IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 8, Issue 9 Ver. III (Sep. 2014), PP 114-123
www.iosrjournals.org

Comparative Laboratory Study on Antimicrobial Effects of Fresh and Dry Ginger (Zingiber officinale), Taif, KSA

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Abstract: *This work was done for estimation the degree of losing the antimicrobial activity for fresh and dry Ginger (Zingiber officinale) due to dryness proses and shelf life time stores. The experiments were done by exposure of some pathogenic microorganisms (MOs) to Ginger boil water extracts and detection of mortality rates of MOs.*

The experiments showed mortality rates for Staph. aureus were 36, 33, 30.7, 27.3 and 24.3, the total differences were 11.7%. Mortality rates for E. coli were 41.7, 39, 36, 32.3 and 28.3%, the total differences were 13.4%. Mortality rates for Candida albicans were 31.7, 39.3, 27, 23.3 and 22%, the total differences were 9.7% respectively.

Confirmed experiments were done by using ants (Solenopsis spp.), that revealed mortality rates were 00, 100, 100, 80, 40, 10, 10, 10, 00, and 00% from control and the nine specimens respectively. The mortality rates were show 1st, 2nd and 3rd specimens were started killing the ants at the 1st day, while the 4th specimen started killing the ants at the 2nd day, but the 5th, 6th, and 7th specimens were started killing the ants at the 5th day of experiments respectively.

Key words*: Ginger, Zingiber officinale, Experiments, Pathogenic, Microorganisms (MOs), Mortality rates, Staph. aureus, E. coli, Candida albicans, ants, Solenopsis spp., Killing.*

I. Introduction

The fresh Ginger (Zingiber officinale) rhizomes, contain the gingerols were identified as the major active components and 6-gingerol 5-hydroxy-1-(4-hydroxy-3-methoxy phenyl) decan-3-one is the most abundant constituent in the gingerols series. The powdered rhizome contains 3-6%fatty oil, 9% protein, 60-70%carbohydrates, 3-8%crude fiber, about 8%ash, 9-12%water and 2-3%volatile oil. The volatile oil consists of mainly mono and sesquiter–penes; camphene, beta-phellandrene, curcumene, cineole, geranyl acetate, terphineol, terpenes, borneol, geraniol, limonene, linalool, alpha-zingiberene30-70%, beta-sesquiphellandrene15-20%, beta-bisabolene10-15% and alpha-farmesene. In dried Ginger powder, shogaol a dehydrated product of gingerol, is a predominant pungent constituent up to biosynthesis3-5. Oleoresin, which is isolated by acetone and ethanol extraction, contains4-7.5%of dried powder, pungent substances namely gingerol, shogaol, zingerone and paradol. The oleoresin has also been found to contain zingiberol, the principal aroma contributing component as well as zingiberene, gingediol, diarylheptanoids, vitamins and phytosterols[1]. Fresh Ginger contains 80.9%moisture, 2.3%protein, 0.9%fat, 1.2%minerals, 2.4%fiber and 12.3%carbohydrates. The minerals present in Ginger are iron, calcium and phosphorous. It also contains vitamins such as thiamine, riboflavin, niacin and vitamin C[1]. Medical plants have a long history of use and their use is widespread in over world countries. According to the WHO report 80% of the words population rely mainly on traditional therapies which involve the use of plant extracts or their active substances[2]. Ginger contains 1-2%oil, which imparts the unique flavor to the spice[2-3]. Ginger belongs to Zinberaceae family, the part of the plant used is rhizome[4-5]. In dried Ginger powder, shogaol a dehydrated product of gingerol, is a predominant pungent constituent up to biosynthesis[3-5]. Oleoresin, which is isolated by acetone and ethanol extraction, contains 4-7.5% of dried powder, pungent substances namely gingerol, shogaol, zingerone and paradol[6]. In the fresh Ginger rhizome, the gingerols were identified as the major active components and gingerol 5--hydroxy-1-(4-hydroxy-3-methoxy phenyl) decan-3-one is the most abundant constituent in the gingerol series. The powdered rhizome contains 3-6%fatty oil, 9%protein, 60-70%carbohydrates, 3-8%crude fiber, about 8%ash, 9-12%water and 2-3%volatile oil[7]. Antibacterial effect revealed, both gingerols and shogaols have antibacterial effects which aids in resolving stomach problems[8]. Ginger has strong antibacterial properties, active constituents of Ginger inhibit multiplication of colon bacteria. It inhibits the growth of E. coli, Staph. spp.,[9-10]. Antimicrobial property of the

