IOSR Journal Of Humanities And Social Science (IOSR-JHSS)
Volume 20, Issue 4, Ver. V (Apr. 2015), PP 87-93
e-ISSN: 2279-0837, p-ISSN: 2279-0845.
www.iosrjournals.org

Comparison Of Different Surface Cleaner's Efficacy With The Help Of Statistical Analysis

Tariq Zaman[1], J.Siddiqui [2]
[1](Product Development /Hamdard University / Pakistan)
[2](HIESS / Hamdard University / Pakistan)
[3](R & D lab / Hamdard University. / Pakistan)
[4](R & D la b/ Hamdard University. / Pakistan)

Abstract: *This study shows the comparison of different disinfectant. With four organisms i.e.Staphylococcus aureus, Eschericia coli, Pseudomonas aeruginosa and Enterococcus hirea are tested against two test condition i.e. clean condition and dirty condition with selected disinfectant in five minutes contact time.*
The study shows, which disinfectant is more effectively killing all test organisms and provide more protection. Market survey shows that there is more impact of brand name on people. Through data analysis it is clear that the branded surface cleaner provide more protection against germs as compare to local surface cleaner. After getting complete results hence it is proved that branded surface cleaner gives five or greater log reduction against all four organisms when treated with clean and dirty condition in five minutes contact time by using the method EN 1276.
Keywords: *In-Vitro,Disinfectant,Surface Cleaner,Efficacy,American Type Culture Collection (ATCC)*

I. Introduction

The basic purpose of this research is comparison of different surface cleaners. There are so many previous researches available which support this study like comparison of different disinfectant against Household product which are used as cleaning agent or effect of disinfectant on different microorganism. This study is one step ahead because this study shows the comparison of different disinfectant in which we compare the branded surface cleaners against locally manufactured surface cleaners as well as this study shows the effect of these selected surfaces cleaner against different pathogens. The Purpose of this study is to establish the effectiveness of brandedSurface Cleaners against locally manufactured surface cleaner with the help of Statistical Analysis and prove which provides more protection, a branded surface Cleaner or locally manufactured surface cleaner.After getting complete results of all surface cleaner's we will be able to prove that which surface cleaner provides more protection against defined pathogens(so it is assumed that other non-pathogenic organism are also covered) and provide better and healthy life. The study will be applicable only on mentioned surface cleaners available in Karachi region are checked to ensure the effectiveness against all given pathogens Study is valid for all surface cleaners available in market. Locally made and imported. All surface cleaners are treated with four pathogenic microorganism i.e (E.coli, S.aureus, P. aeruginosa&Enterococcus.Hirae)A Five log^{10} reduction of all four organisms (E.coli, S.aureus, P.aeruginosa&Ent.hirae) in 5 minutes at 20 ± 1.0 ºC as required by international standard EN1276 (appendix A).

II. Materials & Methods

2.1 Population

Through market survey below is the list of available surface cleaner in Pakistan. The population size is finite. For this survey different markets/super store of Karachi region is targeted which includes;
Empress Market Saddar,Naheed Super store, Imtiaz Super store, Shazz Super store, Makro Super store, Matro Super store,Hyderi Mart, Liaquatbad Super Market,Local Market Gulshan, Nazimabad, North Nazimabad, North Karachi, Korangi, Surjani town, PIDC Khi, MalirCantt. Etc.
List of available surface cleaner in Pakistan

1. Floor polish phenylene
2. Grace white phenyl
3. Caroline Pine-Sol Concentrated Transparent Phenyl
4. Local surface cleaner
5. Glee floor
6. Acid floor cleaner
7. Dettol multi-purpose cleaner
8. Pine oil floor

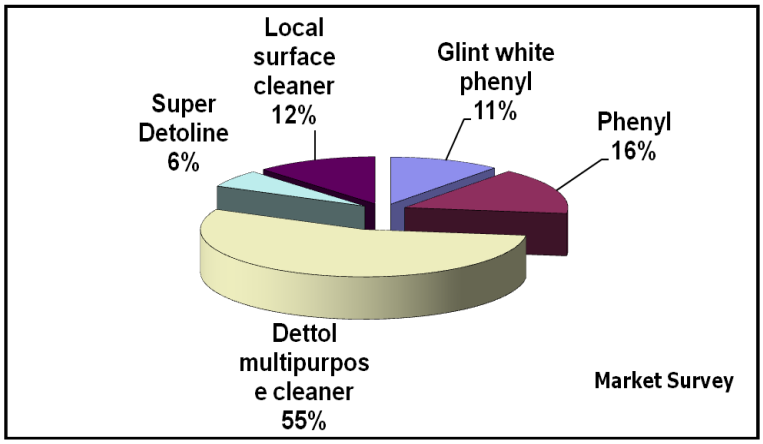
9. Glint White Phenyl
10. Antibacterial floor cleaner
11. Super Dettoline
12. Floor and Hard Surface Cleaner
13. FIT

3.2 Sample

Samples are selected according to market share through Questionnaires (Appendix B).

