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Aquafaba as an Emulgator for Spreadable Fish Pate

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Abstract

Within increasing global population, the utilization of all the by-product and cooking product of animal and plant based food items has gain importance in both academia and food industries. Aquafaba is a nutritionally-rich, cooking water that left after boiling process of legumes and this product most commonly sold as dried form commercially. In addition to its nutritional value, aquafaba offers rheological and functional properties in the food products. Emulsified fish products have become popular over the world, especially ready to eat products due to its spreadable form and admirable sensory characteristics. Besides these benefits, water holding capacity impact on the rheological properties and chemical properties are crucial for storage period.In this research, aquafaba was used as a emulsifier food additives at the 5 and 10 % levels in emulsified carp fish product. Control group was evaluated as without aquafaba addition. The proximate composition and water holding capacity was determined following to production emulsified products. The results clearly indicate that the aquafaba addition improve the emulsification capacity of carp product. The statistically significant proximal differences were observed among groups, especially in protein level. The higher water holding capacity and highest protein level was observed in the 10% aquafaba added groups. The usage of aquafaba as an emulsifier food additives has the potential to be used in different food products.

Key Words: *Aquafaba, fish pate, carp meat, quality,emulsifier,seafood*

Introduction

Climate change and increasing human pooulation limit the accessibility of protein source globally. Alternative animal based and protein based protein sources have gained interest to meet the protein demand over the world. Besides to valorisation of animal and protein based food item's wastes and by -products, utilization of cooking juices of foods have increased over the last decade Caponio et al.,2022). Especially cooking juices from high protein content of food can be used owing to its high nutrition value (Blejan and Nour, 2023). Aqafaba is a robust model for meeting this protein demand which can be obtained from boiling water of several kind of legumes (Buhl et al.,2019). In addition to vegetarian diets, this excellent protein sources used in different food complex due to its functional properties (Damian et al.,2018). Well-emulsifing capacity of aquafaba is one the important active role of this food additive therefore in addition to common usage of aquafaba in the bakery products, alternative usage of this product in other food mixtures has gained attention (Meurer et al.,2020).
Within increasing demand and consumer attidues to speadable food products from speadable cheese and lives and nuts, spreadble fish products have commonly take a part in the commercial markets (Cedeño-Pinos et al.,2022). Fish pate is known one of the traditional and frequently used spreadable fish products in the world (Bolívar et al.,2023). Due to the demand of smoothy texture and easily spreadable characteristics, different kind of emulsifiers can used to improve emulsifier capacity of the end products (Schilling,2019). Carp (*Cyprinus carpio*) widelt distrubutred in freswater and accepted as a non-economic species (Acar et al.,2018).Valorisation of this non-economic species in a new product could be important fpr sustainibilty of fresh water species. In this research, the investigeations of utilization of aquafaba at different rate as an emulsifier in the carp pate.

Materials and Methods

Aquafaba, in the form of cooking juice from chickpeas, was kindly donated by commercial producers (Döhler Inc., Turkey). Fresh carp (*Cyprinus carpio*) was purchased from a local fishery market in the Eskişehir province,Turkey. Carp was transferred to the laboratory at the cold chain on the caching day.
Carp is then washed and eviscerated prior to the filleting process. Then fresh fish were filleted with a sharp filleting blade and then mixed by laboratoy type mixer. The total amount of carp meat was divided into three groups for further application. Carp meat was mixed with iced water, salt,spices and mush pateto. Aquafaba in the dried form was added to mix at the 5% and 10 %.Carp pate without any aquafaba addition condiedered as control group.

All the pate groups were full filled into packaging materials (around 100 g) manually and closed. Then, thermal treatment was applied in a laboratory-type oven at 80 °C through 45 min in laboratory type oven.Pâté groups were stored in the refrigerator at 2±1 °C during 2 weeks. Following to 2 weeks, WHC analyses was performed to evaluate emulsifier capacity.

Water-holding capacity (WHC) of carp pategroups were determined according to El Khalifa et al.(2005) 1 g of pate sample was placed into the previously weighted centrifuge tubes, and mixed with 14 mL of deonized water and stirred in an automatic tube stirrer.Then mixture was kept at the ambient temperature during 30 min prior to centrifugation.Then sample was centrifugated at 5,000 × g during 25 min. Following to centrifugation, the tube was inversed to excessin of water by tissue paper. The water absorption was determined by the difference between the weight of sample prior and after to centrifugation and expressed as g/g of water hold of sample.

