Antimicrobial potentials of some selected microorganisms associated with supernatant solution of fermented maize mash *Omidun*

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This study was carried out to investigate antimicrobial potentials of *Omidun*, the supernatant of “ogi” an acid fermented cereal mash made from maize. The antimicrobial activity of some microorganisms commonly isolated from *imidun* was determined singly and in combinations against *Escherichia coli* ATCC 25922 and *Salmonella abaetetuba* ATCC 35460 by the disc diffusion method using some commercial antibiotics as control. Generally, all the organisms isolated from *Omidun* inhibited growth of the test organisms with exception of the yeast strains. There was significant difference (p<0.05) between the effect of some known antibiotics on the test organisms, though Ciprofloxacin gave the highest inhibition zone (21 and 20 mm) but not as high as the inhibition zone given by *Aspergillus fumigatus* alone and in combination with yeast and *Lactobacillus plantarum* (39 mm). This study shows that the inhibition zone produced by *A. fumigatus* is higher than that of any of the commercially produced antibiotics, there is inter-relationships and potential therapeutic property between the microorganisms in *Omidun* against some gastro enteric organisms. Consumption of hygienically prepare *Omidun* by diarrhea patients should be encouraged as control.

Key word: *Omidun*, ogi, diarrhoea, antimicrobial, inhibition zone.

INTRODUCTION

*Escherichia coli* and *Salmonella* species are examples of principal gastroenteric bacteria known to cause diarrhoea which is the passage of loose or liquor stool more frequently than is normal for the individual. Diarrhoea diseases represent a major health problem in developing countries and also a high risk to travellers who visit these countries. Conservative estimates place the global death toll from diarrhoea diseases at about two million death per year (1.7 to 2.5 million death), ranking third among all causes of infectious disease death worldwide. Most of these occur in children under five years of age (WHO, 2004).

Medically, diarrhoea is often controlled by the use of antibiotics. However, in recent times, there have been increases in antibiotic resistant strains of clinically important pathogens including those causing diarrhoea. This has led to the emergence of new bacteria strains that are multi-resistant (Aibinu et al., 2003). The non availability, high cost and limited effective span of new generation antibiotics have resulted in increase in morbidity and mortality (Williams, 2000), hence, the need for substances from other sources with proven antimicrobial activity. Consequently, this has led to the search for more effective antimicrobial agents among materials of plants origin with the aim of discovering potentially useful active ingredients that can serve as source and template for the synthesis of new antimicrobial drugs (Pretorius et al., 2003; Moreillion et al., 2005).

*Omidun*, the supernatant of “ogi” an acid fermented...
cereal mash made from maize or corn has been traditionally found to be of medicinal importance in the South-Western part of Nigeria. It is used to soak bark of root of some plants to treat not only fever and malaria but is popularly used as solvent for herbal extraction. It has been used in the extraction of antimicrobial agents from some leaves such as Bryophyllum pinnatum and Kalanchoe crenata (Albinu et al., 2007). Information from indigenes also claims that Omidun is popularly used in the control of diarrhoea. It is traditionally produced by soaking the maize/corn grains in cold or warm water for 24 to 72 h to allow for fermentation before it is wet milled, sieved and soured. Sedimentation of the soured “ogi” for 48 to 72 h gives rise to omidun (Odunfa and Adeleye, 1985; Onyekwere et al., 1989; Teniola and Odunfa, 2001).

The microorganisms responsible for the fermentation of maize for “ogi” production play important role for aroma, microbial stability and flavour. The significance of yeasts and moulds occurring in maize dough fermented for “kenkey” production has been reported. Jespersen et al. (1994) reported that the number of yeasts present and the significant multiplication of the dominant species are likely to influence the organoleptic and structural quality of the dough for “kenkey” production. Hamad et al. (1992) found that fermented sorghum dough with high number of yeasts has a more pleasant smell than dough with less yeast. While information is available on the contribution of yeasts to “kenkey” production, there is scant information on their roles in the fermentation of “ogi”.

