

Volume 4, No.1

IJIS

**International
Journal of Integrative Sciences**

2019

**Trincomalee Campus,
Eastern University, Sri Lanka**



Trincomalee Campus

Eastern University, Sri Lanka



International Journal of Integrative Sciences

2019

International Journal of Integrative Sciences (IJIS)

Editor

Prof. V. Kanagasingam
Rector, Trincomalee Campus, EUSL
Senior Lecturer in Human Resource Management, Faculty of Commerce and Management, EUSL

Editorial Board

Dr. T. Bhavan
Senior Lecturer, Dep. of Economics,
Faculty of Commerce and Management, EUSL

Dr. K. Premakumar
Senior Lecturer, Dep. of Agricultural Chemistry,
Faculty of Agriculture, EUSL

Dr. M. Koneswaran
Senior Lecturer, Dep. of Chemistry,
Faculty of Science, EUSL

Mr. M. Rajendran
Department of Agricultural Engineering
Faculty of Agriculture, EUSL

Dr. V. Anavarathan
Senior Lecturer, Unit of Siddha Medicine,
Faculty of Applied Science, Trincomalee Campus, EUSL

Dr. B. Uthayanan
Senior Lecturer, Unit of Siddha Medicine,
Faculty of Applied Science, Trincomalee Campus, EUSL

Ms. E.W.M.S. Boyagoda
Senior Lecturer, Dept. of Languages and Communication Studies,
Faculty of Communication and Business Studies, Trincomalee Campus, EUSL

Ms. Anuja Raveenther
Senior Lecturer, Dep. of Business and Management Studies,
Faculty of Communication and Business Studies, Trincomalee Campus, EUSL

Mr. M. Ramanan
Senior Lecturer, Dept. of Computer Science,
Faculty of Applied Science, Trincomalee Campus, EUSL

Advisory Committee

Prof. F. C. Ragel, Professor of Physics, Vice Chancellor, Eastern University, Sri Lanka
Prof. Nilanthi De Silva, Director/Quality Assurance Council, UGC, Sri Lanka
Prof. P. Vinobaba, Senior professor in Zoology, Eastern University, Sri Lanka
Prof. P. Balasundarampillai, Professor of Geography, University of Jaffna, Sri Lanka
Prof. Athula Gnanapala, Professor in Tourism Management, Sabaragamuwa University, Sri Lanka
Dr. S.T.W.S. Yapa, University of Sri Jayawardhanapura, Sri Lanka
Mr. Manoj Gupta, MD, Lanka Indian Oil Corporation PLC, Sri Lanka
Mr. Aruna Dayanatha, Director, Right-X (Pvt.) Ltd., Sri Lanka
Eng. T. Thavasilingam, Chairman, NGO Consortium, Trincomalee District, Sri Lanka



Trincomalee Campus, Eastern University, Sri Lanka,
Konesapuri, Nillaveli, 31010 Sri Lanka

Tel: +94 26 2227317

Mail: editorijis@esn.ac.lk

Visit: www.tc.esn.ac.lk

The International Journal of Integrative Sciences (ISSN 2536-8354) is published annually by Trincomalee Campus, Eastern University, Sri Lanka.

Objectives: The principal objective of the journal is to provide a medium for disseminating findings of study and research addressing issues, practices and development in Multidisciplinary Science. This journal is open to scholars and practitioners to publish their work in the field of Multidisciplinary Science. Thereby, we invite them to submit their articles so that this publication will be a platform for networking and sharing of empirical and theoretical research experiences on the issues in the society.

Editorial policies: Manuscripts should be original contribution and should not have been submitted for any other publication previously or submitted simultaneously for publication elsewhere. By submitting a manuscript, the author transfers copyright to the journal. A contributor is, however, able to publish a manuscript in a work of which he/she is the author/editor/joint author/joint editor.

Refereeing and editing: Each submission for publication will be submitted for review by two expert referees in the given field of study. The comments and suggestions received will be forwarded to the author with requests for revision before the article is accepted for publication. The editor reserves the right to edit the article to the format of journal.

Correspondence: All correspondence regarding journal articles should be sent to the Editor, International Journal of Integrative Sciences. Sales requests should be addressed to the Librarian or Asst. Librarian, Trincomalee Campus, EUSL.

Subscription rate: A single copy of the journal is priced Rs.500.00. Please make payment in favour of the Trincomalee Campus, Eastern University, Sri Lanka, Konesapuri, Nilaveli.

Whilst every effort is made by the publisher and the editorial board to ensure the accuracy of facts or information appearing in the journal, any inaccurate or misleading data that may appear are the sole responsibility of the contributor. Thus the publisher, editor, the editorial board and their respective employees shall not be held responsibilities for the consequences of any such inaccurate or misleading data. Further, no part of this journal may be reproduced or transmitted in any form without the expressed permission of the copy right holder (Trincomalee Campus, EUSL).

TABLE OF CONTENTS

	Page
[1] Statistical Screenings of Medium Components for the Production of Chitinase Enzyme using Sugarcane Bagasse Sudhakar, P., Subhagar, S.	01
[2] Factors affecting consumption of organic food products in Batticaloa Prabaharan T., Shamini H.	04
[3] Representation of Violence in Children's Television Cartoons and Its Impact on Children in Sri Lanka Jayasekara, J.M.C.I., Boyagoda, E.W.M.S.	13
[4] Challenges of the Sri Lankan Tamil cinema in socio political and economic environment Joel Jairus, R., Sivapriya Sriram	23
[5] Adult Education in the 21st Century: Can we shift to Technology aided teaching? Dharmawardene R.P.	30
[6] Scientific investigation of hibiscus vitifolius - a Tamil traditional medicinal plant against hepatitis c Anbu Jeba Sunilson J., Anita Gnana A.V.	36

Statistical Screenings of Medium Components for the Production of Chitinase Enzyme using Sugarcane Bagasse

Sudhakar. P * and Subhagar.S

*Biochemical Engineering Laboratory, Department of Chemical Engineering,
Annamalai University, Annamalai nagar – 608002, Tamilnadu, India.
psudha211@yahoo.co.in

Abstract - Statistics based experimental designs were used to optimize the medium components for Chitinase production. Considering the industrial importance of enzymes, the optimization studies were performed on strains of *Trichoderma viride* (MTCC167) which produce Chitinase enzyme using sugarcane bagasse as substrate. Preliminary studies on the factors colloidal chitin, KH_2PO_4 , yeast extract, $(\text{NH}_4)_2\text{SO}_4$, urea, CaCl_2 , NaH_2PO_4 and $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ enabled identification of important variables with respect to Chitinase production. The Central Composite Design (CCD) contains a total of 31 experimental trials involving the replications of the central points. Central Composite Design was employed to investigate the effect of critical parameters. The dependent variables selected for this Chitinase yield (U/gds). The most important factors with respect to each strain were then identified using fractional factorial. In general, colloidal chitin, KH_2PO_4 , yeast extract and $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ affected the Chitinase production. CCD was used for model building and chitin and yeast extract were found to have an interactive effect on Chitinase production in *T.viride* whereas yeast extract alone had a quadratic effect on Chitinase production in the strain. Similarly, colloidal chitin and yeast extract had a quadratic effect on Chitinase production using *T.viride*. The optimal values of important variables were determined by Response Surface Methodology (RSM) and numerical optimization.

Keywords: *Chitinase, Trichoderma viride, Optimization, Sugarcane bagasse.*

I. INTRODUCTION

Chitinases are part of the glycosyl hydrolase family, which hydrolyzes the 1→4 β -glycoside bond of N-acetyl d-glucosamine. Chitinase seems to be more widespread in nature than expected; a large number of chitinases isolated from different organisms were reported. In the past two decades, many bacterial strains that produced chitinases were isolated, purified, and characterized; most of them are members of genera *Serratia marcescens*, *Pseudomonas fluorescens*, *Bacillus subtilis*, *Chromobacterium violaceum*, *Paenibacillus illinoisensis*, *Vibrio harveyi*, and *Streptomyces griseus*. In contrast, only a very small number of chitinases are commercially available. Therefore, the future of chitinases is closely related to an increase in their production. Herein, this study was undertaken to study the problems that occur in the production of chitinases and applications. The most significant factors that influence biosynthesis are discussed.

II. MATERIALS AND METHODS

Microorganism

Trichoderma viride (MTCC167) is obtained from Microbial Type Culture Collection (MTCC), Institute of Microbial Technology, and Chandigarh, India. They were grown on Potato Dextrose Agar prior to their use for inoculum development for chitinase production.

Substrate Preparation

Sugarcane bagasse is collected from M.R.K Cooperative sugar mill, Sethiathope, Tamilnadu, India. The sugarcane bagasse is powdered by using laboratory grinder at 3000 rpm. All the substrates are sieved by 100 mesh and the fine powder is preserved in a sealed plastic bag at 4°C to prevent any possible degradation or spoilage.

Plackett-Burman Design

Plackett-Burman, a two factorial design identifies critical chemical and physical parameters required for maximum enzyme production by screening N variables using N + 1 experiments.

Central Composite Design (CCD)

The RSM used in the present study is a Central Composite Design (CCD) involving four different factors. Experiments are conducted in a randomized fashion. The CCD contains a total of 31 experimental trials involving the replications of the central points. Where Y is the chitinase activity (U/gds), x1-colloidal chitin, x2-KH₂PO₄, x3-yeast extract and x4-MgSO₄·7H₂O. The result of the experiments with the second order polynomial equation is used to describe the effect of independent variables on chitinase yield in terms of linear, quadratic and cross product terms.

Solid State Fermentation

Solid state fermentation (SSF) is carried out in 250 ml Erlenmeyer flasks which contain 1g of powdered sugarcane bagasse along with the nutrients defined by the experimental design. The flasks are incubated in a rotary shaker (200 rpm) at 30°C for 144 h. Samples are withdrawn periodically (24 h interval) and the chitinase enzyme concentration are found at regular intervals of time.

Enzyme Extraction

The crude chitinase is extracted by mixing of fermented materials with 25 ml of distilled water and stirred for 20 minutes in the reciprocating shaker. Then it is filtered and centrifuged for 20 minutes. The supernatant is used as the crude enzyme and then studied for enzymatic measurements by DNS method (Miller, 1959).

III. RESULT AND DISCUSSION

In Plackett-Burman design experiments are conducted in 12 runs to screen the media components for the production of chitinase by *T.viride* using sugarcane bagasse as substrate. The Pareto chart offers a convenient way to view the results obtained by

Plackett-Burman design CCD is used to determine the optimum conditions for the chitinase production by *T.viride* using sugarcane bagasse. From Plackett-Burman design screened nutrients are further optimized by central composite design for medium optimization (colloidal chitin, KH_2PO_4 , yeast extract and $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$). Thirty one experiments are performed at different combinations. The predicted and observed responses along with design matrix are identified.

IV. CONCLUSIONS

In the present work, it is confirmed that the solid state fermentation (SSF) can be used to enhance the chitinase production using *Trichoderma viride* for sugarcane bagasse as substrate, the nutrients, The optimum conditions for the maximum production of chitinase are: Colloidal chitin - 4g, yeast extract-1.0g, KH_2PO_4 - 0.5g, and $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ - 0.12g. The predicted response for chitinase production is 33.02U/gds, while the actual response is 34.30U /gds.

REFERENCES

- [1] Kavi Karunya S, Reetha D, Saranraj P, John Milton D. (2011), Optimization and Purification of Chitinase Produced by *Bacillus subtilis* and Its Antifungal Activity against Plant Pathogens. IJPBA, 2(6), pp. 1680-1685
- [2] Madhavan-Nampoothiri K, Baiju TV, Sandhya C, Sabu A, Gorge S, Pandey A, (2004), Process optimization for antifungal chitinase production by *Trichoderma harzianum*. Process Biochem. 39, pp. 1583-1590.
- [3] Nawani NN, Kapadnis BP., (2005), Optimization of chitinase production using statistics based experimental designs. Process biochemistry, 40, pp. 651-660
- [4] Parameswaran Binod, Tunde Pusztahelyi, Viviana Nagy, Chandran Sandhya, George Szakacs, Istvan Pocs, Ashok Pandey, (2005). Production and purification of extracellular chitinases from *Penicillium aculeatum* NRRL 2129 under solid-state fermentation. Enzyme and Microbial Technology 36, pp. 880-887.

Factors affecting consumption of organic food products in Batticaloa

T.Prabaharan^{*1}, H.Shamini^{#2}

^{*}Eastern University, Sri Lanka

[#]Trincomalee Campus, Eastern University, Sri Lanka

¹p_thambirajah@yahoo.co.in

²shamnew91@gmail.com

Abstract- Organic food consumption has become an important alternative to conventional food consumption in the sustainable environment. In Sri Lanka, the organic food market follows a positive trend, although the consumption rate is still less compared to the rest of the world; therefore, it is necessary to identify the factors influencing in the increase of organic food consumption. Hence the objective of the study is to analyse and discuss the organic food market and its' consumption in Sri Lankan context.

This study presents factors affecting consumers to consume organic food products in Batticaloa. A sample of 200 consumers' response attained through online survey with structured questionnaires to examine key factors influencing to consume organic food. The data obtained from the survey were analyzed with reliability test, and mean regression analysis. The findings reported that environmental concern, health and safety conscious, knowledge of organic food, perceived price of organic food and availability of organic food are influencing customers to consume organic food products. Out of these, Health and safety conscious and environmental concern are highly influencing factor in the consumption of organic food products. Hence, study concluded that health and safety conscious and environment concern are key reasons why people buy organic food products.