1. Glint White Phenyl
2. Fit
3. Dettol Multipurpose Cleaner
4. Local Surface Cleaner
5. Super Detoline

According to market survey pie chart shows the consumption of Surface cleaners according to which;
55% of population used Dettol multipurpose cleaner
16% Population used Phenyl
12% Population used Local surface cleaner
11% Population used Glint
6% Population used Super Detoline



3.3 Research Tool

- Questionnaire
- Ghost shopping

3.4 Step In Instrument Designating

In-vitro test methodology

3.5 Validity

Method EN1276 which issued is already a validated international Method.
The test is also validated through in vitro testing.

III. Results & Discussions

4.1 Analysis According To Data

According to Test method EN1276 the colony count result expressed as;
"Plates containing between 14 and 330 cfu ml-1 should be used to derive counts.
The Weighted Mean"
The Weighted Mean is the average of choice, and is used when two dilutions have colonies in the range 14-330 cfu ml-1.
Use the number of colonies from two successive dilutions as follows:
Where duplicate plates are used, add up all four plates and divided by 2.2(all plates must between 14 and 330).
Multiply this number by the reciprocal of the highest dilution as shown below:
Example (double plating)
10-1 280,290

10-1 40,52
280+290+40+52=662
662/2.2=301
301 x 10 (reciprocal of 10-1) =3010=3.01 x 103
The Arithmetic Mean

The Arithmetic Mean is used when only one dilution has colonies in the range 14-330 cfu ml-1 and duplicate plating is used. Divide the mean of two numbers by two. Like the weighted mean, multiply by the dilution reciprocal as shown above.

Example (double plating)
10-1 280,290
280+290=570
570/2=285
285 x 10 (reciprocal of 10-1) =2850=2.85 x 103
Handling of data with no survivors or no growth plates
When no survivors are recovered for the purpose of calculation consider the number of colonies recovered to be <14 x the reciprocal dilution factor.
Example:
10-1 0
<14 x 10(reciprocal of 10-1) = <1.4 x 10 2
The log value of this is <2.15. As no actual organisms were recovered.
When all plates are uncountable (TNTC):
When all plates are uncountable (TNTC) consider the mean number of colonies in the greatest dilution to be >330 x the reciprocal dilution factor.
Example:
10-1 330
>330 x 10 (reciprocal of 10-1)=>3.3 x 103
The log value of this is >3.52. As uncountable organisms were recovered.

4.2 Results:

Table # 1 shows surface cleaner's results when treated with Escherichia coli

Test Organism	Test Samples	Initial Count (Log Nc)	Final Count(Log Nd)		ME=Log Nc - Log Nd	
			Clean condition	Dirty Condition	Clean condition	Dirty Condition
E.coli ATCC 10536	Glint-White Phenyle	7.15	3.16	3.51	3.99	3.64
	Glint-White Phenyle		3.14	3.55	4.01	3.6
	Glint-White Phenyle		3.17	3.52	3.98	3.63
	Glint-White Phenyle		3.11	3.49	4.04	3.66
	Glint-White Phenyle		3.14	3.55	4.01	3.6
E.coli ATCC 10536	FIT- Phenyle	7.15	3.95	4.08	3.2	3.07
	FIT- Phenyle		3.96	4.06	3.19	3.07
	FIT- Phenyle		3.99	4.09	3.16	3.06
	FIT- Phenyle		3.96	4.08	3.19	3.07
	FIT- Phenyle		3.99	4.09	3.16	3.06
E.coli ATCC 10536	Dettol surface cleaner	7.15	<2.15	<2.15	>5.0	>5.0
	Dettol surface cleaner		<2.15	<2.15	>5.0	>5.0
	Dettol surface cleaner		<2.15	<2.15	>5.0	>5.0
	Dettol surface cleaner		<2.15	<2.15	>5.0	>5.0
	Dettol surface cleaner		<2.15	<2.15	>5.0	>5.0
E.coli ATCC 10536	Super Detoline	7.15	3.14	3.94	4.01	3.21
	Super Detoline		3.11	3.92	4.04	3.23

