Modification of pea starch for increased utilization in the food industry

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SPG Contributions	Project Status	Duration/Timeline of Project (Year to Year)	Total Project Cost
$99,824.05	Completed	July 2015 – December 2017	$99,824.05

Project Description

Native pea starch has limited use in the food industry due to tendency of the gel to retrograde and exhibit syneresis or weeping. Consequently, a large percentage of native pea starch is used in the paper or pharmaceutical industries. Native pea starch has unique properties, which can be functionalized to enhance its tendency to thicken less, gel slowly, and form thin gels. Improving the functional properties of pea starch has important economic impact in the climate of finding applications for co-products. Furthermore, as the demand for pea protein increases, finding food applications for pea starch remains a key priority for the industry. In addition to understanding the functional properties and health benefits of pulses and pulse fractions, modifying pea starch will enhance its inherent functional properties for specific applications in foods.

The objective of this research was to develop processes that would facilitate commercial utilization of the functional properties of pea starch, derived from wet and dry streams, by the food industry. Native pea starches were thermally processed using drum drying and extrusion processing technologies with no chemical additives. The increasing demand for clean label claims has driven the evaluation of the technologies used to physically improve the functional properties of the pea starches. The physicochemical, functional and nutritional properties of twenty-nine native and physically modified pea starches (PMPS) were analyzed.

Outcome

Twelve commercial starches (modified and unmodified maize, rice and tapioca) typically used in various product categories were analyzed, and four were used as controls in application studies with the PMPS. The PMPS displayed noticeably higher levels of rapidly digestible starch contents but lower levels of slowly digestible and resistant starch contents than their respective controls. The viscosity profiles showed significant differences in both the cold and cooked starch profiles. Consequently, an application test matrix was used to optimize the starch formulae in specific food categories. In application tests, the functional properties of the PMPS as food ingredients were demonstrated successfully as a glaze, rub, binder, sauce, and coating in meat and non-meat applications. As an ingredient, the modified pea starch is suited for food applications in the allergen-free and non GMO markets. Additionally, the physical modification processes produced PMPS ingredients that could promote clean label statements. The absence of modified pea starches is evident by the sparse information on performance available to end users for desired applications. Hence, the performance of the PMPS with improved functional properties were evaluated successfully in specific food formats. PMPS replaced commercial corn, rice, and tapioca starches that are increasingly used to enhance texture, viscosity, and sensory quality in the industry. Successful applications of the modified pea starches in food formats depended on the starch stream, modification technology used, and the tested matrix. These results will assist the food industry, improve the modification processes and guide product developers using PMPS. Consequently, facilitating the implementation in consumer products would reduce the quantity of pea starches from either wet or dry fractionation streams. Modified pea starch is highly valuable, particularly to Western Canada's expanding pulse processing activities.

Research Objective

OBJECTIVE 1
To develop a process for pre-gelatinization and drum drying of pea starches.

OBJECTIVE 4
To develop four food product prototypes using the modified starches for performance evaluation.

OBJECTIVE 2
To develop an extrusion process for modification of pea starches.

OBJECTIVE 3
To evaluate chemical and functional properties of the modified pea starches in comparison to corn, wheat and potato starches.