Keywords- *Health & Safety conscious, Environmental Concern, knowledge, Perceived Price, Availability and Organic Consumption*

I. INTRODUCTION

Over the last few years, consumers have focused increasing concern about food habits and dietary patterns. Consumers became more knowledgeable about health and nutrition, and precise greater concern about food quality and safety. Human actions are the major reasons for many serious environmental problems such as climate change, air pollution and the reduction of natural resources. Therefore, enhance the adoption of environmentally friendly behaviours are the foundation to create environmental sustainability [1]. Consuming eco-friendly products including organic food is considered as one of the major action for the adoption of environmentally friendly behaviours [2].

However, in Sri Lanka, the market for organic products is less developed. Further, none of the marketers have adopted successful marketing strategies for the sustenance of the

organic market in the country. But, there is a growing trend among urban consumers to try organic products [3]. Therefore, it is important for the marketers to be able to understand the different factors affecting the extent of organic food consumption behavior. So, there are many factors which affect Organic Consumption in Sri Lankan market. This study aims to boost organic food consumption by analyse the significant determinants of organic food consumption.

II. PROBLEM STATEMENT

Continuously increasing consumer demand for organic food has stimulated considerable research on consumer behavior toward organic food [4]. Several studies have been conducted examining consumers' attitudes towards organic food products. Most of them have measured attitudes regarding the purchase of organic food products [5, 6]. However, research related to the identification of factors affect consumption of organic food products is rather limited [7, 8]. And also, Piyasiri in his research mentioned that, the market features of organic products in Sri Lanka show that it is still in the "introduction stage" of the product life cycle. [9]

In this paper an attempt is made to identify. This study attempts to fills the literature gap and empirical gap. The findings provide further understanding on the factors affect organic food consumption pattern in Batticaloa district by providing answers to the research questions raised in the study.

A. Research Objectives

1. Identify the factors effect on organic food consumption in Batticaloa.
2. To identify the level of selected factors
3. Identify which factors has the greater impact on organic food consumption in Batticaloa.

III. LITERATURE REVIEW

Organic food

Organic foods are conventionally safe, produced using ecologically and environmentally sound methods that do not involve synthetic inputs such as pesticides and chemical fertilizers, do not contain genetically modified organisms (GMOs) and do not processed with irradiation, industrial solvents, or chemical food additives. [10]

Baker described organic food market is as a promising and predicting to grow strongly.[11] Therefore investigating drivers or motives for organic food consumption has become an important marketing research issue in recent years. [12]

- ### A. *Environmental concern-Organic foods are obtained through environment-friendly production and processing, so environmental concern is expected to have positive effects on purchase of organic products. And the following hypothesis formulated.*

H1: Environmental concern has a positive effect on consumption of organic food

- B. Health and safety conscious-* Concern for health and safety are considered subjective intention of an individual to improve their health. Few research findings show that health benefit is one of the prime reasons to the consumers for purchasing of organic foods. Jensen in his study found that health variables have a positive effect on consumer attitude towards organic foods in Malaysia. [13] And also study clarified that consumer purchase intentions toward were weak where health related awareness was low. Therefore, Hypothesis 2 is stated as follows.

H2: Health and safety conscious has a positive effect on consumption of organic food

- C. Knowledge of organic food-* Knowledge of organic food refers to the extent to which consumers have strong cognitive thought related to this area. The study of Smith and Paladino, found that consumers' knowledge of social and environmental issues positively affects their attitude and purchase behaviour towards organic food products. [14] It is therefore hypothesised that:

H3: Knowledge of organic food has a positive effect on consumption of organic food

- D. Perceived price-* It is considered as expected price customers willing to pay. Perceived price by comparison to conventional food is the barrier most frequently mentioned by consumers when they refer to organic food purchase. [6] Price is considered to be the most important barrier for the development of organic food product. Therefore, the following hypothesis formulated;

H4: Perceived price of organic food has a negative effect on consumption of organic food

- E. Availability of product-* availability is a very important factor also for consumers when it comes to the purchasing process of organic food products [15]. The study of Young reported that limited availability of a product had a negative influence on consumer attitude and purchase behaviour towards organic food products. [16] Conversely, another the study noted that availability of a product had a positive relationship with green purchase intention and behaviour. [17] Thus the hypothesis formulated as;

H5: Availability of organic food has a positive effect on consumption of organic food

IV. METHODOLOGY

Descriptive research design was adopted for this study. The research method used was online survey. A structured questionnaire was used which employed with multiple-choice questions and Likert scale questions.

Survey first asked about respondent's home town and experience of organic food consumption, if the response is obtained as Batticaloa and had the prior experience in the consumption of organic food then they allowed to fill further questions through online. Under the convenience sample",

200 properly filled online questionnaires were considered for the analysis. This sample size was considered adequate based on Cooper and Schindler, [18] proposition that statistically, in order for generalisation to take place, a sample of at least 30 must exist and also in their study they took 200 as sample size.

Questionnaire contains the Questions including asking respondents to evaluate the behavior of organic food consumption and the factors that influence on organic food consumption. Including; environmental concern, health and safety conscious, knowledge of organic food, perceived price of organic food and availability of organic food. Each variable operationalized and measured by four questions. Further few questions covers aspects of demographics characteristic. The data analysis for this research done by using the statistical package SPSS. The results were presented below.

A. Conceptual Model

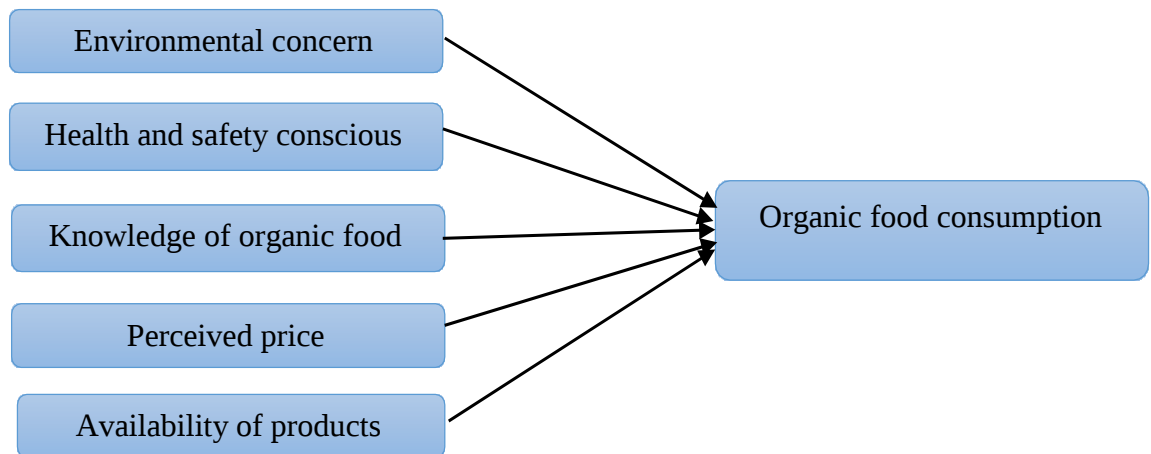


Fig1: Conceptual frame work

V. RESULTS AND DISCUSSION

The data presentation and analysis are presented with frequency distribution, mean, and standard deviation, correlation and regression analysis with research variable in order to achieve formulated research objective. Further the first research objective was attained by proper literature analysis.

A. Sample Profile

Descriptive statistical analysis was run on respondents' demographic variables. The results are shown in Table1.

Table 1: Summary of demographic information

Demographic Profile		Frequencies	Percentages (%)
Gender	Male	118	59
	Female	82	41
Age groups	18-30	73	36.5
	31-40	59	29.5
	41-50	57	28.5
	51-60	9	4.5
	Above 60	2	1
Education	Primary school	31	15.5
	Secondary School	55	27.5
	High School	61	30.5
	Graduation	39	19.5
	Post-graduation	14	7
Monthly Income	Less than 30,000	57	28.5
	30001-50000	78	39
	50001-70000	36	18
	70001-90000	14	7
	Above 90000	15	7.5
Frequency of purchase organic food	Rarely	29	14.5
	Occasionally	49	24.5
	Often	70	35
	Very Frequency	52	26

In the Batticaloa district the majority of the respondents are males (59%), while, regarding their age, it can be concluded that there is almost more than 60% of respondents age distribution fall between 18-40. The sample is an educated one, since 30.5% of the respondents graduated high school and 26.5% have a graduate and post graduate degree.

A significant percentage of 28.5% of the respondents have a less income, below 30,000Rs. Regarding Frequency of purchasing organic food, most of the respondents in Batticaloa are often organic product consuming consumers as it is accounted 35%. Meanwhile the percentage of occasionally and very frequently consumption rate of Batticaloa respondents' seem to be around same percentage. (24.5% and 26%).

B. Descriptive Statistics of Study Variables

The descriptive data including, reliability, mean, and standard deviation of the study variables was obtained and shown in following Table2.

Table 2: Reliability

Variable	No. of Statements	Cronbach's Alpha coefficient
Environmental concern	4	.880
Health and safety conscious	3	.745
Knowledge of organic food	4	.718
Perceived price	3	.805
Availability of products	4	.785
Consumption	6	.904

All selected factors were tested for reliability analysis. The Cronbach's Alpha coefficient value for all attributes above .7, which indicated strong internal consistency among the attributes. Therefore, the variables used in this study were concluded as reliable. Sekaran posits that the result of reliability tests below 0.60 is considered to be poor, whereas if it is greater than 0.60 it can be acceptable and if the results of reliability show range between 0.80, it is considered a good result [19].

Table 3: Level of variables

Dimension	Mean	SD	Decision Attribute
Environmental concern	3.531	.902	High Level
Health and safety conscious	3.596	.771	High Level
Knowledge of organic food	3.260	.859	Moderate Level
Perceived price	3.384	.871	Moderate Level
Availability of products	3.272	.885	Moderate Level
Organic Consumption	3.568	.601	High Level

According to the results Environmental concern, Health & safety conscious and organic consumption found to be high level. It shows that consumers in Batticaloa district have high level of attention toward Environmental concern, Health & safety conscious and organic consumption.

At the same time, Knowledge of organic food, Perceived price and Availability of products found to be moderate Level. To conclude, customers in Batticaloa have moderate level attention regarding these factors.

C. Regression Analysis

The hypotheses stated in the literature review were created to determine whether organic food consumption can be influenced by the selected factors. Thus, a Multiple Linear Regression Analysis was performed between environmental concern, health and safety conscious, knowledge of organic food, perceived price of organic food and availability

of organic food (independent variables) and organic food consumption (dependent variable).

Table 4: Regression predicting Organic food consumption with selected factors

Coefficients ^a					
Model		Unstandardized Coefficients		t	Sig.
		B	Std. Error		
1	(Constant)	-.336	.216	-1.558	.021
	Environmental concern	.295	.057	5.165	.000
	Health and safety conscious	.461	.061	7.578	.000
	Knowledge of organic food	.235	.054	4.386	.000
	Perceived price	-.048	.035	-1.377	.017
	Availability of products	.205	.049	4.193	.000
a. Dependent Variable: Organic food consumption					

The coefficient of determination $R^2 = 0.69.3$, means that 69.3% of the variability of organic food consumption is explained by the selected factors. Furthermore, selected five factors have significant influence ($p < 0.05$) on organic food consumption. This indicates that the alternative hypotheses (H1, H2, H3, H4, and H5) are appropriate and can be accepted.

Analyzing the coefficients, the variables that present the highest relative contributions to explain organic food consumption are firstly health and safety conscious, followed by environmental concern, knowledge of organic food and availability of organic food respectively. Meanwhile, Perceived price negatively impact on consumption of organic food. The results are supported by few of previous studies, proved that health and safety conscious and environmental concern are strongest motivators for consuming organic food products. [20, 21]

VI. CONCLUSIONS AND RECOMMENDATION

This paper provides an empirical examination of the factors affecting the consumption of organic products in Batticaloa. Based on primary data collection, results revealed the most important factor that affects the choice of a consumer to consumers in the market of organic fruits and vegetables is the health and safety conscious. Most respondents have high level of concern toward factors affecting consumption of organic food. People who have a greater concern for health and safety and environment concern.

This study provides a preliminary analysis of the proposed conceptual model defines organic food consumption. Variables environmental concern, health and safety conscious, knowledge of organic food and availability of organic food have a positive significant impact with organic food consumption. At the same time, perceived price has negative impact on organic food consumption. These variables are good predictors for induce the consumption of organic food.

With this research, manufactures and marketers of organic food products are expected to know the factors influencing consumer to consume organic food products. Hence, marketers should design advertising campaigns targeting the health & safety conscious and environmental concern, as it is highly influence on the consumption of organic products. Perceived price has negative impact on organic food consumption. Therefore, the prices of organic products should be competitive with the conventional products rather than fixing higher prices.

In view of increasing availability of organic products, retailers must adopt adequate distribution strategies, namely to identify organic certified producers and create partnerships, expand distribution channels and launch more retail shops. Meanwhile, marketers also need to be consider in enhancing the knowledge of customers as it is also induce the consumption of organic foods. It could be reached through the adoption of proper awareness programs would help in promoting the organic product consumption.