volatile oil from the rhizomes of Ginger[11]. The essential oil from Ginger, was studied for antimicrobial activity, inhibit multiplication of colon bacteria, this can be counteracted with inhibits the growth of E. coli[12-13]. Ginger is thick scaly rhizomes which are aromatic, thick lobed, branched, have a scaly structure and they possess a spicy lemon like scent, contain both aromatic and pungent components. The antimicrobial activity of Ginger may be due to the considerable amounts of phenolic compounds[14]. Ginger effect on the oral bacteria, crude extract of the Ginger can inhibit the growth of oral bacteria in vitro[15]. Ginger extract showed antimicrobial activity[16]. Traditionally Ginger has been used to treat intestinal infections, especially related with digestive problems[17]. The antimicrobial effectiveness of extracts of Ginger on E. coli, were ascertained. The plant extracts showed activity on the tested MOs[19]. Ethanol extracts had been utilized as a solvent, the results would have shown larger inhibitory zones for the MOs tested[20]. The active compounds contained in Ginger are divided into two groups: volatile essential oils and fragrant or harsh phenol compounds, 10%ethanolic Ginger extract showed antimicrobial activity[21]. Gingerols related components have been found to have antimicrobial activities[22]. The inhibitory effect of Ginger in the form of extract against several bacteria[23]. Ginger is used as a herb and also a spice especially in the East area[24]. Ginger extract was used against the growth of pathogenic Staph. aureus isolated from milk of some local cows infected with clinical mastitis revealed the antibacterial effects[25]. Aqueous extract of Ginger roots were used for antibacterial activity against various G-negative and G-positive bacteria. It showed clear antibacterial activity against pathogenic bacteria, which this activity was enhanced with the increasing of concentrations belongs to them, the extract gave highest activity against Staph. aureus[26, 28]. Ginger has been reported to decrease 3log cycles of the MOs in the beef sausages after (2-3) months of frozen storage when used as an antimicrobial agent at the concentration of 1%[27]. Ginger extract showed zone of inhibition against MOs study was first of its kind where 10%ethanolic Ginger extract along with positive control was used against MOs in order to compare the efficacy of ethanolic ginger extract, commonly known as Ginger is one such plant product which has been used from ancient time. It has been shown to possess promising inhibitory effect on many of the oral MOs, there was scarcity of studies which had tried to assess antimicrobial potential of Ginger extract against Candida albicans[29]. Gingerols and shagelol have been accounted for antimicrobial activity of Ginger[30]. Fresh Ginger juice showed inhibitory action against Fungi spp.[31-32]. Isolation of antifungal compounds from an African land race of Ginger, and the identification of 6, 8 and 10-gingerols and 6-gingerdiol as the main antifungal principles. The compounds were active against 1human pathogens at concentrations of <1mg/mL. The gingerols content of the African land race was at least 3times higher than that of typical commercial cultivars of Ginger[33]. Significant antifungal activities were evident with extracts from members of the Zinberaceae. Ginger extract containing Gingerols inhibits the growth of many Fungi spp. in vitro and the activity might be contributed to the preventive effects of its different agents. Ginger is listed in modern pharmacopoeias and repertories and has a wide range of confirmed pharmacological properties as antifungal properties of Ginger extract[33]. There are topical and systemic antifungal agents that may be indicated to control oral candidiasis[34]. The essential oil from Ginger, was studied for antifungal activity against Fungi spp.[12]. Ginger extract showed antifungal activity against Candida albicans[18]. The extract of rhizomes has pronounced inhibitory activities against Candida albicans. In the Ginger rhizome there are several components which have antifungal effects. Gingerols and shagelol identified as more active agents[35]. Ethanolic extract of Ginger powder has pronounced inhibitory activities against Candida albicans, that Ginger has broad different antifungal agents are present in the Ginger extract. In the Ginger rhizome there are several components which have antifungal effects. Gingerols and shagelol are identified as more active agents. crude extract of Ginger can inhibit the growth of oral MOs in vitro[36]. Ginger extract has obvious effect on Fungi spp. growth[37]. Since these compounds and their relative concentration vary from oil to oil and from different oils which accounts for a varied antimicrobial activity[38]. It has been known from ancient times that essential oils from aromatic and medicinal plants possess biological activity, antibacterial, antifungal and antioxidant properties. Due to the growing interest in the use of essential oils in both the food and the pharmaceutical industries. Ginger is a rhizomatous plant grown throughout South-eastern Asia, China and in parts of Japan, Austria, Latin America, Jamaica and Africa. Ginger has been used as a spice and medicine in India and China since ancient times. Its plants were grown in pots and carried to abroad on sea long voyages to prevent scurvy. The spice was known in Germany and France in the 9th century and in England in 10th century for its medicinal properties, It is widely used in ayurvedic medicines and in folklore medicines[39]. Most of the ayurvedic preparations contain dry pepper and Ginger which contains 1-2%oil, imparts the unique flavor to the spice, the chemical composition of fresh Ginger oil and the naturally occurring flavoring compounds[3-4]. The antimicrobial property of the volatile oil from the rhizomes of Ginger, the essential oil from Ginger, were studied for antimicrobial activity against bacteria and Fungi app.[11-12]. Reports on the bioassay-guided isolation of antifungal compounds from an African land and the identification of 6, 8 and 10gingerols and 6-gingerdiol as the main antifungal principles[33]. Fresh and dry Ginger extracts revealed, volatile oils from fresh and dried Ginger rhizomes, zingiberene was the major compound in both Ginger oils. Fresh oil contained geranial8.5%as the second main compound and had more oxygenated compounds29.2% compared to dry Ginger oil14.4%. The dry Ginger oil also contained

