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RESEARCH ARTICLE

INVESTIGATION OF ANTIBACTERIAL ACTIVITY OF *ALLIUM CEPA* (ONION) *ZINGIBER OFFICINALE* (GINGER)

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ABSTRACT

Antibiotic resistance bacteria are one of the major problems challenging the health care system in general. The Antibacterial activity of fresh (Onion) Allium Cepa and (Ginger) Zingiber officinale juices against multidrug resistance bacteria viz., Staphylococcus aureus, Bacillus Subtillis was investigated using agar well diffusion method. This study indicates that the fresh juices of Allium Cepa and Zingiber officinale possess significant antibacterial potency against multidrug resistant bacteria. The antibacterial activity and medicinal properties of Ginger and Onion extracts were studied. Ginger extracts were obtained using solvents Alcohol and Water. The extracts were assayed for antibacterial activity and bacterial growth inhibition activity. The results showed that both the extracts the aqueous and alcoholic extracts have antibacterial activity and they also inhibit bacterial growth. The results also showed that Ginger extract possess antibacterial properties and could be used for the treatment of bacterial infections.

INTRODUCTION

The onion is one of the oldest cultivated vegetables in history. It is thought that bulbs from the onion family have been utilized as a food source for Millennia. Onion consists of its herbaceous plant part and its edible bulb part. It is probably a native to southwestern Asia. (Ody 1997) The leaves are bluish –green and hollow. The bulbs are large, fleshy and firm. There are three main varieties- white, red and purple skinned. (Irrine FR. Shallot 1976) The relative pungency of onion has both genetic and environmental components. Sulphur compounds in onions have also been shown to be anti-inflammatory both by inhibiting formation of thromboxanes and by inhibiting the action of platelet-activating factor (PAF). Thiosulfinates condition anti-thrombotic benefits, including antioxidant activity, (The Free Encyclopedia 2006; Ying and Chang 1998) reduced serum cholesterol and enhance in vitro platelet activity. (Goldman *et al.,* 1995 This later effect is important for cardiovascular health by reducing the probability that platelets aggregate in the blood, a major cause of heart attacks and strokes. (Havey 1999) Hence, thiosulphinates found in onion have been shown to inhibit in-vitro platelet aggregation. (Moritsau *et al.,* 1992; Briggs and Goldman 2002) Ginger consists of the fresh or dried roots of *Zingiber Officinale*. In humans, ginger is thought to act directly on the gastrointestinal system to reduce nausea. (Yamahara 1990) Traditionally, ginger has been used to treat intestinal infections, especially related with digestive problems. Equally, its antibacterial 'power' is effective against preventing numerous intestinal problems that take place as a result of the alteration of the intestinal flora. This is ideal to avoid the formation of ulcers by eliminating the *Helicobacter pylori*, a bacterium whose secretions of ammonia are responsible for many ulcers, especially those of the duodene, and for other stomach problems like gastritis, since the plant is able to neutralize the excess of gastric acid that is another of the causes that favours the formation of ulcers. (The Free Encyclopedia 2006) The gingerols have analgesic, sedative, antipyretic, antibacterial and gastrointestinal tract motility effects. Ginger has the capacity to eliminate harmful bacteria, such as *Escherichia coli*, responsible for most of the diarrhoea, especially in children, *Bacillus cereus,* which mainly causes diarrhoea and nausea. It has been shown to reduce the stickiness of blood platelets, hence may help reduce risk of artherosclerosis (Wood 1988; Foster S. Ginger 2000)

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Literature review

Need of work

Nowadays there is increase in various bacterial diseases or diseases caused by the bacteria. To treat this type of diseases always various antibiotics are used but some antibiotics do not resist that bacteria and fails to treat that bacterial infection. Various antibiotics are available, but human body produces the antibodies against that antibiotic which are regularly used & body may not produce the effect of that antibiotic. Hence antibiotic resistant bacteria are one of the major problems challenging the health care system in general.

Table 1.

S.No.	Author	Name of article/ journal	Name of subject
1	G. O. Adeshina*, S. Jibo, V.E. Agu, J.O. Ehinmidu (Department of Pharmaceutics & Pharmaceutical Microbiology, Ahmadu Bello University, Zaria, Nigeria)	Research article, International Journal of pharma & bio science.	Antibacterial activity of fresh juices of *Allium cepa* (Onion) & *Zingiber officinale* (Ginger) against multidrug resistant bacteria
	Result/Conclusion: Allium Cepa (onion) showed antibacterial activity against multidrug Pseudomonas aeruginosa, Salmonella typhi & E. coli while Zingiber Officinale (Ginger) did not show antibacterial activity against the organisms. White onion showed more antibacterial activity than red onion against the organisms.		
2	S. P. Malu, G. O. Obachi, E. N. Tawo & B. E. Nyong (Department of Chemistry/ Biochemistry, Cross River University of Technology, Calabar.)	Global journal of Pure & Applied Science vol 15, no 3, 2009 365-368 copyright to Bachudo science Co.Ltd printed in Nigeria, ISSN 1118-057.	Antibacterial activity & Medicinal Properties of Zingiber Officinale (Ginger).
	Result/ Conclusion: The results showed that the extracts except the water extract have antibacterial activity. The results that ginger roots extracts, viz. n-hexane, ethyl acetate & soxhlet extracts have antibacterial activities on colliform Bacillus, Staphylococcus epidermis &Streptococcus viridians while the water extracts did not have antibacterial activity on these bacteria. The results may suggest that n-hexane; ethyl acetate & soxhlet extract of Ginger root could be potent against bacterial infections while the water extract of Ginger roots could be ineffective.		