Previous studies have concentrated mainly on the role of the lactic acid bacteria and their use as starter culture in “ogi” production (Odunfa, 1985; Teniola and Odunfa, 2001). Important enzymatic qualities with nutritional effect had been reported in many lactic acid bacteria and yeasts in indigenous fermentation. These enzymes allow the break down of many complex substances such as starch, oligosaccharides, protein and phytic acid complexes thus increasing the quantities and qualities of easily digestible nutrient in foods (Olasupo et al., 1996). This feature is of major benefit to the consumers of “ogi”, majority of who are infants, children and convalescent adults with weak digestive systems. Recent studies have sought to optimize the role of Lactobacillus spp in the safety of fermented foods. Lactobacilli are important organisms recognized for their fermentative ability as well as their health nutrition benefits. They produce various compounds such organic acids, diacetyl, hydrogen peroxide and bacteriocin or bactericidal proteins during lactic fermentations (Lindsgreen and Dobrogosz, 1990).

The first mould observed to produce antibiotics (penicillin) was Penicillium notatum (Pelczar et al., 1993). Aspergillus fumigatus is by no means unique among moulds in its capacity to produce antimicrobial compounds entirely unrelated chemically, possessing strong antibiotic activity. Oxford and Riastrick (1942) found that certain strains of A. fumigatus are able to produce spinulosin and fumigatin which are pigmented quinines, both of which possess antibacterial properties. Later, Waksman et al. (1943) isolated fumigacin which showed greater antibacterial activity than fumigatin. A. fumigatus was also reported to simultaneously produce two antibiotically active agents, glotoxin and fumigacin.

The presence of microorganisms and their attendant vitamins and soluble nitrogen compounds present in “ogi” cannot be ruled out in “Omidun”. Reports have shown that series of work had been done on the microbial, nutritional and therapeutic values of “ogi” but nothing has been done on the therapeutic effect of the microorganisms in Omidun. Also, the role of lactic acid bacteria in “ogi” has been well exposed but the possible roles of yeasts and moulds in omidun have not been understood, hence this research to investigate the potential therapeutic effects of microorganisms associated with Omidun.

**MATERIALS AND METHODS**

**Traditional preparation of Omidun**

Omidun was prepared traditionally by the soaking and fermentation of corn kernels in water for 28 to 72 h, wet milling, sieving and souring. Sedimentation of the soured “ogi” for 72 h gave rise to Omidun. The 72 h supernatant solution (Omidun) of the soured “ogi” was collected for analysis.

**Test organisms**

The test organisms E. coli ATCC 25922 and Salmonella abaeetetuba ATCC 35460 were typed cultures obtained from Lagos University Teaching Hospital (LUTH) IIdi Araba, Lagos, on nutrient agar slants and were taken to Abeokuta Microbiology laboratory, University of Agriculture for confirmation. Each was re-cultured on fresh sterile nutrient agar plates for purity. Morphological and Biochemical tests were carried out on each of the pure isolates to confirm their identity before use.

**Determination of minimum inhibitory concentration (MIC)**

The antimicrobial agents (microorganisms isolated from omidun were diluted serially in Mueller – Hinton broth to generate decreasing concentration up to 10⁶. To each of the dilutions, 1 ml of 18 h broth of the test organisms was added and incubated at 37°C for 18 h. The resulting turbidity was adjusted to McFarland standard.

**Antibiotics sensitivity pattern of the test organisms**

This was carried out using disc diffusion method of Ochei and Kolhatkar (2008). 1 ml of 18 h broth culture of each of the test organisms was transferred into sterile Petri dishes (different organism per plate) using sterile syringe. Each plate was then overlaid with 20 ml molten nutrient agar, swirled carefully for even distribution of the organisms within the agar and allowed to gel. Standard commercial antibiotics disc were distributed on the seeded agar plates and incubated at 37°C for 24 h. The diameter of the zones of inhibition around the antibiotics were measured and recorded.
Antimicrobial effect of microorganisms isolated from Omidun

1 ml of 18 h broth of the test organisms (E. coli ATCC25922 and S. abaetetuba ATCC 35460), overlaid with 20 ml Nutrient broth and allowed to gel after swirling for even distribution. The impregnated discs with each of the microorganisms in omidun (Candida albicans, Candida parasitopsis, Candida pseudotropicalis, Candida tropicalis, Saccharomyces cerevisiae, A. fumigatus and Lactobacillus plantarum) were distributed on the gel (22 mm from each other and 14 mm from the edge of the plate). The discs were gently pressed for uniform contact with the surface of the medium, incubated at 37°C for 24 h and observed for zones of inhibition, which was measured and recorded.