ar-curcumene11%, β-bisabolene7.2% sesquiphellandrene6.6% and δ-cadinene3.5%. Antimicrobial activity of the oils against bacteria, Candida albicans, are comparable with the reference compounds[40].

The aim of this work: The present study was aimed to screen and evaluated the activity of Ginger antimicrobial (bacteria and fungi) effects according to the dryness process and shelf life time stores. It was carried on comparing of several specimens of Ginger were classified according to dryness process and shelf life time stores. The experiments were done in-vitro to estimate antimicrobial potential degree of Ginger boil water extracts against some pathogenic microorganisms (MOs): (Staph. aureus, E. coli and Candida albicans) isolates. Also, a confirmed in-vitro experiments it was done by exposed ants to the same Ginger boil water extracts specimens, for confirming the experiments results were discharged.

II. Materials and Methods

Preparation of Ginger boil water extracts:

- **Specimens purchasing:** Fresh green rhizomes of Ginger specimens were purchased of the same type, specimens were purchased from supermarkets and the dry Ginger specimens from herbal markets based on the dryness process and durations of shelf life time storage, that all be done from different KSA souks.
- **Preparation specimen No.1=Zero fresh green control**: Peeling and chopping of the rhizomes were done by sterile knife. Weighted 100gm of fresh green Ginger slides+100ml sterile water=200in total, were mixed in sterile electric blender. Boiled the output on direct flame for 5-10minutes and then had left for 1hr. Filtrated by sterile gauze, saved the liquid filtrates in sterile cap tubes and coarse filtrates in sterile gauzes were putted in sterile cap containers with numbering in the freezer.
- **Preparation specimen No.2=Zero dry control:** It had done by transferred Ginger green to dry specimen. Weighted 100gm of fresh green Ginger in slides, left for dry in period of 4-5days under sunlight, it was given amount equal to 8-10gm after drying. Grinded the dry specimen by sterile grinding mill. Weight was equaled to 8-10gm dry specimen+190ml sterile water=200in total, boiled the output on direct flame for 5-10minutes and then had left for 1hr. Filtrated by sterile gauze, saved the liquid filtrates in sterile cap tubes and coarse filtrates in sterile gauzes were putted in sterile cap containers with numbering in the freezer.
- **Preparation specimens No.(3-9)=(store age were 1, 3, 5, 7, 9, 11 months and >1yr.):** It was dry and had been purchased from herbal market, weighted 8-10gm of dry Ginger specimen+190ml sterile water=200in total, boiled the output on direct flame for 5-10minutes and then had left for 1hr. Filtrated by sterile gauze, saved the liquid filtrates in sterile cap tubes and coarse filtrates in sterile gauzes were putted in sterile cap containers with numbering in the freezer[41].

Microbes experiments:

- **Preparation microbial isolates:** Pathogenic MOs (Staph. aureus, E. coli and Candida albicans) were diagnosed and procured from Official Microbiology Laboratory. Inoculums were prepared by direct colony suspension of sterile small amount was inoculated into nutrient broth in sterile cap tube and incubated at 37^{o}C till to match 0.5McFarland standard.
- **Microbial experiment steps:** Fixed volume of each MOs (concentration=10^3/ml) will be mixed with equal volume of Ginger boil water extract for each specimen in sterile cap tube. The mixers were kept for 10, 30, and 50minutes and were adjusted by stop watch. Microbial plates were inoculated from each sterile cap tube after each time period separately with its own data, then incubated at 37°C for 48hrs.
- **Monitoring mortality rates of MOs during the experiments:** MOs growth were determined for each period of time and mortality rates were calculated by (100%-Growth%= Died%). Mortality rates were compared with controls and between MOs it selves[42-43].

