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Research Article

Cloud stabilizing properties of pectin from pomelo peel in carrot juice

Phanuphong Phuangsinoun, Sudarat Harnkham and Prasong Siriwongwilaichat*

Department of Food Technology, Faculty of Engineering and Industrial Technology, Silpakorn University, Nakhon Pathom 73000, Thailand

*Author to whom correspondence should be addressed, email: deersong1@yahoo.com

Abstract: The aim of this study was to evaluate the potential for stabilizing clouding in carrot juice by using pectin extracted from pomelo peel. Six commercial pectins including CU 701, CU020, CU 501, CU 201, AYD and CJ 201 were used for comparison. The properties of carrot juice were measured for O.D., sedimentation, viscosity and sensory test. It was found that carrot juice treated with pomelo pectin gave lower O.D. compared to commercial pectins, nevertheless was close to CU 201 and CJ 201. On the other hand AYD pectin gave the lowest solid sedimentation in carrot juice, followed by CU 501, pomelo pectin, CU 201 and CJ 201, respectively. The carrot juice treated with CU 020 provided the highest viscosity, followed by CU 201, CU 501, CU 701, AYD, CJ 201, pomelo pectin, and control (no pectin added), respectively. The sensory evaluation showed that carrot juice treated with pomelo pectin gave the highest overall appreciation score, close to AYD, CU 501, CU 701 and CU 201 ($p > 0.05$). However, the application of CU 501 and CU 020 in carrot juice received the highest viscosity appreciation score ($p < 0.05$). In addition, carrot juice treated with CU 501 gave the highest homogeneity appreciation score, but was not significantly different from those treated with CJ 201, CU 020, CU 701 and CU 201 ($p > 0.05$).

Keywords: pomelo pectin, carrot juice, clouding properties, viscosity, beverage, additives

Introduction

Pectin is a hydrocolloid used in various food products. It provides improved food characteristics including thickening, stabilizing and textural properties in many foods such as dairy products, beverages, jam, jelly, bakery products and confectionery. The main source of pectin is from citrus fruit peel (Wang, *et al.*, 2002). Pomelo (*Citrus maxima* Merr.) is an interesting pectin source, although it is not currently exploited at an industrial production scale. However, little is known about its properties in the food system. The aim of this study was to evaluate clouding properties of pectin extracted from pomelo peel in carrot juice and comparing it with commercially available products.

The clouding stability properties of pectin used in food are due to its rheological and polarity properties (Kimball, 1991). The clouding of fruit juice is stabilized when pectin is added mainly because of the viscosity properties of pectin. Increasing viscosity of fruit juice retards movement of clouding particles, thus the agglomeration with subsequent sedimentation is avoided (Okoth, *et al.*, 2000).

Materials and Methods

Materials and Equipment: Pectin extracted from pomelo peel (prepared by the Faculty of Pharmacy, Silpakorn University), commercial pectins as shown in Table 1, carrot, sucrose, distilled water, citric acid, homogenizer (Vltra turrex T25 basic, Labortechnik), hand refractometer, UV-visible spectrophotometer (Model G10, Centrifuge, Brookfield).

Table 1. Pectins used in experiments.

Pectin	Source	%DE	Mw (Da)
Pectin classic CJ 201	Herbstreith & Fox KG	68–76%	39,178
Pectin Amid CU 020	Herbstreith & Fox KG	43%	150,000
Pectin classic CU 701	Herbstreith & Fox KG	38%	70,000
Pectin classic CU 501	Herbstreith & Fox KG	56%	180,000
Pectin classic CU 201	Herbstreith & Fox KG	68-76%	200,000
Pectin AYD	Degussa (Unipectine^{TM})	69-74%	49170
Pomelo pectin	Silpakorn University	91.46%	18,000

Methods:

Carrot juice preparation: Carrot was washed, peeled, chopped, and blanched at 80°C for 10 minutes. The pulp was ground by a blender before filtration to obtain carrot juice. Total soluble solids and pH of the juice were controlled at 8 and 4 °Brix respectively. Each pectin solution was then added to the carrot juice to obtain various concentrations of 0.1, 0.2, 0.3, 0.4 and 0.5%. The control sample was prepared without pectin added. The juice was then homogenized at 11,000 min^{-1} for 5 minutes, followed by pasteurization at 75°C for 20 minutes.

Sample examination: Carrot juice samples were measured for O.D. (at 533 nm), sedimentation, viscosity and sensory test. The sedimentation of carrot juice was reported as relative precipitation; $W_R = \frac{W_P \times 100}{W_s}$

where W_P = weight of sediments and W_S = weight of total solids.

