Effect of tragacanth gum-based coating containing lemon grass extract on the shelflife of chilled stored Wolf herring (*Chirocentrus dorab*) steaks

Due to the negative perception of consumers against synthetic chemical preservatives, many recent studies are focused on the use of natural extracts of plant origin for enhancing the storage life of perishable foods like fishes. *Cymbopogon citrates* (Fig. 1), commonly known as lemon grass, is widely used in tropical countries as folk medicine, due to its antimicrobial efficiency. For the present study, lemon grass leaves were purchased from local market in Veraval, Gujarat and dried in a hot air oven at 50 °C. The dried leaves were powdered and extracted with 40 % ethanol in 1:10 ratio using Soxhlet extraction system for 5 h. Extract was filtered and the residue was re-extracted. The filtered extracts were combined and concentrated using a rotary evaporator. The final thick solution was dried at 50 °C in a vacuum drier and the extract was stored at 4 °C until further use. The amount of total phenolics in the lemon grass extract (LGE) determined with Folin–Ciocalteu reagent was 130.02±0.03 mg GAE/g. Further, the antioxidant potential of LGE was assessed by DPPH free radical assay and ferric reducing antioxidant power assay (FRAP) and compared with synthetic antioxidant. The DPPH scavenging action of LGE was concentration-dependent and was lower than that of BHA. Antimicrobial activity of LGE on *Chirocentrus dorab* (Fig. 2) was analyzed by disc-diffusion method. Bacterial strains used were gram positive *Staphylococcus aureus* (ATCC 25923) and gram negative *Escherichia coli* (ATCC 25922). DMSO was used as negative control and Ampicillin was used as positive control. LGE showed activity against both the bacteria. Zones of inhibition were 22.10±0.2 mm and 10.00±0.1 mm, respectively against *S. aureus* and *E. coli*. The antimicrobial efficiency and antioxidant activity of plant extracts are generally linked to the presence of phenolic compounds in them (Wong and Kitts, 2006).

Fig.1. Lemon grass leaves, *Chirocentrus dorab* used for the study

Natural biopolymer-based edible coatings can enhance the shelf life of food by reducing its quality loss by preventing the transfer of moisture, lipids, flavours or gases across the package. Tragacanth gum (TG) is a natural polymer, which is non-toxic and bio-compatible and hence is widely used as an emulsifier and thickener in the food and drug industries. It is a natural gum obtained from the dried sap of several species of Middle Eastern legumes of the genus *Astragalus*. TG contains water soluble fraction known as tragacanthin (30–40%) and non-water-soluble fraction called bassorin (60–70%). Due to its multiple advantages, there is an increased attention on preparation of antimicrobial and antioxidant edible coatings containing plant extracts and essential oil for food preservation, which are considered as eco-friendly active packaging. In the present work, effect of TG- based edible coating containing lemon grass extract (LGE) on the

shelflife of chilled stored *Chirocentrus dorab* was studied. *C. dorab*, widely known as wolf-herring was purchased from Jaleshwar landing centre (Gujarat, India) and brought to the laboratory in thermocol boxes with ice. The beheaded and gutted fishes were cut into steaks of 2.5 cm width. A batch of steaks were not given any coating and kept as control. The remaining steaks were further separated into two batches for treating with two different coating solutions. One group was coated with 5% TG solution and the other one was coated with TG containing 100 µg/mL LGE. The fishes were dipped in coating solutions for 15 min. and then allowed to drain for 2 min. Later, the fish steaks were packed in multilayer film of ethylene–vinyl alcohol (EVOH) (nylon, EVOH and polyethylene) and stored in ice. Fresh wolf herring had a moisture content of 74.13%. Protein and fat contents of the fresh fish were 20.4 and 4.2%, respectively. During storage, there was a significant reduction in total volatile base nitrogen formation and fat oxidation in TG+LGE coated fish, compared to control. Total mesophilic count of the control exceeded the allowable limit of 7 log cfu/g, after 12th day of storage, indicating that the microbial shelf life of the control samples was almost 12 days (Fig. 3.). There are previous reports on the antimicrobial efficiency of edible coatings in combination with natural plant extracts to maintain quality of fish flesh. Choulitoudi*et al*. (2016) have reported about the antimicrobial and antioxidant activity of *Saturejathymbra* (L.) extracts in edible carboxymethyl-cellulose coating and its potential to prolong the shelf life of gilthead seabream fillets. TG and TG+LGE coated samples were sensorily acceptable for 15 and 18 days, respectively in chilled condition compared to 12 days for uncoated control. It is clear from the results that TG-based edible coating containing LGE can retain the quality and improve the shelf life of fish steak during chilled storage (Table 1.).

Table 1. DPPH scavenging action (%) of lemon grass extract
***Values are expressed as mean ± standard deviation (n=3)**

*DPPH scavenging ability (%)	Concentration (µg/mL)		
	25	50	100
LGE	68.42±0.42	74.11±0.60	89.66±0.68
BHA	74.23±0.24	84.22±0.50	98.33±0.14

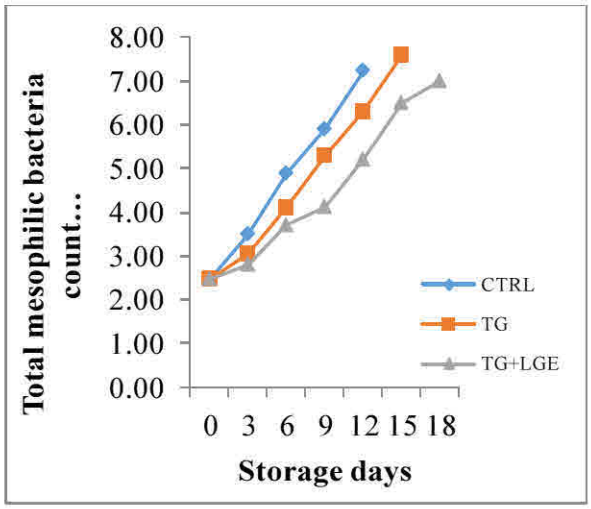

Fig. 3. Changes in the total mesophilic bacteria count of fish steaks during chilled storage

References

Choulitoudi, E., Bravou, K., Bimpilas, A., Tsironi, T., Tsimogiannis, D., Taoukis, P. and Oreopoulou, V. (2016) - Antimicrobial and antioxidant activity of *Saturejathymbra* in gilthead seabream fillets edible coating. *Food &Bioproducts Processing*, **100:** 570–577.

Wong, P.Y.Y. and Kitts, D.D. (2006) - Studies on the dual antioxidant and antibacterial properties of parsley (*Petroselinumcrispum*) and cilantro (*Coriandrumsativum*) extracts. *Food Chem.*, **97:** 505–515.

Remya S., [1]George Ninan, Ashish Kumar Jha and [1]Ravishankar C. N.
Veraval Research Centre of ICAR-Central Institute of Fisheries Technology, veraval
[1]ICAR- Central Institute of Fisheries Technology, Cochin