Table # 2 shows surface cleaner's results when treated with Staphylococcus aureus

Test Organism	Test Samples	Initial Count (Log Nc)	Final Count(Log Nd)		ME=Log Nc - Log Nd	
			Clean condition	Dirty Condition	Clean condition	Dirty Condition
S. aureus ATCC 6538	Glint-White Phenyle	7.35	2.91	2.94	4.44	4.41
	Glint-White Phenyle		2.93	2.94	4.42	4.41
	Glint-White Phenyle		2.91	2.93	4.44	4.42
	Glint-White Phenyle		2.90	2.93	4.45	4.42
	Glint-White Phenyle		2.93	2.94	4.42	4.41
S. aureus ATCC 6538	FIT- Phenyle	7.35	2.93	3.3	4.42	4.05
	FIT- Phenyle		2.95	3.29	4.4	4.06
	FIT- Phenyle		2.92	3.3	4.43	4.05
	FIT- Phenyle		2.94	3.3	4.41	4.05
	FIT- Phenyle		2.92	3.29	4.43	4.06
S. aureus ATCC 6538	Dettol surface cleaner	7.35	<2.15	<2.15	>5.0	>5.0
	Dettol surface cleaner		<2.15	<2.15	>5.0	>5.0
	Dettol surface cleaner		<2.15	<2.15	>5.0	>5.0
	Dettol surface cleaner		<2.15	<2.15	>5.0	>5.0
	Dettol surface cleaner		<2.15	<2.15	>5.0	>5.0
S. aureus ATCC 6538	Super Detoline	7.35	3.06	3.08	4.29	4.27
	Super Detoline		3.05	3.06	4.3	4.29
	Super Detoline		3.05	3.07	4.3	4.28
	Super Detoline		3.07	3.07	4.28	4.28
	Super Detoline		3.06	3.08	4.29	4.27
S. aureus ATCC 6538	Local Surface Cleaner	7.35	>3.51	>3.51	< 3.51	>3.51
	Local Surface Cleaner		>3.51	>3.51	< 3.51	< 3.51
	Local Surface Cleaner		>3.51	>3.51	< 3.51	< 3.51
	Local Surface Cleaner		>3.51	>3.51	< 3.51	< 3.51
	Local Surface Cleaner		>3.51	>3.51	< 3.51	< 3.51

Table # 3 shows surface cleaner's results when treated with Pseudomonas aeruginosa

Test Organism	Test Samples	Initial Count (Log Nc)	Final Count(Log Nd)		ME=Log Nc - Log Nd	
			Clean condition	Dirty Condition	Clean condition	Dirty Condition
P. aeruginosa ATCC 6538	Glint-White Phenyle	7.41	3.06	3.33	4.35	4.08
	Glint-White Phenyle		3.07	3.31	4.34	4.1
	Glint-White Phenyle		3.05	3.32	4.36	4.09
	Glint-White Phenyle		3.05	3.31	4.36	4.1
	Glint-White Phenyle		3.31	3.07	4.1	4.34
P. aeruginosa ATCC 6538	FIT- Phenyle	7.41	2.55	3.13	4.86	4.28
	FIT- Phenyle		2.55	3.12	4.86	4.29
	FIT- Phenyle		2.54	3.12	4.87	4.29
	FIT- Phenyle		2.55	3.13	4.86	4.28
	FIT- Phenyle		2.54	3.12	4.87	4.29
P. aeruginosa ATCC 6538	Dettol surface cleaner	7.41	<2.15	<2.15	>5.0	>5.0
	Dettol surface cleaner		<2.15	<2.15	>5.0	>5.0
	Dettol surface cleaner		<2.15	<2.15	>5.0	>5.0
	Dettol surface cleaner		<2.15	<2.15	>5.0	>5.0
	Dettol surface cleaner		<2.15	<2.15	>5.0	>5.0
P. aeruginosa ATCC 6538	Super Detoline	7.41	3.01	3.10	4.4	4.31
	Super Detoline		3.02	3.11	4.39	4.3
	Super Detoline		3.02	3.12	4.39	4.29
	Super Detoline		3.01	3.12	4.4	4.29
	Super Detoline		3.01	3.10	4.4	4.31
P. aeruginosa ATCC 6538	Local Surface Cleaner	7.41	>3.51	>3.51	< 3.51	>3.51
	Local Surface Cleaner		>3.51	>3.51	< 3.51	< 3.51
	Local Surface Cleaner		>3.51	>3.51	< 3.51	< 3.51