Viscosity and sensory tests of carrot juice were measured at pectin concentration of 0.3%. The viscosity of carrot juice was measured using a spectrophotometer at a speed of 100 rpm, with probe no. S61. Hedonic scale (7-points) was employed for sensory evaluation with 30 untrained panels.

Results and Discussion

The clouding of carrot juice was indicated by O.D. as shown in Figure 1. This clouding increased with increasing pectin concentration. It was found that carrot juice treated with pomelo pectin gave lower O.D. compared to commercial pectins, nevertheless was close to CU 201 and CJ 201. Amongst all pectin, CU 501 preserved the most cloudy appearance of carrot juice.

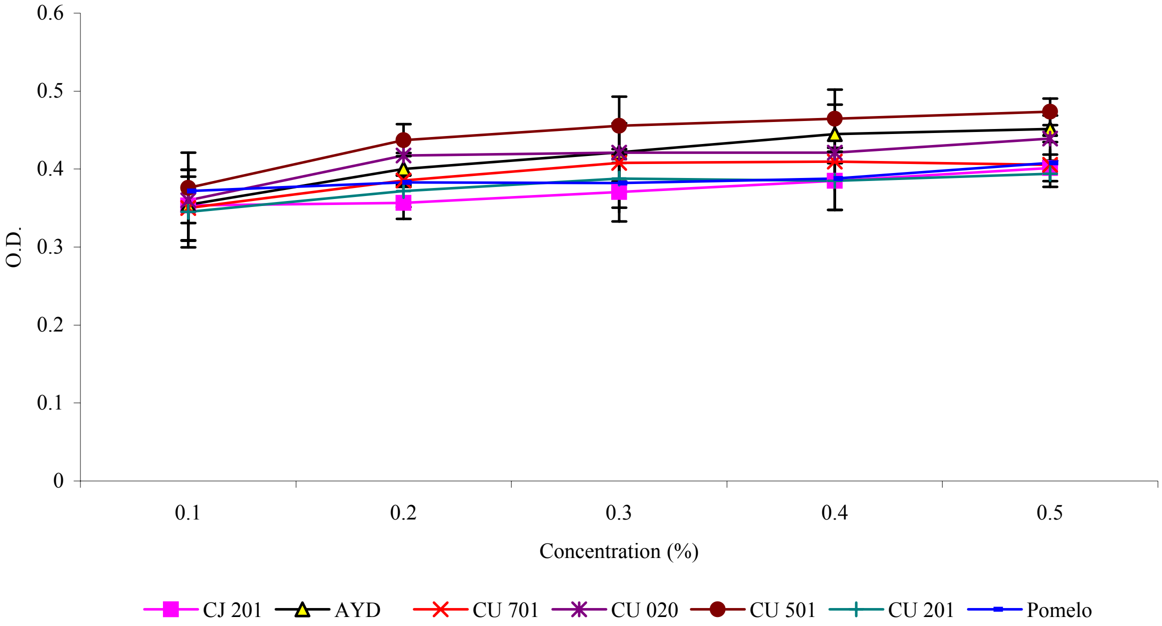

Figure 1. Effect of various pectins on clouding of carrot juice.

The relative sedimentation of carrot juice is shown in Figure 2. It was found that AYD pectin gave the lowest solid sedimentation in carrot juice, followed by CU 501, pomelo pectin, CU 201 and CJ 201, respectively.

