Development & Standardization of Plant Based Meat Patties Using Green Gram

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Abstract : *This study is to develop vegan patties (plant based patty) which potentially act as a meat alternative and to determine the impact of green gram as a meat substitute at various formulations, with the proximate analysis (physicochemical properties) and sensory characteristic. The five different formulations (P1, P2, P3, P4, P5) of green gram is used as an alternative of meat where sample (P1) is used as a control sample. By the proximate and sensory analysis, the sample (P2) is having superior organoleptic qualities followed by samples (P3, P4). The sample (P2) contains 32.9% of moisture, 20.4% protein, 3% of ash content. Therefore, the Sample (P2) is accepted for developing the plant based patties with the better sensory attributes compared to other samples and having a proper combination of green gram, soya chunk powder and raw jack fruit powder whereas (P5) is not accepted for preparation of patty due to lack of texture.*
Keywords: *Plant based patties, Green gram*

1. INTRODUCTION

Plant based meat are the products which stimulate the properties of the meat which alter the meat functionally that resembles nearly to the nutritive properties, sensory attributes, favorable health impacts of the alternatives (Bhushette et al., 2022). On average 6Kg of plant protein is required for 1Kg of meat protein (Dekkers et al., 2018). Several techniques have been developed to assist the consumers in reducing their meat consumption which includes plant based meat extenders which act as fillers in processed meat to reduce the meat consumption and development of structured products (Dekkers et al., 2018).

Vegan food has less greenhouse gases (GHG) than animal foods. 25%- 55% of GHG emission can be reduced by Vegan foods. Than ruminant meat the legume production reduces the emission of GHG by 250 times. Vegan foods can reduce heart diseases, type 2 diabetes & strokes. According to WHO's International Agency for research on Cancer proved processed meat is carcinogenic (He et al., 2020).

There are many plant based proteins for producing meat patties like TVP/Soy, wheat/pea protein or mix is used. The main ingredients which are mostly used are tofu, temph and Seitan (He et al., 2020). For increasing texture and appearance, non-meat components have also been employed as emulsifiers, nevertheless, they must be assessed for stability, yield, textural flavor, and price.

Legumes are regarded as good providers of high-quality protein(Morbos et al., 2019). There is rising interest globally in using legumes as meat alternatives since they are sources of protein, complex carbs, and nutritional fiber.

Green gram (Mung beans), the most widely grown legume in Eastern Visayas, have the most potential of any legume because they are not only a high-quality protein source,

but they are also easily accessible and the least expensive of all plant protein sources (Morbos et al., 2019). It is having high protein content of 22.5% (Nimkar & Chattopadhyay, 2001).

The soaked & ground green gram is the main ingredient used as a meat alternative, with combination of other ingredients like soya chunk powder and raw jack fruit powder. These ingredients are used as binders, stabilizers & even act as meat alternatives. In terms of texture and characteristics, jackfruits are similar to meat and are preferred by vegan consumers (Bhushette et al., 2022). Jackfruit is having high fiber content & act as antioxidant. To make a product stiffer or softer, or to give it the desired quality, texture, binding capacity and amount of chewiness, texturized vegetable proteins (TVP) are frequently utilized (Joshi & Kumar, 2015). This soy chunks made by using soy concentrate. It contains a protein called beta-conglycinin.

This study was conducted to analyze the effects of using ground and soaked green gram as a meat extender on the qualities and consumer acceptability of burger patties. It sought to determine the impact of various amounts of green gram, soya chunks & jack fruit rind powder.
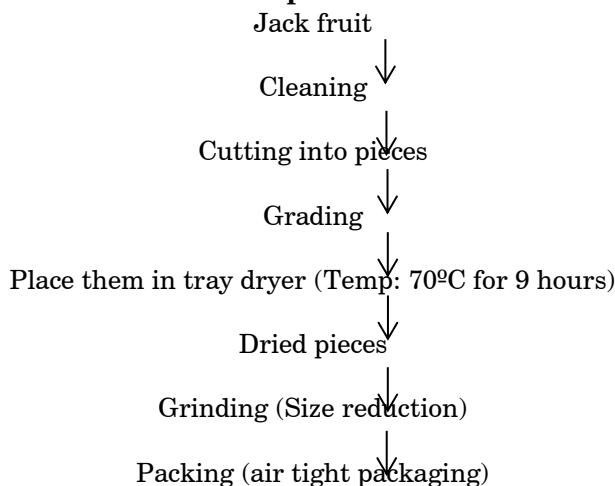
2. MATERIALS & METHODS

2.1 Materials/ Ingredients required

The ingredients which are used for preparing vegan patties are; seeds of mung bean, soya chunks, jack fruit rind and other ingredients, such as salt, garlic, monosodium glutamate, black pepper, sunflower oil.