REFERENCES

- [1] Taufique, K. M. R., Vocino, A., and Polonsky, M. J., (2017), The influence of eco-label knowledge and trust on pro-environmental consumer behaviour in an emerging market. *Journal of Strategic Marketing*, 25, pp. 511–529.
- [2] Van Doorn, J., & Verhoef, P. C., (2015), Drivers of and barriers to organic purchase behavior. *Journal of Retailing*, 91, pp. 436–450.
- [3] Anuradha, H., (2001), Organic Farming, a Growing Trend. *Sunday Observer*, 14.10.2001: 25.
- [4] Rana, J.; Justin Paul, J., (2017), Consumerbehavior and purchase intention for organic food: A review and research agenda. *Journal of Retail Consumer Service*, 38, pp. 157–165.
- [5] Huang, C.L., (1996), Consumer preferences and attitudes towards organically grown produce. *European Review of Agricultural Economics*, 23, pp. 331-342.
- [6] Jolly, D.A., H.G. Schutz, K.V. Diaz-Knauf and J. Johal (1989). Organic Foods: Consumer attitudes and use. *Food Technology*, pp. 60-66.
- [7] Thompson, G. D. (1998). Consumer Demand for Organic Foods: What we know and what we need to know. *American Journal of Agricultural Economics*, 80(5), pp. 1113-1118.
- [8] Thompson, G. D. and J. Kidwell (1998). Explaining The Choice Of The Organic Produce: Cosmetic Defects, Prices And Consumer Preferences, *American Journal of Agricultural Economics*, 80, pp. 277-287.

- [9] Piyasiri and Ariyawardana, (2002), Sri Lankan Journal of Agricultural Economics. Volume 4. Part 1, pp.107-119.
- [10] Paul, J., & Rana, J. (2012), Consumer behavior and purchase intention for organic food. *Journal of Consumer Marketing*, 29, pp. 412–422.
- [11] Baker S, Thompson KE, Engelken J. (2004), Mapping the values driving organic food choice, *European Journal of Marketing* 38(8), pp. 995-1012.
- [12] Squires L, Juric B, Cornwell TB., (2001), Level of market development and intensity of organic food consumption: cross-cultural study of Danish and New Zealand consumers, *The Journal of Consumer Marketing* 18(4/5): pp. 392 409.
- [13] Jensen, K.O., Denver, S. and Zanolli, R. (2011), “Actual and potential development of consumer demand on the organic food market in Europe”, *NJAS – Wageningen Journal of Life Sciences*, Vol. 58 Nos 3-4, pp. 79-84
- [14] Smith, S., & Paladino, A. (2010), Eating clean and green? Investigating consumer motivations towards the purchase of organic food. *Australasian Marketing Journal*, 18, pp. 93–104.
- [15] Irianto, H. (2015), Consumers’ attitude and intention towards organic food purchase: An extension of theory of planned behavior in gender perspective. *Int. J. Manag. Econ. Soc. Sci*, 4, pp. 17–31.
- [16] Young, W., Hwang, K., McDonald, S., Oates, C. J., (2010) Sustainable consumption: green consumer behaviour when purchasing products. *Sustainable Development* 18(1), pp. 20-31.
- [17] Tarkiainen, A., Sundqvist, S., (2005), Subjective norms, attitudes and intentions of Finnish consumers in buying organic food. *British Food Journal* 107(11), 808- 822.
- [18] Cooper DR, Schindler PS., (2003), *Business research methods*. (8th ed.). Boston: 15 McGraw-Hill Irwin.
- [19] Sekaran, U., (2003), *Research methods for business.A skill building approach*. New York: Wiley.
- [20] Pearson, David et al., (2013), Organic food: Exploring purchase frequency to explain consumer behavior. *Journal of Organic Systems*. 8(2), pp. 50-61.
- [21] Dr.K.Chiranjeevi et al., (2015), Shopping behavior of consumers towards organic food products. *Journal of Marketing and Consumer Research*.14, pp. 47-51.

Representation of Violence in Children's Television Cartoons and Its Impact on Children in Sri Lanka

Jayasekara, J.M.C.I^{*1} and Boyagoda, E.W.M.S^{*2}

^{*} Department of Languages and Communication Studies, Trincomalee Campus, EUSL

¹*isurijayasekara567gmail.com*

²*boyagodas@esn.ac.lk*

Abstract - Children begin watching cartoons on television by the age two or three children and become an enthusiastic viewer. Later on, they become violent and addictive to the television cartoons. This research seeks to find out the representation of violence in television cartoons and to examine the impact of the cartoon on children. In order to carry out the objectives of the research, qualitative was employed. Primary data were collected through content analysis and in-depth interview method. The social cognitive theory was the theoretical framework for the study. The research found out that, television cartoons do represents violent content. Among nine categories of violence, majority of television children cartoons have used physical violence and verbal violence rather than other violence and time also allocates highly. According to findings of the in-depth interview method also, most of the children imitate and copy cartoon characters and adventures which are in cartoon stories. After watching cartoons, mind and behaviour (especially talking style, walking style, way of deal with others, decision making) of children has been changed heavily.

Keywords - *Media violence, Social Cognitive Theory, Representation, Television Cartoons, Violence*

I. INTRODUCTION

Television is a powerful audio-visual medium which dominated among other media. There are numerous studies examining the impact of television and all of them have shown that even in the cultures where computers take a prominent place, the popularity of television does not diminish (Lemish, 2008).

Watching television is predominantly the activity indulged at home, something that parents accept and approve of regardless of the children's age. Children usually watch television with their brothers and sisters, as well as with their friends and children of the same age. In such situations, the interaction related to the contents being watched is richer and serves as a source of information and knowledge about numerous phenomena that children normally watch on the TV (Alexander, Rayan & Munoz, 1984).

According to Bandura (1991) "Of the numerous stimuli that influence how people will behave at any given moment, none is more ubiquitous or effective than the actions of others". The media is one of the most important agents of socialization of children and

youth. According to Lemish (2008) none of the media, not even the television is inherently a good or bad agent of socialization.

It is important to note that television is very present and powerful medium and that it vastly influences the perception of reality among the children including the children's understanding of the phenomena they are exposed to. But children, especially at their early age, gladly watch programmes designed for them, their attention is very easily occupied by easily memorable actions, colourful characters and cheerful melodies. At their early age children do not distinguish reality from fantasy shown on television. Hence, the degree of their identification and engagement in the content is greater in that period. This level of identification with the content is even higher if it is in harmony with the culture, environment, or some belief already experienced by the child. Identifying with television characters may take different forms, sometimes the identification is based on the actual position of the child, or on the position or status sought by the child, while sometimes, there are para-social interactions when the child behaves as if it knows and experiences friendship towards the fictional television character (Hoffner, 1996, Lemish, 2008).

Children have been much more interested in cartoons over many years and it has become a primary action to some lives. Typically, children began watching cartoons on television by the age two or three children become enthusiastic viewer. This has become a problem because too many children are watching too much television and they have become violent and addictive. Children watch the cartoons on the television and they see material that is not appropriate for their age group. The children who watch too much cartoon on television are more likely to have mental and emotional problems, along with brain and eye injuries and unexpectedly the risk of a physical problem increases (Hossler, 1978).

II. OBJECTIVES

General objective

1. To find out the representation of violence in TV cartoons in Sri Lanka.

Specific Objectives

1. To find out the violence represented in the TV cartoons.
2. To find out main types violence represent in TV cartoons
3. To find out allocated time for violence in TV cartoons.
4. Find out impact of the TV cartoons on children in Sri Lanka.

III. REVIEW OF LITERATURE

In 2015, Habib and Soliman found out more negative effect more than positive effect of Television cartoons towards the children. Television cartoons change the children's mind and behavior. In the conclusion, they stated that cartoon is a double weapon which ruin an individual's childhood through excessive exposing to sexual and violence content, or could aid in raising a balanced child with proper mental state. Finally they

say cartoon of the strong factor that does affected an individual's childhood and take considerable time from the young to old schedule.

Odukomiaya, (2014) found that most of the children like and influenced by action cartoons which contain degree of violence and aggregation. Most popular cartoons characters such as 'Spider man', 'Superman', 'Ben Ten' and 'Ninja Turtles' have projected violence and aggression. Most of the children want to be like cartoon character and do what they do. They consider those cartoon characters as role model in their daily activities and believe them to be reality. The cultivation theory was the major concept of the study.

In 2006, Krish proved that violence in cartoon is an intrigue part of cartoon content. Some of violent cartoons connect with comedic element, but some of cartoons portray the violence such as pushing, shoving and hitting etc. Laboratory experiment using cartoon with comedic violence have consistently failed to demonstrate significant differences in person orient aggression. Active mediation that focuses on the feeling of the victim appears to lessen the enjoyability of comedic violence and the acceptance of aggregation to solve problems. These finding suggest that counteracting of negative effect of cartoon violence on youth may be as simple as making an active mediation statement during viewing.

Drinka (2013) found out that the average television involvement of the kids was about 4 hours per day and concluded that children are continuously watching usual cartoon fare and they are violent like 'Road runner or Scooby doo'. According to answers of the parents, Children are manifesting certain aggressive behaviour like shoving, yelling, bullying, and destroying things after watching cartoons. More positive behaviours are also tracked like sharing, cooperating and begging sensitive to other problem.

Hassan and Daniyal (2013) found that behavior of school going children in class is influenced by the frequency of watching cartoons. The teachers believe that cartoon has a strong impact on the "in class" behavior of the children often used to demonstrate television related behavior in the class room. They found out strong association violence and the behavior of the children. Hassan and Daniyel stated that they there is a strong impact of cartoon network on school going kids which can be seen on their life style, dressing, aggressive and violence behavior and their language. 82.6% of children prefer fight scenes between two characters E.g.: Tom and Jerry. 57.8% of them like fight with their classmates and other children after watching comedic fights.

The research literature has consistently found that there is a strong impact for children in television cartoons.

IV. METHODOLOGY

In order to carry out the objective of the research, qualitative methodology was used. Primary data were collected using the coding sheets. The researchers analyzed the content of the TV cartoons focusing on violence represented. The unit of the analysis in

this study is the scene by scene of the television cartoons. The researchers used purposive sampling method to select cartoons programmes which telecasted in television channels. According to that most viewed two TV cartoon programmes in Sri Lanka were 'Super Shiva' cartoon and 'Zorro' cartoon (LMRB report, 2018). In addition to that, in-depth interview method also was conducted to find out the impact of TV cartoons towards children's mind and behaviour. The geographical area of the sample was Kothmale area, Nuwara eliya District, Sri Lanka and twenty (20) parents of children interviewed and asked nine questions.

V. RESULTS

According to findings of the content analysis, it is found that violence is represented in television cartoons. Furthermore, findings of in-depth interviews obviously proved that there is impact of television cartoons on children.

Considering the time allocation, each and every cartoon episode has allocated different time duration for violence content and has portrayed especially two different kind of violence. It generally goes fifteen minutes to twenty minutes and differs from one to another.

Nine categories of violence were used for the data collection. But in children's cartoons represent only physical and verbal violence. Other violence categories do not appear in children's cartoons.

Super Shiva Cartoon

Figure No: 01 describes the time allocation of Super Shiva cartoon. 59.64% percentage has been dedicated in twenty episodes of Super Shiva cartoon for physical violence while 35.29% have been allocated for verbal violence. Beating, slapping kicking, punching, assault with object (Shiva's bicycle) are some of the physical violence available there. As verbal violence, it is visible Threatening violence against a person or her or his family members, Yelling, Lying, Name-calling, Insulting, Swearing,

Unreasonably ordering around, and Verbal assault is when a person forcefully criticizes, insults, or denounces someone.

Figure No: 01 Super Shiva cartoons (20 Episode) – Time allocation for violence

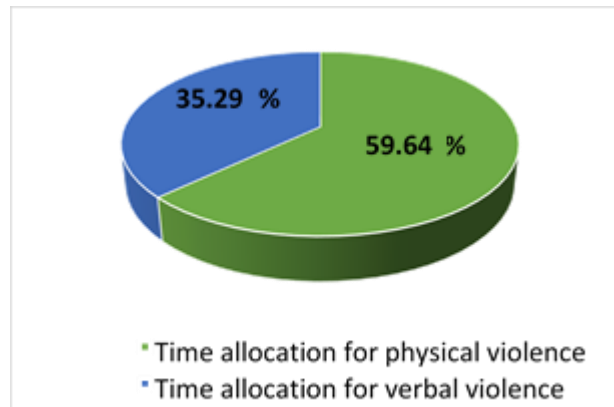


Figure No: 02 Zorro cartoons (20 Episode) – Time allocation for violence

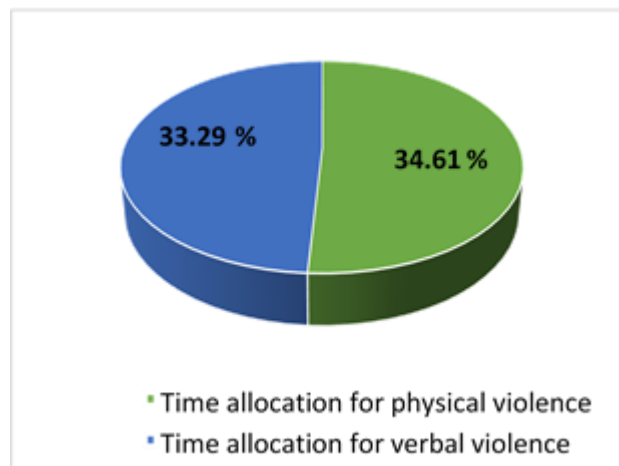


Figure No: 02 indicates that 34.61% dedicates for physical violence while 33.29% allocates for verbal violence. There were scenes related to physical violence like Assaulting with an object (Zorro is bull-finch, he has sharp sword and whip). Majority of physical violence scenes adjoin with swordplay, using the sword subjugate or startle other person, strike other person, beating, slapping, kicking, punching.

