ENGAGING STUDENTS IN PHYSICOCHEMICAL ANALYSES USING MODERN INSTRUMENTATIONS: A PRACTICAL APPROACH TO TEACHING COURSES IN FOOD & NUTRITIONAL SCIENCES

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ABSTRACT

Teaching students in the 21st century has its challenges. It is important to engage students in problem-based activities that will provide a practical approach to the learning process. To achieve optimum learning outcomes necessary for the workforce and/or post baccalaureate degrees, a technology-enhanced learning approach was applied to selected courses in Food & Nutritional Sciences. The project engaged students in hands-on investigative activities to improve learning outcomes and competencies. Students were provided with materials used in product formulation and guided through the theory of food chemistry and analysis. Groups of students produced and analyzed a product that produced information on the chemical and physical characteristics of the end product. This experience exposed students to selective physicochemical analyses through the utilization of modern instrumentation: CEM SmartTrac, TA XT Plus Texture analyzer, gas chromatography etc. Group leaders presented the results with support from the group members. Grouping students allowed them the opportunity to improve their problem solving, interpersonal, and communication skills as they worked to accomplish the assigned task. Furthermore, it exposed students to the scientific and technical fundamentals of food, and nutrition while unveiling the myths generally surrounding the discipline as a non-science and non - technical area. In conclusion, this project allowed students to utilize modern technology in acquiring technical, analytical and research skills appropriate for application to food, nutrition, and related sciences.

Key Words: technology, investigate, problem-based learning, instrumentation.

INTRODUCTION

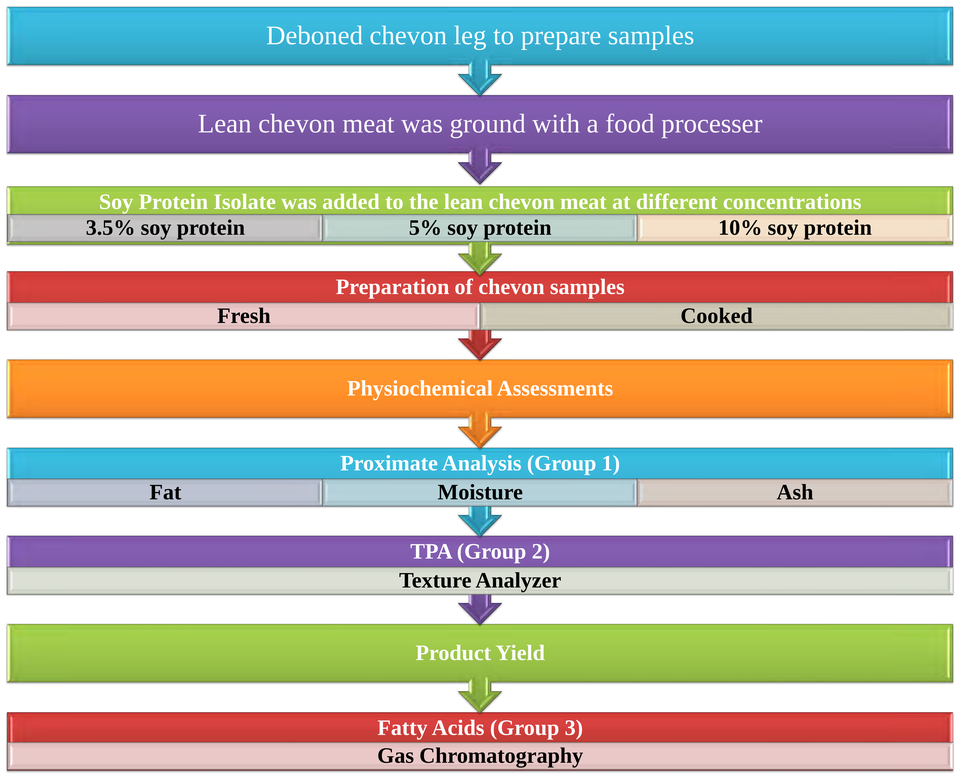
The 21st century has symbolized the future for a new generations of students. In this global marketplace, students need to learn the proper skills and gain hands-on, real-world experience if they hope to survive the workforce. Essential skills combined with real-world application make a dynamite duo in training students to meet the growing demand for qualified professionals in nutrition, food, dietetics, and agricultural sciences. The Department of Food and Nutritional Sciences (FNS) has positioned itself to prepare qualified graduates to meet this growing demand. Through consistent review of the curriculum the Department has focused on innovative use of modern instruments and problem-based learning to enhance student learning outcomes. An additional tool used in increasing competency levels of student learning is the embedded question concept. Teaching in the Department has focused on innovative use of modern instruments and application-based activities to enhance teaching, retention rate, and recruitment.

Student of the 21st century are attracted to technological advances and gravitate towards programs and opportunities that heightened their quest for the use of new technology-based discoveries/programs. Students have unprecedented access to faculty, staff, and modern laboratories in the food, nutrition, and dietetics programs and related sciences during their four years of matriculation. Furthermore, it exposed students to the scientific and technical fundamentals of food, and nutrition while unveiling the myths generally surrounding the discipline as a non-science and non - technical area. This interaction also serves as a recruiting tool for students from other disciplines on the campus that have taken FNS courses as an elective and provides an opportunity for those who may have never thought of a career in , food, nutrition, and dietetics.