Results and Discussion

Water holding capacity is an important parameter in emulsified products quality,shelf life and sensory attributes. This value also essential critical for the industry due to being related to the total weight of end products and thereof profit.Statically important variations were found in the WHC capacity of carp pate ($p < 0.05$).The differences in WHC of carp pate groups are given in Figure 1.While the lowest water holding capacity was determined in the control group as without any aquafaba addition.Thw water holding capacity was increased within rising rate of aquafaba addition as seen in Figure 1.

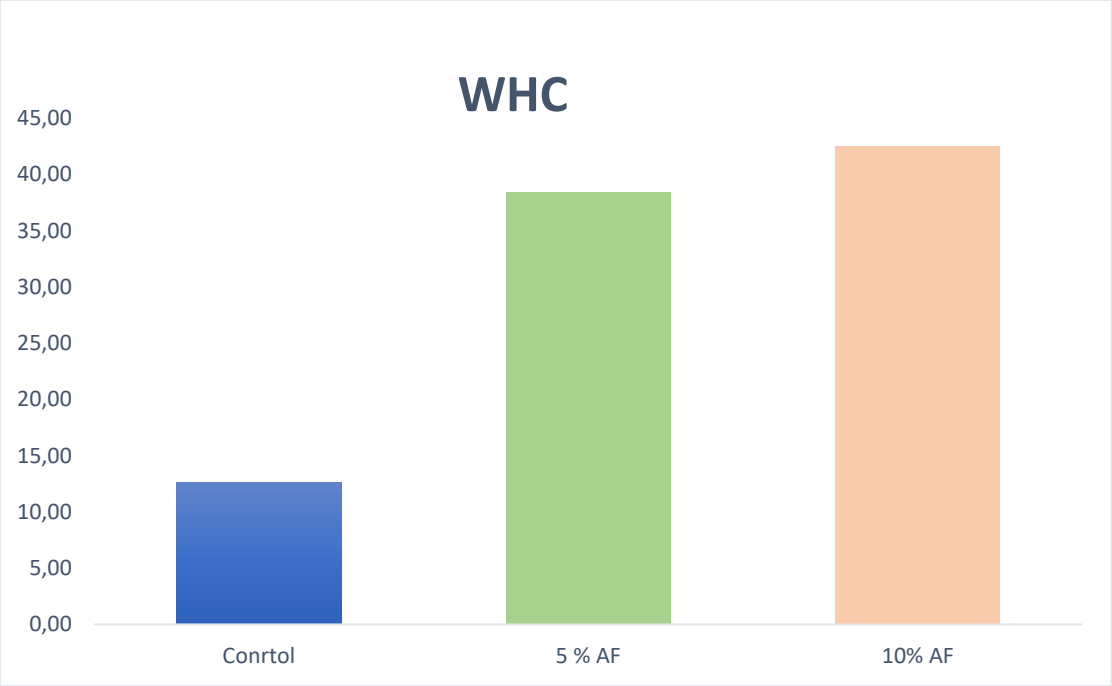

Figure 1. Differencess in water holding capacity of fish pate groups

The differences of water holding capacity of aquafaba enriched carp pate groups were not found statically significant.Thww WHC were found as 39.2 and 42.6 % rate in 5% and 10% aquafaba enriched groups.Relatively higher WHC rate was found in the 10% group that could be related to aquafaba's emulsifier role.These results are in accordance with previous resesearch that also highlighted the emulsifier enhanging properties of aquafaba in different food matrices (Mustafa and Reaney., 2019). Especially in protein –rich food, the characteristic behavior of emulsifiying capcity of aquafaba has superior than other food products (Buhl et als.,2019). As stated in an official report the market of food emulsifiers has grown and estimated to reach nearly US$ 8 billion in 2025 (Grand View Research.,2017).To meet the food emulsifier demand globally, aquafa could be used as emugator in especially emulsified seafood products.

Conclusion

In this research two different valorization processes were applied in a products.Value added plant based aquafaba used as emulsifier in valorization of non-economic carp meat in fish pate.The emulsifier capacity of aquafa clearly showed that this excellent food addtivies could be used in not only bakery products, but also in meat and seaffod industry.

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