Though there are nine categories of violence, there was no any cartoon episode that has been used all of them. Every cartoon episode has used two type of violence; physical violence and verbal violence

In Super Shiva cartoon episodes, 59.64% portray physical violence (Figure no: 1) and Zorro cartoon 1-20 episode 34.61% represent physical violence (Figure No: 2). Representation of violence scene in both cartoon 8.08% represent both physical and

verbal violence and 91.92% represent other scenes. Other scene mean they are not portrayed any violence. Through that all 8.08% violence, 4.58% physical violence portrayed as maximum violence. As physical violence, punching, pushing, slapping, beating, and shoving, kicking, biting, assault with a weapon or other object were used.

In Super Shiva cartoon 1- 1-20 episodes, 33.29% represent verbal violence (Figure no: 1) and Zorro cartoon 1-20 episodes, 33.9% represent verbal violence (Figure No: 2).

Verbal violence represents as expressing negative expectations, expressing distrust, threatening violence against a person or her or his family members ,yelling, Lying, Name-calling, Insulting, swearing, Withholding important information, Talking unkindly to person. Both Super Shiva and Zorro have used above verbal violence.

In-depth interview

In - depth interview method was performed to find out whether there is impact of television cartoon violence or not on children and to prove above content analysis result are admittedly happened to children in society.

According to the responses of the majority of parents, all the children like to watch cartoon every day. Majority of parents allow children to watch cartoons in every evening in their home. It has become a habit of the children. Most of the children after school and after pre-school watch cartoons to be entertained together with their siblings.

Mrs. D. Gunarathne: Yes. I allow to my children to watch cartoons for their mind relaxing.

Mrs. Jayasinghe: Yes. I allow the children to watch the cartoons in the evening time for their happiness.

Mrs. Chamari Perera : Yes. Mostly I allow the children to watch the cartoons in the evening because my little son force me to do so. I allow for his happiness.

Mrs. Hettiarachchi: Yes. I allow my children to watch cartoons for their mind relaxing and now it has become a habit.

During the interviews, the parents mentioned that the children like to watch the cartoons every day evening time and at the weekends also.

On week days television channels telecast cartoons from 3.00 p.m. - 6.00 p.m. So that, majority of children watches cartoons at least two hours per day.

Mrs. D. Gunarathne: They are in front of the television to watch cartoon every evening at 3.00 p.m. Normally my children watch cartoon 02 hours per day.

Mrs. Jayasinghe: Normally I allow them to watch cartoon 4.00 - 5.30 only. If I do not limit the time, they continuously watch cartoons.

Mrs. Chamari perera: Mostly my son likes to watch cartoon every evening at 3.00 p.m and at the weekend days also. I allow him to watch cartoons 1.30 hours per day.

Mrs. Hettiarachchi: Every evening children watch cartoons habitually. Nearly 2.00 hours they watch cartoons.

Although there are number of cartoon programs, children prefer to watch Super Shiva, Zorro, Nil Kurumitto, Viiraa and Jungle book. Among them, children's favorite cartoon program is Super Shiva.

According to majority of parents, children try to imitate and copy cartoon characters especially hero of the particular cartoons. Children prefer to act as Shiva in Super Shiva

cartoon, Zorro in Zorro cartoon. Children like to play like heroes in cartoons. Generally, cartoon hero has a super power. Shiva who is main character of Super Shiva cartoon is a normal child but he has more magical power than other children like EX: Fighting power, skills to achieving goal etc. He has versatile powerful bicycle. According to parents, their male child wants to be Shiva at home; children walk, talk and act like cartoon hero.

Zorro is a society saver from social injustice. He is combatant and he has capable horse, sword and whip and fantastically plays with whip. Participants emphasized that their children want to be Zorro while fighting with each other using sticks. They imitate Zorro character heavily.

Mrs. D. Gunarathne: Super Shiva is my children's favorite cartoon character. In my house the children imitate the cartoon characters after watching the cartoon. Mostly they laugh and shout like the cartoon characters. They have become aggressive than earlier.

Mrs. Jayasinghe: My elder son imagines and changes his appearance like Super Shiva changing the appearance like. My younger son imagines and changes his appearance like Zorro. They like to wear the same dresses like the Super Shiva and Zorro.

Mrs. Chamari Perera: My son wants to be Super Shiva. He forces me to bring the magic bicycle like Super Shiva had. When he rides it, he shouts that he is the Super Shiva and ride it very fast. He hits his sister, using his legs and hands like Shiva's fighting.

Mrs. Hettiarachchi: My children like to be Super Shiva character. My elder son has a bicycle. When he rides it, he uses only front wheel like Shiva. One day he met an accident and damaged his leg. When my child plays with friends he acts like Zorro. He tries to do adventures like Zorro, use sticks and fighting with friends.

Majority of parents' idea stated that there is violence in cartoons. According to their views, there are villain and hero in every modern cartoon story. Hero saves the world not through discussion but actions. Every hero has a magical power. They fight with each other, hurt others, use inappropriate language etc. Children immediately catch what they see and what they hear. According to parents view cartoon mentally affect children. After watching cartoon, children live in a fantasy world while trying to do experiments heavily.

Mrs. D. Gunarathne: Yes, I think there is violence in cartoons. In every cartoons at least one fighting, or slapping scene is available.

Mrs. Jayasinghe: Every modern cartoon story has a hero and a villain who saves the world with fighting. I think cartoon story teller justifies the violence activity from heroism.

Mrs. Chamari Perera: Yes. There are scenes like shouting, hurting, fighting in cartoons.

Mrs. Hettiarachchi: Definitely there is violence in cartoons. Cartoon gives just fantasy world. They do not represent real world. Hero can fight very well and teaches children this is the way hit, punch, push, slap, beat, shove, kick, choke, yell, Lie, insult, and swear others.

According to the responses of the parents, television cartoons always stimulate children towards violence and aggressive activities. Sometimes parents fail to control their children. Ex. One mother had to buy a bicycle like Shiva because son forced her. In the

interview, she mentioned when son rides it, he imagines that he is the Shiva and he wants to fly on the sky using bicycle.

Mrs. D. Gunarathne: Yes. Watching the cartoons stimulate the children to do the super natural power (Climb on the wall to fly, jump from the wall). It is danger. After watching the cartoons, they become more aggressive. I think watching cartoon is not good for children because it affects the children's education level also.

Mrs. Jayasinghe: Mostly the children fight with other students like Zorro so at that time injuries happening. I think watching cartoon affect the children mentally. It creates the violence, aggressiveness in their mind. Cartoon change children toward aggressiveness. Children mostly imitate the cartoon characters. Because mostly interact with their friends shoving, yelling like cartoon characters. They play with friends cartoon characters like Shiva and Viira so at that time they use sticks and hit the friends.

Mrs. Chamari Perera: When my son play with friends create two gangs to play; Zorro and Shiva group. So at that time they fight within the two groups getting more aggressive. Children imitate the cartoon characters. Even when they engage in studies, they mostly talk about the cartoon characters. I face troubles to divert his mind toward the studies. It seems that cartoon really change children's mind.

Mrs. Hettiarachchi: Children mostly use the words like "I am the Super Shiva" when they jump and running they mostly use the words "I am the Zorro".

So the children mostly imitate the cartoon characters at home; the way of walking, talking patterns. Children catch immediately what they can see and what they can hear. Then they try to copy, imitate what they catch. Critical condition is they try to experience them.

According the findings of the content analysis, it is found that there is violence in television cartoons allocating more time also. Furthermore, in-depth interview results proved again that there is violence in children cartoons and there is negative impact on mind and behavior.

VI. RECOMMENDATIONS

Those who are interested in this field can conduct a comparative study by comparing the representation of violence in television cartoons in Sri Lanka and other Asian countries. Furthermore, future researchers can concentrate the effect of other mass media; mega tale dramas, Video games etc. on children.

Furthermore particular attention should be paid to violence in TV programs complained about by the parents and the children. This underlines the importance of the aforementioned recommendation on the necessity of an increased parental care when it comes to the content their children watch on television, and the requirement that they act as a "filter" for the threatening and inappropriate content.

It is recommended to increase the production and broadcasting our own children's programme that fits the socio-cultural context and the children growing up in Sri Lanka. Majority of Sri Lankan television cartoons are Indian productions. Own production offers a variety of content and genre options that individual programmes could make different, allows an integrative approach and diversity of contents.

It is better to create world accepted policy for content of children cartoon programmes. It will help to refuse inappropriate violence content of the cartoon programmes. Strengthening the educational role of the children's TV programmes also would be much better. The parents mentioned the requirement of having more quizzes and travelogue programmes and programmes about science, nature, animals, content to help them in learning and education.

Conducting the researches to examine different aspects of the phenomenon of television and children, especially the parental role in children watching on television; media literacy among children and the ways to encourage its development are also recommended further.

REFERENCES

- [1] Anderson, C.A., Berkowitz, L., Donnerstein, E., Huesmann, L.R., Johnson, J.D., Linz, D., Malamuth, N.M., Wartella, E., (2003), The influence of media Violence On youth. Retrieved on 17, January, 2018 from https://deepblue.lib.umich.edu/bitstream/handle/2027.42/83429/2003.Anderson_etal.InfluenceofMediaViolenceonYouth.PsychologicalScienceinthePublicInterest.pdf?Sequence=1&isAllowed=y.
- [2] Ahuvia, A., (2000), Traditional, interpretive, and reception based content Analysis improving the ability of content analysis to addressed issues of pragmatic and theoretical concern Retrieved on 02, August, 2018 from <https://writing.colostate.edu/guides/pdfs/guide61.pdf>
- [3] Drinka, G., (2013), 'Cartoons violence and aggressive' Retrieved on 19 January, 2018. From <https://www.psychologytoday.com/intl/blog/when-the-media-is-the-parent/201307/violent-cartoons-and-aggressive-preschoolers>
- [4] Fische, S., (2010), Powerful or Pretty: A Content Analysis of Gender Images in Children's Animated Films. Retrieved on 12, February, 2018 From <https://etd.auburn.edu/bitstream/handle/10415/2065/ThesisSabrinaFischer.pdf>
- [5] Gentile, D.A., Saleem, M., Anderson, C.A. (2007), Public Policy and the Effects of Media Violence on Children. Retrieved on 3, January, 2018 From <https://zdoc.site/public-policy-and-the-effects-of-media-violence-on.html>
- [6] Gerding, A., (2011), A content analysis of tween television programming. Retrieved on 18, January, 2018. From http://dspace.udel.edu/bitstream/handle/19716/10655/Ashton_Gerding_thesis.pdf?sequence=1
- [7] Gökçearslana, A., (2010), The effect of cartoon movie on children's gender Development. Retrieved on 14, January, 2018. From <http://w3.gazi.edu.tr/~armagangokce/7.pdf>
- [8] Hassan, A., Daniyal, M., (2013), Cartoon Network and its Impact on Behavior of School Going Children: A Case Study of Bahawalpur, Pakistan. Retrieved on 11January, 2018. From <http://www.ijmess.com/volumes/volume-II-2013/issue-I-03-2013/full-2.pdf>

- [9] Hoffner, 1996, Lemish, 2008, Analysis of TV programmes for children in Serbia. Retrieved on 18, January, 2018. From https://www.unicef.org/serbia/sites/unicef.org.serbia/files/201808/Analysis_of_TV_programmes_for_children_in_Serbia.pdf
- [10] Krish, (2006), Cartoon violence and aggression in youth. Retrieved on 19 January, 2018, From <https://www.geneseo.edu/~kirsh/vita/AVB360.pdf>
- [11] Odukamaiya, E.I., (2014), Cartoons Influence towards Violence and Aggression in School Age Children in Nigeria. Retrieved on 3, February, 2018 From <http://irep.emu.edu.tr:8080/jspui/bitstream/11129/1718/1/Odukamaiya.pdf>

Challenges of the Sri Lankan Tamil cinema in socio political and economic environment

*R. Joel Jairus, #Sivapriya Sriram

**Trincomalee Campus, Eastern University Sri Lanka

joeljairus77@gmail.com* and sivapriyasakthilingam@yahoo.com#

Abstract - The research seeks to find out the challenges faced by the Sri Lankan Tamil cinema industry using case study method. In addition to that, the study examines the reasons for the depressing state of Tamil cinema in Sri Lanka and remedies taken by the authority to uplift the status of Tamil cinema in Sri Lanka. In order to carry out the objectives of the research, survey methodology were employed. Primary data were collected through Questionnaire and interviews. The research found out that, Sri Lankan Tamil audience is influenced by the South Indian cinema. Distribution of theaters, Lack of producers, Lack of media support, South Indian style of filmmaking, the average standard of the Sri Lankan Tamil films, no much films on nativity, no institution for professional filmmaking and acting, dialogue delivery, facial expression, poor sound quality, editing, poor cinematography, technology usage, setting, stories, screenplay, over acting have been identified as the main defects in Sri Lankan Tamil cinema by the audience. Though films of LTTE have been destroyed by the Sri Lankan government there is no influence from the Sri Lankan government on Sri Lankan Tamil industry. The study recommends that future researchers can have interview with more directors as numbers of filmmakers have started to make feature films. The future researchers can have interview with Short film directors to know about the possibilities to their Feature film making and Sinhala directors to know about the successful process of Sri Lankan Sinhala Film industry.. The future researcher can wide the sample to other many universities' students as this study included only two universities. The study didn't analyses any Sri Lankan Tamil films. If the future researcher finds Sri Lankan films, the researcher can analyze them.

Keywords - *Challenges, Sri Lankan Tamil Cinema, Short films, Sinhala films, Survey method*

I. BACKGROUND OF THE STUDY

“Since time began humankind has gathered round campfires in the dark to listen to stories. They remind us of who we are, where we have come from, and where we want to go. I think today the cinema is the modern campfire and audiences go to the dark space of the cinema and sit in the light of the screen to get their stories,” says New Zealand film director, Gaylene Preston (2017).