Antimicrobial effects of different combinations of the isolates

The MIC of the isolates was determined in different combinations when they were impregnated into the discs. The impregnated discs were distributed on media containing E. coli ATCC25922 and S. abaetetuba ATCC 35460, incubated at 37°C for 24 h and the zone of inhibition was measured and recorded.

Table 1. Inhibitory effects of L. plantarum and A. fumigatus alone and in combination.

<table>
<thead>
<tr>
<th>Microorganisms from Omidun</th>
<th>MIC (CFU/ml) against E. coli ATCC 25922</th>
<th>Zone diameter (mm) against E. coli ATCC 25922</th>
<th>MIC (CFU/ml) against S. abaetetuba ATCC 35460</th>
<th>Zone diameter (mm) against S. abaetetuba ATCC 35460</th>
</tr>
</thead>
<tbody>
<tr>
<td>L. plantarum</td>
<td>0.25</td>
<td>32±0.1&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.13</td>
<td>28±0.3&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>A. fumigatus</td>
<td>0.07</td>
<td>34±1.4&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>0.03</td>
<td>34±0.7&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>L. plantarum + A. fumigatus</td>
<td>0.13</td>
<td>35±0.4&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.25</td>
<td>35±1.3&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Mean values within a column with the same letter are not significantly different (p>0.05).

Table 2. Summary of the Inhibitory effects of L. plantarum with different yeast combinations.

<table>
<thead>
<tr>
<th>Yeast</th>
<th>Inhibition zone (mm) on E. coli ATCC 25922</th>
<th>Inhibition zone (mm) on S. abaetetuba ATCC 35460</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single yeast</td>
<td>32.0±1.5&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>32.6±2.3&lt;sup&gt;ab&lt;/sup&gt;</td>
</tr>
<tr>
<td>Double yeast</td>
<td>31.7±1.7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>32.0±1.7&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Triple yeast</td>
<td>33.4±1.1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>33.4±1.1&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Four yeast</td>
<td>32.5±0.9&lt;sup&gt;a&lt;/sup&gt;</td>
<td>33.7±1.1&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Mean values within a column with the same letter are not significantly different (p>0.05).

Antimicrobial assay of omidun

Omidun the supernatant of ‘ogi’ locally used for the control of gastro-enteritis was tested for its antimicrobial effect on two known gastroenteric bacteria (E. coli ATCC 25922 and S. abaetetuba ATCC 35460) and examined for the presence of microorganisms with antimicrobial effect on the two gastroenteric bacteria. Omidun samples on S. abaetetuba ATCC 35460 showed zone of inhibition ranging from 8 to 12 mm and the antimicrobial activity was significant (p<0.05) in all the samples. Omidun samples from yellow maize on E. coli ATCC 25922, had inhibition zone which ranged from 9 to 12 mm, while on S. abaetetuba ATCC 35460 given inhibition zone of 7 to 12 mm. There was a significant difference (p<0.05) in the antimicrobial activity of omidun from yellow maize on both E. coli ATCC 25922 and S. abaetetuba ATCC 35460 (Table 4).

