How to Improve Marinated Meat Products?

by Karen Laustsen

Maintaining the quality and consumer appeal of uncooked, cured or marinated meat products is often a big challenge for meat manufacturers and the distribution chain.

Especially when meat cuts have been dressed with a marinade, or have been injected or tumbled with a standard brine solution, a high tendency exists for excess liquid to be visible in the retail packaging. This can result in an undesirable level of product rejection during handling and distribution as well as high levels of complaints from re-sellers, distributors and supermarkets.

Figure 1: Meat products with Ceamgel 1313.

Incorporating a traditional meat brine or marinade into fresh meat products may result in a high cooking loss which, in turn may produce a finished product lacking in juiciness and tenderness.

Uncooked meat products, which are distributed frozen, and which exhibit higher than expected thawing loss at the time of final preparation by the consumer, could also result in customer dissatisfaction thus possibly discouraging them from purchasing the same product brand again.

Figure 2: The seaweed type Eucheuma Spinosum, used, as the raw material for Ceamgel 1313, is cultivated in the waters around the Philippines and Indonesia.

The traditional high quality carrageenan types, successfully used today in the meat industry with the purpose of providing high yield, high water binding, and improved texture and syneresis control, require a heating step to provide functionality. This means, that traditional carrageenan types are not a real option for improving the quality of meat products, which as part of the industrial process will not undergo heat treatment, but are intended for chilled or frozen distribution.

In order to offer a real solution for improving the quality of chilled or frozen uncooked meat and fish products Ceamgel 1313 has been developed by a leading spanish specialist.

Ceamgel 1313 is a special cold soluble as well as cold gelling carrageenan. It is produced from selected species of seaweed. The active component in the seaweed is extracted and isolated by an alcohol precipitation process.

The resulting extract is hereafter converted into a carrageenan in a pure cold soluble iota form, and standardized to perform a constant thixotropic and soft gelling performance in a meat brine test system.

A gel made up from Ceamgel 1313 is pumpable and exhibits an extraordinary good water binding capacity. The concentration of Ceamgel 1313, needed in the gel, depends on the application in question, but ranges from water gels of 0,2-0,3 % for injecting to 0,5 – 2,5 % in tumbling processes.

A meat brine for injecting or a marinade, prepared correctly and with 0,2 – 0,3 % Ceamgel, will provide a viscosity of 200 – 300 cps after addition of salt. This viscosity gives a working range, that is very suitable for injection.

The benefits of Ceamgel 1313 for injection have been demonstrated in a wide range of meat products, such as whole chickens, chicken breast, bacon, pork loin, beef, and meat pieces with bone etc, where yield increases of 15 – 30%, reduced drip and cooking loss have easily been achieved.

Fresh meat appearance is prolonged and juiciness and tenderness is improved in all injected products.

Table 1 demonstrates data generated by the company METALQUIMIA S.A., Spain, on injector system with spray effect for marinated products, AUVISTICK 130.

Using a tumbling procedure, Ceamgel 1313 likewise has been intro-

Figure 3: Ceamgel 1313 is an iota type carrageenen, that is elastic and with a thixotropic behavior, very different from Kappa carrageenan, traditionally used for improving texture of cooked meat products.

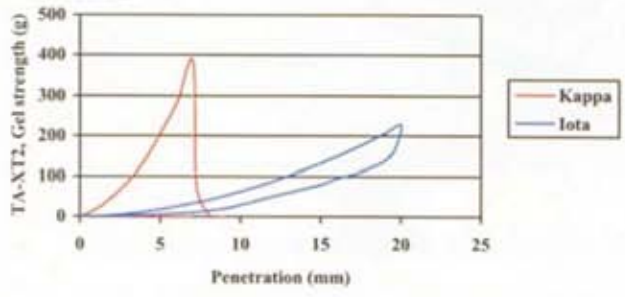
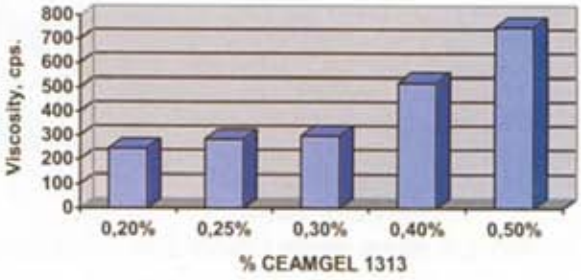


Figure 4: Viscosity of a water gel as function of use level of Ceamgel 1313.



