INTERNATIONAL JOURNAL OF CURRENT RESEARCH IN BIOLOGY AND MEDICINE
ISSN: 2455-944X
www.darshanpublishers.com
DOI:10.22192/ijcrbm Volume 3, Issue 2 - 2018

Original Research Article

DOI: http://dx.doi.org/10.22192/ijcrbm.2018.03.02.003

Evaluation of Hepatoprotective activity of Gowthamar Chooranam in carbon tetrachloride induced liver damage in rats

D.Prakash[*1], G.Anitha[2], V. Velpandian[3], N.J.Muthu kumar[4], V.Banumathi[5]

[*1] Residential Medical officer, National institute of siddha Tambaram sanatorium Chennai-47.
[2] PG Scholar, Post Graduate Department of Gunapadam, National institute of siddha Tambaram sanatorium Chennai-47.
[3]Associate Professor, Post Graduate Department of Gunapadam, Government Siddha Medical College, Arumbakkam, Chennai – 106.
[4] HOD, Post Graduate Department of Sirappu maruthuvam, National institute of siddha Tambaram sanatorium Chennai-47.
[5] Director, National institute of siddha, Tambaram sanatorium Chennai-47.
Corresponding author: Dr.D.Prakash MD(S),
Residential Medical Officer, National Institute Of Siddha, Tambaram Sanatorium,
Chennai-47
E-Mail: *drprakash2687@gmail.com*

Abstract

The Gowthamar chooranam (GC) is traditionally used in siddha system. The present study was evaluated the hepatoprotective activity of GC against carbon tetrachloride induced liver damage in wistar albino rats. The GC was used 100mg/kg and 200 mg/kg given orally to the animals. The silymarin 100 mg/kg was given as standard drug. The GC was effective in protecting the liver against the injury produced by carbon tetrachloride. There was a significant produced action in wet liver weight, liver volume, direct and total bilirubin, SGOT, SGPT, ALP.

Keywords: Gowthamar chooranam, Hepatoprotective, carbon tetrachloride, bilirubin,silymarin.

Introduction

The Gowthamar chooranam (GC) is traditionally used in siddha system[1]. The present study was evaluated the hepatoprotective activity of GC against carbon tetrachloride induced liver damage in wistar albino rats. The Siddha system of medicine become more popular all over the world because of the curative property, less toxic and has no side effects[2]. Carbon tetrachloride induced hepatotoxicity model is widely used for the study of hepatoprotective effects of drugs. It is a potent hepatotoxic producing centrilobular necrosis which causes liver injury. CCl4 is bio transformed by the cytochrome P450 system to produce the trichloromethyl free radicals, which in turn covalently binds to cell membranes and organelles to elicit lipid peroxidation[3]. Hepatoprotective agents were very less in the world so this is the time to evaluate new hepatoprotective agents through pharmacological studies in animal model.

Materials and Methods

CCL_4 induced hepatotoxicity in rats model was used for evaluation of hepato-protective activity for the Gowthamarchooranam. Animals were divided into five groups, each group containing six animals.

Group I (normal) received distilled water or 2% CMC for 14 days. Group II (Control) received CCl_4 1ml/kg, i. p. 1:1 dilution with coconut oil on 5th day. Groups III-IV, received Gowthamarchooranam (100mg/kg and 200mg/kg p.o) for 14 days and CCl_4 induction on 5th day. Group V received standard marketed drug silymarin (100mg/kg per day, p.o.) for 14 days and CCl_4 induction on 5th day.

After 14 days of experimental period blood sample had been collected individually for all the animals by retro-orbital puncture method and the blood was allowed to clot for 30 min[4]; serum was separated by centrifuging and was used for various parameter estimations. Later all the animals were sacrificed by cervical dislocation, liver samples were collected and the individual weights of the livers were estimated. For histopathological study, liver tissue was quickly removed after autopsy and fixed in 10% formalin in saline[5].

Biochemical parameters studied

The activities of serum glutamate pyruvate transaminase, and serum glutamate oxaloacetate transaminase were estimated using standard methods. Estimation of serum ALP, serum bilirubin and electrolytes[6] were also carried out to assess the acute hepatic damage caused by CCl_4.

Statistical analysis

The data obtained from the study were subjected to statistical analysis by one way ANOVA followed by Dunnet 't' test, and results were expressed in terms of Mean±SEM values. Statistical analysis was performed using INSTAT- V3 Software programme.

