International Journal Of Scientific And University Research Publication

ISSN No 2364/2018

Listed & Index with
ISSN Directory. Paris

Multi-Subject Journal

Volum : (3) | Issue : 211 |

INTERNATIONAL JOURNAL OF SCIENTIFIC AND UNIVERSITY RESEARCH PUBLICATION

Research Paper

EFFECTS OF EXTRACTS OF TRADITIONAL INDIAN SPICES, GARLIC (ALLIUM SATIVUM) AND GINGER (ZINGIBER OFFICINALE) ON THE GROWTH RATE OF ESCHERICHIA COLI(E. COLI) AND BACILLUS SUBTILIS (B. SUBTILIS).

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The present study was designed to estimate antimicrobial effects of the Garlic (Allium sativum) and Ginger (Zingiber Officinale) extract. The medicinal properties of garlic and

xtract. The medicinal properties of garlic and ginger were very well recognized since ancient times ***in India and have been used as an important constituent of Ayurvedic Medicines to cure many diseases and infections.Two potent pathogens, responsible for many infections, like food borne illness, Escherichia Coli (E.coli) and Bacillus Subtilis (B.Subtilis)were selected. The present investigation was carried out using the nutrient broth dilution method and the growths of both of these microorganisms were asessed against different volume of garlic and ginger extract respectively. Their growth was examined after 24-h by spectrophotometric analysis. The result showed that both garlic extract and ginger extract had good inhibitory action against microbial growth. Garlic extract proved to give satisfactory results as a potent inhibitory substance against both the microorganism while ginger extract showed medium activity.***

Garlic, ginger, antimicro- bial, E.coli, Bacillus sp.

in garlic and also bioflavonoids like quercetin and cyanidin in it have great value in preventing diseases and infectionsalong with other anti microbial oils like clove oil (Nzeako, B. C., et. al., 2006.)Ginger), a member of the Zingiberaceae family, is a *Zingiber Officinale*(rhizomatous plant recognized as popular spice used in the daily diet in many Asian countries. In addition, it has been reported that the main ingredients of ginger like volatile oil, gingerol, shogaol and diarylheptanoids work as antioxidant, anti-inflammatory, anti-lipid, anti-diabetic, analgesic, antipyretic and antitumor (Hasan et. al., 2012). Zingerone may have activity against enterotoxin producer which is already proven in mice (Chen, J.C., et. al., *E.coli*strains of 2007).At present, there is a growing interest to detect natural compounds characteristics and activities, like plant extracts of herb and spices for the preservation of foods, flavor characteristic and sometimes show antioxidant activity as well as antimicrobial activity. This gives the stimulus for our present study to focus on garlic and ginger extracts.

aterials and method:M

Two wellknown and commonly used spices known for their antimicrobial activities, namely garlic and ginger were verified against two opportunistic pathogens of significant importance, (Sofia, et *Bacillus Subtilis (B. Subtilis)* and*Escheria coli(E.coli)*namely ., 2008).Garlic and *et. al* ., 2012 & Fujisawa H*t. ale*. al., 2007, Guo JJ ginger were procured from the local market. Both of them were first cleaned using tap water in order to remove any dirt or debris, and later using sterile distilled water. Samples were dried in a laminar flow biological safety cabinet. Five hundred grams of both garlic and ginger was skinned and homogenized using an aseptic blender and the extract was sieved using sterile muslin cloth. The extract was considered of 100 % concentration. Different volumes of garlic and ginger extract were directly used in experiments.The microorganisms used for antibacterial activity evaluated were obtained from the Department of Microbiology, B.E.T.S Science College, Palanpur, Gujarat, and 222

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and *Bacillus Subtilis(B. Subtilis)* they were Gram-positive bacteria *Escheria coli (E.coli).*Gramnegative bacteria

dology for ExperimentationhoteM

15 mL nutrient broth was added in test tubes through a pipette and were sealed at the top with a cotton plug respectively. Sterilization was carried out in an autoclave at 121ºC and 15psi for 15 minutes.24 culture in *B. Subtilis* h old culture was was added in 11 test tubes and rest 11 test tubes respectively.Concentration of 0.4, 0.8, 1.2, 1.6 and

