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19. TECHNOLOGICAL FEATURES OF CARBONATES FOR EQUIVALENT REPLACEMENT OF PHOSPHATE PREPARATIONS

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Food-grade phosphates of various chemical forms (e.g., orthophosphates, pyrophosphates, and polyphosphates, etc.) have been broadly used as synthetic food additives in the meat industry to manufacture meat products, mainly due to their positive effects on the quality profile, sensory attributes, and shelf life of the final products. Phosphates have a unique characteristic of synergistically functioning with

sodium chloride to increase the solubility of salt-soluble myofibrillar proteins, subsequently promoting the cooking yield and gel properties of meat products. Moreover, phosphates can efficiently raise pH values to alkaline levels and increase ionic strength, eventually increasing the water-holding capacity of meat products. Phosphates also possess the ability to split the complex of actomyosin formed during rigor mortis mainly through the sequestration of calcium or magnesium cations. Furthermore, because of their excellent antioxidant potential, phosphates can effectively retard lipid oxidation, while protecting the flavor and color of meat products during storage. However, with the increasing demand and consumption of processed meat products in many countries, the daily intake of phosphates has become more than two- to threefold higher than intake in the 1990s [1]. The excessive intake amounts of phosphates from processed meat products contributes to an increased risk to health.

Carbonates (e.g., sodium or potassium carbonate (PC)), which are classified as acidity regulators, have been used for the processing of meat products, mainly due to their alkalization effects. Xiong indicated that the alkaline carbonates effectively increased the net negative charge of myofibrillar proteins and then promoted the swelling degree of myofibrils, subsequently increasing the water-holding capacity of myofibrillar proteins during thermal treatment [2]. Moreover, because their size is smaller than that of phosphates, carbonates can more easily penetrate the muscle tissue and interact with higher amounts of side chains of meat proteins, significantly promoting the repulsive forces among meat proteins and resulting in higher water retention. In the last decade, numerous concentrated studies have reported that carbonates could be used as phosphate replacers to prepare marinade solutions for enhancing the quality profile (e.g., color, tenderness, water-holding capacity, and flavor) of fresh meat or aquatic products. Currently, the increasing market trend or consumer demand for manufacturing phosphate-free meat products (e.g., sausage, meatball, meatloaf, and ham) has accelerated the use of phosphate-replacing carbonates by numerous researchers and food industry stakeholders. Furthermore, considering sodium reduction in meat products, PC has been thought to be a preferred

phosphate replacer, more so than sodium carbonate. Kaewthong and Wattanachant also suggested that a higher concentration of carbonates led to some adverse effects on the function and integrity of actomyosin [3].

However, a lower concentration of PC did not exhibit the optimal substitution effect. Thus, more research is required to identify some suitable techno-functional additives to combine with PC to completely replace phosphates from meat products.

Literature

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