The type of maize from which omidun was prepared did not significantly (p>0.05) affect the antimicrobial activity exhibited on the gastro-enteric bacteria. However, the microorganisms isolated from omidun have varied antimicrobial activities against the tested organisms, this correlates with the observation of previous workers that plants contain substances that are antimicrobial (Olukoya, 1986). A. fumigatus showed a significantly higher (p<0.05) antimicrobial activity than L. plantarum as its zone of inhibition on E. coli ATCC 25922 and S. abaetetuba ATCC 35460 was 34 mm each. However, combination of L. plantarum and A. fumigatus showed the widest zone of inhibition of 35 mm on both E. coli ATCC 25922 and S. abaetetuba ATCC 35460. (Table 1). There was a significant difference (p<0.05) when different number combinations of yeasts with L. plantarum was used on E. coli ATCC 25922 though it was not significant (p>0.05) on S. abaetetuba ATCC 35460 (Table 2). Table 3 shows the inhibitory activity of A. fumigatus with different number combinations with yeasts in the test organisms. There was a significant difference (p<0.05) in the inhibition zones observed when different numbers of yeast were

STATISTICAL ANALYSIS

The Diameter of inhibition zone produced by the microorganisms singly and in combinations was subjected to Analysis of Variance (ANOVA) and Duncan Multiple Range Test to separate the means and it was determined at the 5% probability level using Statistical Package for Social Scientists 16.0 for Windows (SPSS, 2007).

RESULTS

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**Antimicrobial assay of L. plantarum and A. fumigatus alone and in combination**

*L. plantarum* isolated from *Omidun* when used alone showed diameter of zone of inhibition of 32 mm against *E. coli* ATCC 25922 and 28 mm against *S. abaetetuba* ATCC 35460 (Table 1). This inhibition is greater than that expressed in any of the commercial antibiotics (Table 5) and this makes *L. plantarum* of potential use in the control of gastro enteric *E. coli* and *S. abaetetuba*. Similar antimicrobial activity has been reported by Obadina et al., 2006; Valenzuela et al., 2008; Ma et al., 2009). *L. plantarum* has also been reported to produce metabolic products which are with antimicrobial activities (Barnby-Smith et al., 1989; Larsen et al., 1993; Sanni et al., 1999).

*A. fumigatus* showed higher antimicrobial activity than *L. plantarum* on both *E. coli* ATCC 25922 and *S. abaetetuba* ATCC 35460 (Table 1). *A. fumigatus* has been reported to show antimicrobial effects against pathogenic bacteria. Recently, Kusari et al. (2009) reported the production of an anticancer drug, deoxypodophyllotoxin, from *A. fumigatus*. The drug has also shown antimicrobial efficacy against some pathogenic microorganisms including *E. coli*. Furtado et al. (2005) has also been reported to the production of some antimicrobial metabolites from *A. fumigatus*. When *A. fumigatus* and *L. plantarum* were combined, the antimicrobial effect was higher than when each of them was used singly and that suggests a possible synergistic action between the two organisms. This is in agreement with Furtado et al. (2002) who reported an increase in the antimicrobial activity of *A. fumigatus* when bacteria were added to it.

**Inhibitory effect of L. plantarum and A. fumigatus in different combination with five yeasts**

When different numbers of yeasts were combined with *A. fumigatus* and *L. plantarum* respectively, varying antimicrobial activities were observed and that was probably indicated by the different zones of inhibitions obtained (Tables 2 and 3). The antimicrobial activity was similar when single yeasts were combined with *A. fumigatus* and *L. plantarum* respectively. The highest antimicrobial activity in this work was observed when *A. fumigatus* and *L. plantarum* were combined with five yeasts respectively and this is higher than in any of the commercially produced antibiotics (Table 4). When used singly and in combination with different types of yeasts, *L. plantarum* and *A. fumigatus* showed varying antimicrobial activities which were higher than any of the diameters of zone of inhibition gotten when commercially used antibiotics were used. This work shows that some microorganisms isolated from *Omidun* can inhibit gastro enteric *E. coli* ATCC 25922 and *S. abaetetuba* ATCC 35460 and there was a possible synergistic effect in the activity of *L. plantarum*, *A. fumigatus* and yeasts against the gastro enteric bacteria (Figure 1).

