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Effect of Fermentation Duration on the Growth Inhibitory Activity of Maize "Ogi" Liquor on Common Diarrhoeal Bacteria

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The effect of fermentation duration of "ogi" produced from maize (*Zea mays*) on the growth of some common diarrhoeal bacteria viz *Escherichia coli, Shigella dysenteriae, Staphylococcus aureus* and *Salmonella typhimurium* was investigated in this study using agar gel diffusion assay. The liquor of "ogi' that has undergone fermentation for 3 days exerted the greatest inhibition on the growth of all the test bacteria used. Based on this observation, it is suggested that the liquor of maize "ogi" that has undergone fermentation for 3 days should be exploited in the treatment of bacterial diarrhea caused by these organisms especially in rural areas where they may not have access to conventional medical attention.

Keywords: Maize, "ogi", fermentation duration, diarrhoeal bacteria, growth inhibition.

In the bid of looking for a local cure for the treatment of running stomach, people living in rural communities in the south west part of Nigeria drink the slurry of raw "ogi" to relieve the condition. This has led to some investigations by some researchers to know whether raw "ogi" has antibacterial properties since most of the organisms that cause diarrhea are bacteria. In the investigation carried out by Olukoya *et al*.,[1] they reported that raw "ogi" slurry has antibacterial activity and this property is as a result of the presence of Lactobacilli in the slurry. Ogunbanwo *et al.,*[2] went further to identify the actual metabolite produced by these bacteria and they discovered that it is the bacteriocin produced by these organisms that is responsible for their growth inhibitory property. Adebolu *et al.,*[3] also carried out an investigation to determine whether the type of grains used has any effect on the antibacterial activity of "ogi" prepared from these grains. It was observed that the liquor of "ogi" prepared from guinea corn and the one from millet exerted higher growth inhibitory activity on majority of the test bacteria used.

Although there are some works on antibacterial activity of "ogi", more is still desired so that this knowledge can be maximally exploited. In this present study the effect of fermentation duration of "ogi" on the efficacy of its liquor in inhibiting the growth of selected test diarrhoeal bacteria was investigated.

MATERIAL AND METHODS

Diarrhoeal organisms like *Escherichia coli, Staphylococcus aureus, Shigella dysenteriae* and *Salmonella typhimurium* were collected from the Nigerian Institute of Medical Research (NIMR), Lagos, Nigeria.

White maize (*Zea mays*) grains used in this study were purchased from the main market, Akure, south west, Nigeria.

Traditional preparation of "OGI"

One kilogram of the grains was cleaned and steeped in cold water just enough to cover it

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in a clean plastic bucket with a cover at room temperature of 28 ± 2^{0}C. The grains were rinsed in clean water, wet milled with a local grinder before sieving with a clean cheese cloth. The pomace was discarded and the filtrate (slurry) was allowed to settle during which fermentation took place by the natural flora of the grains. Every morning for 7 days, the liquor on top of the "ogi" filtrate was collected into a sterile container and was tested for growth inhibitory activity on the test organisms. Moreover, the pH and the titratable acidity of the liquor were determined daily. The pH was measured using Jenway pH meter that has been standardized with appropriate buffers while the titratable acidity was determined according to AOAC[4].

Determination of the antibacterial activity of maize "ogi" liquor, fermented or unfermented on the test bacteria

For testing antibacterial activity of the liquor, 0.1ml of overnight broth culture of the test organisms (10^5) was introduced (one organism per sterile petridish), overlaid with sterile nutrient agar (cooled to 45°C), swirled to allow even distribution of the organisms in the agar and left to solidify. A well was bored in the centre of each plate (6mm in diameter) and 0.3ml of the liquor from freshly prepared "ogi" was introduced into each well. The plates were then incubated at 37°C for 24h. Zones of inhibition around the wells were looked for and when present was measured with a transparent ruler. This assay was repeated using the liquor from "ogi" that has undergone fermentation for different days.

RESULTS AND DISCUSSION

From this investigation, both the liquor of maize "ogi" that is freshly prepared and the liquor of maize "ogi" that has undergone fermentation for different days inhibited the growth of all the test bacteria used (Table 1). The greatest inhibition however was achieved with the liquor of maize "ogi" that has undergone fermentation for 3 days, the zones of inhibition mediated by the liquor ranged from 17.0 to 19. 0 mm. The pH of this liquor was 2.97 (Table 2) while the titratable acidity (% lactic acid) was 29.48 % (Table 3). After the third day, in spite of the general low pH of the liquor used, the growth inhibition zones on all the test bacteria started to decrease and by day 6, it has reduced to zero for *Salmonella typhimurium* but it was not until day 7 that it reduced to zero for *Escherichia coli* and *Shigella dysenteriae.* For *Staphylococcus aureus,* the zone of inhibition remained constant with diameter of 9.00 mm by day 7. The greatest inhibition seen on the third day might be as a result of bacteriocins produced by the lactic acid bacteria such as *Lactobacillus plantarum* and *Lactobacillus fermentum* that are normally associated with the fermentation of "ogi"[3,5]. This metabolite acts by specifically destroying bacterial membrane[6]. Although it is produced during the early log phase of the growth curve of producing bacteria, according to Ogunbanwo *et al.,*[2] it may exerts its activity for up to 48h at 30 - 37°C. So the high inhibition recorded in the first 72h might be as a result of the collaborative effect of both bacteriocin and lactic

Table 1. Growth inhibition of test bacteria by the liquor of the prepared maize "ogi", fermented and unfermented.

Days	*Shigella dysenteriae*	*Escherichia coli*	*Staphylococcus aureus*	*Salmonella typhimurium*
0*	8.0	6.0	6.0	6.0
1	11.0	17.0	14.0	12.0
2	18.0	10.0	12.0	12.0
3	18.0	19.0	18.0	17.0
4	13.0	14.0	12.0	11.0
5	14.0	15.0	9.0	12.0
6	14.0	11.0	9.0	0.0
7	0.0	0.0	9.0	0.0

*Unfermented

Table 2. The pH and titratable activity (TTA) of the "Ogi" liquor used.

Days	pH	TTA (% lactic acid)
0*	3.96	10.34
1	3.29	11.97
2	3.17	30.46
3	2.97	29.48
4	2.92	30.64
5	2.86	33.73
6	2.84	34.82
7	2.78	36.99

* Unfermented

acid produced by these bacteria. However when the effect of the bacteriocin waned by the third day, there was reduction in the growth inhibitory activity of the liquor inspite of the low pH as seen by day 4.

This work has been able to show that the liquor of maize "ogi" that has undergone fermentation for 3 days exerted the greatest growth inhibitory activity on the test bacteria used. It is therefore suggested that the liquor of maize "ogi" that has undergone fermentation for this duration be exploited in treating diarrhea, caused by these bacteria especially by people who use raw "ogi" for the treatment of running stomach.

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