	Local Surface Cleaner		>3.51	>3.51	< 3.51	< 3.51
	Local Surface Cleaner		>3.51	>3.51	< 3.51	< 3.51

Table # 4 shows surface cleaner's results when treated with Enterococcus hirea

Test Organism	Test Samples	Initial Count (Log Nc)	Final Count(Log Nd)		ME=Log Nc - Log Nd	
			Clean condition	Dirty Condition	Clean condition	Dirty Condition
Ent.hirae ATCC 10541	Glint-White Phenyle	7.44	2.8	2.91	4.64	4.53
	Glint-White Phenyle		2.81	2.93	4.63	4.51
	Glint-White Phenyle		2.79	2.91	4.65	4.53
	Glint-White Phenyle		2.8	2.92	4.64	4.52
	Glint-White Phenyle		2.79	2.91	4.65	4.53
Ent.hirae ATCC 10541	FIT- Phenyle	7.44	2.92	3.03	4.52	4.41
	FIT- Phenyle		2.93	3.02	4.51	4.42
	FIT- Phenyle		2.92	3.03	4.52	4.41
	FIT- Phenyle		2.93	3.02	4.51	4.42
	FIT- Phenyle		2.92	3.03	4.52	4.41
Ent.hirae ATCC 10541	Dettol surface cleaner	7.44	<2.15	<2.15	>5.0	>5.0
	Dettol surface cleaner		<2.15	<2.15	>5.0	>5.0
	Dettol surface cleaner		<2.15	<2.15	>5.0	>5.0
	Dettol surface cleaner		<2.15	<2.15	>5.0	>5.0
	Dettol surface cleaner		<2.15	<2.15	>5.0	>5.0
Ent.hirae ATCC 10541	Super Detoline	7.44	2.91	2.95	4.53	4.49
	Super Detoline		2.90	2.93	4.54	4.51
	Super Detoline		2.91	2.96	4.53	4.48
	Super Detoline		2.91	2.93	4.53	4.51
	Super Detoline		2.90	2.96	4.54	4.48
Ent.hirae ATCC 10541	Local Surface Cleaner	7.44	>3.51	>3.51	< 3.51	>3.51
	Local Surface Cleaner		>3.51	>3.51	< 3.51	< 3.51
	Local Surface Cleaner		>3.51	>3.51	< 3.51	< 3.51
	Local Surface Cleaner		>3.51	>3.51	< 3.51	< 3.51
	Local Surface Cleaner		>3.51	>3.51	< 3.51	< 3.51

IV. Conclusion

Five different surface cleaners which are normally used/available to consumer were tested against four organisms at clean condition and dirty condition to check the efficacy that which surface cleaner gives five or greater log reduction against all used organism.When we compare the results we have seen that the branded Surface Cleaner achieves efficacy of an average of greater than 1 log higher reduction against all four test organisms as compared to the locally available ordinary unbranded surface cleaners. This study shows the comparison of different disinfectant. Four organisms i.e. Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa and Enterococcus hirea are tested against two test condition i.e. clean condition and Dirty condition with selected disinfectant in five minutes contact time. The study shows, which disinfectant is more effectively killing all test organisms and provide more protection. Market survey shows that there is more impact of brand name on people. Through data analysis it is clear that the branded surface cleaner provide more protection against germs as compare to local surface cleaner. After getting complete results hence it is proved that branded surface cleaner gives five or greater log reduction against all four organisms when treated with clean and dirty condition in five minutes contact time by using the method EN 1276.

V. Future Aspects

This study is very beneficial as this study shows the comparison of different disinfectant in which we compare the branded surfaces cleaners against locally manufactured surface cleaners. As well as this study shows the effect of these selected surface cleaner against different pathogens. In future this study will help in research. As we selected only four pathogens; in future this study may proceed with specific diseases causing pathogen like diarrhea causing organism or like typhoid causing pathogen with one of the effective surface cleaner. In this study the contact time of each organism with surface cleaner is five minutes, in future this study will go further with more shorter contact time like two or three minutes.

VI. Recommendation

- Regular cleaning products do a good job of removing dirt, but only disinfectants or surface cleaners with defined antimicrobial activity kill the germs that can cause many illnesses.
- Surfaces like kitchen counters and bathroom floors, door knobs, toilet seats and children's toys may be contaminated with bacteria even when they're not visibly dirty.