S.No	Author	Name of Journal	Name of Subject
3	N. Azu, R Onyeagba, O. Nworie, J. Kalu	N. Azu, R Onyeagba, O. Nworie, J. Kalu	Antibacterial Activity Of Allium cepa (Onions) And Zingiber officinale (Ginger) On Staphylococcus aureus And Pseudomonas aeruginosa Isolated From High Vaginal Swab.
	Result/ Conclusion: The result of this work indicates that the water-soluble extracts of onions and ginger have antibacterial properties. When the extracts were tested on Staphylococcus aureus and Pseudomonas aeruginosa, the widest zones of inhibition were obtained with P. aeruginosa. It was clear from this work that the solvent of extraction affected the degree of antibacterial activity of the extracts. It was observed that the ethanolic extract of ginger gave the widest zone of inhibition (22mm) using the concentration of $0.8gml^{-1}$ while the ethanolic extract of onion gave 11mm with $0.8mgl^{-1}$ each against P. aeruginosa. This credit to ethanol extraction was supposed to ethanol being an organic solvent and will dissolve organic compounds better, hence liberate the active component required for antimicrobial activity. The hot water extracts of onions did not inhibit the growth of Pseudomonas aeruginosa. This may be explained by the fact that the antimicrobial substance in the onion extracts, which are mainly Phenolic compounds are destroyed by heat from the hot-water which might have raised the temperature of the extracts inactivating them.		

S.No.	Author	Name of Article/ Journal	Name of Subject
4	Rajesh Kumar Mishra*, Anil Kumar & Ashok Kumar Pharmacy College, Itaura, Chandeshwar, Azamgarh, Uttar Pradesh, India	International Journal of Pharmaceutical and Chemical Science	Pharmacological Activity of *Zingiber Officinale.*
	Result/ conclusion: This Article has outlined some of the current thinking with regard to the experimental advances in gingerol & analogues. So far, reveals the empirical use of Ginger in several ayurvedic medicinal products.		

5	Saad B. ALMasaudi & Mona O. AlBureikan. Department of Biology, Faculty of Science, King Abdullaziz University, Jeddah, Saudi Arabia	Life Science Journal 2012;9(2)	Antibacterial activity of Onion juice (Allium cepa), Honey, & Onion-Honey Mixture on Some Sensitive & Multi-resistant Microorganisms.
	Result/Conclusion: The results clearly showed that Onion & Honey had an Antibacterial Activity against all tested microorganisms [Methicillin-sensitive Staphylococcus aureus (MSSA), Methicillin resistant staphylococcus aureus (MRSA), S.*Pyrogen*, Vanomycin-resistant enterococci (VRE), Vanomycin-sensitive enterococci (VSE)] *at* different concentrations. Onion-Honey mixtures have antibacterial activity on all tested microorganisms with different concentrations. The antimicrobial activity of Onion was significantly stronger on tested microbes than Honey, but when the Onion & Honey mixtures is used especially (v/v 1:1) it becomes clear that the Onion & Honey mixtures have stronger effect on most microbes than Onion alone or Honey alone.		

S.No.	Author	Name of Article/ Journal	Name of Subject
6	K.P. Deshmukh 1* and Y.D. Deshmukh2. 1) School of Life Sciences,S.R.T.M.University, Nanded (M.S.) India. 2)Departments of Vocational Studies, Nutan College, Umri, Dist. Nanded (M.S.) India.	International Journal of Green and Herbal Chemistry An International Peer Review E-3 Journal of Sciences IJGHC, December 2013- February 2014; Vol.3, No.1, 204-210. E-ISSN: 2278-3229	Antibacterial Analysis of (*Syzygium Aromaticum*) Clove, (*Zingiber Officinale*) Ginger, (*Allium Cepa*) Onion, (*Allium Sativum*) Garlic against Three Human and Two Plant Pathogens
	Result/Conclusion: It may be concluded from the findings that among all tested hot water extract, the hot water extract of garlic showed good inhibitory effect against plant pathogens, *Xanthomonas citri* of clove showed good inhibitory effect against tested human and plant pathogens. While hot Concentration (gml-1) Zone of inhibition diameter (mm) Sr.no *E.coli E.carotovora P.vulgaris P.aeruginosa X.citri* and *E.carotovora* than human pathogens *P.vulgaris, P.aeruginosa* and *E.coli*. It is also concluded that hot water extract of onion is not found to be effective against tested plant and human pathogens that is does not show inhibitory activity against tested pathogens. This may be explained by the fact that antimicrobial substances in the onion extracts, which are mainly Phenolic compounds are destroyed by heat from hot water inactivating them16. While the hot water extract of Ginger only show inhibitory effect against *P.aeruginosa* this result substantiate the findings of Azu .17 and it did not inhibited the growth of *E.coli, E.carotovora, P.vulgaris*, and *Xanthomonas citri* the reason for this is hot water.		
S.No.	Author	Name of Article/ Journal	Name of Subject
7	M.N. Indu[i]; A.A.M. Hatha[ii] C. Abirosh[i]; U. Harsha[i]; G. Vivekanandan[iii] [i]school Of Environmental Sciences, Mahatma Gandhi University, Gandhi Nagar, Kottayam, Kerala, India [ii]department Of Biology, School Of Pure And Applied Sciences, The University Of The South Pacific, Suva, Fiji [iii]laboratory Of Histopathology, Graduate School Of Aquatic Biosciences, Tokyo University Of Fisheries, Konan, Minato, Tokyo, Japan	Brazilian Journal of Microbiology *Print version* ISSN 1517-8382 Braz. J. Microbiol. vol.37 no.2 São Paulo Apr./June 2006	Antimicrobial activity of some of the south-Indian spices [*Allium sativum* (garlic), *Myristica fragrans* (nutmeg), *Zingiber officinale*(ginger), *Allium cepa* (onion) and *Piper nigrum* (pepper)] against serotypes of *Escherichia coli*,*Salmonella*, *Listeria monocytogenes* and*Aeromonas hydrophila*
	Result/ conclusion: Among The Five Spices Tested, Three (Garlic, Nutmeg And Ginger) Showed Antibacterial Activity. The Result Of The Antibacterial Activity Against Serogroups Of *E. Coli*.		