مقدمة

, the use of dietary supplements, local **In the Indian Subcontinent** kitchen spices and herbal remedies are popular for the people. They provide a short-term effect of medical conditions like inflammation, pain and swelling, while they have antimicrobial, anti-inflammatory and antimutagenic actions as their long term effect. There is in fact, a strong need of scientifically recognizing a strong relationship between beneficial properties of spices and their use in food on human health.Food borne pathogens play a major role in causing severe health hazards to population as they are widely spread in the is one such opportunistic food borne pathogen *E.coli* environment. often leading to infection causing severe diarrhea, occasional kidney failure and other severe health problems. Bacillus species, due to their capability to form heat stable toxins also constitute major food borne pathogen, leading to severe medical conditions. Different spices showed a vast range of inhibitory effect towards food spoilage and industrial yeast, out of which a few exhibited a complete inhibitory effect whereas others were insignificant to the action of spices against them (Sofia, et. al., 2007).In the present study spice pure extract from garlic and ginger were applied to study their effect *Bacillus Subtilis* and*Escherichia coli (E.coli)* on is a rod shaped, *richia coli (E.coli) ehscE*microorganisms.*(B.Subtilis)* Gram-negative bacterium that is most commonly found in the gut of is one of *E.coli* both humans and animals most of which are harmless. the most commonly present organism in feces, so it is known as an indicator organism, and thus when food or water bodies are contaminated by fecal discharge it can directly cause its infection and -is a soil-*illus Subtilis (B. Subtilis) cBa*can be fatal in many cases. welling, Grampositive, rodshaped bacterium. Food borne illness in humans causing severe nausea, vomiting and diarrhea has been shown by certain harmful strains of this bacterium. This condition arises due to survival of the bacterial endospores when food is inappropriately cooked. Under unfavorable conditions, bacterial vegetative cells form spore in order to survive. In a few patients symptoms, may last longer (Kotiranta A, et. al., 2007 & Roberts, T. , commonly known as garlic, is a *Allium sativum*A., et. al.,1996). species in the onion genus, and was proven to be a very effective antimicrobial agent when its extracts completely inhibited the growth of many Grampositive and Gramnegative organisms as well as some fungi. Garlic is a plant, which kills bacteria, fungus, parasites and lowers glycaemia and cholesterol and have liver protector property and includes antitumor agents. The antimicrobial activity of ., 2012; Fuji- sawa *et al*garlic is attributable to allicin inside it (Guo JJ ., 2008). It is also declared that components including sulphur *et al*H

respectively. *illus Subtilis cBa* and*E.coli* 0.631 OD was obtained for As the extract volume is increased to 0.8 mL, the significant decrease *illus cBa* OD (0.133) whereas minor change was observed in*E.coli* in i.e., 0.587. Ginger is reported as a weak antimicrobial agent *Subtilis* with compare to garlic and here the same results were achieved (D ., 2009). When 1.2 mL of ginger extract was added in to *t. ale*Tagoe nutrient broth, a noteworthy decrease in OD i.e., 0.063 and 0.445 respectively. While the *illus Subtilis cBa* and*E.coli* were attained for addition of 1.6 and 2.0mL ginger in nutrient broth gave encouraging whereas *E.coli*results and near about 100% inhibition was achieved in In this *.silitSubillus cBa*only 31.92% inhibition was obtained for study, a profound observation was made that both the antimicrobial *.acillus SubtilisB* rather than*E.coli* agent were more affective on shows that it is Gramnegative, facultative *E.coli* Physiology of is rodshaped, *illus Subtilis cBa*anaerobic and nonsporulating, whereas endospore forming bacteria, and due to endospore it can tolerate extreme environmental conditions.

استنتاج

The present experiment was aimed for the observing antimicrobial activities of garlic and ginger extracts on E.coli and Bacillus Subtilis. It was found out that both garlic and ginger extracts had inhibitory effects on both the types of microorganisms taken into the study. Amongst the two spices used, garlic extract had a more significant effect on microbes than ginger extract; however, the effects of ginger extracts cannot be excluded.Usage of garlic and ginger extracts as a primary remedy against microbial infection or disease may prove beneficial in the first course. However, their significant inhibitory effect still needs to be studied further for proving them to cure or majorly affect the growth of studied microbes in due course. Further in depth studies are strongly recommended to certainly validate their dose and proportional effect in curing the disease caused by selected microbes.

Acknowledgements

This research has been carried by generous guidance and help from Dr. Manoj Koradiya, Principal (I/C), BETS Science College, Palanpur, Gujarat, India.