- Germs can be spread to other surfaces through dirty cleaning cloths and sponges.
- When we compared 5 different surface cleaners with four microorganisms at five minutes contact time then we came to know that branded surface cleaners gives one greater log reduction as compared to other surface cleaners & its effectively kills all mentioned organisms and provide more protection clean & healthy environment.
- In order to disinfect the surfaces effectively, the instructions on product labels need to be followed carefully
- Always use a surface cleaner which is antibacterial in nature to protect your family from illness/disease and to give your family a happy healthy life.

Acknowledgement

First of all I would like to thanks ALLAH who is the most beneficial and merciful who made me able to end my project report successfully. I highly indebted to Javed Lodi for his guidance and constant supervision as well as for providing necessary information regarding my project report. I would like to express my gratitude towards my Mother, Father and my best friend Syeda Sidra Ali and Nida Ahmed for their kind cooperation and encouragement which help me in completion of my project report successfully. My thanks and appreciation also goes to my group friend's Askry-ul-hassan, Syed Ebad Ali & Uzma Usman who has helped me out with their abilities.

References

[1]. Z. MoustafaGehan, W. Anwer, H.M. Amer, I.M. EL-Sabagh, A. Rezk and
[2]. E.M.BadawyDepartment of Veterinary Hygiene and Management, Department of
[3]. Virology,Faculty of Veterinary Medicine, Cairo University, Giza, Egypt.
[4]. Wanda Olson, Donald Vesley, Marilyn Bode, Polly Dubbel and Theresa Bauer(January / February1994) Journal of Environmental Health.
[5]. Oluwayemisi Agnes Olorode (PhD); Okpokwasili Gideon Chijioke (PhD); Jacinta AgbarachiOpara (PhD) (2013) Ecology Environment and Conservation paper.
[6]. Mundi KS1, EL Okoye, BO Uba, CO Esimone and AA Attama(2013) International journal of applied sciences and engineering
[7]. LP Wijesinghe, TK Weerasinghe(2010) SRI LANKA JOURNAL ONLINE Vol.6
[8]. Lauren Crawford, BS; Zhi-Jian Yu, PhD; Erin Keegan, BS; and Tina Yu, MS (2000) Published in infection control today
[9]. International Journal of Poultry Science 8 (3): 237-241, 2009ISSN 1682-8356 © Asian Network for Scientific Information, 2009
[10]. http://www.trade-ideas.com/glossary/statistical-analysis/
[11]. http://www.trade-ideas.com/Glossary/Statistical_Analysis.html
[12]. http://www.toolingu.com/definition-850115-19836-hepatitis-c.html
[13]. http://www.thenewelginpractice.co.uk/Library/Conditions/Articles/staphylococcal-infections/introduction
[14]. http://www.studymode.com/essays/Marketing-Survey-44465566.html
[15]. http://www.statearkansas.info/web-business/website-value-free-cms/
[16]. http://www.smallbusiness.wa.gov.au/step-1-why-do-market-research
[17]. http://www.smallbusiness.wa.gov.au/how-to-write-a-questionnaire/
[18]. http://www.smallbusiness.wa.gov.au/assets/BIZguides/new.bizguides.how.to.write.a.questionnaire.PDF
[19]. http://www.sljol.info/index.php/OUSLJ/article/download/4113/3381
[20]. http://www.slideshare.net/goboundless/chemistry-25961149
[21]. http://www.sgo.fi/~baylie/Tsegayethesis.pdf
[22]. http://www.sciencedirect.com/science/article/pii/S1567134806000955
[23]. http://www.sciencedirect.com/science/article/pii/S1198743X14648990
[24]. http://www.sciencedirect.com/science/article/pii/B9780123735935000628
[25]. http://www.science.gov/topicpages/b/bacteria+serratia+marcescens.html
[26]. http://www.questia.com/library/encyclopedia/washing-soda.jsp?l=W&p=1
[27]. http://www.publicgardens.org/files/schwetz_1996-spring.pdf
[28]. http://www.pjbs.org/ijps/8(3).htm
[29]. http://www.kosmix.com/topic/Serial_dilution
[30]. http://www.jrhbio.com/85040/index.html
[31]. http://www.infectioncontroltoday.com/articles/2000/11/a-comparison-of-commonly-used-surface-disinfectan.aspx
[32]. http://www.ijapscengr.com/volume-1-no-1-2013/
[33]. http://www.freepatentsonline.com/5994365.html
[34]. http://www.elitecme.com/dynamic/pdf/ICNY04.pdf
[35]. http://www.ejbio.com/pps/2012/24.pdf
[36]. http://www.dicardiology.com/company/flowmedica-inc
[37]. http://www.cosc.canterbury.ac.nz/research/reports/PhdTheses/2007/phd_0705.pdf
[38]. http://www.cdc.gov/ncidod/dhqp/pdf/guidelines/Disinfection_Nov_2008.pdf
[39]. http://www.cdc.gov/hicpac/pdf/guidelines/Disinfection_Nov_2008.pdf
[40]. http://www.castirontrader.com/cooler_warmers.html
[41]. http://www.biomedscidirect.com/journalfiles/IJBMRF2012592/a_clinico_microbiological_study_of_ventilator_associated_pneumonia_in_a_tertiary_care_hospital.pdf
[42]. http://www.aciscience.org/docs/Alternative_Hard_Surface_Cleaners.pdf
[43]. http://traditionalfoodadventure.com/tag/nursing-mamas-nutrition-affects-immune-factors-on-breastmilk/
[44]. http://thescitechpub.com/journals/JST/jst_issue_spl.aspx
[45]. http://search.ebscohost.com/Login.aspx?r=37.8238281294013&svr=02&lang=en_us&x?direct=true&db=ECD&AN=77243874&site=ehost-live&EPSource=esi&lp=login.asp&ref=&authtype=ip,uid