Ants experiments:

- **Preparation ants:** This preparation for confirmatory the effect of Ginger using soil insects that infect the plants. Ants (Solenopsis spp.) were obtained for purchased from a nursery in Green Island Al-Hada, it was chosen ants from the soil, suffer from the spread of the ants, and affected plants in loses. Ants of the same type and with the same qualities of the virtual, have been saved in the portfolio cover with gauze for reaches air and light.
- **Ants experiment steps:** Preparation of the Ginger specimens boil water extract (Ginger rough juice) by half teaspoon for each specimen numbered. Preparation the ants equal in number, attributes and work in control and tested groups. Each division of ants was total 10ants, were placed in sterile petri dishes into account the size of the ants and the dishes are numbered starting from control till specimens No.9. Put ants control with soil without putting Ginger. Prepare the dishes and explained Ginger, ants and provided the right accommodation, temperature, humidity, and ventilation. Put Ginger specimen and each ants in the middle of dish and covered dish with sterile gauze to get the ants on the appropriate amount of air and keep them from escape out the dish.
- **Monitoring ants behavior and mortality rates during the experiments:** With specimens (1-3), ants tried to escape from Ginger specimen and assembled at edge of the dishes, specimen (1) ants accelerated the

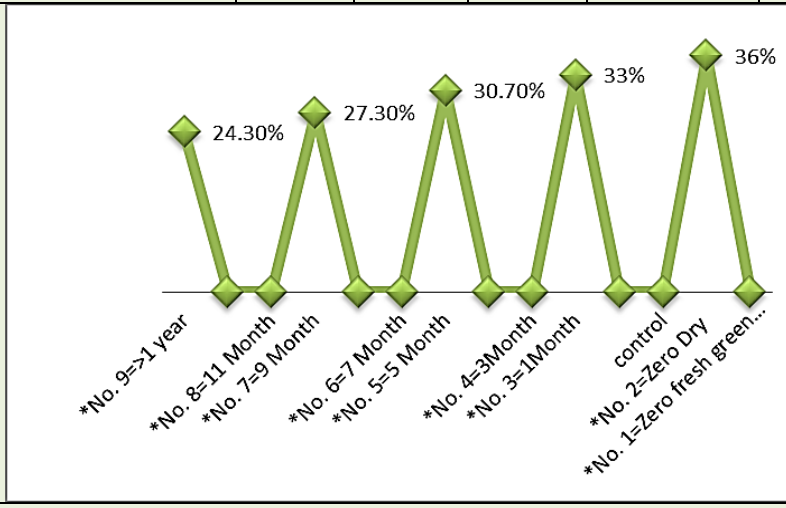
movement in an attempt to escape from in contact with leachate water from Ginger specimen and assembled on edge of the dish and got death after half an hr. of treatment. With specimens (2-3) ants tried to get closer to Ginger juices and escaped movement also fast, tried to escape from them, but coming back and back again, but escaped again, and degrees of mortality in (1-2) days of the experiments were differ, specimen (4) the ants carried a fraction of Ginger and water came into contact with succulents and event mortality different numbers and different times but not in the (1-2) days of experiments. With specimens (5-9) the ants carried a part of the Ginger headed towards outside the dishes had become so prevalent in the Ginger specimen dish away from the center and touches the Ginger water had not been seen on the excessive kinetic behavior of ants and event mortality rate was very low compared to the concentration of the previous specimens.

Data Analysis: The data were recorded during the experiments and study periods were also entered into Microsoft Excel Sheet program for summarized and analyzed[44-45].

III. Results and discussion

Table and diagram 1: The prevalence of mortality rates for *Staph. aureus were exposed to Ginger boil water extracts

Items	*Staph. aureus			Main%	Differences
Time exposed Specimens *No.	10 *min.	30 *min.	50 *min.		
*No. 1=Zero fresh green control	18%	35%	55%	108/3=36%	
*No. 2=Zero Dry control	18%	35%	55%		
					3%
*No. 3=1Month	15%	32%	52%	99/3=33%	
*No. 4=3Month	15%	32%	52%		
					2.3%
*No. 5=5 Month	12%	30%	50%	92/3=30.7%	
*No. 6=7 Month	12%	30%	50%		
					3.4%
*No. 7=9 Month	10%	27%	45%	82/3=27.3%	
*No. 8=11 Month	10%	27%	45%		
					3%
*No. 9=>1 year	8%	25%	40%	73/3=24.3%	
Total					11.7%