**Inhibitory effects of antibiotics on E. coli ATCC 25922 and S. abaetetuba ATCC 35460**

Antimicrobial effect of some known antibiotics against the two gastro enteric bacteria showed varying degree of activity to the test organisms. There was a significant difference (p<0.05) in the activity of the different antibiotics to *E. coli* ATCC 25922 and *S. abaetetuba* ATCC 35460. Ciprofloxacin, Azithromycin, Cefuroxime and Ceftriazone were effective against the test microorganisms by showing diameters of inhibition zones greater than the standard 14 mm value of sensitivity.

### Table 3. Summary of the Inhibitory effect of *A. fumigatus* in different combinations with yeasts.

<table>
<thead>
<tr>
<th>Yeast</th>
<th>Inhibition zone (mm) on <em>E. coli</em> ATCC 25922</th>
<th>Inhibition zone (mm) on <em>S. abaetetuba</em> ATCC 35460</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single yeast</td>
<td>32.2±1.4ab</td>
<td>32.9±2.0ab</td>
</tr>
<tr>
<td>Double yeast</td>
<td>31.7±1.7b</td>
<td>32.1±1.5b</td>
</tr>
<tr>
<td>Triple yeast</td>
<td>33.4±1.1a</td>
<td>33.7±1.0a</td>
</tr>
<tr>
<td>Four yeast</td>
<td>33.3±1.1a</td>
<td>34.0±1.0a</td>
</tr>
</tbody>
</table>

Mean values within a column with the same letter are not significantly different (p>0.05).

### Table 4. Summary of the Inhibitory effect of *L. plantarum* and *A. fumigatus* in different combination with five yeasts.

<table>
<thead>
<tr>
<th></th>
<th>Inhibition zone (mm) on <em>E. coli</em> ATCC 25922</th>
<th>Inhibition zone (mm) on <em>S. abaetetuba</em> ATCC 35460</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>A. fumigatus</em> + Five yeast</td>
<td>39a</td>
<td>39a</td>
</tr>
<tr>
<td><em>L. plantarum</em> + Five yeast</td>
<td>38a</td>
<td>39a</td>
</tr>
</tbody>
</table>

Mean values within a column with the same letter are not significantly different (p>0.05).
Figure 1. Mean Inhibitory effect of *L. plantarum* and *A. fumigatus* with different combinations of yeasts on *E. coli* ATCC 25922 and *S. abaetetuba* ATCC 35460.

Table 5. Inhibitory effects of antibiotics on *E. coli* ATCC 25922 and *S. abaetetuba* ATCC 35460.

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th>Zone diameter (mm) against <em>E. coli</em> ATCC 25922</th>
<th>Zone diameter (mm) against <em>S. abaetetuba</em> ATCC 35460</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ciprofloxacin</td>
<td>21±0.0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>20±1.4&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Azithromycin</td>
<td>20±0.0&lt;sup&gt;b&lt;/sup&gt;</td>
<td>20±0.0&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Cefuroxime</td>
<td>17±0.4&lt;sup&gt;c&lt;/sup&gt;</td>
<td>16±0.1&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Ceftriazone</td>
<td>17±0.0&lt;sup&gt;c&lt;/sup&gt;</td>
<td>14±0.3&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Augmentin</td>
<td>15±0.5&lt;sup&gt;d&lt;/sup&gt;</td>
<td>10±0.2&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Amoxycillin</td>
<td>6±0.0&lt;sup&gt;e&lt;/sup&gt;</td>
<td>8±0.1&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>Tetracycline</td>
<td>4±0.0&lt;sup&gt;f&lt;/sup&gt;</td>
<td>6±0.4&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>4±0.0&lt;sup&gt;f&lt;/sup&gt;</td>
<td>4±0.0&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Mean values within a column with the same letter are not significantly different (p>0.05); Zone diameters ≥ 14 mm – Sensitive; Zone diameters ≤ 14 mm – Resistant.

The two organisms showed resistance to Gentamicin, Tetracycline and Amoxycillin showing diameters of inhibition zones less than 14 mm (Table 5). Augmentin was effective against *E. coli* ATCC 25922 but *S. abaetetuba* ATCC 35460 was resistant to it (Table 5).

