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INTRODUCCIÓN The Common Fisheries Policy (CFP) of 2013 established the gradual introduction of the obligation of by-catch species landing; therefore, the fishery industry must seek ways for the exploitation of these species that cannot be employed for direct human consumption [1].

Discards, by their own nature, are constituted by a variable number and

proportion of marine species. Its composition changes with the season, the fishing area, etc., and this heterogeneity constitutes a limitation to valorise this precious resource at a standardized industrial level, as for example, through the elaboration of restructured fish products.

The seaside arrowgrass (*Triglochin maritima*) is an edible halophyte plant that

can be found in the North coast of Spain; it is scarcely and locally consumed, although its use as ingredient in nouvelle cuisine is beginning. As well, the seaside arrowgrass is rich in flavonoids with antioxidant and antibacterial properties [2], making this plant a potential candidate to be used as a functional ingredient.



OBJECTIVE The objective of this work was to design a fish product made of underutilized marine resources: several discarded Mediterranean fish species at two different proportions and an halophyte plant ethanolic extract.

MATERIALS AND METHODS

Two restructured fish products were elaborated using two different mixtures of four fish minces from two catches (figure 1).

The restructured product was provided with a core of seaside arrowgrass extract gelatine gel (figure 2a) and an encapsulated extract of seaside arrowgrass (figure 3), which were added to the salt-ground muscle. Starch, i-carrageenan, and egg white protein were also incorporated in the formulation. The antioxidant activity of the plant extract before and after microencapsulation was determined.

The restructured product was obtained by thermal treatment at 90°C for 45 min (figure 2b,c). Gel strength was determined on the gels. A crunchy cover was applied afterwards to improve the sensory appeal.

An untrained panel performed a triangular test (UNE-EN ISO 4120:2008) to detect significant differences between samples.