Allium cepa (Onion) and *Zingiber officinale* (Ginger) both these drugs possesses the antibacterial activity. To treat the bacterial disease we can also use the alcoholic and aqueous extracts of *Allium cepa* (Onion) and *Zingiber officinale* (Ginger). This work is done to investigate the antibacterial activity of Mix alcoholic extract of *Allium cepa* (Onion) and *Zingiber officinale* (Ginger).

As an option for antibiotics we can also use the herbal drugs like Onion and Ginger. Antibiotic resistant bacteria may resisted by the various herbal drugs or herbal drug may possesses the more antibacterial activity than the standard antibiotic drug.

Experimental

Ginger *(Zingiber Officinale)*

Fig. 1. Ginger Tea (thegingertea.com)

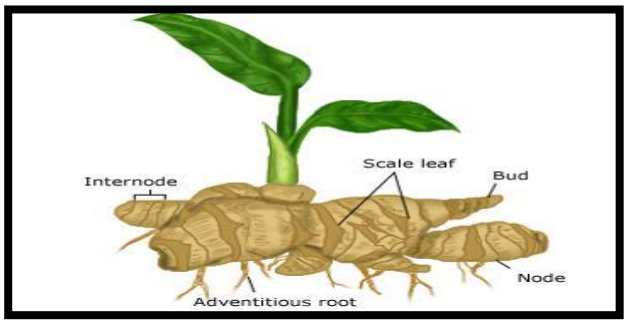


Fig. 2. Ginger rhizome (www.tutorvista.com)

Table 1. (http://en.wikipedia.org/wiki/Ginger)

Scientific classification	
Kingdom:	Plantae
Clade:	Angiosperms
Clade:	Monocots
Clade:	Commelinids
Order:	Zingiberales
Family:	Zingiberaceae
Genus:	*Zingiber*
Species:	*Z. officinale*
Binomial name	
Zingiber officinale Roscoe	

Synonym: Zingiber, Zingiberis.

Biological source: Ginger consists of Rhizomes of *Zingiber Officinale*, scrapped to remove the outer skin & dried in the sun.

Family: Zingiberaceae

Geographical source: It is said to be native of south East Asia, but it is cultivated in the Caribbean island, Africa, Australia, Mauritius, Jamaica, Taiwan and India. More than 35% of the world's production is from India.

Fig.3. An erect stem of ginger (http://en.wikipedia.org/ wiki/Ginger)

Macroscopic Characters

Colour: Externally it is buff colored.
Odour: Agreeable and Aromatic
Taste: Agreeable and Pungent
Shape: The rhizomes are Laterally Compressed, bearing short, flat, ovate and oblique branches on the upper side with bud at the apex. It is perennial herb with thick tuberous rhizomes. They erect leafy aerial stem grows up to approximately 1 meter in height and has purple flowers. Its roots are used as spice in cooking throughout the world.

Potentially active chemical constituents

Volatile oil: 1 to 4%

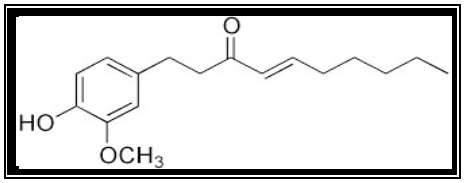
Phenolic compounds: shogaols and gingerols

Sesquiterpenes: bisapolene, zingiberene, zingiberol, sesquiphellandrene, curcurmene

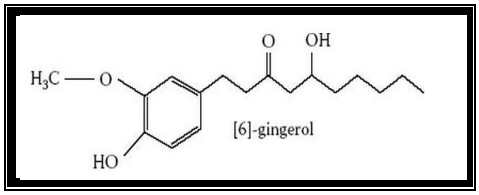
Other: 6-dehydrogingerdione, galanolactone, gingesulfonic acid, zingerone, geraniol, neral, Monoacyldigalacto sylglycerols, gingerglycolipids Aroma and flavour are the main characters of Ginger and are due to Volatile oil and Phenolic resins of oleo resin respectively. The pungent taste of ginger is

due to non volatile phenylpropanoid derived compound, gingerols and shogaols. The shogaols are formed from gingerols when ginger is dried or cooked. (Kokate and Gokhale ?)

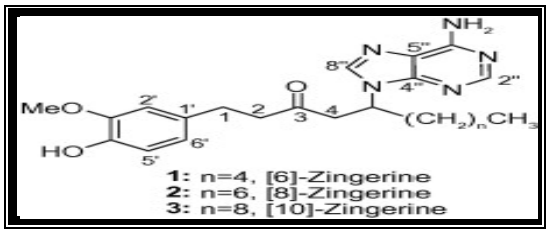
1) Phenolic compound: a) Shogaol



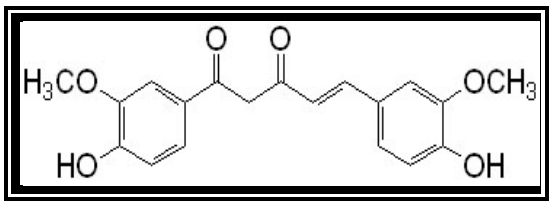
b) 6- gingerol



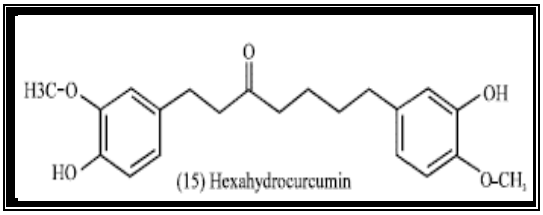
2) Sesquiterpenes: a) zingiberene



b) Curcumine



c) Hexahydricurcumin



3) Others: (Kokate and Gokhale ?)

