

precipitate and neutralization of the treated brine with HCl. In 1973, spent brine samples were taken from six tanks in a commercial tankyard and treated according to Geisman's procedure. Organic matter, COD, protein, Kjeldahl nitrogen and mineral content were determined for each brine before and after treatment with NaOH. In addition, the precipitates were collected, dried and analyzed. Results are shown in Tables 13 and 14.

Table 13. Effect of base treatment of spent brines on brine composition (a)

	Precipitate (g)	Total organic matter (g)	Kjeldahl Nitrogen (mg)	Biuret Protein (mg)	COD ppm
Untreated spent brine	—	2.11	62.7	52.2	12600
Treated brine	—	2.03	56.2	41.7	12150
Precipitate from base treatment	0.19	.08	2.7	—	—
% Removed by base treatment	—	3.8	10.4	20.1	3.6

(a) All results are the mean of six samples; data are expressed as the amount per 100 ml spent brine.

Table 14. Mineral analysis of spent brine (a)

	Ca(%)	P(%)	Mg(%)	Fe ppm	Cu ppm	B ppm	Zn ppm	Al ppm
Untreated spent brine	.092	.017	.016	10.6	1.2	1.5	3.3	4.6
Treated brine	.051	.002	.00	1.5	1.3	1.3	2.4	13.8
Precipitate from base treatment	21.1	-7.9	7.5	-4900	98	65	568	1587
% Removed by base treatment	45	88	100	86	0	13	27	—

(a) Data expressed on the basis of liquid volume for the brine. The precipitate results are expressed on the basis of dry weight of precipitate.

The conclusions reached from this analysis are:

1. Very little organic matter is removed by base treatment.
2. It follows that BOD and COD are not significantly lowered. Therefore, this is *not* a suitable treatment for removal of organic material.
3. Only small amounts of protein and nitrogen are removed.
4. Mainly inorganic matter is found in the precipitate after base treatment. Significant amounts of calcium, magnesium, phosphorus and iron are removed from spent brine.

5. Since 2% of the spent brine is organic matter and only about 0.4% lactic acid is present, about 80% of the organic matter in spent brine consists of unidentified compounds.

Fermentation of Cucumbers in Spent Brine

Size 3B cucumbers were fermented in base treated, heat treated and untreated spent brine and control (fresh) brine. The salt concentration was maintained at 25° salometer during fermentation. The initial pH of the spent brine tanks was 4.0. Acid production in heated spent brine and fresh brine is shown in Fig. 11. Acid production in the other spent brine treatments was similar to that for the heated spent brine. Results indicate that:

1. The brine resulting from the fermentation of cucumbers in spent brine was higher in pH and titratable acidity due to the presence of buffering substances.
2. Slightly faster fermentation was evident with the spent brine.
3. There were no discernable differences in color, odor and texture between pickles fermented in spent brine and those fermented in fresh brine.

Repetitive Recycling

In one experiment, spent brine obtained from a commercial tankyard in which 1972 cucumbers

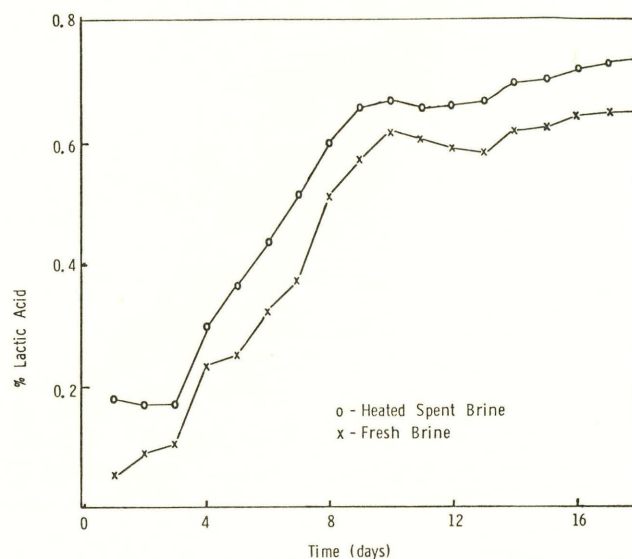


Fig. 11. Lactic acid production during fermentation of 3B cucumbers in heat treated spent brine and fresh brine.