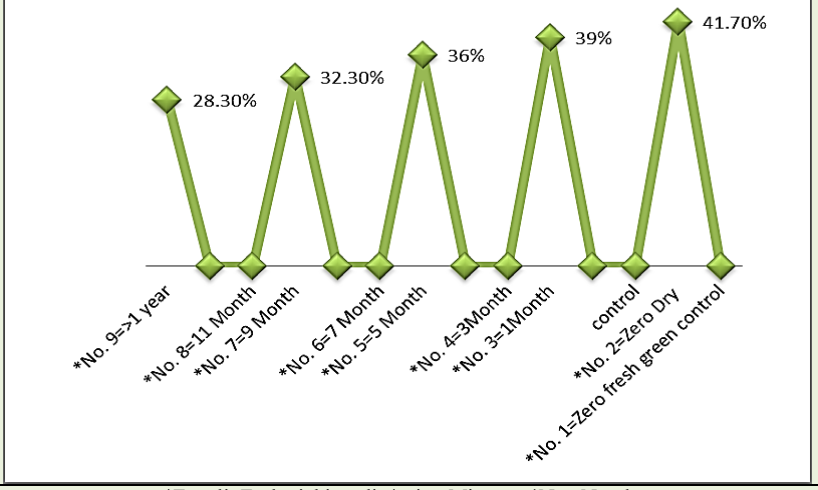
*Staph. aureus: Staphylococcus aureus, *min.: Minutes, *No.: Number

Table and diagram 1 showed the prevalence of mortality rates for Staph. aureus were exposed to Ginger boil water extracts, that revealed the main mortality rates of the nine specimens after exposed for 10, 30 and 50minutes were 36, 33, 30.7, 27.3 and 24.3%. The differences between the nine specimens were 3, 2.3, 3.4 and 3% and the total differences were 11.7% respectively. Ginger inhibits the growth of Staph. spp.,[9-10]. In vitro antimicrobial potential of the Ginger extract against the growth of pathogenic Staph. aureus isolated from milk of some local cows infected with clinical mastitis[25]. Aqueous extract of Ginger roots were used for antibacterial activity against various G-negative and G-positive bacteria. It showed clear antibacterial activity against pathogenic bacteria, which this activity was enhanced with the increasing of concentrations belongs to them, the extract gave highest activity against Staph. aureus[26, 28]. Ginger has been reported to decrease 3log

cycles of the MOs in beef sausages after (2-3)months of frozen storage when used as an antimicrobial agent at the concentration of 1%[27].

Table and diagram 2: The prevalence of mortality rates for *E. coli were exposed to Ginger boil water extracts

Items	*E. coli			Main%	Differences
Time exposed Specimens *No.	10 *min.	30 *min.	50 *min.		
*No. 1=Zero fresh green control	20%	40%	65%	125/3=41.7%	
*No. 2=Zero Dry control	20%	40%	65%		
					2.7%
*No. 3=1Month	18%	37%	62%	117/3=39%	
*No. 4=3Month	18%	37%	62%		
					3%
*No. 5=5 Month	15%	33%	60%	108/3=36%	
*No. 6=7 Month	15%	33%	60%		
					3.7%
*No. 7=9 Month	11%	30%	56%	97/3=32.3%	
*No. 8=11 Month	11%	30%	56%		
					4%
*No. 9=>1 year	10%	25%	50%	85/3=28.3%	
Total					13.4%



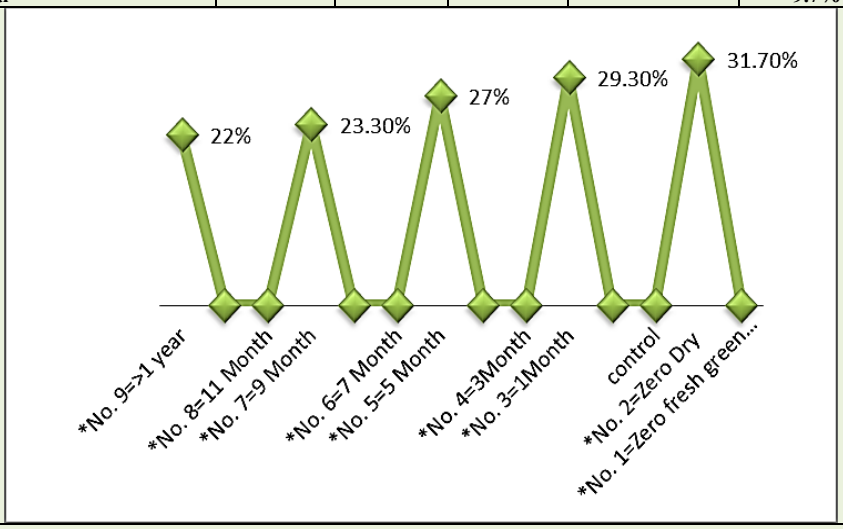
*E. coli: Escherichia coli, *min.: Minutes, *No.: Number