Though *A. fumigatus* have been known to be pathogenic, it showed high antimicrobial activity against the test organisms even more than the known antibiotics indicating that it produced antimicrobial compounds. Based on the findings of this study, some microorganisms associated with the supernatant solution of fermented cereal mash have been found to posses...
therapeutic properties.

DISCUSSION

The results of antibacterial activity of Omidun on gastroenteric E. coli ATCC 25922 and S. abaetetuba ATCC 35460 is consistent with previous reports regarding the use of Omidun in the control of diarrhea. The antimicrobial potential of omidun, the supernatant of ogi an acid fermented cereal mash made from maize, is not surprising as ogi has been claimed to possess antimicrobial potentials. The inhibition zone shown by L. plantarum (32 mm against E. coli ATCC 25922 and 28 mm against S. abaetetuba ATCC 35460) is greater than that expressed in any of the commercial antibiotics (Table 5) and this makes L. plantarum of potential use in the control of gastro enteric E. coli and S. abaetetuba. This inhibitory ability may be due to the production of antimicrobial compounds by L. plantarum. Similar antimicrobial activity has been reported by Obadina et al., 2006; Valenzuela et al., 2008; Ma et al., 2009). L. plantarum has also been reported to produce metabolic products which are with antimicrobial activities (Barnby-Smith et al., 1989; Larsen et al., 1993; Sanni et al., 1999).

A. fumigatus showed higher antimicrobial activity than L. plantarum on both E. coli ATCC 25922 and S. abaetetuba ATCC 35460 (34 mm respectively). Under proper conditions, A. fumigatus is known to produces fumagillin a compound originally used as a treatment against Nosema apis, a microsporidial fungal pathogen of honey bees and has proven itself effective against human amoeba parasites as well as microsporidial diseases (Wikipedia, 2011). A. fumigatus has been reported to show antimicrobial effects against pathogenic bacteria. Recently, Kusari et al., (2009) reported the production of an antitumor drug, deoxypodophyllotoxin, from A. fumigatus. The drug has also shown antimicrobial efficacy against some pathogenic microorganisms including E. coli. Furtado et al. (2005) has also been reported to the production of some antimicrobial metabolites from A. fumigatus. When A. fumigatus and L. plantarum were combined, the antimicrobial effect was higher than when each of them was used singly and that suggests a possible synergistic action between the two organisms. This is in agreement with Furtado et al. (2002) who reported an increase in the antimicrobial activity of A. fumigatus when bacteria were added to it.

It appears that over all the microorganisms isolated from omdun, yeast strains when used alone and in combination with other yeasts gave no zone of inhibition. However, its combination with bacteria and mould yielded zone of inhibition. This indicates possible synergistic reaction existing among all the microorganisms from Omidun. Upon the combination of different numbers of yeasts with A. fumigatus and L. plantarum respectively, varying antimicrobial activities were observed and that was probably indicated by the different zones of inhibitions obtained. The antimicrobial activity was similar when single yeasts were combined with A. fumigatus and L. plantarum (32 mm) respectively. The highest antimicrobial activity in this work was observed when A. fumigatus and L. plantarum were combined with five yeasts respectively (39 mm) and this is higher than in any of the commercially produced antibiotics (the highest being 21 mm for ciprofloxacin).

Though A. fumigatus have been known to be pathogenic, it showed high antimicrobial activity against the test organisms even more than the known antibiotics indicating that it produced antimicrobial compounds. Based on the findings in this study, some microorganisms associated with the supernatant solution of fermented cereal mash have been found to posses therapeutic properties. Hence, this study suggests the consumption of hygienically produced omdun in the control of gastro enteric conditions such as diarrhea.

However, further work is highly recommended in order to ascertain by means of isolation and identification the particular metabolite produced by the strain of A. fumigatus associated with Omidun that actually inhibits the growth of E. coli and S. abaetetuba, also to identify the gene responsible for the production of such antimicrobial compound.

REFERENCES