[46]. http://search.ebscohost.com/Login.aspx?r=37.8238281294013&svr=02&lang=en_us&x?direct=true&db=ECD&AN=83518287&site=ehost-live&EPSource=esi&lp=login.asp&ref=&authtype=ip,uid
[47]. http://search.ebscohost.com/Login.aspx?r=37.8238281294013&svr=02&lang=en_us&x?direct=true&db=ECD&AN=83518306&site=ehost-live&EPSource=esi&lp=login.asp&ref
[48]. http://scholar.lib.vt.edu/theses/available/etd-04192001-153328/unrestricted/6_Table_of_Figures.pdf
[49]. http://salarean.com/attachments/article/210/An%20Analysis%20of%20the%20Trickster%20Archetype%20as%20Represented%20by%20the%20Rabbit%20Character%20in%20Khmer%20Folktales.pdf
[50]. http://movehumanityforward.org/forums/phpbb/viewtopic.php?f=7&t=138400
[51]. http://miami.uni-muenster.de/servlets/DerivateServlet/Derivate-3095/diss_petersen.pdf
[52]. http://medtech.syrene.net/forum/showthread.php?3175-Comparison-of-Commonly-Used-Surface-Disinfectants&s
[53]. http://medical-dictionary.thefreedictionary.com/efficacy
[54]. http://jcm.asm.org/cgi/reprint/33/5/1258.pdf
[55]. http://health.nv.gov/IPCI/HAIToolKit2pg.pdf
[56]. http://foodsafety.hubpages.com/hub/Glossary
[57]. http://etd.lib.metu.edu.tr/upload/12614690/index.pdf
[58]. http://archwayconsultants.com/product/para-gem/
[59]. Hossein Nowrozi1, Ali Kazemi2, Farshad Ghoshchi3, Reza kachuei4, RohollahRezaei(2013) Bulletin of Environment, Pharmacology and Life Sciences india.
[60]. Duong, Cam Thuy. "An integrative approach to identify novel target genes for reduction of diacetyl production in lager yeast", TechnischeUniversität Berlin, 2009.
[61]. Dr.SharadadeviMannur. Y,AssociateProfessor,Dept.of Microbiology, Sri Siddhartha Medical College, Tumkur.(2013) Journal of evolution of medical and dental science.
[62]. Dasani Sonal, RaiShalini, SurveNutan, KuttisankaranRajashree (2012) Electronic Journal of Biology, Vol. 8(2)
[63]. Chioma C. Okore (2014) American Journal of Biology and Life Sciences
[64]. ByMirjaReichel, AnastasijaSchlicht, Christiane Ostermeyer and Günter Kampf (MAY 2014) Biomed central the open access publisher
[65]. AdijatOlabisiAtayese,HyacinthIzukaEffedua , Kolawole Sunday Oritogun, KehindeTitilope Kareem, AfolabiOgunledun(2010) Academia Arena