Table and diagram 2 showed the prevalence of mortality rates for E. coli were exposed to Ginger boil water extracts, that revealed the main mortality rates of the nine specimens after exposed for 10, 30 and 50minutes were 41.7, 39, 36, 32.3 and 28.3%. The differences between the nine specimens were 2.7, 3, 3.7 and 4% and the total differences were 13.4% respectively. Ginger has strong antibacterial properties, active constituents of Ginger inhibit multiplication of colon bacteria. It inhibits the growth of E. coli[9-10]. The essential oil from Ginger, was studied for antimicrobial activity. In vitro studies have shown that active constituents of Ginger inhibit multiplication of colon bacteria, this can be counteracted with Ginger[12]. It inhibits the growth of E. coli[13]. Crude extract of the Ginger can inhibit the growth of oral bacteria in vitro[15]. The antimicrobial effectiveness of extracts of Ginger on E. coli, were ascertained. The plant extracts showed activity on the test MOs[19]. Ginger has been reported to decrease 3log cycles of the MOs in beef sausages after (2-3) months of frozen storage when used as an antimicrobial agent at the concentration of 1%[27].

Table and diagram 3: The prevalence of mortality rates for *Candida albicans were exposed to Ginger boil water extracts

Items	Candida albicans			Main%	Differences
Time exposed Specimens *No.	10 *min.	30 *min.	50 *min.		
*No. 1=Zero fresh green control	20%	30%	45%	95/3=31.7%	
*No. 2=Zero Dry control	20%	30%	45%		
					2.4%
*No. 3=1Month	18%	27%	43%	88/3=29.3%	

***No. 4=3Month**	18%	27%	43%		
					2.3%
***No. 5=5 Month**	16%	25%	40%	**81/3=27%**	
***No. 6=7 Month**	16%	25%	40%		
					3.7%
***No. 7=9 Month**	13%	20%	37%	**70/3=23.3%**	
***No. 8=11 Month**	13%	20%	37%		
					1.3%
***No. 9=>1 year**	11%	19%	36%	**66/3=22%**	
Total					**9.7%**

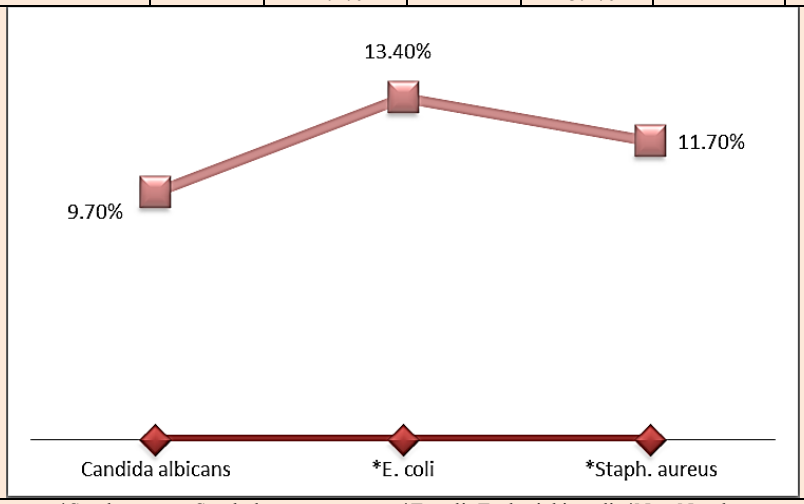


*min.: Minutes, *No.: Number

Table and diagram 3 showed the prevalence of mortality rates for Candida albicans were exposed to Ginger boil water extracts, that revealed the main mortality rates of the nine specimens after exposed for 10, 30 and 50minutes were 31.7, 39.3, 27, 23.3 and 22%. The differences between the nine specimens were 2.4, 2.3, 3.7 and 1.3% and the total differences were 9.7% respectively. Ginger extract has been shown to possess promising inhibitory effect on many of the oral MOs, there was scarcity of studies which had tried to assess antimicrobial potential of Ginger extract against Candida albicans[29]. Gingerols and shagelol have been accounted for antimicrobial activity of Ginger[30]. Fresh Ginger juice showed inhibitory action against Fungi spp.[31-32]. Isolation of antifungal compounds from an African land race of Ginger, and the identification of 6, 8 and 10-gingerols and 6-gingerdiol as the main antifungal principles. The compounds were active against 1human pathogens at concentrations of <1mg/mL. The gingerols content of the African land race was at least 3times higher than that of typical commercial cultivars of Ginger[33]. Significant antifungal activities were evident with extracts from members of the Zinberaceae. Ginger extract containing Gingerols inhibits the growth of many Fungi spp. Ginger is listed in modern pharmacopoeias and repertories and has a wide range of confirmed pharmacological properties as antifungal properties of Ginger extract[33]. There are topical and systemic antifungal agents that may be indicated to control oral candidiasis[34]. The essential oil from Ginger, was studied for antimicrobial activity against Fungi spp.[12]. Ginger extract showed antimicrobial activity against Candida albicans[18]. The extract of rhizomes has pronounced inhibitory activities against Candida albicans. In the Ginger rhizome there are several components which have antifungal effects. The gingerols and shagelol identified as more active agents[35]. Ethanolic extract of Ginger powder has pronounced inhibitory activities against Candida albicans, that Ginger has different antifungal agents are present in the Ginger extract. In the Ginger rhizome there are several components which have antifungal effects. The gingerols and shagelol are identified as more active agents[36]. Ginger extract has obvious effect on Fungi spp. growth[37]. The antimicrobial property of the volatile oil from the rhizomes of Ginger, the essential oil from Ginger, were studied for antimicrobial activity against Fungi app.[11-12]. Reports on the bioassay-guided isolation of antifungal compounds from an African land and the identification of 6, 8 and 10gingerols and 6-gingerdiol as the main antifungal principles[33].