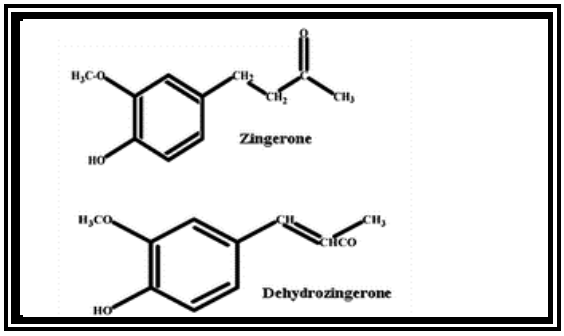


Table 2. Nutritional values PER 100 G (3.5 OZ) (http://en. wikipedia.org/wiki/Ginger)

Energy	333 kJ (80 kcal)
Carbohydrates	17.77 g
Sugars	1.7 g
Dietary fiber	2 g
Fat	0.75 g
Protein	1.82 g
Thiamine (vit.B_1)	0.025 mg (2%)
Riboflavin (vit.B_2)	0.034 mg (3%)
Niacin (vit.B_3)	0.75 mg (5%)
Pantothenic acid (B_5)	0.203 mg (4%)
Vitamin B_6	0.16 mg (12%)
Folate (vit.B_9)	11 µg (3%)
Vitamin C	5 mg (6%)
Vitamin E	0.26 mg (2%)
Calcium	16 mg (2%)
Magnesium	43 mg (12%)
Manganese	0.229 mg (11%)

Uses: Potential clinical benefits

1. Cardiovascular: Cardio tonic, antilipemic
2. Pulmonary: none
3. Renal and electrolyte balance: none
4. Gastrointestinal/hepatic: Antinausea/antiemetic, carminative and antiulcer
5. Neuropsychiatric: See Immune modulation: anti-inflammatory for headache
6. Endocrine: Hypoglycemic
7. Hematologic: Antiplatelet
8. Rheumatologic: See Immune modulation: Anti-inflammatory for arthritis
9. Reproductive: none
10. Immune modulation: Anti-inflammatory for arthritis and headache
11. Antimicrobial: Antiviral, antibacterial, antifungal
12. Antineoplastic: Antineoplastic
13. Antioxidant: Antioxidant
14. Skin and mucus membranes: none
15. Other/miscellaneous: Warming/diaphoretic (http://www. childrenshospital. org/holistic)

Allium cepa (Onion)

Fig. 4. Onion main Image (www.epicurious.com)

The onion, known scientifically as *Allium cepa*, is, on the surface, a humble brown, white or red, paper-thin skinned bulb; yet, despite its plain looks, it has an intense flavor and is a beloved part of the cuisine of almost every region of the world. The word onion comes from the Latin word *unio*, which means "single," or "one"—reflecting of the onion plant producing a single bulb, unlike its cousin, the garlic, that produces many small bulbs. The name also describes the onion bulb when cut down the middle; it is a union (also from *unio*) of many separate, concentrically arranged layers. (http://whfoods. org/genpage.php)

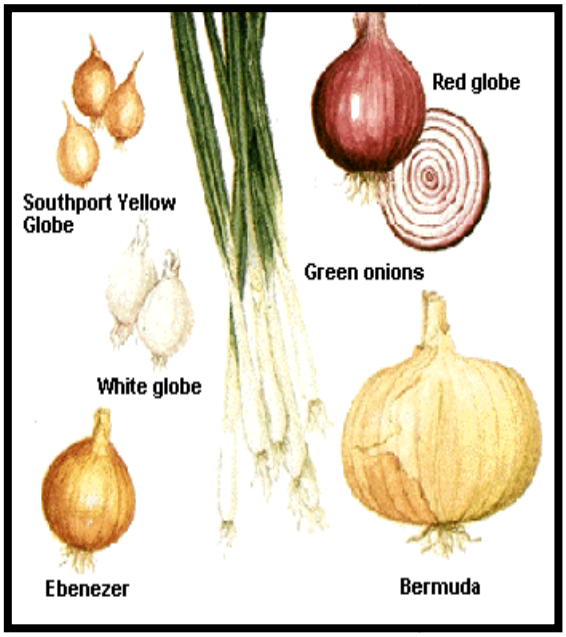


Fig.5. Onion (Science.houstuffworks.com)

Fig. 6. Onion pieces (www.couponclippingcook.com)

Table 3. Scientific classification (http://en.wikipedia. org/wiki/Onion)

Kingdom	Plantae
Clade	Angiosperms
Clade	Monocot
Order	Asparagales
Family	Amaryllidaceae
Subfamily	Allioideae
Genus	Allium
Species	A .Cepa
Binomial Name	*Allium Cepa*

Fig.7. Red onion (http://en.wikipedia.org/wiki/Onion)

Fig.8. Roots, leaves and developing bulb (http://en.wikipedia. org/wiki/Onion)

Indian squill (Urginea)

Synonym: Jungli Pyaj, Sea onion, Scilla.

Biological source

Urginea consist of dried slices of the bulbs of *Urginea Indica* kunth, family *Liliaceae.* The European Squill is obtained from the bulbs of *Urginea Maritima* (Linn)

Geographical source

As the name indicates, it is found in India. It is grown on sea costs including Konkan and Sourashtra and also in the dry hills of the lower Himalayas at an altitude of 1500m. European Squill is grown in Italy, Spain, Greece, France and Algeria.

Macroscopic characters

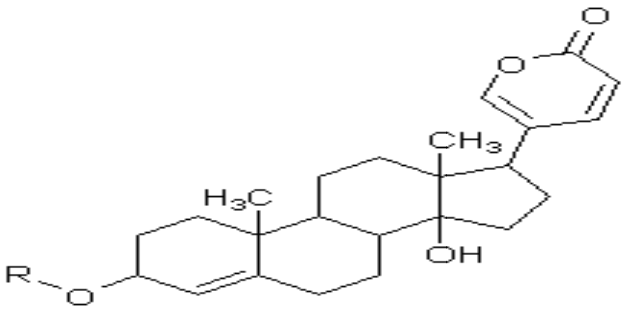
Colour: The slices of Squill bulbs are slightly yellowish to white.
Odour: Slight and characteristic
Taste: Bitter, mucilaginous and Acreed.
Size: The slices of the Indian Squill are united in groups of 4 to 8, which are curved.