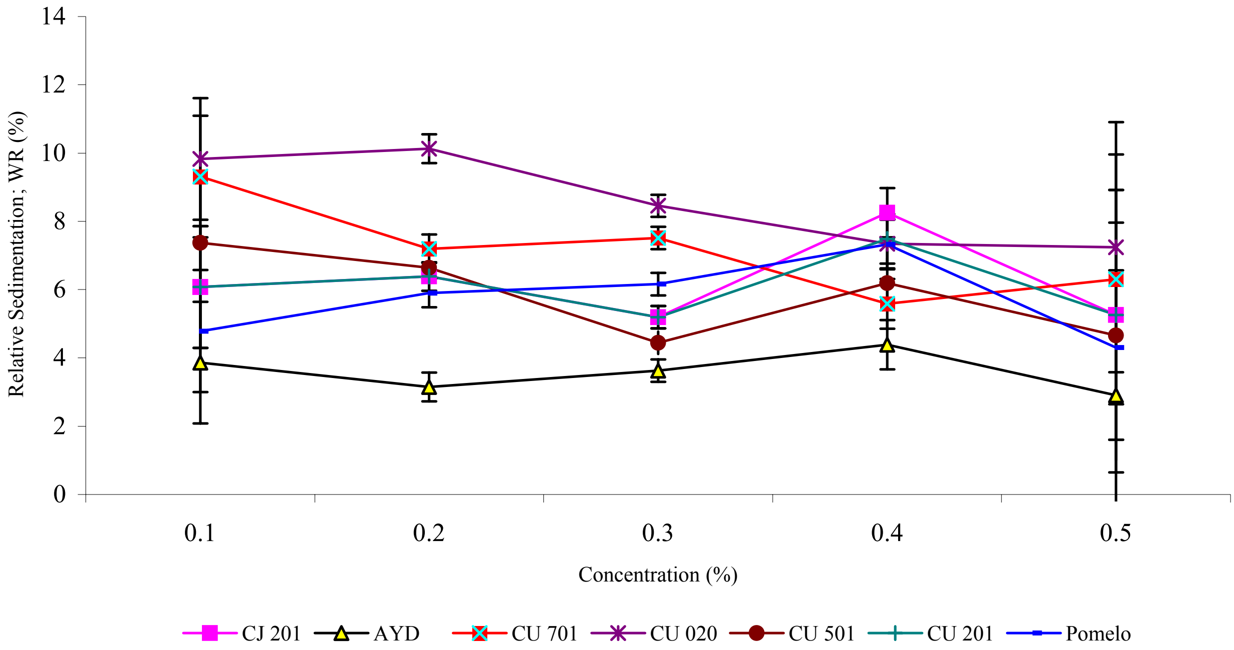

Figure 2. Effect of various pectins on the relative sedimentation of carrot juice.

Carrot juice treated with CU 020 provided the highest viscosity, followed by CU 201, CU 501, CU 701, AYD, CJ 201, pomelo pectin and control (no pectin added), respectively, as shown in Figure 3.

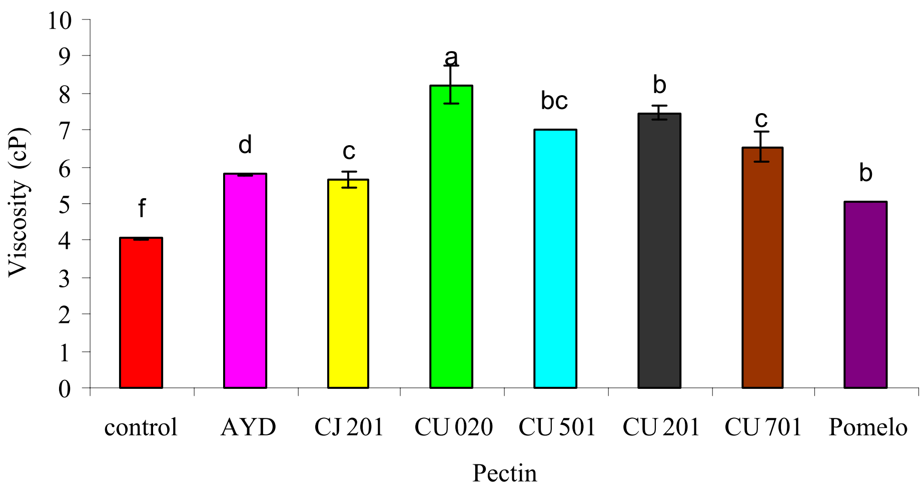

Figure 3. Effect of various pectins on viscosity of carrot juice.

The sensory evaluation showed that carrot juice treated with pomelo pectin gave the highest overall appreciation score (Figure 4), close to AYD, CU 501, CU 701 and CU 201 ($p > 0.05$). However, the application of CU 501 and CU 020 in carrot juice received the highest viscosity appreciation score ($p < 0.05$) as shown in Figure 5.