Table and diagram 4: The comparative prevalence of mortality rates for microbial strains were exposed to Ginger boil water extracts

Items Specimens *No.	*Staph. aureus		*E. coli		Candida albicans	
	Main%	Differences	Main%	Differences	Main%	Differences
*No. 1=Zero fresh green control	36%		41.7%		31.7%	
*No. 2=Zero Dry control						
		3%		2.7%		2.4%
*No. 3=1Month	33%		39%		29.3%	
*No. 4=3Month						
		2.3%		3%		2.3%
*No. 5=5 Month	30.7%		36%		27%	
*No. 6=7 Month						
		3.4%		3.7%		3.7%
*No. 7=9 Month	27.3%		32.3%		23.3%	
*No. 8=11 Month						
		3%		4%		1.3%
*No. 9=>1 year	24.3%		28.3%		22%	
Total		**11.7%**		**13.4%**		**9.7%**

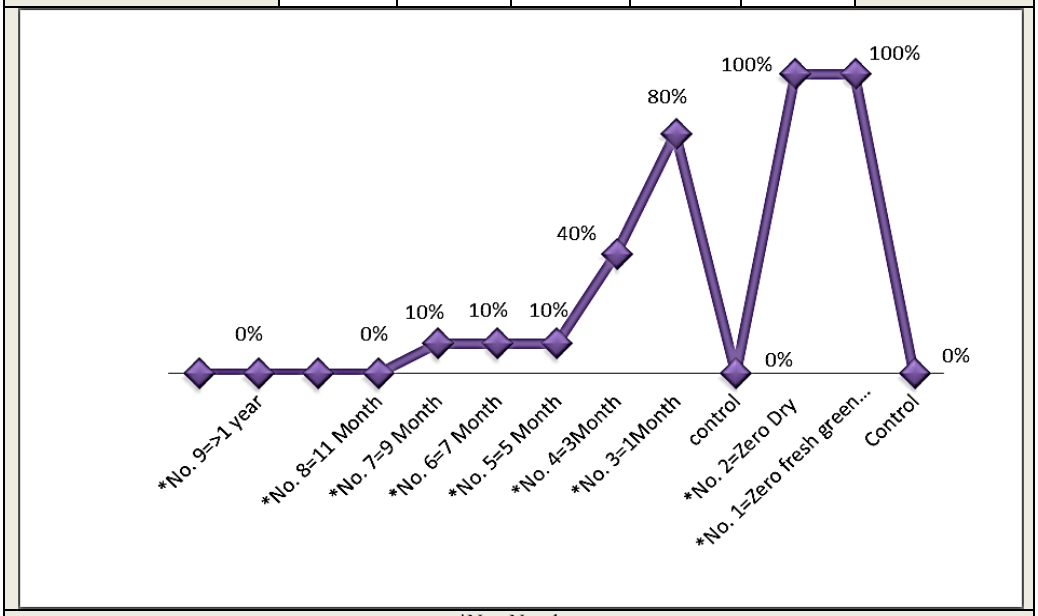


*Staph. aureus: Staphylococcus aureus, *E. coli: Escherichia coli, *No.: Number

Table and diagram 4 showed the comparative prevalence of mortality rates for microbial strains were exposed to Ginger boil water extracts, that revealed the antimicrobial were on E. coli, Staph. aureus and Candida albicans as 13.4, 11.7 and 9.7% respectively. Antibacterial effect revealed, both gingerols and shogaols have antibacterial effects which aids in resolving stomach problems[8]. Ginger has strong antibacterial and to some extent antifungal properties, active constituents of Ginger inhibit multiplication of colon bacteria[9-10]. Antimicrobial property of the volatile oil from the rhizomes of Ginger[11]. The essential oil from Ginger, was studied for antimicrobial activity. In vitro studies have shown that active constituents of Ginger inhibit multiplication of colon bacteria, this can be counteracted with Ginger[12]. The antimicrobial activity of Ginger may be due to the considerable amounts of phenolic compounds present in Ginger[14]. Focused on the effect of Ginger on the oral bacteria and fungi. crude extract of the Ginger can inhibit the growth of oral bacteria in vitro[15]. Ginger extract showed antimicrobial activity[16]. Traditionally Ginger has been used to treat intestinal infections, especially related with digestive problems[17]. The antimicrobial effectiveness of extracts of Ginger were ascertained. The plant extracts showed activity on the test MOs[19]. Ethanol extracts had shown larger inhibitory zones for the MOs tested[20]. The active compounds contained in Ginger are divided into two groups: volatile essential oils and fragrant or harsh phenol compounds, 10%ethanolic Ginger extract showed antimicrobial activity[21]. Gingerols related components have been found to have antimicrobial activities[22]. The inhibitory effect of Ginger in the form of extract against several bacteria[23]. Ginger is used as a herb and also a spice especially in the East[24]. The in vitro antimicrobial potential of the Ginger extract against the growth of pathogenic MOs[25]. Aqueous extract of Ginger roots were used for antibacterial activity against various G-negative and G-positive bacteria. It showed clear antibacterial activity against pathogenic bacteria, which this activity was enhanced with the increasing of concentrations belongs to them, the extract gave highest activity[26, 28]. Ginger has been reported to decrease 3log cycles of the MOs in beef sausages after (2-3) months of frozen storage when used as an antimicrobial agent at the concentration of 1%[27].