Sri Lankan cinema encompasses the films made in Sri Lanka. It is a fledgling industry that has struggled to find a footing since its inauguration in 1947 with Kadawunu Porondurwa produced by S.M. Nayagam of Chitra Kala Movietone. Sri Lankan films

are usually made in the Sinhalese language, as well as in Tamil Language. In the first nine years most films were made in South India and followed the conventions of Indian cinema. Studio shooting was the norm, with Indian style sets erected in film studios. Even though it is popularly held that Rekava, made in 1956 by pioneer director Lester James Peries, was the first Sinhala film to be shot completely out of studio, it was really the film "Gambada Sundari", made in 1950 which was the first film shot outside studios. (Thampi Ayya Thevathas)

It was also the first Sri Lankan film where, like in "Rekawa", the dialog was recorded on the spot. In 1964, Lester James Peries again contributed to the development of Sri Lankan cinema with Gamperaliya which was the first Sinhala film to feature no songs and like Rekava shot completely outside the studio. It garnered massive praise for portraying Sinhala culture in a realistic manner and was hailed by critics and audiences alike.

Sri Lankan Tamil cinema, the Tamil language film industry in Sri Lanka, has remained relatively small with fewer than 100 films produced. The Tamil film industry in Sri Lanka is not as developed as Sinhala cinema or its Indian counterpart, the Tamil cinema of Kodambakkam, Chennai, Tamil Nadu. There is a lot of competition from Tamil films from Tamil Nadu, India as well as obstacles from the long run ethnic civil war in Sri Lanka. Tamils contributed significantly to Sinhala cinema as well as Indian Tamil cinema. Only a few Tamil language films were produced in the Northern Province of Sri Lanka. Earlier Tamil movies produced were all most destroyed or unrecovered due to civil war. A Sinhalese film was dubbed in Tamil in December 29, 1951. The movie Samuthayam (Society), an adaptation of C.N. Annadurai's Velaikkari was made in 16 mm and Technicolor. It was shown in 1962 and 1963. Thottakkari (Plantation Woman), released on March 28, 1962, was the first Sri Lankan Tamil film in the standard 35 mm format.

So far there are 36 Tamil films have been made. There are few posters and advertisements of Sri Lankan Tamil films since 1960s, but most of the films had been dropped. Many Tamil Films made by LTTE also are concealed. The Tamil Films which were produced here are restricted in film screenings. Those films were shown only one or two times and had not distributed to the theatres in other areas. Though a specific group of audience are ready to welcome the Sri Lankan Tamil Films, but the directors are failed to impress the Sri Lankan Audience. Sri Lankan directors mostly try to imitate south Indian films' style. (Thampi Ayya Thevathas)

The Sri Lankan Tamil cinema can be divided into 4 generations or collaboration,

1. Sri Lankan Tamil Film makers worked with Sinhala Tamil Film Makers.
2. Sri Lankan Tamil Film makers worked alone.
3. Sri Lankan Tamil Film makers worked with South Indian Film Makers.
4. Sri Lankan Tamil Film makers work with Diaspora producers.

Since no much formal studies have so far been undertaken for the Sri Lankan Tamil cinema, the aim of the present study is to find out the present state of Tamil cinema in Sri Lanka.

II. METHODOLOGY

Research Methodology is a way to find out the result of a given problem on a specific matter or problem that is also referred as research problem. In Methodology, researcher uses different criteria for solving/searching the given research problem. Different sources use different type of methods for solving the problem. If we think about the word “Methodology”, it is the way of searching or solving the research problem. (Industrial Research Institute, 2010).

Survey Methodology

Social science methodology largely depends upon survey methods in its research endeavor as it has the advantage of to have a great deal of information from a larger population. It can also be adapted to obtain personal and social facts, beliefs and attitudes. It is also said that survey research method is an inappropriate tool for the study of multitude. Survey research method is a descriptive research used for the collection of data from the representative sample of the target population. (T.Mathiyazhagan & Deoki Nandan, 2010)

In this research, the data was collected as mentioned below:

- 40 Tamil respondents
- 10 Sinhala respondents

The questionnaire instrument consisted of three parts, personal information of the respondents, mode of information resources and type of information received.

The studies had Personal Interviews from below mentioned people.

Three interviews of Sri Lankan Tamil film directors

Two interviews of Sri Lankan Tamil film critiques

Non-Random sampling is a sampling technique where the samples are gathered in a process that does not give all the individuals in the population equal chances of being selected. This study was conducted with 30 Tamil students of Trincomalee campus, 10 Sinhala students of Trincomalee campus and 10 Media Studies Tamil Students in University of Jaffna.

III. RESULTS AND DISCUSSION

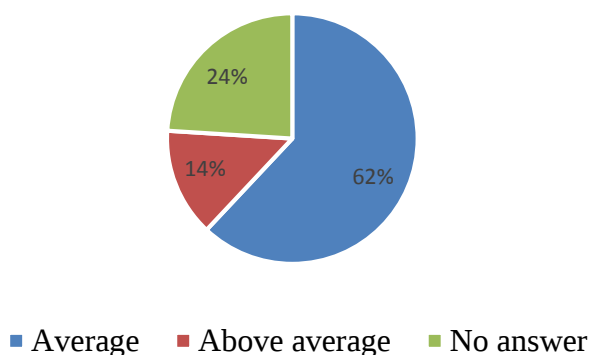
According to this study, 100% of the respondents watch movies and most of the respondents like to watch comedy films. Komalikal and Komali Kings are well received by the Sri Lankan Tamil audience as they are comedy movies.

South Indian Influence on Sri Lankan Tamil audience is one of the reasons for the depressing state of Sri Lankan Tamil industry. Sri Lankan theatre owners support South Indian films rather than Sri Lankan Tamil films and many studios owned by Tamils

were destroyed during the civil war in Sri Lanka. Though most of the respondents like to watch Sri Lankan Tamil films related to Sri Lankan Nativity, the film Ponmani was failed in theatres as it spoke about the caste problems in Jaffna and after that no directors were ready to make art films. Most of the respondents appreciate the screenplay, plot, dress, characters sketch, music, efforts, production, direction, cinematography, satisfactory output with limited resources and nativity in Sri Lankan Tamil films. But the film analysts stated that only the technical elements are better nowadays and the filmmakers should concern more on the plot and stories.

The majority of the respondents stated that Sri Lankan Tamil films have the problems in dialogue delivery, facial expression, poor sound quality, editing errors, poor cinematography, technology usage, setting, promotion, stories, and screenplay and over acting. The Sri Lankan Tamil film directors stated that one of the main problems is lack of media support. Sri Lankan Tamil media are not supporting the Sri Lankan Tamil filmmakers much. Theatre's distribution system is not appropriate to undeveloped Sri Lankan Tamil Cinema

Standard of Sri Lankan Tamil short films

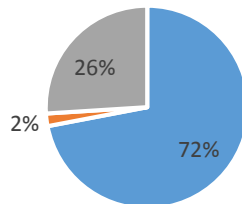


80% of the respondents have watched Sri Lankan Tamil short films and majority they have rated the standard of the Sri Lankan Tamil short films as average. The film analysts have stated that short filmmakers are making good feature films in Tamil Naadu. Sri Lankan short film makers also can improve their self by preparing their selves and studying about filmmaking. Filmmakers have regionalism and discrimination as Sri Lankan Tamil Cinema and Eezham cinema. There are no producers to invest on Sri Lankan Tamil films.

Currently most of the Sri Lankan Tamil films are produced by Diaspora Sri Lankan Tamils. Majority of the respondents and the directors and film analyst stated that there are no political influences on Sri Lankan Tamil cinema. Sri Lankan Tamil cinema has not satisfied the respondents as they rated it as below average followed by average and low level. Majority of the respondents expect commercial films, romantic films, action

films and good films from the Sri Lankan Tamil filmmakers which have the content of nativity and should not follow the south Indian style.

Films on nativity



- Respondent who appreciate the films on nativity
- Respondent who don't appreciate the films on nativity
- No answer

The Film analyst and the respondents agree that filmmaking institute should be implemented in Sri Lanka to learn professional way of filmmaking and professional acting. An association or an industry should be implemented to approach the needed things easily for filmmaking and guide the artists with rules and regulation.

IV. CONCLUSION

The study concludes that, South Indian Influence on Sri Lankan Tamil audience is one of the major reasons for the depressing state of Sri Lankan Tamil industry. Theatre owners support South Indian films rather than Sri Lankan Tamil films from the early days. Because of the ethnic violence in 1983 many Tamil studios were destroyed and many artist, producers, actors and technician migrated to other countries. Tamil Film studios were destroyed. Sri Lankan Tamil media started to telecast only South Indian films. Though some Sri Lankan Tamil films have been made in Jaffna, Batticaloa, Colombo & Trincomalee, Filmmakers have regionalism and the discrimination as Sri Lankan Tamil Cinema and Eezham cinema.

Most of the Sri Lankan Tamil films have been limited to a theatre or a screening only as the movie producers were lack of money and the distribution and the circuit system that theatres use for Indian films don't suit to Sri Lankan film producers. Sri Lankan media give less priority to the promotion of Sri Lankan Tamil cinema. Lack of producers is another problem that Sri Lankan Tamil cinema faces. As Sri Lankan Tamil's population is less, the investors are not interested to produce movies in Sri Lanka but in

India. At present, 90% of Sri Lankan Tamil products such as feature film, short films & songs are produced by diaspora Tamil people.

Dialogue delivery, facial expression, poor sound quality, editing, poor cinematography, technology usage, setting, promotion, stories, screenplay, over acting have been identified as the main defects in Sri Lankan Tamil cinema by the audience. Though the Sri Lankan government had destroyed the Tamil Films made by LTTE, there are no influences from the government in Sri Lankan Tamil Industry. Sri Lankan Tamil audience appreciate all kind of movies which good in qualities and stories. They are interested in movies on nativity but there are no much Sri Lankan Tamil film on nativity and related to culture. Sri Lankan Tamil makers are afraid to make unique art films on Sri Lankan Tamil culture, as the film 'Ponmani' was failed among Sri Lankan Tamil audience. 'Ponmani' was rejected by the audience and the theatre owners as it spoke about the caste system in Jaffna.

There is no organized industry for Sri Lankan Tamil cinema to control the artist and technicians with rules and regulation. There is no professional Tamil institution for teaching acting. Sri Lankan Tamil filmmakers are making more short films than feature films as they find it easy to make with limited budget. But the standard of the Sri Lankan Tamil short filmmakers are rated as average by the audiences. In Tamil Naadu, Short film makers have proved that they can create a quality feature films. As the Sri Lankan short films are average in the standard, the filmmakers should learn the professional way of filmmaking to make a quality feature film.

As the Sri Lankan Tamil audience are expecting Sri Lankan Tamil cinema without the South Indian style, it can be developed by creating films with identity, professional and natural acting and good method of storytelling. Therefore Tamil institutions for filmmaking and professional acting should be implemented in Sri Lanka.

Recommendation

The researcher has interviewed only three Sri Lankan Tamil directors. The future researchers can have interview with more directors as many of filmmakers have started to make feature films. The future researchers can have interview with Short film directors to know about the possibilities to their Feature film making and Sinhala directors to know about the successful process of Sri Lankan Sinhala Film industry. The study sample was limited to the students in Trincomalee Campus and the University of Jaffna. The future researcher can wide the sample to other university students too. The study didn't analyses any Sri Lankan Tamil films. If the future researcher finds Sri Lankan films, the researcher can analyze them.

REFERENCES

- [1] Adebisi, Fadhilat Titilayo, Adeyemo, Saheed O. Adeyemi, (2017), Re-Emergence of Cinema Culture in Lagos State: Dynamics and Challenges, IOSR Journal Of Humanities And Social Science (IOSR-JHSS) Volume 22, Issue 3, Ver. I (March.

- 2017) retrieved on 11, July, 2018 from <http://www.iosrjournals.org/iosr-jhss/papers/Vol.%2022%20Issue3/Version-1/L2203018588.pdf>
- [2] Elizabeth T. Giwa, (2014) Nollywood: A Case Study of the Rising Nigerian Film Industry- Content & Production retrieved on 9, July, 2018 from https://opensiuc.lib.siu.edu/cgi/viewcontent.cgi?article=1667&context=gs_rp
- [3] Faber, Liz and Walters, Helen, (2003), Animation Unlimited: Innovative Short Films Since 1940. London: Laurence King, in association with Harper Design International. ISBN 1-85669-346-5.
- [4] Gerring, John, (2018), Organizing your social science research paper: Writing a case study Retrieved on 18.08.2018 from <http://libguides.usc.edu/writingguide/casestudy>.
- [5] Hagener, Malte & Töteberg, Michael, (2002), Film: An International Bibliography. Stuttgart: Metzler. ISBN 3-476-01523-8, International Journal of Humanities and Social Science ISSN 2220-8488 (Print), 2221-0989 Retrieved on 15 August 2018
- [6] King, Geoff (2002). New Hollywood Cinema: An Introduction. New York: Columbia University Press. ISBN 0-231-12759-6
- [7] Prof.Dr. Werner Patzelt, (2016), Case study research and the Grounded theory approach Retrieved on 16 August 2018 from <http://ipsa.sbe.metu.edu.tr/case-study-research-and-grounded-theory-approach>
- [8] Pamela Baxter., Susan Jack, (2008), Qualitative Case study Methodology, The Qualitative Report, Retrieved on 16 August 2018 From <https://nsuworks.nova.edu/tqr/vol13/iss4/2/>
- [9] Sue Soy, (2006), The Case Study as a Research Method, Uses and Users of information, Retrieved on 14 August 2018 From <https://www.ischool.utexas.edu/~ssoy/usesusers/l391d1b.htm>
- [10] Thampiayya Devadas, (2000), Story of the Sri Lankan Tamil Cinema, Kaanthalam.
- [11] Thackway, Melissa, (2003), Africa Shoots Back: Alternative Perspectives in Sub-Saharan Francophone African Film. Bloomington, IL: Indiana University Press. ISBN 0-85255-576-8.