Results and Discussion

The present studies were performed to assess the hepatoprotective activity in rats against Carbon tetrachloride as hepatotoxin[7]. Clinical signs in rats that received **CCl_4** (Group B) included dullness and loss of appetite. The serum enzymes like SGOT, SGPT, ALP and total bilirubin of treated animals were significantly reduced ($p<0.01$) by seven days pretreatment of GC at two dose levels 100mg/kg and 200mg/kg, when compared with CCl4 treated control. No significant clinical abnormalities in other groups. At necropsy, in-group B **CCl_4**the liver showed fatty changes and slight increase in liver weights compared to the control groups. These changes were less noticed or disappeared in the GC treated groups and Silymarin group. Changes in the serum constituents In Table 44, the activities of serum SGPT, SGOT and ALP and the concentration of total protein, bilirubin and albumin in the GC treated groups (Tables 3) and the Silymarin group, were significantly decrease when compared to CC **l_4** treated group and almost near the normal value when compared to the negative control.

The changes associated with Carbon tetrachloride induced liver damage of the present study appeared similar to the acute viral hepatitis. In CC **l_4** induced hepatotoxicity, the administration of the toxicant CC **l_4** showed a distinct rise in the levels of serum marker enzymes namely ALT, AST, ALP and Total Bilirubin as shown in Table.no.43. These data suggests a dose dependent hepatoprotective activity of GC. The present studies were performed to assess the hepatoprotective activity in rats against CCL4 as hepatotoxin to prove its claims in clinical practice against liver disorders[8].From the Table 1 it was evident that GC was able to reduce or normalize the wet liver weight and wet liver volumes and also all the elevated biochemical parameters (Tables 1) due to the hepatotoxin intoxication.

The levels of total proteins and albumin were reduced due to the CC **l_4** induced hepatotoxicity[87]. The reduction is attributed to the initial damage produced and localised in the endoplasmic reticulum which results in the loss of P450 leading to its functional failure with a decrease in protein synthesis and accumulation of triglycerides leading to fatty liver. Reduction in the levels of SALP, ALT and AST towards the normal value is an indication of regeneration process[9,10]. The protein and albumin levels were also rose suggesting the stabilization of endoplasmic reticulum leading to protein synthesis. The protective effect exhibited by GC at dose level of 200 mg/kg was comparable with the standard drug. The GC treatments significantly ($P<0.01$) reversed the levels of ALP and bilirubin ($P < 0.01$). Standard (100 mg/kg) treated animals also showed significant

decrease in elevated biochemical parameters (P<0.01), and bilirubin (P<0.01) levels when compared to control rats. The hepatotoxicity induced by CCl4 is due to its metabolite CCl3•, a free radical that alkylates cellular proteins and other macromolecules with a simultaneous attack on lipids, in the presence of oxygen, to produce lipid peroxides, leading to liver damage[11,12].

The GC thus has a potential application in the acute condition of jaundice. A possible mechanism of the GC on bilirubin levels may be interference with cytochrome P450, resulting in the hindrance of the formation of hepatotoxic free radicals, thereby protecting the integrity of the membrane.

Table 1; Effect of GC on Wet liver weight & Wet liver volumes in CCl_4 induced hepatotoxic rats.

Group	Treatment	Dose	Wet Liver weight (gm/100gm)	Liver volumes (ml/100gm)
A	Normal control	Saline (10ml/kg)	2.875 ± 0.375	2.75 ±0.10
B	Toxicant Control	CCl_4 -1.25 ml/kg, *p.o.*	5.35 ± 0.150	4.4 ±0.15
C	Standard (Silymarin)	100mg/kg, *p.o.*+ CCl_4	3.55 ± 0.05**	3.0 ±0.05**
D	GC - 1	100mg/kg, *p.o.*+ CCl_4	4.15 ± 0.10**	3.665 ±0.015**
E	GC - 2	200mg/kg, *p.o.*+ CCl_4	3.675 ± 0.125**	3.40 ±0.150**

Values are mean ± SEM (n=6) one way ANOVA followed by Dunnet's test.
Where, ** represents significant at P<0.01.

Gr.1. Effect of GC on Wet liver weight & Wet liver volumes in CCl_4 induced hepatotoxic rats.