Table and diagram 5: The prevalence of confirmed experiments using ants (*Solenopsis spp.) revealed mortality rates after exposed to rough Ginger boil water extracts

Items Specimens *No.	Time exposed					Total
Ants *No.=10 for each specimen	1st day	2nd day	3rd day	4th day	5th day	
Control	00/10= 00%					00/10=00%
*No. 1=Zero fresh green control	10/10= 100%					10/10=100%
*No. 2=Zero Dry control	3/10= 30%	4/10= 40%	1/10= 10%	2/10 20%		10/10=100%
*No. 3=1Month	1/10= 10%	3/10= 30%	2/10= 20%	1/10= 10%	1/10= 10%	8/10=80%
*No. 4=3Month		1/10= 10%	1/10= 10%	1/10= 10%	1/10= 10%	4/10=40%
*No. 5=5 Month					1/10= 10%	1/10=10%
*No. 6=7 Month					1/10= 10%	1/10=10%
*No. 7=9 Month					1/10= 10%	1/10=10%
*No. 8=11 Month						00/10=00%
*No. 9=>1 year						00/10=00%



*No.: Number

Table and diagram 5 showed the prevalence of confirmed experiments using ants (Solenopsis spp.) revealed mortality rates after exposed to rough Ginger boil water extracts, it revealed mortality rates were 00, 100, 100, 80, 40, 10, 10, 10, 00, and 00% from control and the nine specimens respectively. The mortality rates were distributed over the days of experiments according to the specimens. The 1st, 2nd and 3rd specimens were started killing the ants at the 1st day of experiment, while the 4th specimen started killing the ants at the 2nd day, but the 5th, 6th, and 7th specimens were started killing the ants at the 5th day of experiment respectively. There are not killing ants with the 8th and 9th specimens, that indicated the lowest effect of Ginger boil water extracts contents on ants. This experiments confirmed the losses of the effective antimicrobial power of Ginger according to the dryness proses and shelf lift times stores. Fresh and dry Ginger extracts revealed, volatile oils from fresh and dried Ginger rhizomes, zingiberene was the major compound in both Ginger oils. Fresh Ginger oil contained geranial 8.5%as the second main compound and had more oxygenated compounds 29.2% compared to dry Ginger oil 14.4%. The dry Ginger oil also contained ar-curcumene 11%, β-bisabolene 7.2% sesquiphellandrene 6.6% and δ-cadinene 3.5%. Antimicrobial activity of the oils against bacteria, Candida albicans, are comparable with the reference compounds[40].

IV. Conclusion

This study was evaluated the losses of antimicrobial activity of Ginger boil water extracts as a test by using some pathogenic MOs and confirmed experiment by using the ants. From the obtained experiment results, that it can be concluded that although Ginger boil water extracts still have antimicrobial activity but proof that the dryness proses and shelf life time stores affect that powerful degrees of active principles in Ginger to be revealed the decline of the antimicrobial activity shelf life time due to dryness proses and shelf life time stores.

V. Acknowledgment

Allot of grateful will be sending to all researchers for their co-operation in experiments work and honesties' in the producing this this paper search. Also allot grateful will be sending to Micro. Lab. Staff for their help in this work.

VI. References

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