2.2 Processing of Ingredients

The green gram of required quantity is soaked in water for 6 hours, later drain the water from it and let it stand for some time for complete removal of water from them. Later grind them in mixer where green gram paste occurs. The soy chunks of required quantity are taken and grinded for powder formation. Later the raw jack fruit powder is prepared.

2.2.1 Preparation of Raw Jackfruit powder

Jack fruit

↓

Cleaning

↓

Cutting into pieces

↓

Grading

↓

Place them in tray dryer (Temp: 70ºC for 9 hours)

↓

Dried pieces

↓

Grinding (Size reduction)

↓

Packing (air tight packaging)

Flowchart 2.2.1: Preparation of Raw Jack fruit powde
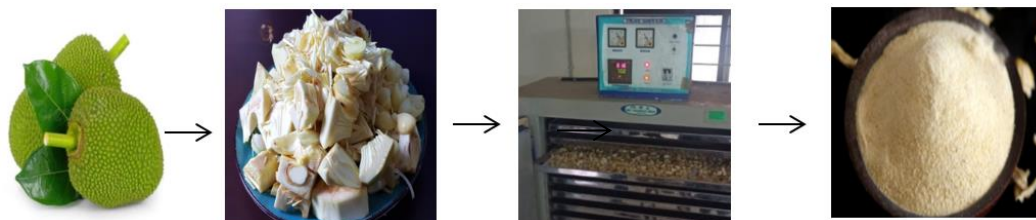
Figure 2.2.1.1: Preparation of Raw Jack fruit powder
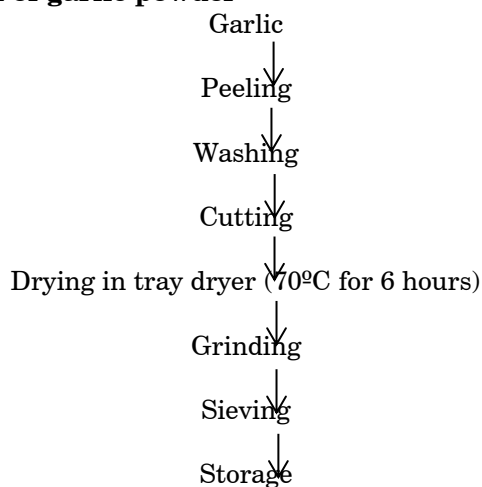
2.2.2 Preparation of garlic powder

Garlic

↓

Peeling

↓

Washing

↓

Cutting

↓

Drying in tray dryer (70ºC for 6 hours)

↓

Grinding

↓

Sieving

↓

Storage

Figure 2.2.2: Preparation of Garlic powder

2.3 Formulations of patties:
2.4

Ingredients	P1 (100%)	P2 (80%)	P3 (70%)	P4 (60%)	P5 (50%)
Green Gram	74.90	59.92	52.43	44.94	37.45
Soya Chunks Powder	-	14.98	22.47	29.96	37.45
Raw Jack fruit Powder	10.0	10.0	10.0	10.0	10.0
Garlic Powder	3.0	3.0	3.0	3.0	3.0
Pepper Powder	2.5	2.5	2.5	2.5	2.5
Salt	2.0	2.0	2.0	2.0	2.0
Sunflower Oil	7.1	7.1	7.1	7.1	7.1
MSG	0.5	0.5	0.5	0.5	0.5

Table 2.3: Formulations of the Patties

P3 (70%)

P4 (60%)
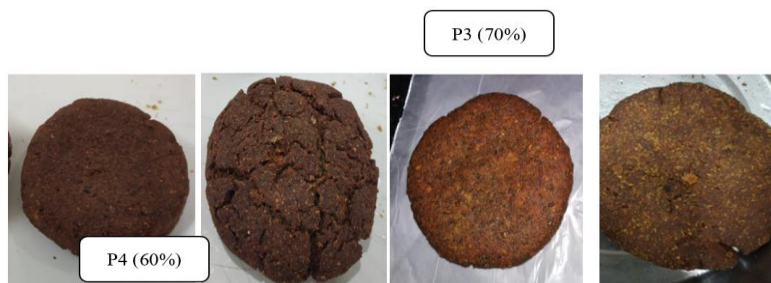
Figure 2.3.1: Preparation of vegan patties

2.5 Preparations of the Vegan Patties:

The burger patties were made using green gram, soya chunk powder, and jackfruit rind powder at five inclusion levels. We need to take required quantity of green gram and soak them in water for 6 hours; later water was drained out and let them stand for some time to complete removal of water. Blend the green gram into paste. Now add all the additional components, such curing mix (salt, water), binder (oil, soya chunk powder and jack fruit powder) and seasoning (garlic powder, black pepper powder, MSG) were added to the various treatments in a constant amount after being mixed together. All these were added into the green gram paste and mix thoroughly without any lump formation. The dough is now molded into patties manually by a cylindrical molder. These are fried in the oil to form a finished product i.e is patty.