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2.0 mLof garlic extract and ginger extractswere added in each test tube accordingly and were labeled.A total volume of 17.1 mLwas made up by adding nutrient broth to it. The test tubes were inubated at the room temperature. The results were observed after 24 h of incubation by taking the optical density (OD) by spectrophotometric analysis.

sisylanAtrophotometric ecpS

The present readings were taken on Systronic 161 spectrophotometer. Dark filter was set for air zero calibrations. Uninoculated nutrient broth was added in 2mL cuvette and OD was taken at 540 nm. The contents were removed and discarded properly. The cuvette was rinsed thoroughly with distilled water and cleaned with tissue paper. The procedure from step 3 and 4 were in the *B. Subtilis* and*E.coli* repeated for test samples of the respective respective test tubes having varying volumes add- ed int them respectively. The readings were taken accordingly.

Results and discussion:

aph 1: Spectrophotometric analysis of garlic extract against rG *B. Subtilis.*and *E.coli* different volumes of

aph 2: Spectrophotometric analysis of ginger extract against rG *B. Subtilis.* and*E.coli* different volumes of

Garlic and ginger are amongst the most commonly used spices in the Indian kitchen. Both of these spices have proven medicinal properties and most widely used as natural remedies in India. Garlic consist an which have anti-bacterial *allicin* active component called is the most common organism (normal flora) found in *E.coli* property. the small intestine of warmblooded animals. Some pathogenic strains can cause severe gastroenteritis, urinary tract infections, and*E.coli* of neonatal meningitis.Volume : 4 | Issue : 12 | December 2015 • ISSN may cause disease related to food *illus Subtilis cBa*No 2277 - 8179 contamination.Optical Density (OD) was considered as the degree of growth in nutrient broth. As the no. of cells increases in the nutrient broth, its turbidity will also increase. Higher cell mass indicates the less inhibitory effect of the extract whereas lower cell mass shows the greater inhibitory effect. On the basis of BearLamberts law, it can be proved that higher OD represents the greater amount of cell mass whereas lower OD signifies the inhibitory effect of the extract.As shown in the above Graphs 1 and 2, extract concentration significantly affect the growth of both Grampositive and *illus cBa* and*E.coli* Gramnegative bacteria. Both the cultures, were found to be sensitive for Garlic and Ginger extract. *Subtilis E.coli* Positive control of the experiment was inoculated with with no addition of any extract which means the *illus Subtilis cBa*and growth of selected organisms without any inhibition. 0.999 And *illus cBa* and*E.coli* 0.890 OD were obtained in positive control of respectively. Uninoculated nutrient broth was used as blank *Subtilis* and its OD was 0.065.When 0.4 mL garlic extract was added in to the were 0.368 and *illus SubtiliscBa* and*E.coli* nutrient broth, OD for 0.253. The results indicated that, 63.17% and 74.68 % less OD was obtained in comparison to positive controls. As the garlic extract *illus cBa* and*E.coli* volume was increased to 0.8 mL, OD for were 0.281 and 0.251 respectively. An interesting point was *Subtilis* found about this result was that when garlic extract volume increase from 0.4 to 0.8 mL it did not show a significant decrease in cell mass. When the garlic extract volume was increased gradually in nutrient were 0.179,0.081 and *E.coli* broth to 1.2, 1.6 and 2.0 mL, OD for OD was 0.201, 0.167 ,*illus SubtiliscBa*0.011 respectively. In case of and 0.117 for 1.2, 1.6 and 2.0 mL garlic extract volume in the nutrient broth respectively. Here steady decrease in OD was observed for both the organisms as the garlic extract volume was increased. When 2.0 mL garlic extract was used 98.89% and 86.85 % *E.coli* less OD was achieved for respectively.When experiment was done with *Subtilis illus cBa*and ginger extract, inherent OD of ginger extract was observed. When 0.4 mL ginger extract was added in the nutrient broth, 0.504 and

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	Vanesha (,M,2016)	Vanesha (,M,2016)	(Vanesha,2016)	Vanesha (,M,2016)
			Majithia Vanesha ***Effects*** **(2016).** ***of Extracts of Traditional Indian Spices, Garlic (Allium Sativum) and Ginger (Zingiber Officinale) on the Growth Rate of Escherichia Coli(E. coli) and Bacillus Subtilis (B. Subtilis)*** ,IJSURP Academic Publisher.	**Footnotes:**

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