Chemical constituents

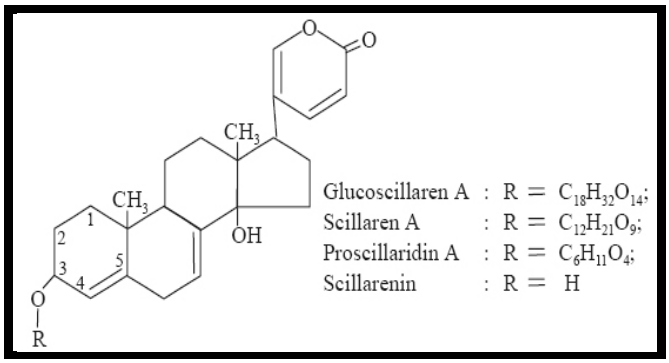
Indian Squill contains about 0.3% of Cardiac glycosides. It yields to alcohol about 20 to 40% of extractives. The other

contents of drug are mucilage about 40% and calcium oxalate. Scillaren A and Scillaren B are major cardiac glycosides of the drug. Scillaren A on hydrolysis (by an enzyme) scillarinase yields proscillaridine A and on acid hydrolysis yields scillaridine A, whereas scillarin B yields proscillaridine B & scillaridine B respectively. European Squill it is a white squill and Red Squill it is a red variety of European Squill. The red colour is due to red anthocyanin pigments present in mesophyll cells or scales. (http:// n.wikipedia.org/wiki/Bacillus subtillis)

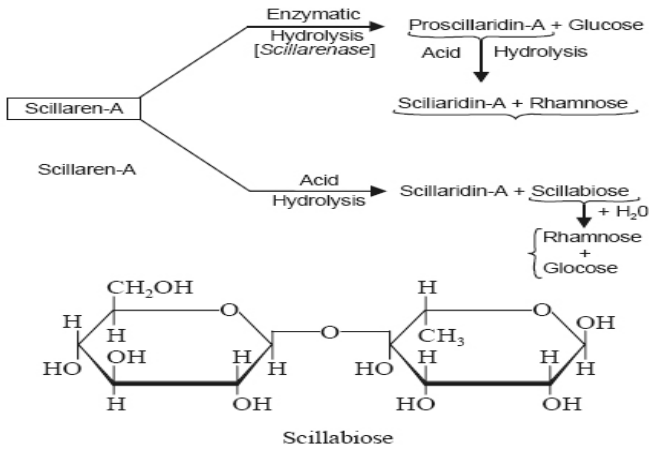
1) Scillaren



2) Glucoscillaren A, Proscillaridine A, Scillarenin



Hydrolysis of scillaren a: (http:// n.wikipedia.org/wiki/ Bacillus subtillis)



Onion: potential clinical benefits

1. Onions are effective against common cold heart disease diabetes.
2. Osteoporosis, coughs and sore throats.
3. They also act as bacteristatic.
4. Certain chemical compounds believed to have anti inflammatory, anticholesterol, anticancer and antioxidant properties such as quercetin are present in onions.
5. They are high in flavonoids which is concentrated on the outer layer of the flesh onions are also high in polyphenols than other allium vegetables.

Health benefits

1. Cardiovascular Benefits: Multiple studies show onion to be a food that provides protection for the heart and blood vessels when consumed in a diet that is rich in other vegetables and fruits—especially flavonoid-containing vegetables and fruits. The benefits of onion in this overall dietary context extend to prevention of heart attack. In virtually all of these diet-based studies, participants with the greatest intake of vegetables (including onions) gain the most protection. The outstanding flavonoid content of onions supports these research findings.

2. Support for Bone and Connective Tissue: Human studies have shown that onion can help increase our bone density. The high sulfur content of onions may provide direct benefits to our connective tissue. Many of our connective tissue components require sulfur for their formation. For example, with the exception of hyaluronic acid, all glycosaminoglycans (GAGS) are sulfated. (GAGS are the premiere family of molecules found in the ground substance of our connective tissue)

3. Anti-Inflammatory Benefits: Allium vegetable has nevertheless been shown to provide important anti-inflammatory benefits. Onionin A—a unique sulfur molecule in onion that is found in the bulb portion of the plant—has been shown to inhibit the activity of macrophages, specialized white blood cells that play a key role in our body's immune defense system, and one of their defense activities involves the triggering of large-scale inflammatory responses.

Table 4. Nutrition and health (http://en.wikipedia.org/wiki/Onion)

Raw Onions	
Nutritional value per 100 g (3.5 oz)	
Energy	166 kJ (40 kcal)
Carbohydrates	9.34 g
Sugars	4.24 g
Dietary fiber	1.7 g
Fat	0.1 g
Protein	1.1 g
Water	89.11 g
Thiamine (vit. B_1)	0.046 mg (4%)
Riboflavin (vit. B_2)	0.027 mg (2%)
Niacin (vit. B_3)	0.116 mg (1%)
Pantothenic acid (B_5)	0.123 mg (2%)
Vitamin B_6	0.12 mg (9%)
Folate (vit. B_9)	19 µg (5%)
Vitamin C	7.4 mg (9%)
Calcium	23 mg (2%)
Iron	0.21 mg (2%)
Magnesium	10 mg (3%)
Manganese	0.129 mg (6%)
Phosphorus	29 mg (4%)

4. Cancer Protection: Onion has repeatedly been shown to lower our risk of several cancers, even when we consume it in only moderate amounts. "Moderate" generally means 1-2 times per week, even though in some studies it has been used to mean up to 5-6 times per week. Colorectal cancer, laryngeal

cancer, and ovarian cancer are the cancer types for which risk is reduced along with moderate amounts of dietary onion. (http://whfoods.org/genpage.php)

Production and Trade

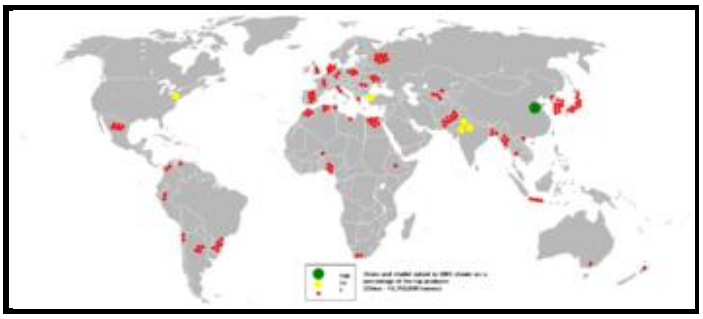


Fig. 9. Production and trade

Onion and shallot output in 2005 It is estimated that around the World, over 9,000,000 acres (3,642,000 ha) of onions are grown annually. About 170 countries cultivate onions for domestic use and about eight percent of the global production is traded internationally.

