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Microbiological Characterization in Alaska Pollack *Sikhae* during Aging at Low Temperature

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As one of researches for extension of shelf-life in *Sikhae*, microbiological characterizations including lactic acid producing bacteria in Alaska pollack *Sikhae* were evaluated during aging at low temperature conditions. Here, Alaska pollack *Sikhae* were fermented with 3 types, e.g. C type, stored at 5°C after 6 days aging at 20°C; A1 type, stored at -2°C after 6 days aging at 20°C; and A2 type, stored -2°C after two stage aging followed by 6 days at 20°C and 7 days at 5°C in that order. The viable cell count in C was in the range of 3.16×10^8 - 4.18×10^8 CFU/g for 56 days of aging, and decreased to 2.61×10^7 CFU/g in 79 days. However, the number in A1 decreased from 2.65×10^8 CFU/g to 4.16×10^7 CFU/g after keeping at -2°C and the number in A2 was also varied from 9.33×10^7 to 2.50×10^8 CFU/g after alternating temperature to -2°C. In C type, *Lactobacillus sp.* was kept in 1.26×10^8 - 2.76×10^8 CFU/g ranges for 56 days, and then decreased to 2.20×10^7 CFU/g in 79 days. The concentration of *Lactobacillus sp.* in A1 decreased from 2.22×10^8 CFU/g to 2.68×10^7 CFU/g at aging condition of -2°C. But those in A2 decreased to 1.17×10^8 CFU/g after 25 days of aging. *Leuconostoc sp.* increased up to 1.50×10^7 CFU/g in C for 14 days and then disappeared afterward. Meanwhile, *Leuconostoc sp.* in A1 decreased gradually to 5.90×10^5 CFU/g at -2°C of aging, whereas those in A2 was the range of 9.60×10^5 - 2.25×10^6 CFU/g after two stage aging. The level of *Pediococcus sp.* in A2 was still maintained 10^7 CFU/g in 79 days after two stage aging, comparing with 2.50×10^5 CFU/g in C and 6.13×10^6 CFU/g in A2. *Aerococcous sp.* increased to 1.26×10^8 CFU/g in 7 days of C and 1.51×10^8 CFU/g in 14 days of A1, respectively, and then decreased in two samples. The same tendency appeared in *Streptococcus sp.* in all samples. *Yeast* was the level of 10^7 - 10^8 CFU/g in C during aging, while those in A1 and A2 were maintained the level of 10^7 - 10^8 CFU/g in early stage of 38 and 56 days, respectively.

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Extension of Shelf-Life of Alaska Pollack *Sikhae* by Two Stages Aging

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Alaska pollack *Sikhae* were stored with 3 types, e.g. C type, stored at 5°C after 6 days aging at 20°C; A1 type, stored at -2°C after 6 days aging at 20°C; and A2 type, stored -2°C after two stage aging followed by 6 days at 20°C and 7 days at 5°C in that order. The chemical properties including VBN, Amino-N, pH, total acidity and sensory evaluation in 3 types *Sikhae* were experimented during fermentation. VBN values (mg%) in all samples (C, A1 and A2) increased from 18.68 mg% in 0 day to 73.56 mg%, 52.43 mg% and 55.00 mg% after 79 days of aging, respectively. Amino-N values (mg%) in C, A1 and A2 were also 255.64 mg%, 167.32 mg% and 200.17 mg%, respectively, in 79 day of aging. The pH of C decreased sharply (from 6.13 to 4.18) up to 14 days of aging and then kept in 4.18 - 4.05 ranges. However, pH in A1 (4.94-4.55 ranges) and A2 (4.42-4.27 ranges) were more higher than that in C (from 4.18 to 4.05) during the storage of alternated temperature to -2°C. Total acidity values gradually increased in 3 types *Sikhae* with aging days. However, the increasing ranges of total acidity in A1 (from 0.94 g% to 1.40 g%) and A2 (from 1.65 g% to 1.98 g%) were lower than that in C after storage of alternated temperature to -2°C. In sensory evaluation, overall acceptance of C increased from 5.67 in 7 days to 7.00 point or more for 38 days of aging and then decreased below 6.00 point gradually. However, scores of A1 and A2 maintained the ranges of 5.00-6.68 and 6.33-7.09 during 79 days of aging, respectively. The point of limit salability (6.00 or more) was preserved until 38 days in C and 79 days in A2 type. Limit salable point of A1 appeared on 14 days only. These results suggested that A2 type was superior to C and A2 from the sensory evaluation, and also extension of shelf-life of Alaska pollack *Sikhae* by two stages aging could be expected until 79 days of aging.