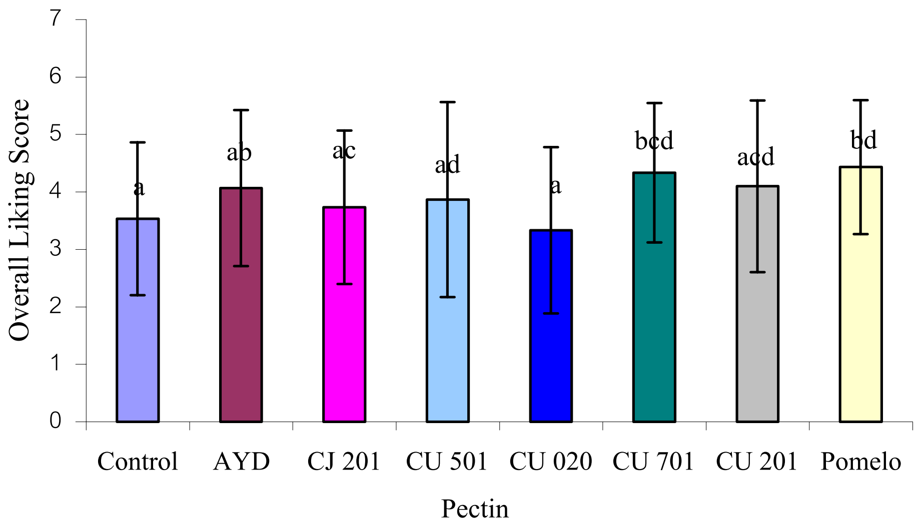

Figure 4. Effect of various pectins on overall appreciation score of carrot juice.

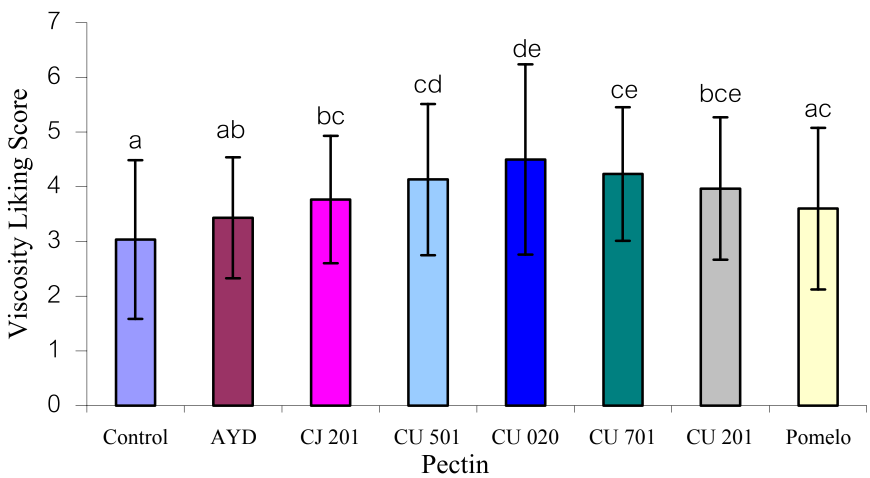

Figure 5. Effect of various pectins on viscosity appreciation score of carrot juice.

In addition, carrot juice treated with CU 501 gave the highest homogeneity appreciation score (Figure 6), but was not significantly different from those treated with CJ 201, CU 020, CU 701 and CU 201 ($p > 0.05$).

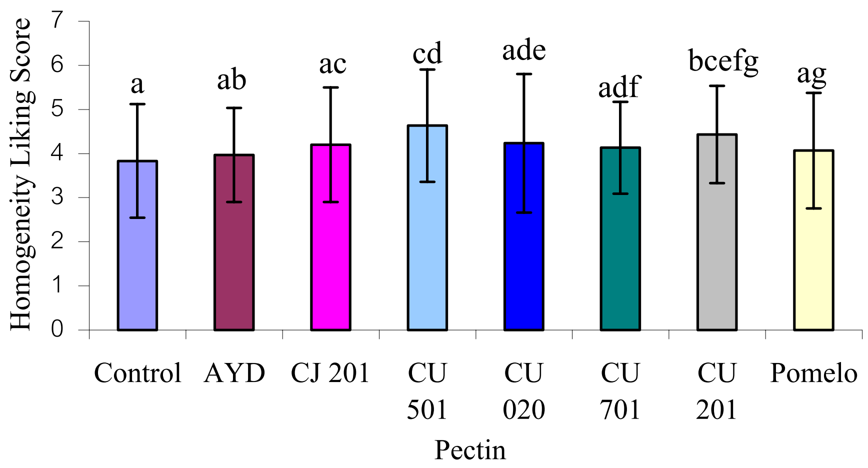

Figure 6. Effect of various pectins on homogeneity appreciation score of carrot juice.

Conclusion

According to this study, pectin from pomelo peel was found to have low efficiency for potential application as a cloud stabilizer in carrot juice when compared to commercial pectins, due to its low molecular weight and low viscosity. Further improvement is therefore necessary before industrial application could be considered.

Acknowledgements

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