Table 5. Production and Trade (http://en.wikipedia.org/wiki/Onion)

Top Ten Onions (dry) Producers	2012 (metric tons)
China	20,507,759
India	13,372,100
United States	3,320,870
Egypt	2,208,080
Iran	1,922,970
Turkey	1,900,000
Pakistan	1,701,100
Brazil	1,556,000
Russia	1,536,300
Republic of Korea	1,411,650
World Total	74,250,809

Eye irritation

Fig. 10. Cartoon chef crying while cutting onion

Cut onions emit certain compounds which cause the lachrymal glands in the eyes to become irritated, releasing tears. Chopping an onion causes damage to cells which allows enzymes called alliinases to break down amino acid sulfoxides and generate sulfenic acids. A specific sulfenic acid, 1-propenesulfenic acid, is rapidly acted on by a second enzyme, the lachrymatory factor synthase (LFS), giving syn-propanethial-S-oxide, a volatile gas known as the onion lachrymatory factor or LF. This gas diffuses through the air and soon reaches the eye, where it activates sensory neurons, creating a stinging sensation. Tear glands produce tears in order to dilute and flush out the irritant. Eye irritation can be avoided by cutting onions under running water or submerged in a basin of water. Leaving the root end intact also reduces irritation as the onion base has a higher concentration of sulphur compounds than the rest of the bulb. Refrigerating the onions before use reduces the enzyme reaction rate and using a fan can blow the gas away from the eyes. The more often one chops onions, the less one experiences eye irritation. The amount of sulfenic acids and LF released and the irritation effect differs among *Allium* species. In 2008, the New Zealand Crop and Food institute created a strain of "no tears" onions by using gene-silencing biotechnology to prevent synthesis by the onions of the LFS enzyme. (http://en.wikipedia. org/wiki/Onion)

Information of bacterial culture for the project work

1) Bacillus subtillis

Bacillus subtillis, known as the hay bacillus or grass bacillus, is a Gram - positive catalase - positive bacterium commonly found in soil. A member of the genus Bacillus, B. subtillis is rod shaped, and has the ability to form a tough, protective endospore, allowing the organism to tolerate extreme environmental condition. Unlike several other well known species, B. subtillis has historically been classified as an obligate aerobe, through recent research has demonstrated that this is not strictly correct. (http:// n.wikipedia.org/wiki/Bacillus subtillis)

2) Staphylococcus aureus

Staphylococcus aureus causes a variety of suppurative (pus-forming) infections and toxinoses in humans. *Staphylococcus aureus* causes superficial skin lesions such as boils, styes and more serious infections such as osteomyelities and endocarditis. It is the major cause of nosocomial infections of surgical wounds and infections associated with indwelling medical devices. *Staphylococcus aureus* causes food poison by releasing enterotoxins into food and toxic shock syndrome by the release of super antigens into the blood stream.

MATERIALS AND METHODS

Collection of plant material

Mature healthy ginger and bulbs of onion were collected from market.

Preparation of plant extract

Onion extraction

The onions were washed with clean sterile distilled water and allowed to air dry for one hour. The outer covering of the onion were manually peeled off. The onion bulbs being separated were washed and extracted in the following ways:

Aqueous extract

1. Exactly 200g of fresh onion bulbs were blended into fine powder and soaked in 400mls of distilled water for 6days. The pulp obtained was left in a clean, sterile glass container and shaken vigorously to allow for proper extraction and it was filtered using a sterile muslin cloth after which the extract was obtained, air-dried and stored below ambient temperature until required.

Alcoholic extract

2. Exactly 200g of fresh onion bulbs were blended and soaked in 400mls of alcohol for 7days and the extract was obtained, air-dried and stored as in (1) above.

Ginger extraction

The ginger rhizomes were washed with clean sterile distilled water and allowed to air-dry for one hour. Then the outer covering of the ginger were manually peeled off and the ginger was washed again and extracted using the following procedures:

Aqueous extract

1) Exactly 200g of fresh ginger were blended into fine powder and soaked in 400mls of distilled water for 7days.

The pulp obtained was left in a clean, sterile glass container and shaken vigorously to allow for proper extraction and it was filtered using a sterile muslin cloth after which the extract was obtained, air-dried and stored below ambient temperature until required.

Alcoholic extract

2) Exactly 200g of fresh ginger were blended and soaked in 400mls of alcohol for 7days and the extract was obtained, air-dried and stored as in (1) above. (http://ISPUB.com)

Test organisms

The extract was tested on the following the use of bacteria Pseudomonas aeruginosa and Bacillus subtillis. All the strains were produced from the Dept of Shankarrao Ursal College of pharmaceutical science and research centre, Kharadi.

Method used for detection of antibacterial activity: (Kokare ?)

Colony plate Method

Colony plate method

The antibacterial activity was performed by colony plate method. This method is most commonly used technique for determination of susceptibility of micro-organisms of chemotherapeutic agent, the fresh culture of bacteria. This culture was spread on nutrient agar media in Petri dish by following aseptic technique. The colonies were prepared on the Petri dish. Aqueous and alcoholic extracts were placed in the colony and transfer to incubator and maintained at 37^0 C $+2^0$C for 24hrs. After the incubation period, the Petri plates were observed for zone of inhibition shown by, aqueous & alcoholic extracts of ginger and onion.

