HYBRID BURGERS BASED ON BEEF AND TEXTURIZED VEGETABLE PROTEINS

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I. INTRODUCTION

Meat and meat products are one of the most important sources of protein in the diet. The global population is growing, such that by 2050, it is estimated to exceed ~ 9 billion. While most of this expansion in population is expected to occur in developing countries, in high-income countries there are also predicted changes in demographics, with major increases in the number of older people, who have a greater requirement for protein. With a larger and older population, global needs for protein are set to increase [1]. The use of alternative sources of proteins that are not competing with meat production can be used to design hybrid meat products that can contribute to cover the new demand of protein. The combined use of meat and vegetable proteins is not something new. Since some decades ago, soya texturized protein has already been added in many meat products.

Another current problem is the loss of biodiversity due to the use of few crops (e.g., soya). There are some orphan crops that are been pushed to increase the biodiversity throw a European project (Cropdiva). One way to valorize these crops is to use texturized proteins obtained from these crops in hybrid meat products.

The aim of this study was to design and evaluate hybrid burgers by combining beef with different texturized vegetable proteins (TVP): soya (TEXPRO-M, Bankom Ltd) (S-TVP), lupin (Elementa Foods) (L-TVP), faba:pea (20:80, Trades) (FP-TVP) and pea (Nutralys T70S, Roquette) (P-TVP). An additional formulation with pea (P-TVP2) was used to study the use of a radish-based colorant (Shade Veggie Red, Exberry).

II. MATERIALS AND METHODS

Beef meat was minced and divided in five batches to prepare five formulations with similar contents of water (70%) and protein (18%), 50% of protein coming from TVPs, which were estimated from ingredients composition. The ingredients with common contents (g/kg) in the five batches were: breadcrumbs (37), salt (16), dextrose (1), white pepper (1), sodium sulfite (0.7), ascorbic acid (0.4), sodium ascorbate (0.3) and cochineal 4% (0.15). An additional batch was used to prepare a reference beef burger, with 880 g of beef, 60 g of water and the same formulation for the rest of ingredients. Table 1 shows the ingredients with different contents. The TVPs were previously hydrated with water in a water:TVP proportion of 2:1. The rest of water was added during the kneading of ingredients.

Table 1 – Ingredients with different addition to the different hybrid burgers (g/kg) and protein content of each TVP.

	Batch					
Ingredients (g/kg):	**Beef**	**S-TVP**	**L-TVP**	**PF-TVP**	**P-TVP**	**P-TVP2**
Beef	880	411	419	417	391	393
TVP	0	169	153	159	149	150
Water	60	363	371	367	403	385
Radish based colorant	0	0.8	0.8	0.8	1.6	16
TVP protein content (%)		51	56	54	65	65

Burgers were individually packed in a modified atmosphere (O_2/CO_2 gas mixture of 70/30) and stored at 4 ± 0.8°C exposed to 10 h lightness/14 h darkness cycles (LED tube T5 meat, PROMOLUX) with

an average intensity of 1000 lux. Visual appearance was evaluated just before packaging (day 0) and after 4 days of storage (before and after cooking). At day 4, burgers were unpacked and wrapped in aluminum foil. Then they were cooked in a pre-heated oven (SCC101, Rational) at 200 ºC until a core temperature of 69 ºC was achieved. Sensory analysis was carried out by 4 panelists, expert and trained on meat burgers according to ISO 8586:2023. Attributes and intensities were agreed-on the description of the hybrid burgers by consensus in two sessions. Attributes: characteristic non-meat odor and taste, sweetness, bitterness, springiness, crumbliness, juiciness and astringency.

III. RESULTS AND DISCUSSION

The raw hybrid burgers are more like a pork burger than a beef burger (Figure 1). The use of radish-based colorant at high dose gives the burger a more beef-like appearance after 4 days, but the color after cooking is too purple.

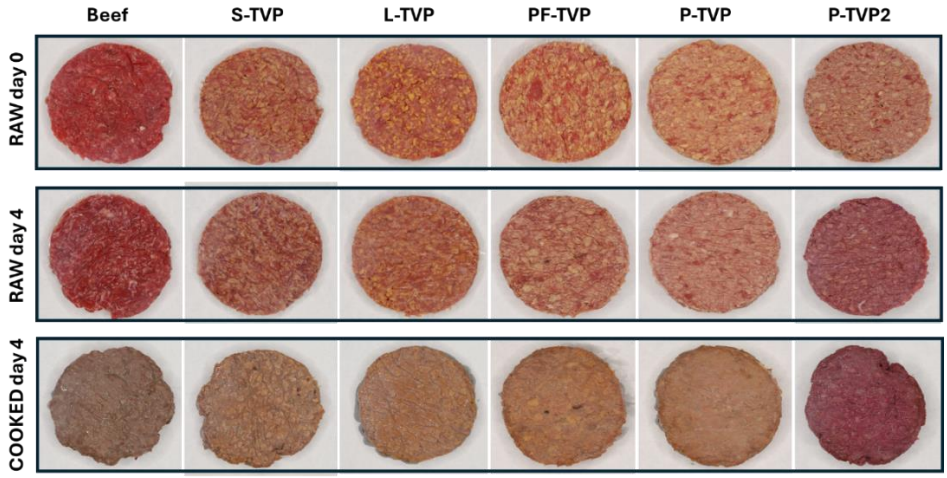

Figure 1. Burgers with different formulations: raw (days 0 and 4) and cooked (day 4)

TVP burgers had a specific smell and taste related to the plant origin of the added TVP (soya, lupin, fava or pea). In the FP-TVP, the fava flavor dominated over the pea flavor. Sensorially, P-TVP was the most neutral. All samples showed a satisfactory binding between the ingredients. In terms of texture, all TVP samples were scored with higher crumbliness, less springiness and similar juiciness than those of beef burgers. The S-TVP samples were slightly sweet and the L-TVP slightly bitter. All TVP samples had a final sensation of astringency but were not unpleasant.

IV. CONCLUSION

The hybrid burgers had a similar texture to the beef burgers, but each one had a specific odor and flavor (not unpleasant) according to the TVP added, being more neutral when the P-TVP was used. In terms of color, the TVP burgers looked more like a pork burger than a beef one. The radish-based colorant can be useful to confer a color more like beef, although the amount added must be adjusted and the color change produced by cooking must be considered.

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