Adult Education in the 21st Century: Can we shift to Technology aided teaching?

R.P. Dharmawardene

Department of English Language Teaching, University of Colombo

ruwini@delt.cmb.ac.lk

Abstract - As adult English language learners enrolling in the one-year Business English Diploma course at the Faculty of Arts in the University of Colombo find it challenging to achieve the outcome of improving English business vocabulary, we explored whether different delivery modes (of face to face, online and blended) influenced this outcome achievement. Three tutors of English taught the same content to three groups of students using face-to-face, online and blended modes over 3 months in the Department of English Language Teaching in the University of Colombo in 2019. With the face to face mode continuing as a control group (n=10), the blended (n=10) and online (n=10) groups received six online modules and four quizzes on vocabulary. While the online group received all lessons and quizzes online with no face to face instructions, the blended group received 70% of the course materials online with six face to face lessons to cover up the balance 30% of the course modules. The control group too received the same vocabulary learning lesson materials and practiced these only in their face to face classes. While the three groups showed the performance as Blended mean score=44.30, Online mean score=41.20, Face to face mean score =45.80 at the pre-test having sixty fill in the blank questions in dialogue completion, the course-end test (of sixty fill in the blank questions in a similar dialogue completion exercise) showed the blended group participants to have scored significantly increased marks (mean score=53.60, $t=-9.508$, $p=.000$), compared to their counterparts (Online mean score=46.90, $t= -5.250$, $p=.001$, Face to face mean score =50.60, $t= -3.627$, $p=.006$) at the significance level of $p < .005$. This study, with further confirmatory evidence, can have implications for teaching Business English vocabulary in the context of teaching English as a second language in higher education.

I. OBJECTIVE

To explore whether different delivery modes (of face to face, online and blended) influenced the outcome achievement of the adult students learning business English vocabulary in Sri Lankan universities.

II. BACKGROUND

Although technology aided instruction can contribute to the improvement of English as a Second Language (ESL) students' proficiency (Lizzio et al, 2002), the traditional face-to-face teaching is still reported to be able to outperform online teaching because it attracts and creates interest in students (Garson, 1998). However, according to Driscoll (2002) blended learning mode, a mode of delivery that combines online digital media

with traditional classroom method can be successfully applied in adult's learning in many disciplines.

Learning Business English has become crucial for working adults in Sri Lanka at present than any other time. Although some business professionals are with great abilities and intelligence, they are usually judged in their society on how well they speak and write in English. Targeting working adults, many Universities in Sri Lanka have started offering weekend Business English courses. Many of those courses are designed to equip adult students with business communication skills and expect students to improve their business vocabulary. Most of those courses are conducted in face-to-face mode in traditional classroom settings while a few of them are conducted in fully online mode. This study investigated how effective it would be if blended mode of delivery was introduced instead of fully online or face-to-face courses in teaching business English vocabulary to adult learners in Sri Lankan University system.

III. METHODOLOGY

The main objective of this study was to compare adult students' performance in using correct business vocabulary in the blended learning (BL), face to face and online modes of delivery. The setting was made at the Department of English Language Teaching (DELT) at the faculty of Arts in the University of Colombo (UOC). The sample of this study consisted of 30 students, both male and female, (age: 21 to 54 years) who were randomly selected from the students who passed the placement test and registered to follow the online Diploma in Business English course for the year 2019 at the DELT, Faculty of Arts, UOC, Sri Lanka. The students were randomly assigned into three groups and instructed to complete six course modules of vocabulary in three different modes of learning, blended, face-to-face and online over three months (refer Table 1).

Table 1. Strategies used to teach the three groups

Study Group	Strategy utilized in teaching vocabulary		
	Course Content	Practicing materials	Assessment criteria
Online	Six modules on vocabulary learning and a lecture note on effective communication skills were uploaded to the LMS. No face to face instructions were given. Access for all materials uploaded to the LMS was granted for all participants.	Four online quizzes and six online activities on vocabulary practicing. Six online modules on writing with new vocabulary and dialogue completion. Online chatting with the tutor.	Pre and post test which included 60 questions on correct vocabulary usage. Tests were conducted in the regular classroom.

Blended	Six lectures face to face on vocabulary development, each two hours duration. LMS access was given to follow 70 percent of the course materials uploaded. The rest was to be studied in the face to face classroom.	Four online quizzes and six online activities on vocabulary practicing. Six online modules on writing with new vocabulary and dialogue completion. Online chatting with the tutor.	Pre and post test which included 60 questions on correct vocabulary usage. Tests were conducted in the regular classroom.
Face to face	Six modules on vocabulary learning were taught in the class. A lecture on effective communication skills was delivered in the face to face class. No online access was given to the participants.	Four online quizzes and six online activities on vocabulary practice were conducted in the class using printed handouts. Six modules on writing with new vocabulary and dialogue completion were also done using printed materials in the face to face mode.	Pre and post test which included 60 questions on correct vocabulary usage. Tests were conducted in the regular classroom.

The online and blended learning courses were delivered using a Moodle based Learning Management System (LMS). The same online exercises on vocabulary were distributed in printed version to the participants in the face to face mode. The entirely online group studied the content online and they were not given instructions in a physical learning environment. BL group followed 70% of the course units online and the balance 30% in their face to face classrooms. Three Tutors of English who have similar level of experience in teaching with the same educational qualifications were assigned to teach to three groups of students. The researcher hypothesized the same level of outcome from all three groups at the end of the course. The data was analyzed using independent t-tests and two tailed t test in SPSS Version 20.0.

IV. RESULTS

Paired t Test was utilized to compare the pre test scores of the blended group (BLpre) with the post test scores of the same group (BLpost), the pre test scores of the online group (OLpre) with the post test scores of the same group (OLpost) and the pre test scores of the face to face group (F2Fpre) with the post test scores of the same (F2Fpost).

The study results show that there is a significant difference between the mean scores of the pre and post tests conducted for each group of participants (Blended mode= 9.300, Online mode=5.700, face to face mode=4.800). However, the improvement of the

participants who learned business vocabulary through the mode of blended learning was the highest (Mean = 9.300) compared to their counterparts.

Table 2: Paired Sample pre and post mean scores of the learning performance of blended, online and face to face groups.

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	BLpre	44.30	10	5.314	1.680
	BLpost	53.60	10	3.921	1.240
Pair 2	OLpre	41.20	10	4.315	1.365
	OLpost	46.90	10	4.932	1.560
Pair 3	F2Fpre	45.80	10	4.467	1.413
	F2Fpost	50.60	10	3.239	1.024

Table 3: Paired Samples t Test results comparing vocabulary learning performance of blended, online and face to face groups.

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	BLpre - BLpost	-9.300	3.093	.978	-11.513	-7.087	-9.508	9	.000
Pair 2	OLpre - OLpost	-5.700	3.433	1.086	-8.156	-3.244	-5.250	9	.001
Pair 3	F2Fpre - F2Fpost	-4.800	4.185	1.323	-7.794	-1.806	-3.627	9	.006

Significance level $p < .005$

The result of this study is contradictory to the results presented by Adam et al (2015) after studying two sections of an introductory microbiology course that was taught in hybrid and traditional methods. In his study, one section was taught through a hybrid (BL) format and the other through a traditional (face to face) format. Students were randomly assigned to the two sections. Both sections were provided with identical lecture materials, in-class worksheets, in-class assessments, and extra credit opportunities; the main difference was in the way the lecture material was delivered-online for the hybrid section and in person for the traditional section. Analysis of final grades of his study revealed that students in the traditional section did significantly

better than those in the hybrid section ($p < 0.001$) which shows the opposite results of the present study.

When performance in the two sections of Adam's study was compared for each class year separately, the differences were only significant for second years ($p < 0.001$); freshmen, juniors, and seniors did not perform differently in the hybrid versus the traditional section. An anonymous midterm survey had suggested factors are likely contributing to the overall lower success of students in the hybrid section: some students in the hybrid section had not taken lecture notes and/or use the audio component of the online lectures, suggesting minimal interaction with the lecture material for these students. However, in the present study, participants in the blended group were keen on attending face to face classes while actively interacting with their peers and Tutors online.

However, one of the most recent studies conducted to see the effectiveness of using the blended mode instead of the traditional face to face mode in teaching Science, Technology, Engineering and Mathematics education with pre-university science students in Canada (Bazelais, 2018) shows the similar results to that of the present study. It reveals that the students in the blended group perform significantly better than their counterparts.

V. DISCUSSION AND CONCLUSION

The findings of the study provide evidence to prove the fact that the blended mode can be successfully used to support students to improve their business English vocabulary. The results of this study will be of use to the authorities of Higher Educational Institutes including Universities that expect to commence or continue Business English courses with blended mode of delivery. In addition, through the findings of this study, the future adult students who wish to upgrade their knowledge in business English Vocabulary by following an English course in blended mode would be highly benefitted. The same study can be replicated in a different setting at a different time or for different subjects in order to compare the outcome of different pedagogies. Raw data were generated at the University of Colombo in Sri Lanka. Derived data supporting the findings of this study are available from the corresponding author on request.

REFERENCES

- [1] Adams, A.E.M., Randall, S. and Traustadottir, T., (2015), A Tale of Two Sections: An Experiment to Compare the Effectiveness of a Hybrid versus a Traditional Lecture Format in Introductory Microbiology. *CBE - Life Sciences Education*, 14, pp. 1-8.
- [2] Bazelais, P., Doleck, T., & Lemay, D.J., (2018), Investigating the predictive power of TAM: A case study of CEGEP students' intentions to use online learning technologies. *Education and Information Technologies*, 23(1), pp. 93-111.

- [3] Butler-Pascoe, ME, (2009), English for Specific Purposes (ESP), Innovation, and Technology. English Education and ESP, pp. 1–15.
- [4] Chen, B., & Denoyelles, A., (2013), Exploring students' mobile learning practices in higher education. Educause Review, 7.
- [5] Driscoll, M., (2002), Blended learning. Let's get beyond the hype. E-learning, 1-4.
- [6] Garson, G., (1998), Evaluating and implementation of web-based teaching in political science. Political Science and Politics, 31(3), pp. 585-590.
- [7] Lizzio, A., Wilson, K. & Simons, R., (2002), University Students' Perceptions of the Learning Environment and Academic Outcomes: Implications for Theory and Practice. Studies in Higher Education. 27, pp. 27-52. 10.1080/03075070120099359.
- [8] Paul B, Tenzin D , David J. L., (2018), Investigating the predictive power of TAM: A case study of CEGEP students' intentions to use online learning technologies. EAIT 23(1), pp. 93-111.
- [9] Vygotsky, L., (1979), The genesis of higher mental functions. In J.V. Wertsch (Ed) The concept of activity in Soviet psychology. Armonk, NY: M. E. Sharpe.

SCIENTIFIC INVESTIGATION OF HIBISCUS VITIFOLIUS - A TAMIL TRADITIONAL MEDICINAL PLANT AGAINST HEPATITIS C

Anbu Jeba Sunilson J.¹ and Anita Gnana A.V.²

Department of Siddha Medicine, Tamil University, Thanjavur, Tamil Nadu, India¹

School of Pharmacy, KPJ Healthcare University College, Malaysia²

anbujsunil@gmail.com1

Abstract - Tamil Medicine is one of the oldest traditional systems of medicine, which has been originated from India and is practiced mostly in the southern part of India and Sri Lanka for treating various diseases including even chronic conditions. Tamil Nadu is abundant in medicinal plants that can prevent, control and cure wide range of ailments. The present study was aimed to obtain various extracts of *Hibiscus vitifolius* (*H. vitifolius*) roots and to scientifically investigate the traditional claim against CCl₄ induced hepatotoxic rats. The study was also aimed to isolate the active constituents from the pharmacologically active extract followed by elucidate the structure and to evaluate in-vitro hepato-protective activity against hepatitis C virus (HCV). The dried, coarsely powdered *H. vitifolius* roots were successively extracted with petroleum ether, chloroform, methanol and water by cold maceration technique for 6 days. All the extracts (400mg/kg b.wt. p.o.) were evaluated for their hepato-protective activity in CCl₄ induced hepatotoxic rats. On day 7, blood was collected and haematological and biochemical parameters were estimated. Histopathology was performed to confirm the activity. The active methanolic extract was subjected to column chromatography using silica gel (60-120 mesh size) as an adsorbent. Benzene was used to build up the column. The polarity of the mobile phase was gradually changed to elute the active constituent and its structure was established by spectral studies. The isolated compound was tested for in-vitro hepatoprotective studies against Human Hepatoma C virus cell line. The % cellular viability and IC₅₀ value were calculated. Clinical toxicology studies were also carried out. Among all the extracts, methanolic extract of *H. vitifolius* (400mg/kg) showed significant hepatoprotective effect. Methanolic extract (400mg/kg b.wt. p.o.) exhibited the potent hepatoprotective effect against CCl₄ induced hepatotoxicity, as evident by the significant restoration of the haematological and biochemical parameters. Histopathological examination also supported the hepatoprotective effect. Column Chromatography using benzene: ethyl acetate (1:9), eluted out a yellow crystalline compound which gave a positive colour reaction for flavonoid glycoside which was confirmed as gossypin by melting point and spectral data such as UV, IR, ¹H-NMR and Mass spectrum. This was further evident by comparing with the marker compound gossypin by mixed melting point, Co-TLC and Co-HPTLC. In-vitro hepatoprotective studies against Human Hepatoma C virus cell line shows that 170 µg/ml as IC₅₀ value for the isolated compound gossypin. No mortality was observed during 60 days period

of clinical toxicology studies. The present study validates the *Hibiscus vitifolius* for the first time for the treatment of HCV and related liver disorders and its hepatoprotective effects are attributed to the presence of gossypin as active agent. Such a study in the field of Tamil traditional medicines put a firm foundation for standardization and scientific evaluation to establish the therapeutic efficacy of this plant.