PRELIMINARY PHYTOCHEMICAL TEST

Tests for Glycosides [Allium Cepa (onion)]

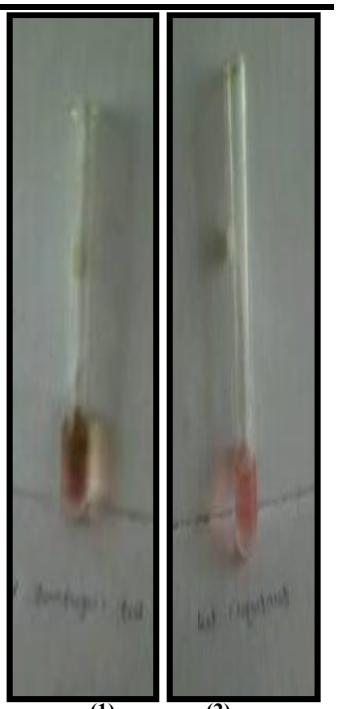
Table No.6 Tests for Cardiac Glycosides: [25]

TEST	OBSERVATION
1) Legal's Test: Alcoholic Extract + 1ml Pyridine + Sodium nitroprusside	Pink to red colour
2)Keller killiani Test: Alcoholic extract + Glacial acetic acid + 1dr Ferric chloride + Conc. Sulphuric acid	Reddish brown colour appears at junction of the two liquid layers.

(1) (2)

Table 7. Test for Anthroquinone Glycoside

TEST	OBSERVATION
1) Borntrager's Test: 3ml alcoholic extract + dil. Sulphuric acid. Boil & filter. Ad equal volumes of chloroform. Shake well. Separate the organic solvent. Add ammonia.	Ammonical layer shows pinkish red colour
2) Modified Borntrager's Test: 5ml alcoholic extract + 5ml 5% ferric chloride + 5ml hydrochloric acid. Heat for 5min in boiling water bath. Cool add benzene. Shake well. Separate organic solvent. Add ammonia.	Ammonical layer shows pinkish red colour.



(1) (2)

TESTS FOR GINGER

Tests for volatile oil

1) Volatile oil have characteristic odour.
2) Filter paper is not permanently stained with volatile oil.
3) Solubility Test: Volatile oils are soluble in 90% alcohol.

Chemical test: (Khandelwal ?) Table No. 8

TEST	OBSERVATION
Boil the drug with 5% Potassiu hydroxide.	Pungency of ginger is destroyed.

Evaluation of antibacterial activity

Table 9. Composition of nutrient agar media

S.No.	Ingredient	Quantity
1	Peptone	1 gm
2	Sodium chloride	0.5 gm
3	Meat extract	0.3 gm
4	Agar	4 gm
5	Distilled water	q. s. 100ml

The pH was adjusted to 7.4 +1 at 25^0 C temperatures & autoclaved at 15lbs/sq.inch pressure & at temperature 121^0 C for 15 mins.

Table 10. Ingredients and their uses

S.No.	Ingredient	Uses
1	Peptone	Source of organic nitrogen
2	Sodium chloride	Maintains the osmotic pressure
3	Meat extract	Contains carbohydrates, water, Soluble vitamins &salt
4	Agar	Solidifying agent
5	Distilled water	Assimilation of water

RESULTS

Antibacterial activity of alcoholic extract

Table 11. Zone of Inhibition of Alcoholic extract of onion, Mix, Ginger against Bacillus subtillis and Staphylococcus Aureus

S.No.	Bacterial Culture	Mean Zone of Inhibition (in mm)		
		Onion extra	Ginger extra	Mix extract
1	Bacillus subtillis	9.00	11.00	13.00
2	Staphylococcus aureus	8.00	9.00	11.00

Antibacterial activity of aqueous extract

Table 12. Zone of Inhibition of Aqueous extract of onion, Mix, Ginger against Bacillus subtillis and Staphylococcus Aureus

S.No	Bacterial Culture	Mean Zone of Inhibition (in mm)		
		Onion extra	Ginger extrac	Mix extrac
1	Bacillus subtillis	7.00	8.00	10.00
2	Staphylococcus aureu	8.00	9.00	11.00

Table 13. Comparison of Mix Alcoholic Extract with the Standard penicillin Drug

S.No	Bacterial Culture	Mean Zone of Inhibition (in mm)	
		Standard Penicillin dr	Mix extract
1	Bacillus subtillis	10.00	15.00
2	Staphylococcus aureus	8.00	13.00

DISCUSSION

The result of this work indicates that the water-soluble extracts and alcoholic extracts of onions and ginger have antibacterial properties.

Fig.11. Zone of Inhibition of Alcoholic extract of onion, Mix, Ginger against Bacillus subtillis

Fig.12. Zone of Inhibition of Alcoholic extract of onion, Mix, Ginger against Staphylococcus aureus

Fig.13 Zone of Inhibition of Aqueous Extract of Onion, mix, Ginger against Bacillus subtillis

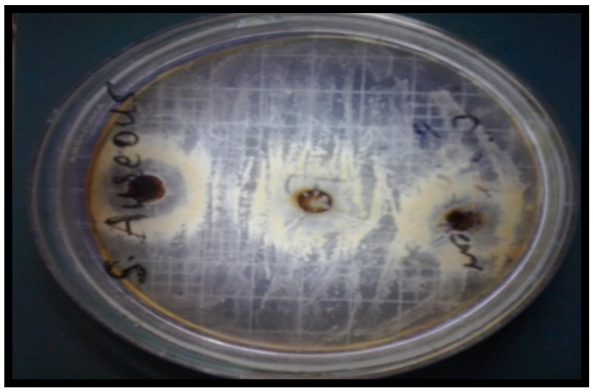


Fig.14. Zone of Inhibition of Aqueous Extract of Onion, mix, Ginger against Staphylococcus Aureus

Fig.15. Comparison of Mix Alcoholic Extract with the Standard penicillin Drug against Bacillus Subtillis

Fig.16. Comparison of Mix Alcoholic Extract with the Standard penicillin Drug against Staphylococcus Aureus

When the extracts were tested on Staphylococcus aureus and Bacillus subtillis, the widest zones of inhibition were obtained with Bacillus Subtillis. These differences in the zones of inhibition may be directly related to the susceptibility of each test organisms to the onions and ginger extracts. In the present study, Penicillin was used as standard antibacterial agent for comparison against the aqueous and alcoholic extract of Allium Cepa (Onion) and Zingiber Officinale (Ginger).