TEST by METALQUIMIA AUVISTICK 130	% Injection	Drip loss after 1 hour	Final yield after 24 hours	Final drip loss after 24 hours	Organoleptical evaluation. Total score*
Pork loin					
Control	20,2 %	2,7 %	15,4 %	4,0 %	14
Ceamgel 1313	22,7 %	2,1 %	19,4 %	2,7 %	16
Beef					
Control	21,0 %	2,8 %	16,2 %	4,0 %	13
Ceamgel 1313	25,7 %	2,1 %	21,8 %	3,1 %	16
Chicken breasts					
Control	18,7 %	4,0 %	12,7 %	4,3 %	15
Ceamgel 1313	18,9 %	1,4 %	16,8 %	1,7 %	17
Whole chickens					
Control	16,8 %	2,5 %	12,7 %	3,5 %	15
Ceamgel 1313	21,6 %	1,9 %	16,6 %	2,5 %	17

Table 1: The control samples were injected with 1,5 % phos-phate and 4,6% salt. In the other tests Ceamgel 1313 was included at 0,23%.

** Organoleptical score is a combination of Appearance, Texture, Juiciness, and Flavor. Max total score = 20*

duced with very good results to the meat and fish industry. Ceamgel 1313 has e.g. been applied in chicken steaks, BBQ spiced chicken legs, chicken breast brochettes, and in reconstituted fish meat products.

Table 2 provides data from a factory production of chicken breast brochettes, where the final product was sold uncooked and frozen. By tumbling with a soft gel based on 0,5% Ceamgel 1313 with 1,5% phosphate and 4,5% salt, the yield and eating quality of the brochettes was significantly improved.

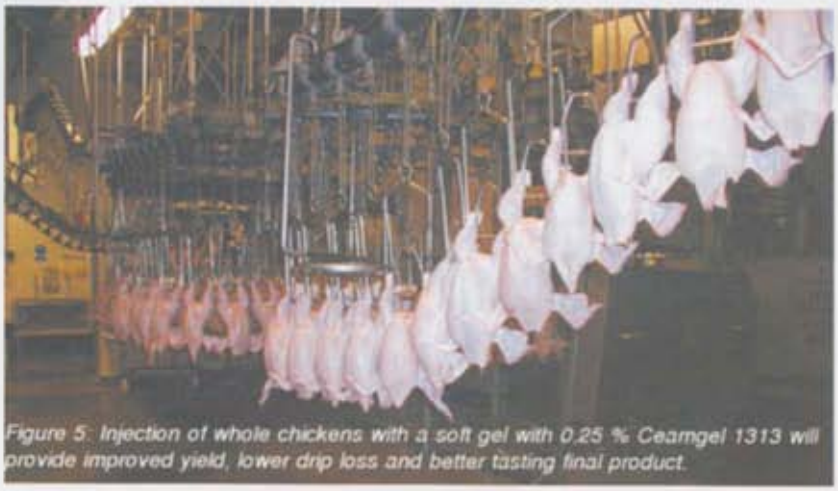


Figure 5: Injection of whole chickens with a soft gel with 0,25 % Ceamgel 1313 will provide improved yield, lower drip loss and better tasting final product.

Table 2

TEST Results Chicken Brochettes	Yield after tumbing	Yield at the time of packing packaging and freezing (1 hour resting)	Yield final preparation (Thawing and subsequent baking for 30 min. at 180°C)	Juiciness 1 = dry 10 = very juicy
Control with no carrageenan in marinade.	23 %	10 %	- 15 %	2
Marinade with standard Kappa carrageenan	27,5 %	21 %	- 2 %	5
Marinade with 0,5 % Ceamgel 1313	27 %	25,6 %	+ 7 %	9

The effectiveness of Ceamgel 1313 depends on several factors. First of all, the order of addition is very important. It is of utmost importance, that Ceamgel 1313 is added to the water BEFORE the addition of any phosphate and salts. Likewise it is important, that sufficient mixing time is allowed to ensure that the carrageenan is fully dissolved thus ensuring optimum performance and a cost effective use level.

Figure 7 provides an illustration of different make-up procedures of a marinade with Ceamgel 1313.

The level of salts and/or phosphates has an impact on the functionality of Ceamgel 1313.

Figure 8 shows how excessive levels of salts decrease the functionality of Ceamgel 1313.

The functionality of Ceamgel 1313 increases with increased temperature, (Figure 9) but some lumping may occur if the water temperature is above 8-10°C. Thus a recommended working temperature, when making up the brine or marinade, is 2-5°C.

Finally the water hardness is important. Figure 10 shows clearly, that water used for dissolving the carrageenan should be soft or demineralized. Water harder than 7 ª German or 12ª French (more than 50 ppm Ca++) is unsuitable.

