

# THE EFFECT OF SOY PROTEIN AND YEAST ON THE SENSORY QUALITY OF BEEF MEATBALLS

## Introduction

High levels of meat consumption are raising environmental and ethical concerns over the impact meat production is having on the planet. The ever-growing population has contributed to this issue. Almost 80% of global agricultural land is used for livestock (FAO, undated). Livestock are also contributing to pollution from greenhouse gases and land clearance. By reducing meat consumption, the environmental and ethical impacts can be reduced. There is also growing evidence that red meats could pose a health hazard and be “probably carcinogenic to humans” (Domingo and Nadal, 2017, 256), giving another reason for reducing consumption. Partial replacement with plant based protein sources could reduce the amount of meat required in popular food products.

## Aims and objectives

To investigate the effect of introducing texturised soy protein (TSP) at different levels with or without nutritional yeast on the sensory and instrumental quality of beef meatballs, including nutritional composition, texture and colour.



## Methodology

All meatballs were prepared using lean minced beef. 5 recipes were followed, all containing beef, salt and breadcrumbs: a control (100% beef), 15 (15% TSP) and 30 (30% TSP) and 15Y (15% TSP with nutritional yeast) and 30Y (30% TSP with nutritional yeast).

Proximate analysis was carried out on the meatballs, identifying the fat, moisture, protein and ash content. Texture analysis was carried out using a texture analyser (Stable Micro Systems) and the internal and external colour of cooked meatballs was measured using a colorimeter (Konica Minolta CR-400). Sensory testing was carried out with 60 participants. The participants were asked to score the organoleptic qualities of the meatballs and the overall acceptability of the samples using liking scales and check-all-that-apply (CATA) terms.

## Results

**Proximate** - 15Y had the highest protein content (%) and had a significantly lower fat content (%) than the control meatball. The addition of soy and yeast increased the carbohydrate content of the meatballs.

**Texture** - The control and sample 15 had a similar hardness however 30 was significantly softer than control.

**Colour** - The control had a significantly higher internal redness ( $a^*$ ) compared to the other samples.  $a^*$  value decreased and  $b^*$  (yellowness) increased with addition of soy. Yeast increased the  $b^*$  of the meatballs.

**Sensory** - 15Y scored highest for overall acceptability (5.95/10) and flavour 5.97/10, scoring significantly higher than the control but not significantly higher than other TSP meatballs. The control meatballs scored the lowest for overall acceptability (5.03/10). No significant difference in appearance was found.

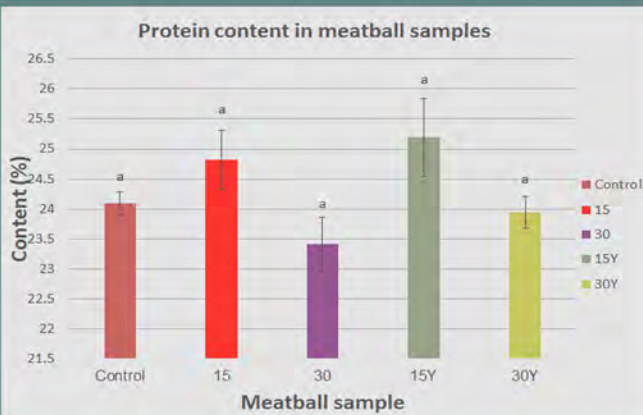


Figure 1: Protein content of meatball samples

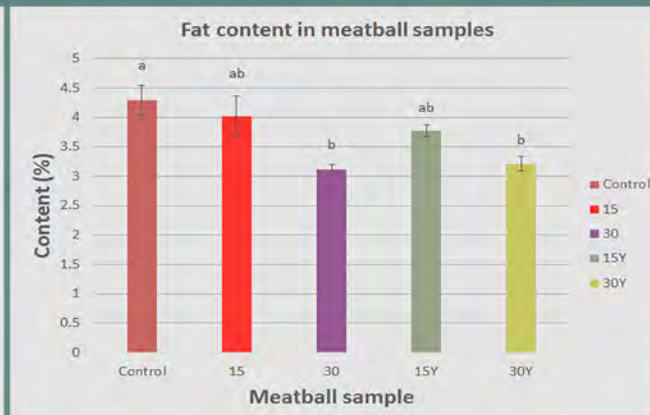


Figure 2: Fat content of meatball samples

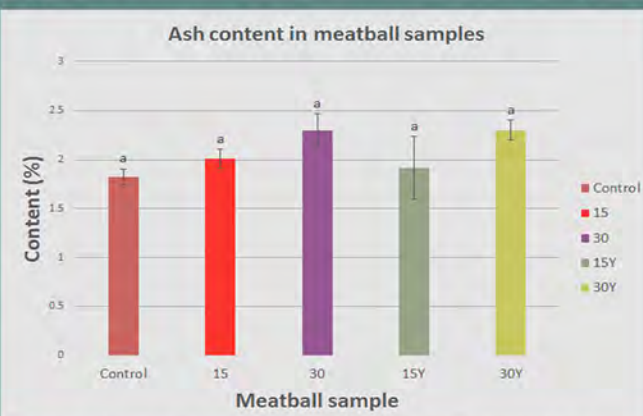


Figure 3: Ash content of meatball samples

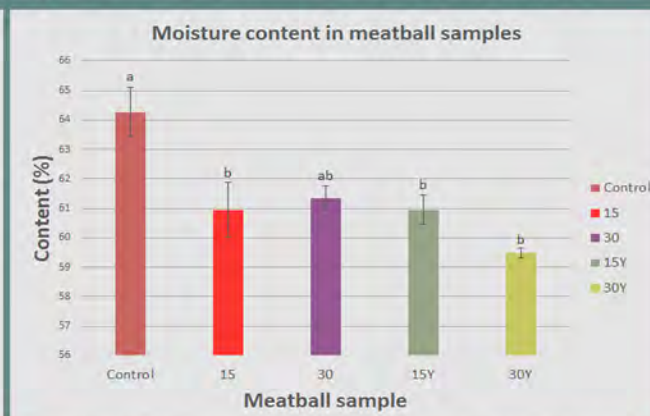


Figure 4: Moisture content of meatball samples

Averages with the same letter on each graph did not show any significant difference ( $P > 0.05$ ) by Tukey's test

## References:

Domingo, J. L. and Nadal, M. (2017) Carcinogenicity of consumption of red meat and processed meat: A review of scientific news since the IARC decision. Food and chemical toxicology, 105 (2017) 256-261. Available from <https://doi.org/10.1016/j.fct.2017.04.028> [accessed 15 August 2018].

FAO (undated) Animal production. FAO. Available from <http://www.fao.org/animal-production/en/> [accessed 14 August 2018].

## Conclusion

Sample 15Y scored higher for flavour, texture and overall acceptability in the sensory analysis suggesting that this was the preferred meatball out of the samples tested. The findings also show that the control meatball scored the lowest for flavour, texture and overall acceptability. This suggests that the addition of TSP and nutritional yeast enhanced the flavour and textural qualities of the meatball, whilst not altering the appearance to the consumer, indicating that meat substitution was successful. Therefore, there is opportunity for further research into meat substitutes to reduce the quantity of meat used in food products.



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