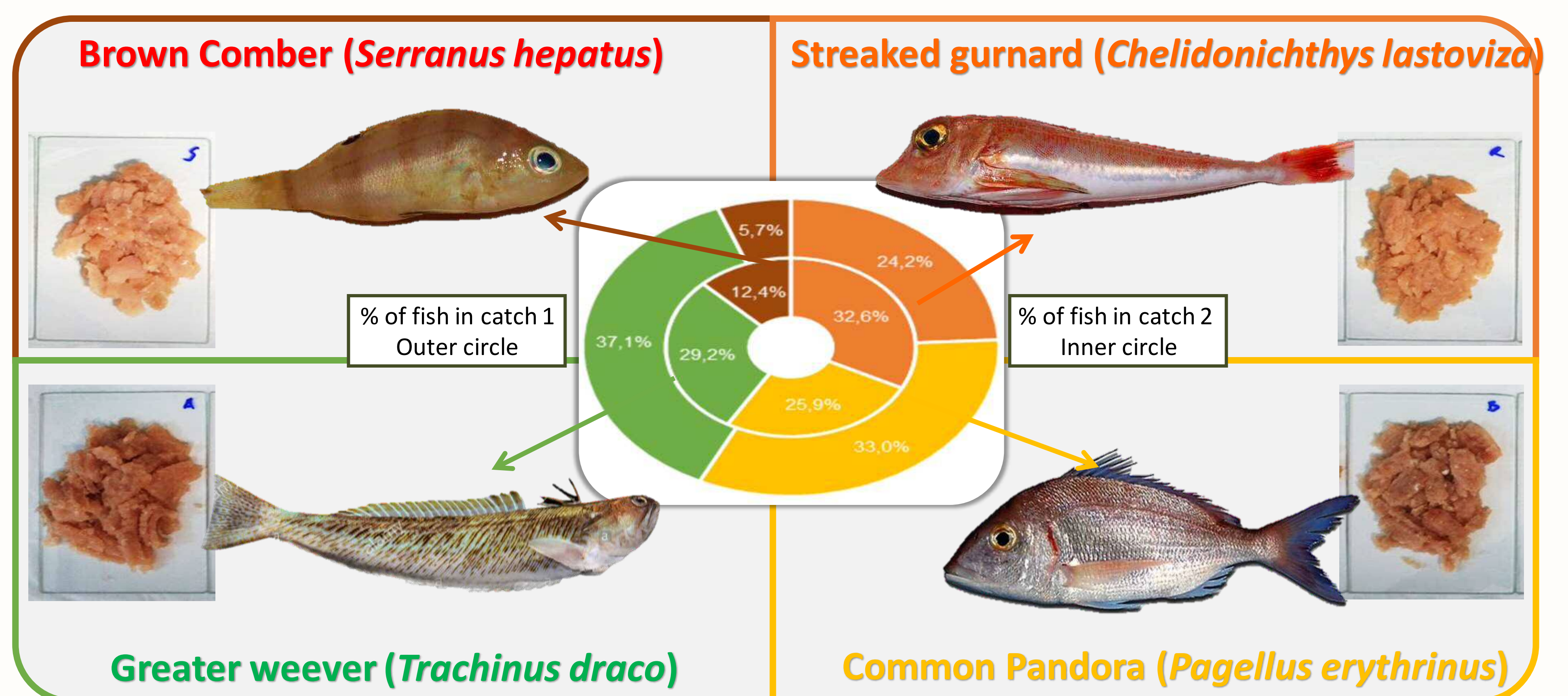


Figure 1: Discarded species and ratios used for minced muscle formulations



Figure 3: from left to right, Seaside arrowgrass, Sonication-favoured extraction and spray drying equipment used for microencapsulation

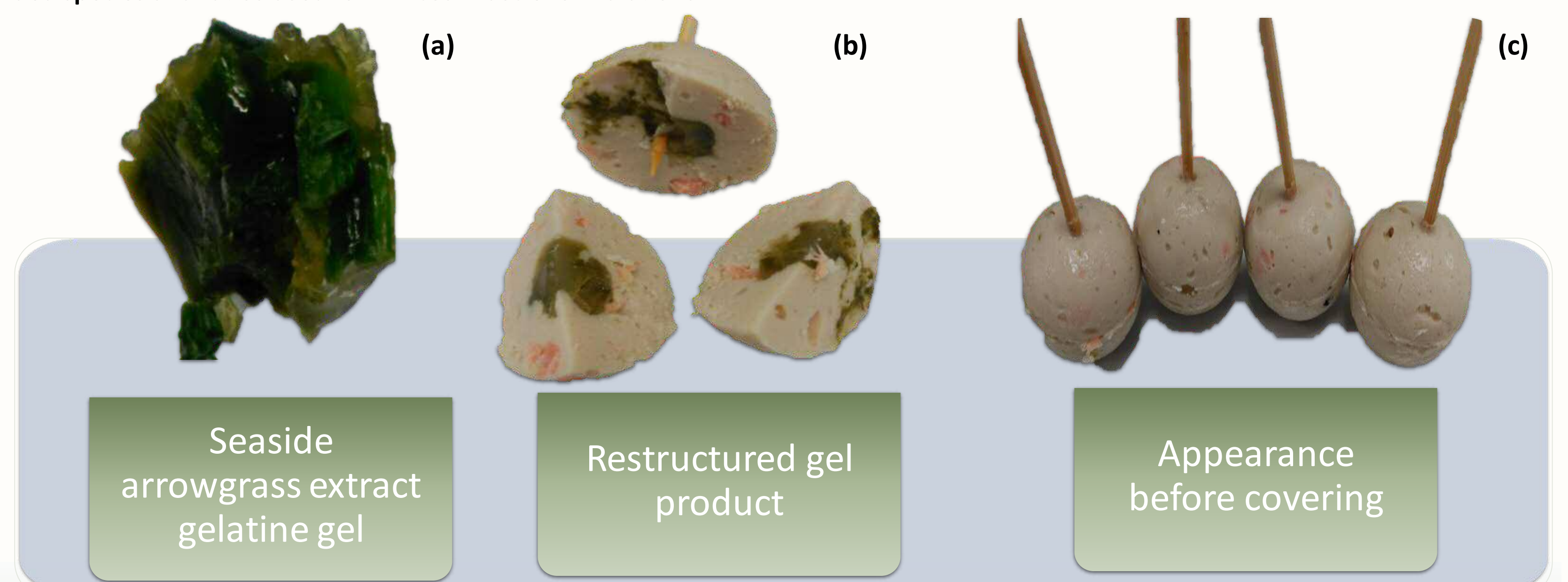


Figure 2

RESULTS AND DISCUSSION

The most outstanding values of antioxidant capacity of the seaside arrowgrass extract corresponded to FRAP activity, which in part remained after encapsulation (Table 1). The microcapsules masked the green colour of the plant extract and modified the texture of the product. No differences between the gels with different proportions of fish were noticeable at gel strength test (figure 4). The sensory analysis revealed that no significant differences were detected depending on the muscle mixture. The typical continuous and gummy texture of a gel product was not appreciable, and it takes the appearance of a product made of non-gelled protein, as "natural muscle". The product was judged to have very good appearance, taste and flavour.