I. INTRODUCTION

Inflammation of the liver and anything that causes inflammation or damage to the liver can be considered as hepatitis. Hepatitis A, B, C, D and E viruses has different modes of transmission and cause hepatitis mild to very severe. Hepatitis A appears only as an acute or newly occurring infection and does not become chronic. Hepatitis B and Hepatitis C (HCV) can also begin as acute infections, but in some people, the virus remains in the body, resulting in chronic disease and long-term liver problems. Hepatitis D is a satellite virus that can only infect people who also have hepatitis B. Hepatitis E, like hepatitis A, is spread through contaminated food and water. Viral hepatitis is the seventh leading cause of death world-wide; 96% of these were due to hepatitis B and C. There are vaccines to prevent Hepatitis A and B; however, no vaccine is available for HCV. According to WHO an estimated 71 million people have chronic hepatitis C infection globally that will develop cirrhosis or liver cancer and approximately 399000 people die each year. In India, the burden of HCV infection is expected to be high with a population over 1.2 billion, as a result, there is a high demand urgent attention is needed for its treatment modalities, as well as success rates. As, modern medicines fail to fulfill the effective treatment to cure this disease, the research on medicinal plants has been increased to find out the novel natural drug against HCV. Tamil Nadu has abundant in medicinal plants that can prevent, control and cure wide range of ailments.



Fig. 1: *Hibiscus vitifolius* Linn.

Hibiscus vitifolius Linn. (Family: Malvaceae) is a shrub found in Asian tropics and Pacific and Indian coastal forests (Fig.1). The plant *Hibiscus vitifolius* (Manjalathuthi) belongs the family Malvaceae is traditionally used by the people of Kanyakumari District, Tamil Nadu, India for the treatment of inflammations and hepatitis. These observations directed the present scientific investigation to evaluate the traditional claim about *Hibiscus vitifolius* as hepato-protective medicine and to isolate the active hepato-protective compound.

II. MATERIALS AND METHODS

Plant material

The *Hibiscus vitifolius* roots (Fig.2) were collected from Kallukoottam, Kanyakumari District, Tamil Nadu India in the month of July 2017 and identified (Herbarium specimen number.10A5) by Taxonomist, Tamil University, Thanjavur, Tamil Nadu, and India.



Fig. 2: *Hibiscus vitifolius* roots

Preparation of extracts

Hibiscus vitifolius roots were washed thoroughly with water and shade dried. The dried roots (1 kg) were ground into coarse powder using ball mill. The powder was divided into four equal portions and macerated with suitable solvents such as Petroleum ether, chloroform, Methanol and distilled water at room temperature for 6 days. Then the extracts were filtered and concentrated using rotary vacuum evaporator under reduced pressure (Anbu et al., 396). The colour, consistency and % yield of the extracts of *Hibiscus vitifolius* roots were noted in table 1.

Preliminary photochemical study

All the extracts of *Hibiscus vitifolius* roots were subjected to preliminary phytochemical analysis to determine the phytoconstituents which might be responsible for hepato-protective activity. The preliminary phytochemical test was carried out for all the extracts to establish the phytoconstituents such as alkaloids, carbohydrates and

glycosides, amino acids and proteins, fixed oils and fats, phenolic compounds and tannins, triterpenoids, saponins, gums and mucilage, flavones and flavonones by standard methods (Harborne JB 33).

Fractionation of the extract

The crude active hepato-protective extract was further fractionated by successive solvent extraction with n-hexane, ethyl acetate and n-butanol (Kingsley et al., 189). Each fraction was collected separately and concentrated using rotary vacuum evaporator under reduced pressure.

Isolation and structural elucidation of bioactive compound

The active hepato-protective active ethyl acetate soluble fraction (100g) was subjected to column chromatography using silica gel (60-120 mesh size) as an adsorbent. Benzene was used to build up the column. The polarity of the mobile phase was gradually changed to elute the active constituent. The isolated compound was confirmed by melting point and the structure was elucidated by various spectral data such as UV, IR, H-NMR and Mass spectrum. This was further confirmed by comparing with the marker compound by mixed melting point, Co-TLC and Co-HPTLC (Praveen and Bhawana, 68).

Animals

Healthy adult albino mice and albino rats were procured from animal house, Tamil University, Thanjavur and housed in groups of six animals, in standard cages, at room temperature (25 ± 3 °C), with 12 h dark/12 h light cycles, and food and water ad libitum. The animals weighing 180 - 220g, were used for the experiment. Twelve hours prior to the experiments they were transferred to the laboratory and given only water ad libitum. The protocol was approved by Institutional animal Ethical Committee (SBCP/F.7(f)/252(b)).

Acute toxicity studies

Acute toxicity studies were carried out on albino mice as per the guidelines (No. 423) given by the Organisation for Economic Co-operation and Development (OECD, 2001), Paris. The animals were fasted overnight prior to the acute experimental procedure. Pet. ether, chloroform, Methanol and aqueous extracts of Hibiscus vitifolius roots were suspended in CMC separately. The extracts were administered separately to all the three animals in each group at a starting single dose of 5 mg/ kg. The animals were observed continuously for signs of intoxication, lethargy, behavioural modification and morbidity for a period of 2 h, then occasionally for 4 h for severity of any toxic signs and mortality. When no mortality was observed the same dose was additionally administered to one

more animal for each group. As no mortality was observed at this dose, the same procedure was repeated for dose levels of 50, 500, 1000 and 2000 mg/ kg of extracts on separate newer groups. The LD50 was thus determined and 1/10th of LD50 value was taken as ED50 value for the present study. The animals were kept under observation up to 14 days after drug administration to find out any delayed mortality (Miller and Tainter, 262). The same procedure was followed to find out the acute toxicity studies of fractions and isolated compound.

Evaluation of hepato-protective activity

Carbon tetrachloride (CCl₄) was used to induce hepatotoxicity in the selected animals. All the extracts (400mg/kg b.wt. p.o.), fractions of hepato-protective active extract (200 and 400mg/kg b.wt. p.o.) and the isolated compound (100 and 200mg/kg b.wt. p.o.) from the active hepato-protective fraction were evaluated for their hepato-protective activity in CCl₄ induced hepatotoxic rats for 7 days. Silymarin (100mg/kg b.wt.) was used as standard drug. The extracts, fractions, isolated compound and silymarin were administered by oral route (Anbu et al., 113.).

III. EXPERIMENTAL DESIGN

Hepato-protective activity of various extracts of *Hibiscus vitifolius* roots

42 albino rats were taken and equally distributed into 7 groups. Group 1 served as solvent control and received 0.5 ml of normal saline. A single dose of CCl₄ (2 ml/kg b.wt. i.p.) was administered into Group 2 which served as hepatotoxic control. Group 3–7 were administered a single dose of CCl₄ (2 ml/kg b.wt. i.p.) on the first day and received Pet. Ether extract, chloroform extract, Methanol extract, aqueous extract of *Hibiscus vitifolius* (400 mg/kg b.wt.) and standard drug, silymarin (100mg/kg b.wt.) respectively for 7 days.

Hepato-protective activity of various fractions of active hepato-protective extracts of *Hibiscus vitifolius* roots

54 albino rats were taken and equally distributed into 9 groups. Group 1 served as solvent control and received 0.5 ml of normal saline. A single dose of CCl₄ (2 ml/kg b.wt. i.p.) was administered into Group 2 which served as hepatotoxic control. Group 3–9 were administered a single dose of CCl₄ (2 ml/kg b.wt. i.p.) on the first day and received n-hexane fraction, ethyl acetate fraction and n-butanol fraction (200 and 400 mg/kg b.wt. p.o.) of active hepato-protective extract of *Hibiscus vitifolius* and standard drug, silymarin (100mg/kg b.wt.) respectively for 7 days.

Hepato-protective activity of isolated compound from hepato-protective fraction of *Hibiscus vitifolius* roots

30 albino rats were taken and equally distributed into 5 groups. Group 1 served as solvent control and received 0.5 ml of normal saline. A single dose of CCl₄ (2 ml/kg b.wt. i.p.) was administered into Group 2 which served as hepatotoxic control. Group 3 – 5 were administered a single dose of CCl₄ (2 ml/kg b.wt. i.p.) on the first day and received the isolated compound (100 and 200 mg/kg b.wt. p.o.) from active hepato-protective fraction of *Hibiscus vitifolius* and standard drug, silymarin (100mg/kg b.wt.) respectively for 7 days.

Screening Isolated compound against Hepatic c virus

Human Hepatoma C virus Cell Line were obtained from Department of Microbiology and Immunology, University of Texas Medical Branch, USA and maintained in 10 % bovine serum at 37 °C in 5 % CO₂ incubated in a humidified incubator. Cultures were frequently examined under inverted microscope for their viability and multiplication. Cell suspensions were seeded into 96-well microtiter plates at a plating density of 0.1 million cells per ml. After 24 h of incubation, cells were exposed to various concentrations of gossypin and incubated for 72 h.

The absorbance was read at a wavelength of 595 nm using an ELISA plate reader. Experiment was carried out in triplicate including untreated cell control and a blank cell-free control. The percentage cellular viability was calculated with the appropriate control taken into account. The concentration which inhibited 50 % of cellular growth (IC₅₀ value) was determined.

Biochemical analysis

On the seventh day treatment, the blood samples of each animal were separately collected by orbital sinus puncture under mild ether anaesthesia in Eppendroff's tubes (1 ml) containing 50 µl of anticoagulant (10% trisodium citrate) and plasma was separated by centrifuging at 6000 rpm for 15 min. The serum was used to analyze serum biochemical parameters, aspartate amino transaminase (ASAT), alanine amino transaminase (ALAT), alkaline phosphatase (ALP), Lactate Dehydrogenase (LDH), cholesterol (TC), albumin, total protein (TP), direct bilirubin (DB) and total bilirubin (TB). Standard assay kits were used to estimate the serum biochemical parameters (Anbu et al., 399).

Statistical analysis

Data were expressed as Mean $\pm$ S.E.M. and subjected to one way ANOVA followed by Dunnet's t-test. Values of $P < 0.01$ and $P < 0.001$ were considered statistically significant.

Histopathological studies

A portion of the liver samples were used for histopathological studies, as per the standard procedure. 10 % neutral phosphate buffer formalin and the hydrated tissue sections were used for the histological examination. Liver pieces of 5 µm in thickness were fixed and were stained with haematoxylin and eosin. The sections were examined under light microscope.

IV. RESULTS AND DISCUSSION

The colour, consistency, and percentage yield of *Hibiscus vitifolius* roots extracts are tabulated in Table 1. Among the four extracts, aqueous extract had the highest percentage yield which was justified by 27.64% whereas Pet. Ether extract had the lowest percentage yield 3.88%. The phytochemical test revealed that the extracts of *Hibiscus vitifolius* roots may contain phenolic compounds and tannins, saponins, triterpenoids, flavonoids, gums and mucilage. In acute toxicity studies, the oral administration of the extracts of *Hibiscus vitifolius* roots did not produce any mortality in mice up to a dose level of 2000 mg/kg. This may be due to non-toxic therapeutic index of this plant. So the dose of the extracts was fixed at 200 mg/kg, i.e. 1/10th of the maximum tolerated dose.

In the present study, following a challenge of CCl₄ toxicant a marked elevation was observed with regard to the serum levels of the enzymes Aspartate Aminotransferase (ASAT), Alanine Amino transferase (ALAT), Alkaline phosphatase (ALP) and Lactate Dehydrogenase (LDH). A marked elevation was also observed in serum bilirubin levels. The total cholesterol (TC), Total protein (TP) and albumin levels were significantly decreased. Among all the extracts and fractions, oral administration of Methanol extract of *Hibiscus vitifolius* (400 mg/kg) and its ethyl acetate soluble fraction (200 mg/kg and 400 mg/kg) showed significant hepato-protective effect as the altered levels were significantly restored towards the normal levels (Table 2, 3, 4 and Fig. 3). In-vitro hepato-protective studies against Human Hepatoma C virus cell line shows that 170 µg/ml as IC₅₀ value for the isolated compound gossypin (Table 5).

Column Chromatography using methanol: ethyl acetate (1:9), a yellow colour fraction was eluted out and concentrated under vacuum that produced bright yellow color needle shape crystalline compound. The isolated compound showed a positive colour reaction for flavanoid glycoside which was confirmed as gossypin by melting point (228° to 230°C) and spectral data such as UV, IR, ¹H-NMR and Mass spectrum.

The isolated compound showed no mortality or toxic symptoms up to 1g/kg b.wt orally. The oral administration of isolated gossypin (100 and 200 mg/kg b.wt) exhibited the potent hepato-protective effect against CCl₄ induced hepatotoxicity, as evident by the

significant restoration of biochemical parameters such as SGOT, SGPT, alkaline phosphate, cholesterol, total protein, albumin, total bilirubin and direct bilirubin. (Table 4) All the histopathological findings were well comparable with the biochemical estimations.

