3.64
Carbohydrates (g%)	3.19
Iron (mg%)	0.92
Calcium (mg%)	6.68
Total phenols (mg%)	0.40
Condensed tannins (mg%)	0.05

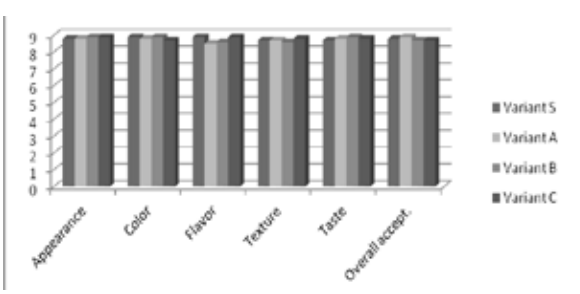

Figure no. 1 Acceptability evaluation of kulfi with different variants

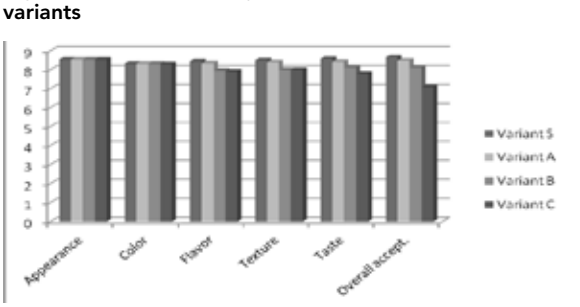

Figure no. 2 Acceptability evaluation of papaya shake with different variants

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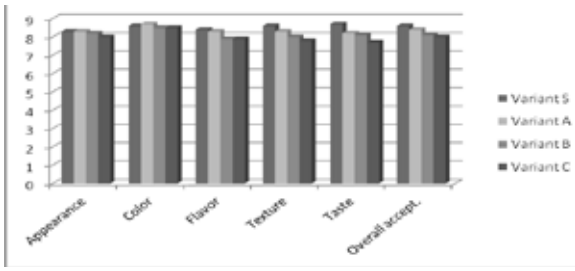

Figure no. 3 Acceptability evaluation of kadhi with different variants

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