	FRAP (mmol eq. /g)	ABTS ng eq. ascorbic acid/g	PHOTOCHEM (ng eq. Trolox/g)
Seaside arrowgrass extract	249,52 ± 3,17	6,13 ± 0,05	3,93 ± 0,67
Encapsulated seaside arrowgrass	70,61 ± 2,14	0,47 ± 0,08	0,30 ± 0,00

Table 1: Antioxidant and free radical scavenging activities of the seaside arrowgrass extract (encapsulated and non-encapsulated)

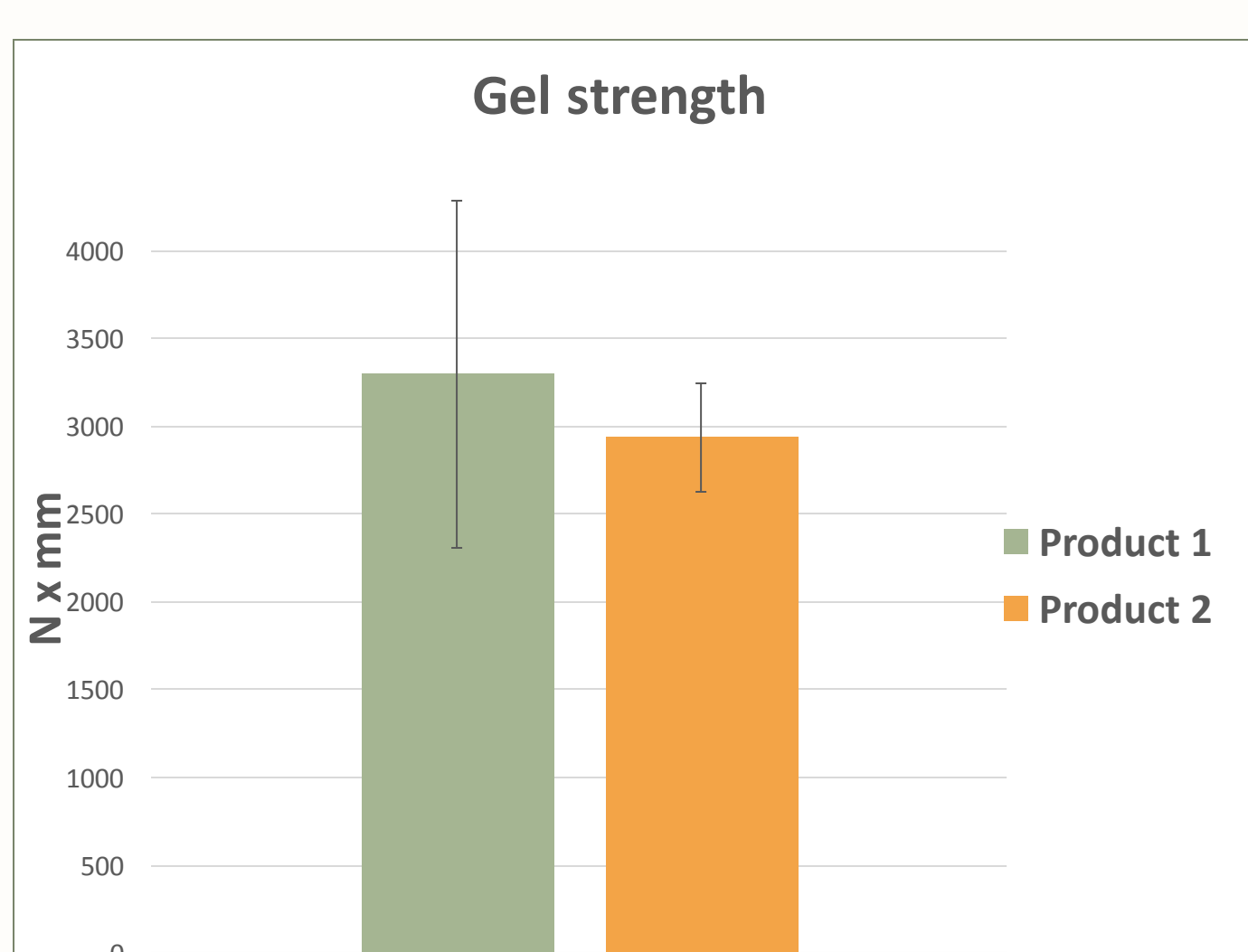
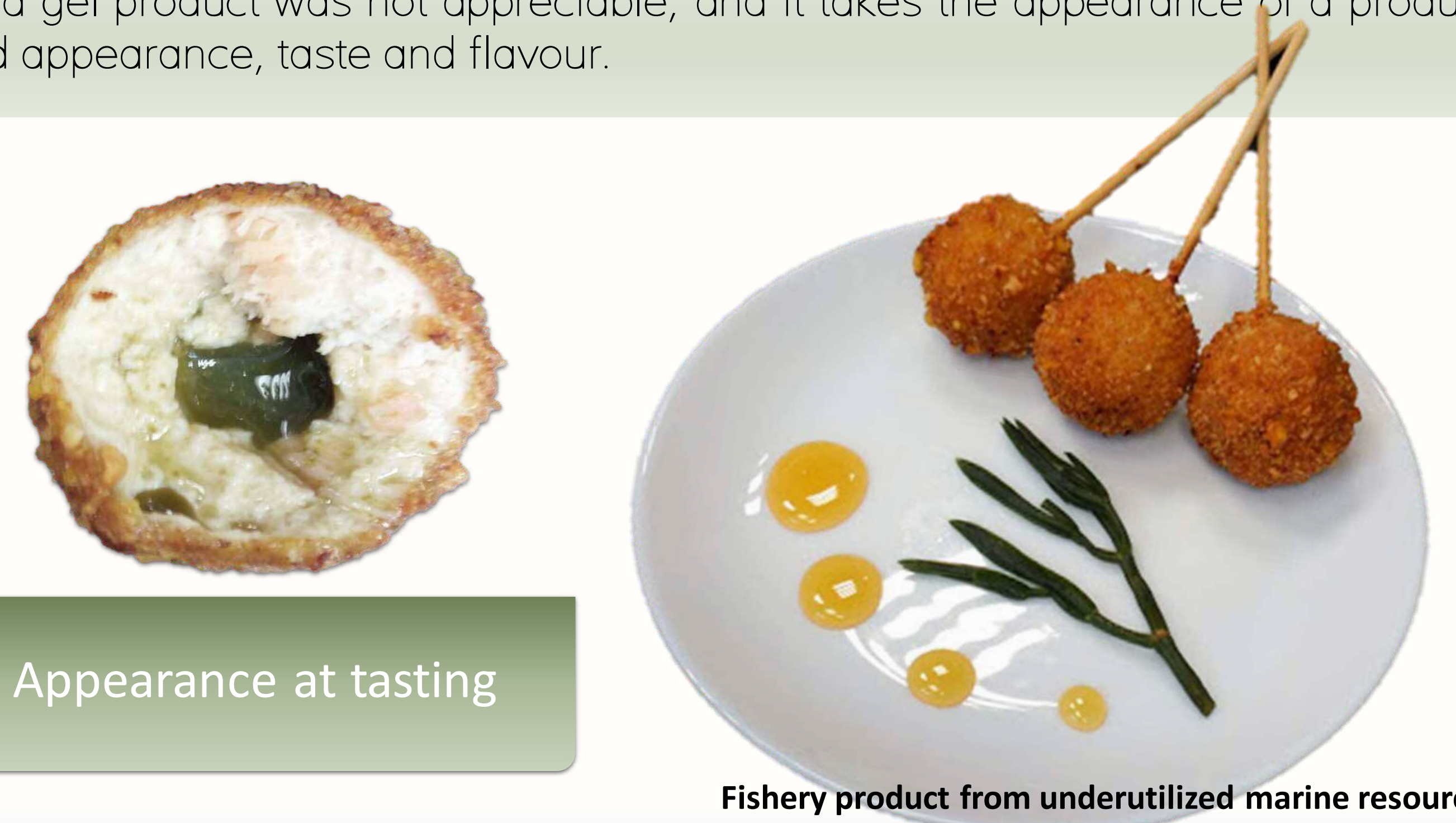


Figure 4: Gel strength of the two restructured products (without the crunchy cover)



Fishery product from underutilized marine resources

CONCLUSION

Fishery products of similar aspect and flavour, potentially functional and with good sensory properties can be obtained from discarded fish and underutilized plants from the littoral, even though the same proportion of fish species is not used. From an industrial perspective this is of enormous importance, given the existing fluctuations in the composition of discarded batches between seasons and areas, as it allows the standardization of this protein material so as to achieve a unique final product. This attractive and avant-garde product can foment the consumption of fish and vegetables in non-accustomed consumers.

References

- [1] Veiga, P., et al. (2016). Marine Policy. 64-71. [2] Boestfleisch, C. and J. Papenbrock (2017). Plos One 12(4): e0176303

Acknowledgements

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