The project uses a systematic approach to advance and promote increased student learning outcomes through application-based activities with integration of modern instrumentations in providing problem-based learning in answering class and research questions at the undergraduate and graduate levels.

A group of FNS students

MATERIALS AND METHODS



RESULTS

Table 1 Proximate Composition of Chevon-base Patties Containing Soy Protein Isolate

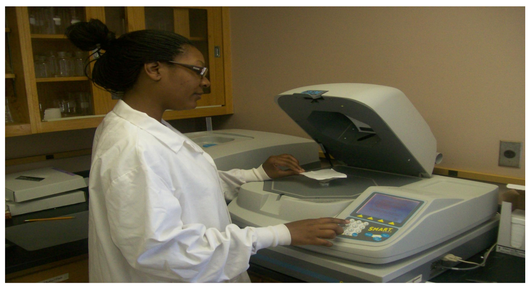
	Moisture	Fat	Ash
Control	76.58±0.24a	2.25±0.41a	1.6±0.00a
PI (3.5%)	72.84±0.42 b	2.62±0.38a	1.53±0.05a
PI (5%)	73.34±0.51 b	2.04±0.33a	1.53±0.51a
PI (10%)	68.5±1.66 c	1.89±0.20a	1.63±0.04a

SPI= Soy Protein Isolate
Means with same superscripts within column are not significantly different at P<0.05

Table 2. Texture Profile Analysis of Formulated Products Containing Different Levels of Soy Protein Isolates

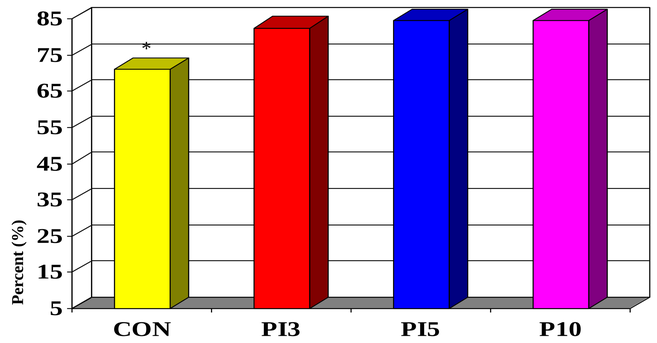
	Hardness	Springiness	Cohesiveness	Gumminess	Chewiness	Resilience
Control	**107.42±43.5a**	**0.96±0.11 a**	**0.87±0.20 a**	**95.2±40.5 a**	**92.7± 42.5 a**	**0.46±0.44 b**
SPI (3.5%)	**13.60±1.0 b**	**0.93±0.1 a**	**0.93±0.02 a**	**12.76±1.1 b**	**11.96± 2.3 b**	**0.54±0.03 a**
SPI (5%)	**10.86±0.9 b**	**0.98±0.04 a**	**0.98±0.02 a**	**9.7±0.66 b**	**9.5±0.50 b**	**0.50±0.11 a**
SPI (10%)	**22.3± 12.5 b**	**0.94± 0.03 a**	**0.86±0.05 a**	**18.8±9.4 b**	**17.6± 8.5 b**	**0.59±0.03 a**

Means within column with the same superscripts are not significantly different at P< 0.05



Microwave and H^1NMR technology equipment

Fig. 1. Effects of Soy Protein Isolate Addition on Product Yield of Formulated Products



ÇON= Control; PI3= Protein isolate 3.5%; PI5= Soy Protein isolate 5%; P10= Soy Protein Isolate 10%

Table 4. Major Saturated and Unsaturated Fatty Acid Content of Chevon-based Patties Containing Soy Isolate

	Palmitic (16:0)	Stearic (18:0)	Oleic (18:1)	Linoleic (18:2)	Arachidonic (20:4)
Control	19.6±0.54	17.3±0.61	37.1±2.1	7.7±1.0	3.5±0.76*
SPI (3.5%)	16.1±0.60[a]	10.9±1.0[a]	30.8±0.77[a]	14.1±0.98[a]	6.56±0.54[a]
SPI (5.0%)	16.8± 0.97[a]	10.0±0.5[a]	31.9±2.4[a]	14.7±1.7[a]	3.2±0.33[b]
SPI (10%)	17.6± 0.60[a]	10.1±0.78[a]	31.2±1.48[a]	16.2±0.70[a]	3.3±0.29[b]

***Adapted from Paleari et al 2008**
Means ± SD
[abc] Means with same superscripts are not significantly different at P<0.05.

SUMMARY

•The control exhibited a higher moisture content compared to products containing soy protein isolate.
•Results revealed that chevon meat-based products have a higher amount of unsaturated fatty acids.
•. Product yield was consistent with moisture loss.
•Texture profile analysis showed significance differences among SPI levels and the control for all parameters measured.

Students using the Gas Chromatography for Fatty acid Analysis

CONCLUSIONS

Grouping students allowed them the opportunity to improve their problem solving, interpersonal, and communication skills as they worked to accomplish the assigned task.

Students were exposed to the scientific and technical fundamentals of food, and nutrition while unveiling the myths generally surrounding the discipline as a non-science and non - technical area.

This application-based project allowed students to utilize modern technology in acquiring technical, analytical and research skills appropriate for application to food, nutrition, dietetics and related sciences.

The activity also allowed students to present their findings in a scientific discipline oriented format.

Students found classes more interesting when they were engaged in hands-on activities.