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Influence of incubation conditions with proteolytic enzymes on electronic nose aroma profiles of chicken viscera packs

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Abstract details:

Proteolytic enzymes, known for their ability to break down proteins into smaller peptides or amino acids, can play a key role in enhancing the sensory characteristics of co-products derived from meat processing. For pet food formulation, these enzymes can serve as a versatile tool for altering the flavor profile of such products to meet the desired specifications.

The objective of this experiment was to determine the aroma profile of ground chicken visceral packs (GCVP) incubated for 1 hour with four different proteolytic enzymes (A, B, C and D). Considering the distinctive required incubation conditions of enzyme D in comparison to enzymes A, B and C, two control treatments were utilized. The study included seven treatments: Raw GCVP, GCVP incubated for 1 h at 64 °C (LOW CTL), GCVP incubated for 1 h at 74 °C (HIGH CTL), GCVP incubated with either enzyme A, B or C at 64 °C for 1 h, and GCVP incubated with enzyme D at 74 °C for 1 h. All treatments, excluding raw GCVP, underwent incubation in 50-mL conical tubes placed inside a water bath at the assigned temperature and time. At the conclusion of the incubation period, the temperature was raised by 16 °C and maintained for 10 min to deactivate the added enzymes. Subsequent to incubation, samples were allowed to cool at room temperature, and three 2-g replicate samples of each treatment were analyzed to evaluate the aroma profile using an electronic nose (Heracles NEO II, Alpha MOS, Toulouse, France). Regardless of enzyme addition, temperature treatment of GCVP increased the number of detected volatiles by 2- to 3-fold compared to raw GCVP. In accordance with the CTL treatments, both LOW CTL (64 °C) and HIGH CTL (74 °C) showed a similar number of detected volatiles after 1 hour (17 and 16, respectively). Enzymes A and C presented the highest and lowest number of detectable volatiles (23 vs. 13) with enzymes B and D remaining intermediate (19 and 18, respectively). Methyl acetate, with an ester functional group (FG), was present in all treatments regardless of incubation temperature or enzyme, after 17 s of retention time (RT). Also, trimethylamine (amine) and acetaldehyde (aldehyde) were detected in all samples after 14 s (except in LOW CTL and enzyme C, respectively). At 1 h of 64 °C incubation, GCVP incubated with enzymes A, B and C presented trimethylamine (amine) after 14 s of RT, whereas in the LOW CTL samples it was not detected. Also, incubation of enzymes A, B and C led to the detection of alcoholic volatiles which were not perceived in the LOW CTL. Incubation of GCVP with enzyme D decreased the number of volatiles present with an ester FG (delta-

valerolactone and methyl cyclohexanecarboxylate; after 57 and 63 s, respectively) and conducted the detection of carboxylic acids (propanoic and pentanoic acids; after 35 and 54 s, respectively) compared with HIGH CTL treatment. Additionally, with 64 °C incubation, alkenes (27 s) and ketones (30 s) were detected in LOW CTL, which were not detected with the incubation of enzymes B and A, respectively. Additionally, ethanethiol, with a thiol FG, was detected after 18 s in all samples incubated at 64 °C for 1 hour but was not detected in samples with higher (74 °C) incubation temperature.

In conclusion, both incubation temperature and the use of proteolytic enzymes can influence the aroma profile of chicken visceral packs detected by an electronic nose. Furthermore, variations in the volatiles of GVCP resulting from each enzymatic treatment may also be affected by the incubation time. Therefore, future studies could explore different incubation times to optimize the achievement of the desired aroma profile of GCVP for a preferred enzyme.

Biography:

Jorge Sandoval is a native of Guatemala. He finished his Bachelor of Science degree in agricultural sciences and production at the Panamerican Agricultural School “Zamorano University” in Honduras. In 2022, he finished his Master of Science degree and is currently working on his doctoral degree program in Poultry Science under the direction of Dr. Jessica Starkey. Jorge’s research involves poultry and swine skeletal muscle satellite cell activity, broiler physiology and nutrition, feed manufacturing, and pet food manufacturing experiments. Jorge has presented his research on developing pet treats derived from various meat animal processing co-products at both local and international conferences as well as to pet food industry stakeholders.