Green gram
↓
Soaking for 6 hours
↓
Water draining
↓
Blending to paste
↓
Add Soya chunk powder & jack fruit rind powder
↓
Mix well
↓
Add seasonings, binders to the mixture
↓
Mix it thoroughly without any lump formations
↓
Dough formation
↓
Mould into patties
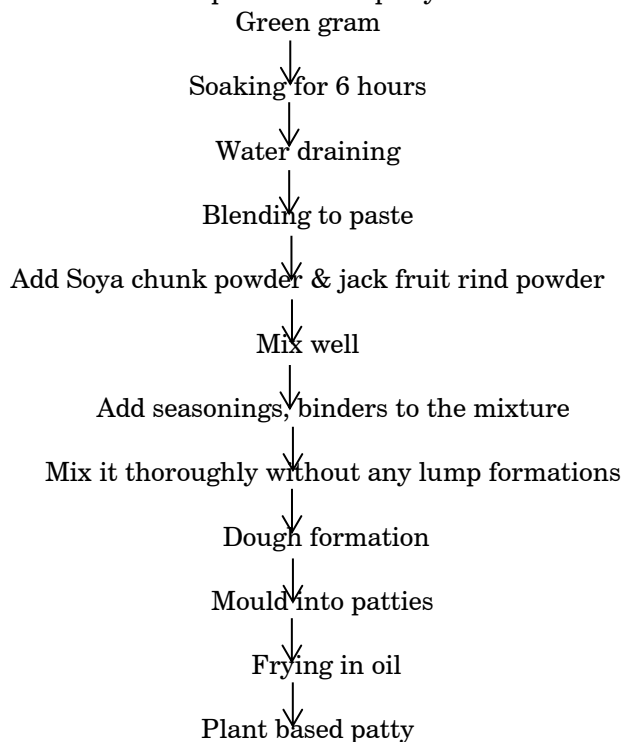↓
Frying in oil
↓
Plant based patty

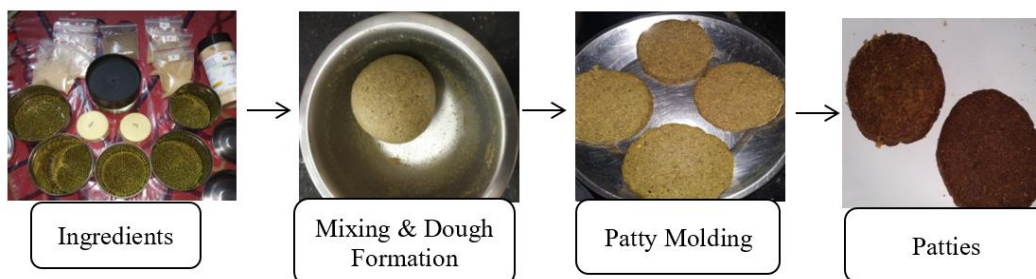Figure.2.4: Flowchart for preparation of Plant based Patties

Figure 2.4.1: Preparation of vegan patties

2. 5 Methods

To test the quality value, a series of methods are used. These are of two types: Physico-chemical analysis and sensory analysis. Physico-chemical analysis includes moisture content, estimation of proteins, ash content, and fat content. Moisture content of the product is estimated using hot air oven method which is an AOAC method of analysis. Protein content is calculated using Kjeldahl method of acid digestion using sulphuric acid (AACC) (S.Sadasivam, A.Manickam, 2008). Ash content is determined using dry ashing method (AOAC method). Organoleptic analysis is the sensory characteristics of the product using 9 points Hedonic scale .

## 3. RESULTS AND DISCUSSION
3.1 Data for Sensory Evaluation

The sensory evaluation is carried out with a team of 20 semi trained panel members. The evaluation procedure is carried out using 9 point hedonic scale in which attributes like color, appearance, taste, texture, flavor and the product's general acceptability, scores are given by each panel member.