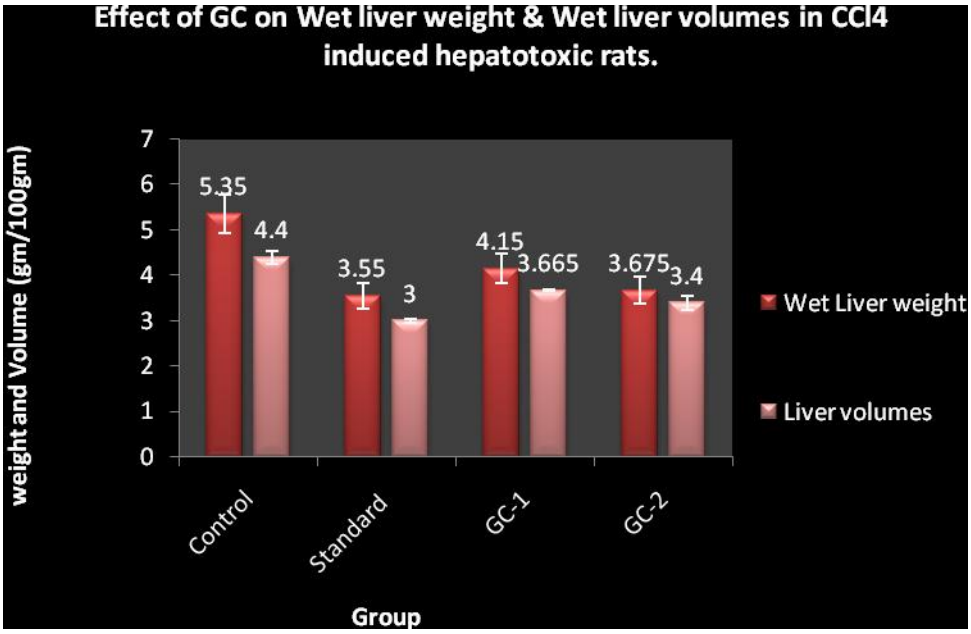


Table 2 : Effect of GC on direct bilirubin, total bilirubin levels in CCl_4 induced hepatotoxic rats.

Group	Treatment	Dose (p.o.)	Direct bilirubin (mg/dl)	Total bilirubin (mg/dl)
A	Normal control	Saline (10ml/kg)	0.173 ±0.0120	0.293±0.029
B	Toxicant Control	CCl_4 -1.25 ml/kg,	1.679 ±0.099	1.8±0.005
C	Standard (Silymarin)	100mg/kg, + CCl_4	0.256 ±0.012**	0.463±0.049**
D	GC - 1	100mg/kg, + CCl_4	1.26 ±0.032**	1.33±0.059**
E	GC - 2	200mg/kg, + CCl_4	0.50 ±0.040**	0.736±0.1105**

Values are mean ± SEM (n=6) one way ANOVA followed by Dunnet's test.
Where, ** represents highly significant at P< 0.01.

Gr 2.Effect of GC on direct bilirubin, direct bilirubin levels in CCl_4 induced hepatotoxic rats.

