

NOTE**Effect of Garlic Extract on Lactic Culture**

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In the present notes the aim is to determine the effect of different garlic extract concentrations on the acid producing activity of *L. bulgaricus* and *L. delbrueckii*.

The combined effect of different garlic concentrations, pH and temperature values on the activity of lactic acid bacteria was studied. It was observed that under optimum culture conditions of pH and temperature *Lactobacillus bulgaricus* and *Lactobacillus delbrueckii* were not able to grow satisfactorily if the garlic concentration in the fermentation culture medium was 1.0% or more. The bactericidal as well as fungicidal action of garlic extract has been reported by several workers¹⁻⁴, on the basis of qualitative studies. Karaioannoglou *et al.*⁵ and Mantis *et al.*⁶ have reported the quantitative effect of freshly prepared garlic extract on *L. plantanum* and *Staphylococcus aureus*. Karaioannoglou⁷ studied the effect of different concentrations of garlic extract on the growth of vegetative cells and outgrowth of spores of *Bacillus aureus*. Mantis *et al.*⁸ also reported the effect of garlic extract on food poisoning microbes.

The objectives of this study were to determine the effect of different garlic extract concentrations on the acid producing activity of *L. bulgaricus* and *L. delbrueckii*.

Garlic Extract Preparation

Dry and clean garlic bulbs were peeled and homogenized with two parts of distilled water. The garlic homogenate was filtered under vacuum through a Whatman filter paper and the garlic filtrate was centrifuged. The clear supernatant solution was sterilized and stored under refrigeration.

Growth Medium

Growth medium consisted of the following ingredients:

Glucose, lactose and yeast extract, 500 mg each sodium acetate and peptone, 600 mg each; KH_2PO_4 and K_2HPO_4 , 50 mg each.; $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, 20 mg; NaCl , $\text{MnSO}_4 \cdot 5\text{H}_2\text{O}$ and $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, 1.0 mg each dissolved in 100 mL of distilled water.⁹

Fermentation Medium

A 20% (w/v) solution of molasses (corresponding to 4.4 g sugar) in distilled water was used as fermentation medium. 100 mL of fermentation medium was taken in 250 mL conical flasks (a total of 30 flasks were used for one set of pH and temperature), sterilized and cooled at room temperature. All the flasks were divided into two sets and each set was sub-divided into five subsets, each consisting of three flasks. Garlic extract was added to concentrations amounting to 0.0, 0.5, 1.0, 2.0 and 3.0% respectively into subsets of both the sets. One set of flasks was inoculated with 0.5 mL inoculum of *L. bulgaricus* and other with *L. delbrueckii*.

All the flasks of first and second set were incubated under optimum pH and temperature (5.8–6.0, 47°C for *L. bulgaricus*¹⁰; 6.0, 45°C for *L. delbrueckii*^{11, 12}). After 6 days of incubation period the contents of the flasks were analysed for the lactic acid¹³ produced and sugar¹⁴ left unfermented.

For the study of the effect of garlic extract under lower and higher pH and temperature values, similar experiments were carried out with the changed pH or temperature.

TABLE-1
EFFECT OF GARLIC EXTRACT ON *L. BULGARICUS* AND *L. DELBRUECKII*

Concentration of garlic extract %	Yield of lactic acid* (g/litre)	Sugar* left unfermented (g/litre)	Yield of lactic* acid (g/litre)	Sugar* left unfermented (g/litre)
(1) pH 5.0 and temp. 40°C				
0.0	15.886	26.431	23.011	19.883
0.5	16.013	25.116	20.000	22.344
1.0	10.990	31.118	19.997	24.630
2.0	8.753	33.016	14.003	27.808
3.0	6.603	35.425	10.816	30.816
(2) pH 5.8–6.0 and Temp. 47°C (<i>L. bulgaricus</i>) pH 6.0 and Temp. 47°C (<i>L. delbrueckii</i>)				
0.0	19.750	22.457	25.175	17.116
0.5	18.598	23.378	22.240	19.753
1.0	10.596	31.001	17.181	24.273
2.0	9.005	32.453	15.220	26.113
3.0	6.485	35.350	12.550	26.110
(3) pH 7.0 and Temp. 50°C				
0.0	16.008	25.080	22.000	19.996
0.5	15.002	25.510	19.710	20.995
1.0	10.116	30.110	15.228	25.210
2.0	6.694	33.220	12.340	27.980
3.0	5.995	33.510	9.875	29.790

*Each value represents mean of three observations. Experimental deviation \pm 2.5–3.5 %

The results of colorimetric analysis are shown in Table-1. The data represent the mean of three trials taken into one observation. It is evident that under optimum pH and temperature garlic extract has a concentration dependent inhibitory effect on the acid producing activity of *L. bulgaricus* and *L. delbrueckii*. When garlic extract was present in 1% concentration in fermentation medium *L. bulgaricus* could produce only half of its capacity of producing lactic acid.

At lower pH and temperature, similar results were observed, *i.e.* yield of lactic acid decreased with the increasing concentration of garlic extract. At higher pH and temperature, inhibition was more and production of lactic acid was insignificant.

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