Table 3.1 Data for sensory evaluation

Attributes	S1(control)	S2	S3	S4	S5
Colour	7.5	8.0	7.0	7.0	6.5
Appearance	7.5	8.0	7.5	6.5	7.0
Taste	7.6	8.2	7.0	7.3	7.0
Texture	7.0	8.2	7.0	7.1	6.5
Flavour	7.6	8.0	7.2	7.0	6.0
Overall Acceptability	7.5	8.5	7.3	7.0	6.5
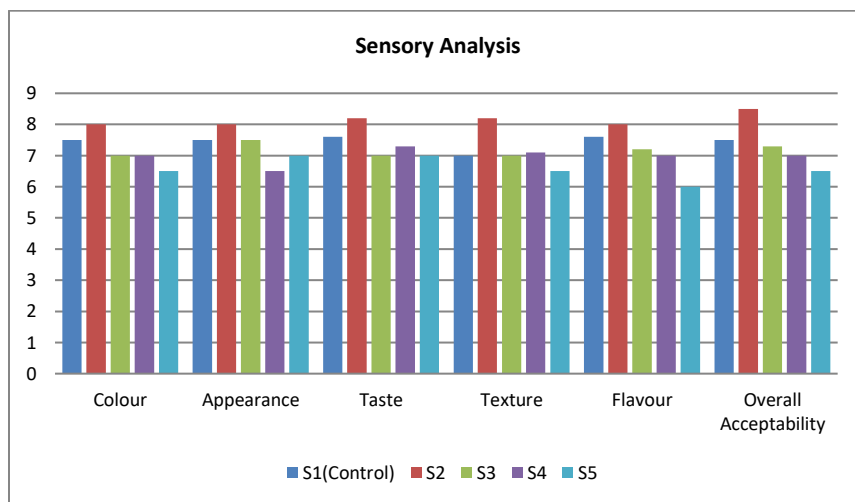
Graph 3.1.1: Sensory Analysis of the patties
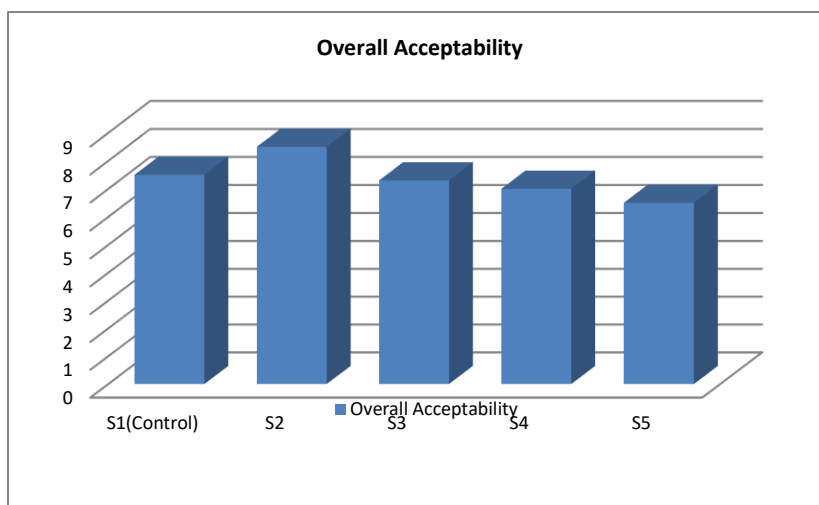
Graph 3.1.2: Overall acceptability of the product

The above graph shows that the Sensory Evaluation of the vegan/ plant based meat patty, where the sample S2 is having overall acceptability when compared with other samples.

3.2 Proximate Analysis of the Vegan meat patties:

S.No	Parameters	Control Sample (P1)	Accepted Sample (P2)
1	Moisture content	38.5	32.9
2	Ash content	4.0	3.0
3	Fat analysis	11.4	9.60
4	Protein Analysis	16.5	20.4

Table 3.2 proximate analysis of patties

From the proximate analysis accepted sample (S2) has the less moisture content, ash content and fat content compared to control sample (S1). The protein content is more compared with the control sample. So by the result, S2 sample is accepted and desirable for preparing plant based meat patties followed by S3, S4. The sample S5 is not accepted due to lack of texture, as it requires the additional binders for formation of patty.

4. SUMMARY AND CONCLUSION

The present study was conducted on "Development and standardization of plant based meat patties using green gram". The preparation of this vegan patties which includes ingredients like green gram, soya chunk powder, raw jack fruit powder, garlic powder, salt, MSG, oil, pepper powder in different proportions. Organoleptic analysis is carried out. From the results sample P2 has superior organoleptic qualities compared to other samples.

The sample (P2) is having good organoleptic properties and good overall acceptability compared to the control sample (P1). The sample (P1) is not desirable due to more moisture content and less protein value compared to sample (P2). The sample (P5) is not accepted due to lack of texture formation of the patty.

5. REFERENCES

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