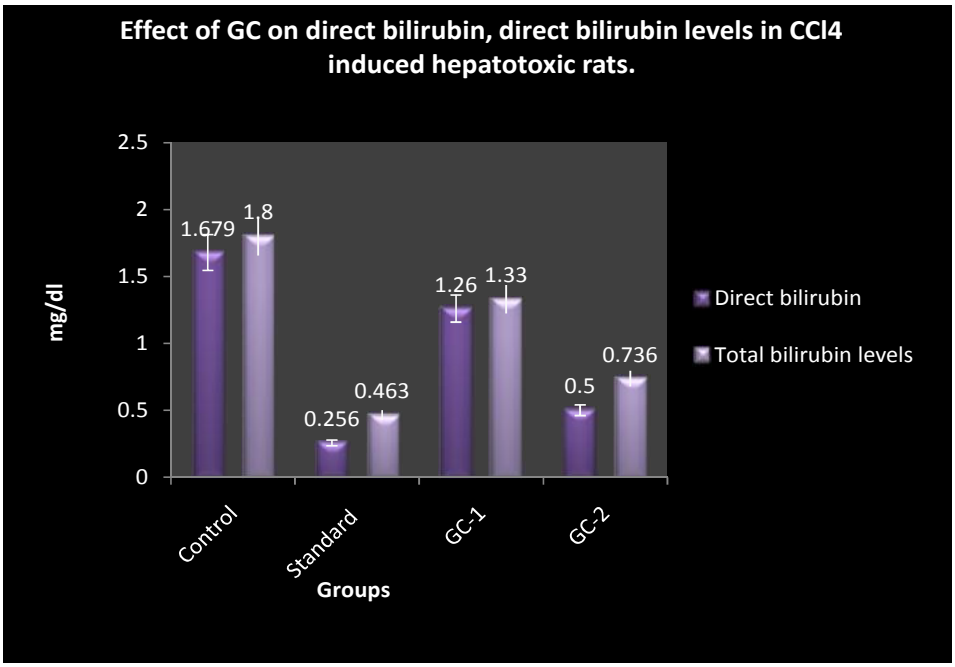
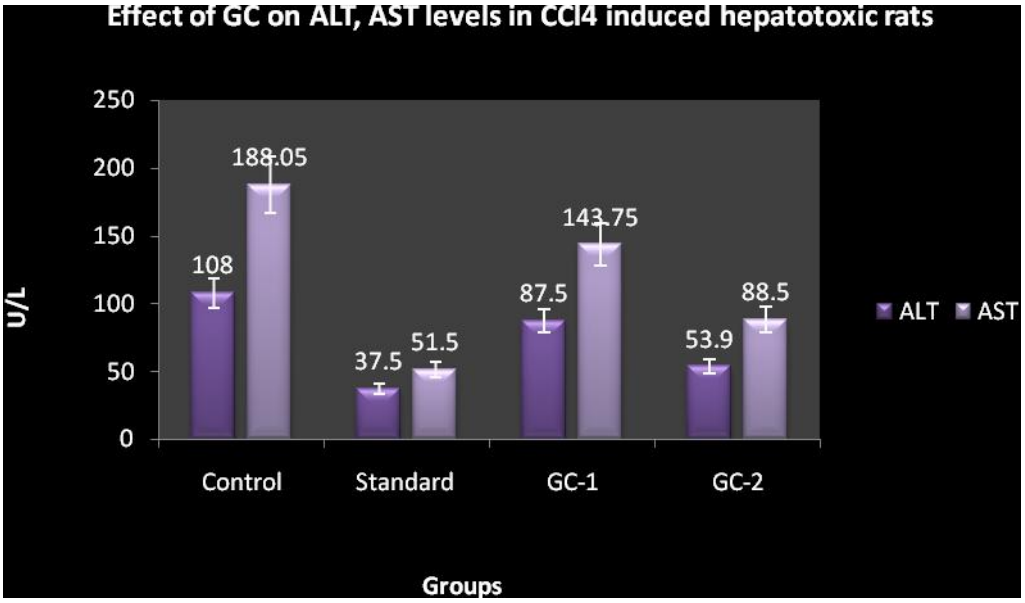


Table 3 : Effect of GC on SGPT, SGOT, ALP levels in CCl_4 induced hepatotoxic rats.

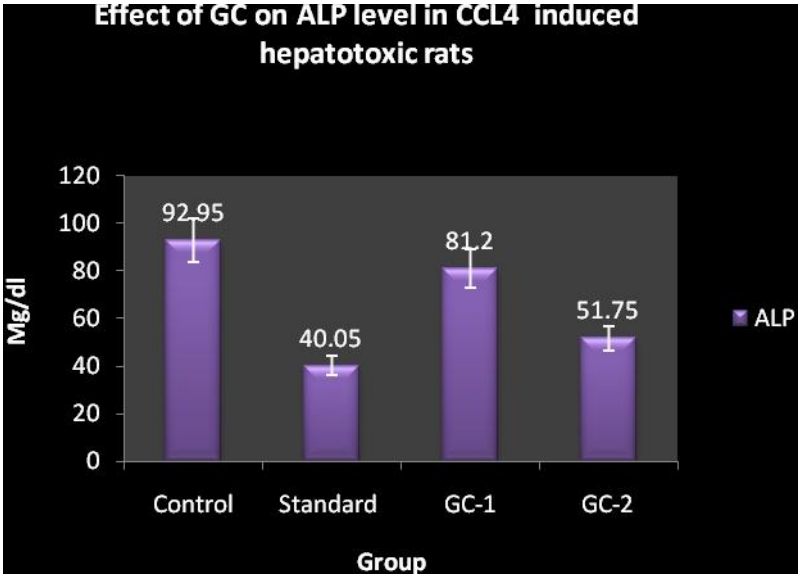
Group	Treatment	Dose (p.o)	SGPT (U/L)	SGOT (U/L)	ALP (mg/dl)
A	Normal control	Saline (10ml/kg)	28.175±0.325	34.05±4.5	33.0±0.50
B	Toxicant Control	CCl_4 -1.25 ml/kg,	108±2.50	188.05 ±2.50	92.95±0.550
C	Standard (Silymarin)	100mg/kg, + CCl_4	37.5±1.0**	51.5±1.0**	40.05±0.55**
D	GC - 1	100mg/kg,.+ CCl_4	87.5±2.0**	143.75±8.750**	81.2±0.30**
E	GC - 2	200mg/kg, + CCl_4	53.9±1.30**	88.5±3.0**	51.75±0.250**