Figure 6: Frozen cod fish, reconstituted with 25 % added water gel, containing Ceamgel 1313, has a 11,5 % frying loss compared to a commercial product with a frying loss of 20,5 %.
Photos & tables: CEAMSA

Summary

For meat and fish processors Ceamgel 1313 offers a real solution for improving the quality of chilled or frozen uncooked meat products.

This new Ceamgel 1313 can be applied to the meat, either by an injection or by tumbling process, and will provide better final yields as well as a lower drip loss during processing and packaging. Due to the exceptional water binding capacity of Ceamgel 1313, a very low use level is sufficient for significant improvement in the tenderness and juiciness of the final meat products.

Marinated meat or reconstituted fish will keep a fresh meat appearance for an extended time, which is especially important for the distribution chain, and for the supermarkets.

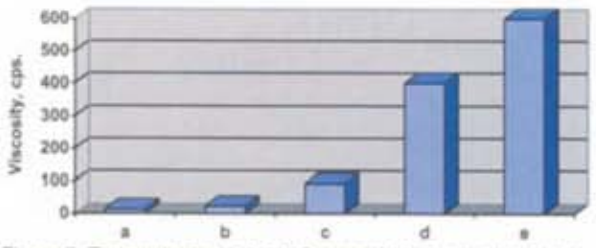


Figure 7: Test system with 0,5% Ceamgel 1313, 2% phosphate and 2 % salt.

a = Carrageenan added AFTER salt
b = Carrageenan added BEFORE the salt, however the phosphate and salt is added as a dry blend immediately after carrageenan addition.
c = Carrageenan added as first ingredient, and the phosphate and salt added as a dry blend 2 min after carrageenan addition.
d = Carrageenan added as first ingredient, with the phosphate and salt added as a dry blend 5 min after carrageenan addition.
e = Carrageenan added as first ingredient and mixed for 5 min. The phosphate is added separately and mixed for 2 min and finally salt is added and mixed for another 2 min.

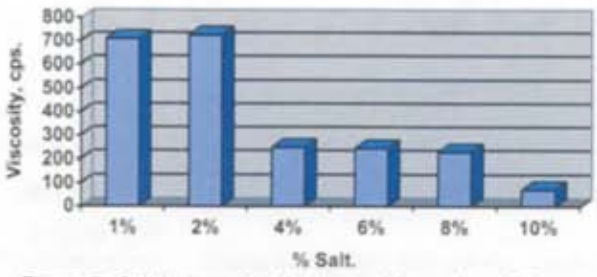


Figure 8: Salt is important for the gel formation of Ceamgel 1313. Optimum level is 1-2% NaCl. Excessive levels decrease the viscosity.

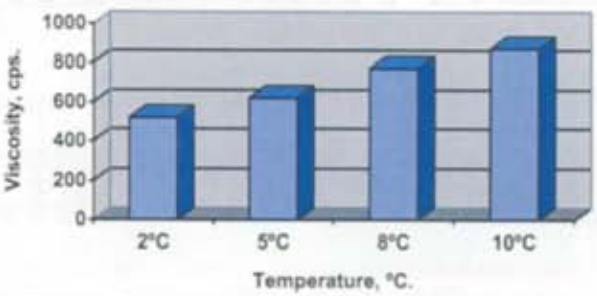


Figure 9: Temperature has some influence of the gel formation of Ceamgel 1313.

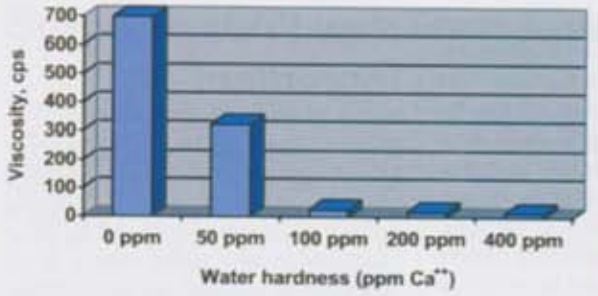


Figure 10: Viscosity of a water gel with Ceamgel 1313 as function of water hardness. (ppm Ca++)

Figure 11: Left: a commercial pork loin product without injection, with a frying loss of 25,9 %, and with a dry and hard texture. Right: a pork loin injected with a gel of 0,25 % Ceamgel 1313, with a final weight gain after 24 hours of 51% and with a frying loss of 18,7% and with a juicy and tender mouthfeel

Ceamgel 1313 is freeze-thaw stable, and the lower thawing loss, combined with a reduced frying loss at the time of final preparation, is an additional benefit to the end consumer.

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