V. CONCLUSION

The present study provides data for fixing up the Pharmacopoeial standards. Gossypin a bioflavonoid compound was isolated for the first time from the *Hibiscus vitifolius* roots which can be taken as a chemical marker for deciding the quality of the roots of *Hibiscus vitifolius*. The hepato-protective activity of *Hibiscus vitifolius* extracts and the isolated compound proved the therapeutic efficacy which supports the traditional use of the plant. Toxicological study proved that the isolated compound was nontoxic. Scientific validation of the roots of *Hibiscus vitifolius* was established for its traditional claim as folklore medicine though further clinical research is required before declaring this isolated compound as a drug for Hepatitis C.

REFERENCES

- [1] Anbu JSJS, Syam M, Dineshkumar C, Anandarajagopal K, Saraswathi A., (2012), *Hibiscus vitifolius* (Linn.) root extracts shows potent protective action against anti-tubercular drug induced hepatotoxicity. *J Ethnopharmacol.* 2012; 141: pp. 396–402.
- [2] Anbu JSJ, Jayaraj P, Syam M., Anita GAV, Varatharajan R., (2008), Antioxidant and hepatoprotective effect of the roots of *Hibiscus esculentus* linn. *Int J Green Pharm.* 2008; 2(3): pp. 113-117.
- [3] Harborne JB., (1994), *Phytochemical methods. A guide to modern techniques of plant analysis.* Chapman and Hall, New York; 1994: pp. 33-34.
- [4] Kingsley CPI, Eugene NO, Mathew OW., (2010), Hepatoprotective effects of methanolic extract and fractions of African mistletoe *Tapinanthus Bangwensis* (Engl. & K. Krause) from Nigeria. *EXCLI Journal* 2010; 9: pp. 187-194.
- [5] Miller LC, Tainter ML., (1944), Estimation of the ED₅₀ and its error by means of logarithmic-probit graph paper. *Royal Soc Med.* 1944; 473: pp. 261–264.
- [6] Praveen KA, Bhawana S., (2013), HPLC analysis and isolation of rutin from stem bark of *Ginkgo biloba* L. *J Pharmacog Phytochem.* 2013; 2(4): pp. 68-71.

Table 1: Percentage of yield, colour and consistency of *Hibiscus vitifolius* roots extracts

Extract(s)	Colour	Consistency	% yield
Pet. ether	Dark brown	Sticky	3.88
Chloroform	Reddish brown	Sticky	9.42
Methanol	Greenish yellow	Semisolid	18.26
Aqueous	Yellowish brown	Solid	27.64

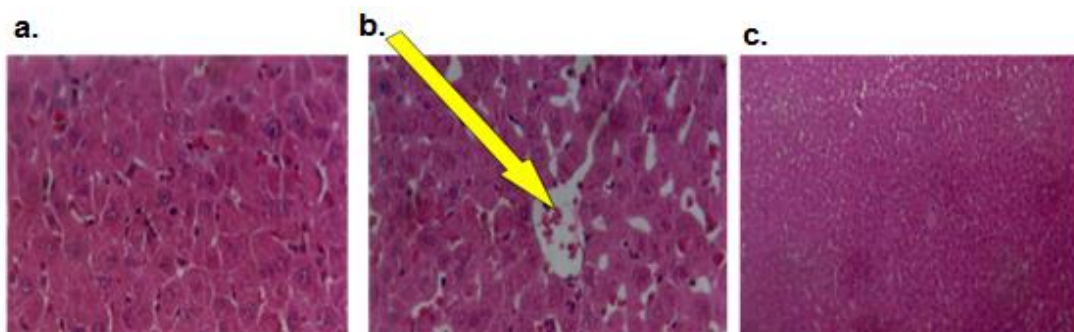


Fig.3. (a) Histopathology of normal rat liver; (b) Histopathological changes in CCl₄ intoxicated rats where the arrow indicates necrosis and inflammation; (c) Histopathological changes in liver treated with isolated compound (200 mg/kg)

Table 2: The effects of various extracts of *Hibiscus vitifolius* on the biochemical parameters in serum of CCl₄ intoxicated rats

Treatment (mg/kg)	ASAT U/l	ALAT U/l	ALP U/l	LDH U/l	TC mg/dl	Total Protein g/l	Albumin g/l	Total Bilirubin mg/dl	Direct Bilirubin mg/dl
Control	75.4 ± 0.74	53.4 ± 0.56	354.12 ± 1.98	398.4 ± 2.12	81.62 ± 0.64	8.62 ± 0.18	4.84 ± 0.28	0.56 ± 0.004	0.422 ± 0.007
CCl ₄ (2ml)	536.82 ^{aaa} ± 3.06	406.20 ^{aaa} ± 2.94	514.12 ^{aaa} ± 1.78	622.24 ^{aaa} ± 3.54	47.26 ^{aaa} ± 1.02	6.02 ^{aaa} ± 0.68	2.34 ^{aaa} ± 0.54	3.64 ^{aaa} ± 0.03	1.96 ^{aaa} ± 0.06
CCl ₄ (2ml) + Pet. ether ext. (400)	464.12 ± 6.34	328.26 ± 4.14	490.06 ± 3.74	552.32 ± 1.78	38.18 ± 1.02	5.66 ± 0.64	2.34 ± 0.08	3.26 ± 0.05	1.56 ± 0.06
CCl ₄ (2ml) + Chloroform ext. (400)	442.66 ± 1.12	320.38 ± 1.68	454.82 ± 2.12	575.42 ± 3.02	41.12 ± 0.92	5.88 ± 1.72	2.48 ± 0.03	3.48 ± 0.04	1.68 ± 0.02
CCl ₄ (2ml) + Methanol ext. (400)	71.32 ^{bbb} ± 1.28	50.32 ^{bbb} ± 1.06	366.22 ^{bbb} ± 3.42	376.24 ^{bbb} ± 1.94	74.68 ^{bbb} ± 0.68	7.46 ^{bbb} ± 0.77	3.62 ^{bbb} ± 0.52	0.48 ^{bbb} ± 0.007	0.32 ^{bbb} ± 0.003
CCl ₄ (2ml) + Aqueous ext. (400)	474.44 ± 2.02	308.78 ± 4.31	482.88 ± 3.24	546.30 ± 4.36	44.52 ± 1.22	5.74 ^b ± 1.87	2.36 ± 0.34	3.51 ± 0.082	1.18 ^b ± 0.002
Silymarin (100)	73.6 ^{bbb} ± 1.41	50.8 ^{bb} ± 0.84	348.48 ^{bbb} ± 1.82	374.62 ^{bbb} ± 1.84	78.21 ^{bbb} ± 0.37	8.0 ^{bbb} ± 0.09	4.52 ^{bbb} ± 0.13	0.54 ^{bbb} ± 0.002	0.391 ^{bbb} ± 0.004

Values are mean ± S.E.M.; n = 6; aP<0.05, aaP<0.01, aaaP<0.001, CCl₄ Vs control; bP<0.05, bbP<0.01, bbbP<0.001, extract treated groups vs CCl₄

Table 3: The effects of various fractions of Methanol extract of *Hibiscus vitifolius* on the biochemical parameters in serum of CCl₄ intoxicated rats

Treatment (mg/kg)	ASAT U/l	ALAT U/l	ALP U/l	LDH U/l	TC mg/dl	Total Protein g/l	Albumin g/l	Total Bilirubin mg/dl	Direct Bilirubin mg/dl
Control	71.43 ± 1.21	49.22 ± 1.06	332.54 ± 3.84	361.23 ± 2.92	76.15 ± 1.42	8.15 ± 0.26	4.34 ± 0.19	0.44 ± 0.003	0.39 ± 0.005
CCl ₄ (2ml)	561.71 ^a aa ± 4.12	430.51 ^a aa ± 3.21	536.44 ^{aa} a ± 2.19	645.77 ^{aa} a ± 3.98	52.56 ^{aa} a ± 1.75	6.81 ^{aaa} ± 0.92	2.78 ^{aaa} ± 0.82	4.12 ^{aaa} ± 0.02	2.08 ^{aaa} ± 0.07
CCl ₄ (2ml) + n-hexane fraction (200)	481.53 ± 5.38	335.54 ± 4.97	508.92 ± 4.02	571.54 ± 2.46	42.76 ± 1.14	6.76 ± 0.72	2.72 ± 0.12	3.54 ± 0.04	1.73 ± 0.08
CCl ₄ (2ml) + n-hexane fraction (400)	475.52 ± 1.47	327.21 ± 1.53	485.17 ± 2.54	552.33 ± 3.13	39.27 ± 1.12	6.83 ± 1.48	2.81 ± 0.04	3.07 ± 0.05	1.26 ± 0.03
CCl ₄ (2ml) + ethyl acetate fraction (200)	75.11 ^{bb} ± 1.59	71.71 ^b ± 1.91	402.52 ^b ± 2.73	431.16 ^b ± 3.38	79.24 ^{bb} ± 1.58	6.98 ^b ± 1.61	3.17 ^{bb} ± 0.07	1.04 ^b ± 0.03	1.52 ^b ± 0.02
CCl ₄ (2ml) + ethyl acetate fraction (400)	73.67 ^{bbb} ± 1.57	52.66 ^{bbb} ± 1.14	358.14 ^{bb} ± 3.75	388.13 ^{bb} ± 2.28	79.22 ^{bb} ± 1.11	7.57 ^{bbb} ± 1.04	3.71 ^{bbb} ± 0.76	0.41 ^{bbb} ± 0.008	0.42 ^{bbb} ± 0.002
CCl ₄ (2ml) + n-butanol fraction (200)	526.67 ± 4.94	361.21 ± 3.97	523.94 ± 3.71	558.63 ± 4.95	49.71 ± 1.31	6.75 ± 1.09	2.72 ± 0.22	3.14 ± 0.054	1.25 ± 0.003
CCl ₄ (2ml) + n-butanol fraction (400)	498.67 ± 3.98	335.21 ± 2.86	487.94 ± 4.29	512.63 ± 4.77	54.71 ± 1.27	6.88 ± 1.52	2.99 ± 0.15	2.95 ± 0.009	1.61 ± 0.004
Silymarin (100)	72.4 ^{bbb} ± 1.17	50.3 ^{bbb} ± 1.11	341.17 ^{bbb} ± 2.91	383.17 ^{bbb} ± 1.22	79.91 ^{bbb} ± 1.13	8.11 ^{bbb} ± 1.02	4.01 ^{bbb} ± 0.17	0.49 ^{bbb} ± 0.011	0.43 ^{bbb} ± 0.005

Values are mean ± S.E.M.; n = 6; aP<0.05, aaP<0.01, aaaP<0.001, CCl₄ Vs control; bP<0.05, bbP<0.01, bbbP<0.001, extract treated groups vs CCl₄

Table 4: The effect of isolated compound on the biochemical parameters in serum of CCl₄ intoxicated rats

Treatment (mg/kg)	ASAT U/l	ALAT U/l	ALP U/l	LDH U/l	TC mg/dl	Total Protein g/l	Albumin g/l	Total Bilirubin mg/dl	Direct Bilirubin mg/dl
Control	70.1 ± 0.82	57.7 ± 0.97	331.94 ± 2.16	372.47 ± 2.34	77.68 ± 0.71	8.04 ± 0.19	4.71 ± 0.16	0.49 ± 0.005	0.396 ± 0.002
CCl ₄ (2ml)	523.14 ^a ± 3.14	411.28 ^a ± 2.72	519.24 ^{aa} ± 1.96	627.56 ^{aa} ± 3.78	44.14 ^{aa} ± 1.11	5.94 ^{aaa} ± 0.91	2.11 ^{aaa} ± 0.71	3.52 ^{aaa} ± 0.06	1.82 ^{aaa} ± 0.08
CCl ₄ (2ml) + Isolated compound (100)	97.1 ^{bb} ± 1.37	85.3 ^{bb} ± 1.49	401.08 ^b ± 3.45	432.13 ^b ± 2.12	86.16 ^b ± 1.53	6.97 ^{bb} ± 1.14	3.51 ^{bb} ± 0.92	0.82 ^{bb} ± 0.007	0.79 ^{bb} ± 0.003
CCl ₄ (2ml) + Isolated compound (200)	74.9 ^{bbb} ± 1.23	62.6 ^{bbb} ± 1.11	371.14 ^b ± 3.03	392.37 ^b ± 2.04	82.27 ^b ± 1.12	7.31.13 ^b ± 1.02	3.96 ^{bbb} ± 0.71	0.42 ^{bbb} ± 0.004	0.34 ^{bbb} ± 0.002
Silymarin (100)	71.7 ^{bbb} ± 1.13	60.2 ^{bbb} ± 1.03	351.26 ^{bbb} ± 1.75	382.55 ^{bbb} ± 2.26	79.42 ^{bbb} ± 1.43	7.71 ^{bbb} ± 0.11	4.64 ^{bbb} ± 0.17	0.51 ^{bbb} ± 0.09	0.42 ^{bbb} ± 0.003

Table 5: Human Hepatoma C Virus Cell Line after 72 h of treatment with Gossypin

Material	IC50 (µg mL ⁻¹)
Gossypin	170
DMSO	>500

List of Authors

Anbu Jeba Sunilson, J., 36
Anita Gnana, A.V., 36
Boyagoda, E.W.M.S., 13
Dharmawardene, R.P., 30
Prabaharan, T., 04
Shamini, H., 04
Sivapriya Sriram, 23
Subhagar, S., 01
Sudhakar, P., 01
Jayasekara, J.M.C.I., 13
Joel Jairus, R., 23