Values are mean ± SEM (n=6) one way ANOVA followed by Dunnet's test.
Where, ** represents significant at P<0.01.

Gr3 .Effect of GC on ALT, AST levels in CCl_4 induced hepatotoxic rats.

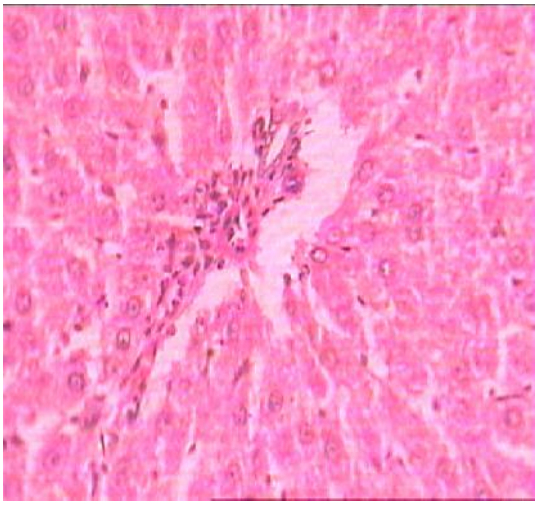


Gr.4. Effect of GC on ALP levels in CCl_4 induced hepatotoxic rats.