Future scope

- There are various antibiotics are used nowadays as a anti-bacterial agents But, Herbal drugs like Onion (Allium Cepa) and Ginger (Zingiber Officinale) also possess anti bacterial activity. Instead of using chemical agents as a anti biotic we can also use herbal drugs which possess same activity or more activity than the antibiotic used.
- Herbal drugs may possess more activity than the antibiotics and also more safer than the chemical agents.
- Antibiotics may causes adverse drug reaction like vomiting, nausea but herbal drug does not causes any side effects. It is the advantages of herbal drugs over the anti biotic.
- Hence, there is a large scope for herbal drugs instead of antibiotic, which gives more advantages effect.

Conclusion

- This work indicates that both the aqueous and alcoholic extracts of Allium Cepa and Zingiber Officinale have

Antibacterial activity against the Staphylococcus Aureus and Bacillus Subtillis bacteria.

- It was also observed that the alcoholic extract of both the drugs shows widest zone of inhibition as compared to aqueous extract against both the bacteria.
- It was also observed that the Mix extract of Allium Cepa and Zingiber Officinale have widest zone of inhibition than the individual extracts. Bacillus subtillis is more susceptible to alcoholic extract and Staphylococcus aureus is more susceptible to aqueous extract.
- As alcoholic extract have more Antibacterial Activity hence only the Mix Alcoholic Extract was compared with the standard Penicillin drug, which also conclude that the Mix Alcoholic extract is more effective than the Standard Penicillin drug.

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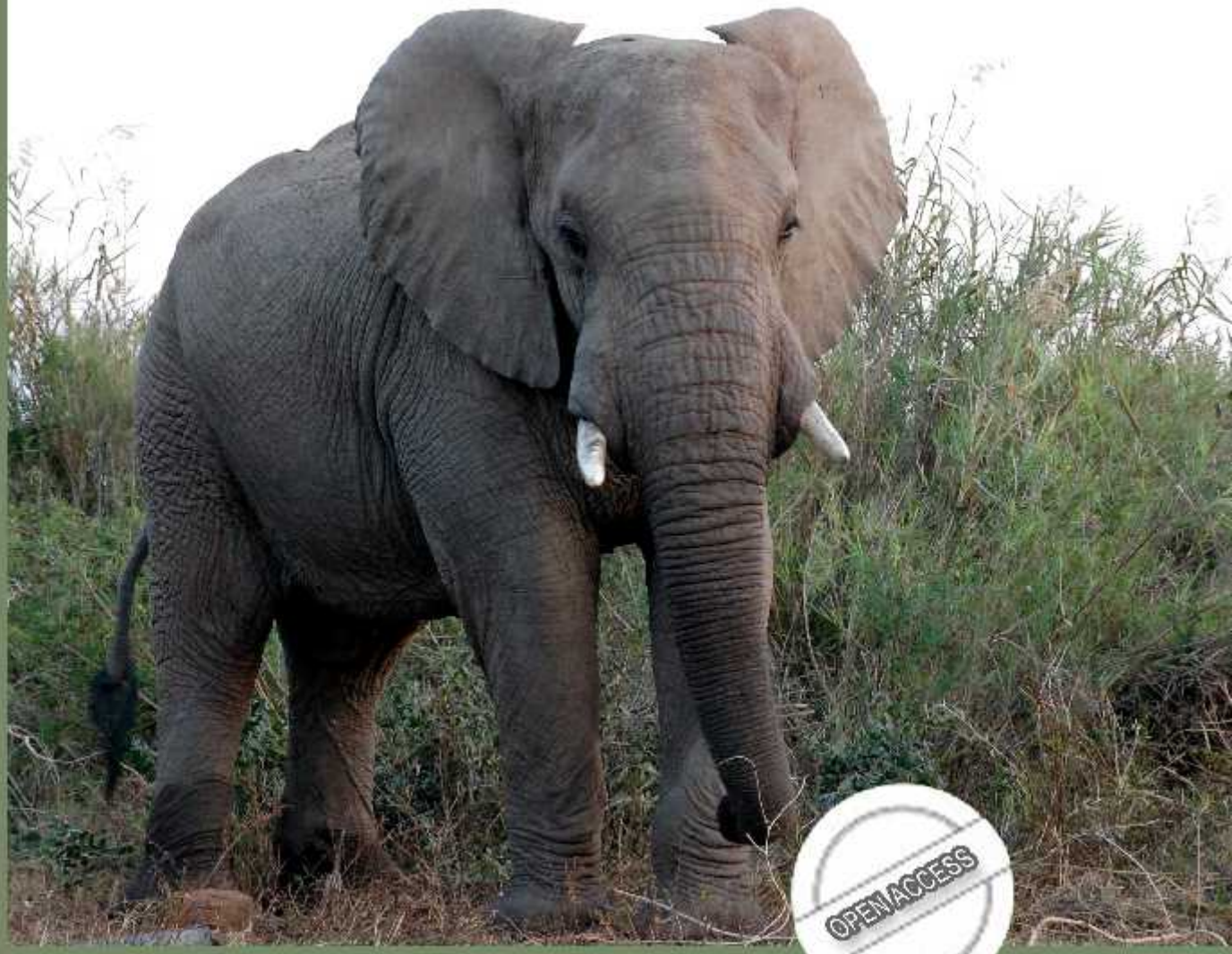

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