

Abstract

Foods for Thai elderly with impaired chewing ability were developed based on results from a survey on food needs. An individual interview on 30 elderly subjects of 75 year of age and up, lived in Bangkok and suburban, were conducted. Common problems they face are unable to chew fibrous fruits and vegetables or hard texture foods. For flavor, they requested foods full with familiar aroma and taste, although taste has to adjust to be milder and put less chilli. Ten reformed food ingredients were developed using various hydrocolloids such as guar gum, gellan gum, sodium alginate, and agar-agar. The selected ingredients are pea eggplant, Chinese chives, baby corn, shitake, kale, stink bean, water mimosa, mushroom stem, cucumber and squid. These reformed food ingredients give a soft but firm texture, easy to bite and remained as a piece after cooking. Kale stir fry with oyster sauce, Squid stir fry with holy basil, Stir fry chive and ground pork and Stir fry stink bean and ground pork were developed and did a sensory evaluation by 62 elderly with difficulty chewing. The preference scores on color, softness and flavor of the reformed ingredients were rated in a range of 4.05 to 4.40 on a 5-point hedonic scale. It indicated that the products were at a good acceptance. Food Action Rating Scale (FACT) was included, asking the panels to indicate whether they would or would not buy a product. All foods were accepted. The degree of buying frequency from more to less was Kale stir fry with oyster sauce, Squid stir fry with holy basil, Stir fry chive and ground pork and Stir fry stink bean and ground pork. For nutritive values of one serving size of the developed dishes were 100g. except Kale stir fry with oyster sauce of 80g. It was found that they provided 72 to 108 kcal of energy, 2 to 4 g of sugar, 0.8 to 9.6 g of protein, 3 to 5.2 g. of fat, 3.3 to 4.5 g. of dietary fiber, 425 to 1087 mg. of sodium, 48 to 202 μ g. of vitamin A, 77 to 171 mg. of calcium, 147 to 161 μ g. of folate and 0.2 to 0.4 μ g. of vitamin B12. Costs of material for Kale stir fry with oyster sauce, Squid stir fry with holy basil, Stir fry chive and ground pork and Stir fry stink bean and ground pork were 4.37, 12.16, 5.66 and 8.50 baht, respectively.

Healthy, ready-meal food products with soft texture suitable for elderly with metabolic syndrome were developed. Six dishes of nutrient-dense foods were chosen for process development and reformulation of fat, sugar and sodium contents to meet the requirement for the metabolic syndrome elderly. Nutritional food ingredients providing good proteins and carotenoid compounds were used in recipes. Products of rice porridge with fish ball, tuna in sugarcane sauce, spinach omelette, chicken stew with green pea, sweet and sour vegetables and mustard green soup with pork were developed and analyzed for nutritional composition. Processing methods of quick cryogenic freezing and commercial sterilization in retort pouch package were compared. Sensory quality of the products using 5-point hedonic scale was performed by 40 panels aged of 75 to 90 yrs. The *in vitro* bioaccessibility of proteins and total carotenoids of the products treated with two processing methods were examined and compared. The contents of carotenoid compounds

in 26 kinds of vegetables were also analyzed, particularly for lutein, zeaxanthin and β -carotene. Daily meal plan was set according to guideline for energy and nutrient requirement for the elderly. The results showed that six elderly foods produced by both sterilization and freezing had shelf-life longer than 6 months and had a good quality for consumption. Both methods did not effect on sensory scores for palatability, tenderness and overall preference of the food products. Only sensory scores for mustard green soup with pork and spinach omelette were significantly different in palatability and overall preference, respectively. The scores indicated that the freezing process provides better sensory quality. The obtained preference scores were from 3.7 to 4.7, indicating that the products achieved the satisfactory qualities and good acceptance by the panels. For nutritional determination, it was found that one serving of the products contained 80 to 160 kcal of energy, 9 to 18 g of protein, 1 to 8 g of fat, 0.26 to 3.23 g of dietary fiber, 1 to 10 g of total sugars and 210 to 450 mg of sodium. Tuna in sugarcane sauce and chicken stew with green pea provides good source of protein, relative to guideline of 16 g per meal. Although all products contained low dietary fiber, spinach omelette had a high content of 3.23 g per serving. Likewise, all products were low in fat, while the highest of 8 g was found with tuna in sugarcane sauce. When analyzed for content of omega-3, tuna in sugarcane sauce contained a high omega-3 of 470 mg per serving. All reformulated foods contained greater sugar than guideline of 2 g per meal. While sodium content of all products were lower than guideline of 450 mg. The effects of processing methods on the *in vitro* bioaccessibility of proteins showed that tuna in sugarcane sauce and spinach omelette in retort pouch had a high % *in vitro* protein digestibility (IVPD) of 89.7% and 89.1%, respectively. This means that protein in these products was easily digested when compared to the others. Rating from high to low in the %IVPD of the products in retort pouch was tuna in sugarcane sauce > spinach omelette > chicken stew with green pea > rice porridge with fish ball > sweet and sour vegetables > mustard green soup with pork. Meanwhile the ranking in %IVPD of the frozen products was rice porridge with fish ball > tuna in sugarcane sauce > spinach omelette > chicken stew with green pea > sweet and sour vegetables > mustard green soup with pork. When carotenoid compounds in fresh vegetables were determined, six Thai indigenous vegetables had a higher content of total lutein and zeaxanthin than the other vegetables. Bai-chapu contained the highest of 13,810.21 μ g./100g, following with spinach, noni leaf, Bai-leang, Bai-tumlaung, kale, water convolvulus, green amaranth and red amaranth, respectively. Whereas, good source of β -carotene was spinach containing the highest of 8,026.37 μ g./100g, following with Bai-tumlaung, penny worth, carrot, red amaranth, Chinese mustard, kale, noni leaf, red oak-leaf (red lettuce) and Bai-chapu, respectively. Moreover, the effects of processing methods on total carotenoids and isomers in products high in vegetable ingredient showed that sweet and sour vegetables and mustard green soup processed in retort pouch had a higher content of total carotenoids

and β -carotene than those processed with freezing. When cooked using conventional method, spinach omelette had higher lutein zeaxanthin and β -carotene than other food products. For the in vitro bioaccessibility of total carotenoids, sweet and sour vegetables cooked using conventional method showed the highest digestion of 57.7%, while chicken stew with green pea had the lowest rate of 10.9%. For processing in retort pouch, the digestion rate from the highest to the lowest was for mustard green soup (52.1%), spinach omelette (37.8%), chicken stew with green pea (20.4%) and sweet and sour vegetables (18.3%). With freezing method, the digestion rate from the highest to the lowest was for mustard green soup (44.5%), spinach omelette (39.3%), sweet and sour vegetables (20.9%) and chicken stew with green pea (10.9%). Costs of material for rice porridge with fish ball (200 g.), spinach omelette (145 g.), tuna in sugarcane sauce (120 g.), chicken stew with green pea (200 g.), sweet and sour vegetables (200 g.) and mustard green soup with pork (200 g.) were 21.23, 7.31, 10.80, 21.00, 12.00 and 10.00 baht, respectively.

Keywords: elderly, reformed vegetable, texture, metabolic syndrome, ready-meal product, nutrition, retort