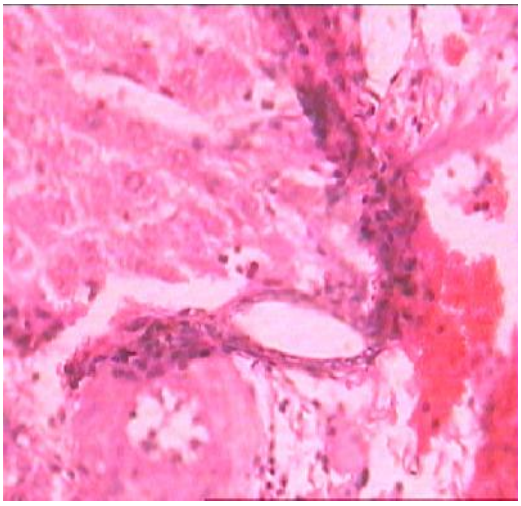


HISTOPATHOLOGY OF LIVER CCL_4 INDUCED RAT MODEL

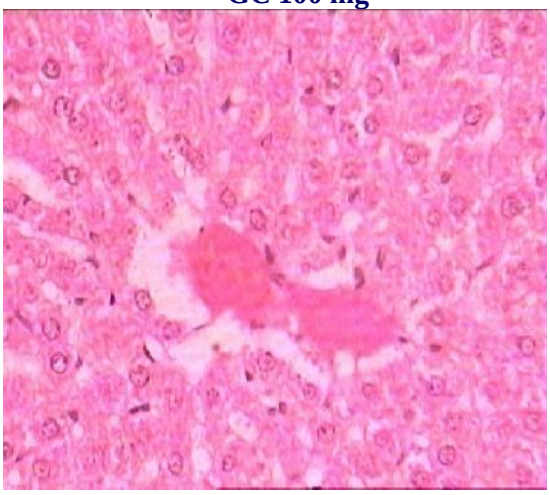
Normal control



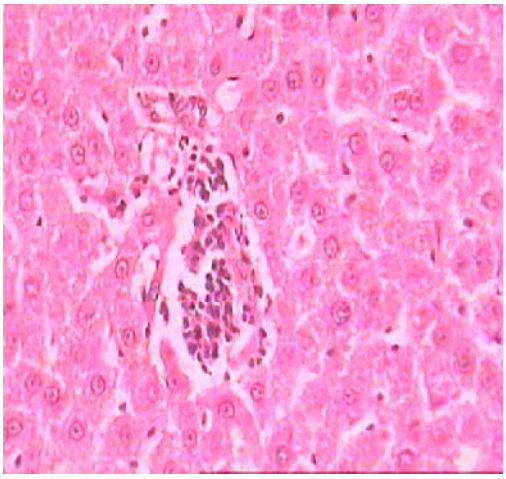
Toxicant control



GC 100 mg



GC 200 mg



Conclusion

It is concluded that Gowthamar chooranam a siddha medicine have shown the hepatoprotective activity in carbon trachloride induced toxicity in rodents and have the significant action on enzymes and proteins for protection of liver. So we can give this medicine for liver protection to the humans.

Acknowledgments

I sincerely express my acknowledgement to The Vice Chancellor, The TamilnaduDr.MGR Medical university, Guindy, Chennai and to the National Institute Of Siddha,Tambaram sanatorium Chennai-47 for their support.

References

1. The Pharmacopoiea Of Siddha Research Medicines byDr.Shanmugavelu L.I.M.H.P.I.M, Dr.G.T.Naidu page 122.
2. Meenadevi VN, Nagendraprasad P,Kalirajan K. Infrared spectral studies on Siddha drugs *Pavalaparpam*. Int J PharmaBio Sci 2010; 1(4): 474-483
3. Recknagel, RO, Glende EA, Dolak JA, Waller RLC. Mechanism of carbon tetrachloride toxicity. Pharmacol Ther. 1989; 43: 139-154.

4.OECD Test Guideline 423, OECDGuideline for Testing of Chemicals.Available:
[http://www.oecd.org/document/html],(2001).

5. Chakraborti KK, Handa SS. Antihepatotoxic investigations on *Boerhaavia repanda* Wild. Indian Drugs, 1989; 2: 19-24.
6. Chaudhari BP, Chaware VJ, Joshi YR, Biyani KR, Hepatoprotective activity of Hydroalcoholic extract of *Momordica charantia* Linn. Leaves against Carbontetra chloride induced Hepatopathy in Rats. Int J Chem Tech Res Coden (USA): 2009; 1 (2): 355-358.
7. Johnston DE, Kroening C. Mechanism of early carbon tetrachloride toxicity in cultured rat hepatocytes. PharmacolToxicol. 1998; 83: 231-239.
8. Cotran RS, Kumar V, Robbins SL. Cellinjury and cellular death. Robbin's Pathologic Basis of Disease, 5th ed. Prism Book Pvt Ltd; 1994: 379-430.
9. Kaplowitz N, Aw TY, Simon FR, Stolz A.Drug-induced hepatotoxicity. Ann Int Med 1986; 104: 826- 839.
10. Manjunatha BK, Mankani KL, Vidya SM, Krishna V, Manohara YN. Hepatoprotective activity of *Butea superb* against carbon tetrachloride induced hepatic damage in rodents. Phcog Mag 2008; 4 (15): 41-45.
11. Mehta RS, Shankar MB, Geetha M, Saluja AK. Hepatoprotective activity of *Trianthema portulacastrum*. Indian drugs 1999; 36: 241-243.
12. Singh S, Metha A, P Metha. Hepatoprotective activity of *Cajanus* against carbon tetrachloride induced liver damage. Int J Pharm Pharmaco Sci 2011;

Access this Article in Online	
Quick Response Code	Website: www.darshanpublishers.com
	Subject: Siddha Medicine

How to cite this article:
D.Prakash, G.Anitha, V. Velpandian, N.J.Muthu kumar, V.Banumathi. (2018). Evaluation of Hepatoprotective activity of Gowthamar Chooranam in carbon tetrachloride induced liver damage in rats. Int. J. Curr. Res. Biol. Med. 3(2): 15-21.
DOI: http://dx.doi.org/10.22192/ijcrbm.2018.03.02.003