World Journal of Pharmaceutical Sciences
ISSN (Print): 2321-3310; ISSN (Online): 2321-3086
Published by Atom and Cell Publishers
Available online at: http://www.wjpsonline.org/
Short Communication

Evaluation of nephrotoxic potential of *iyengaria stellata*

Bushra Riaz*[1], Rahila Najam[2], Sana Sarfaraz[1], Humera Anser[1], Saira Saeed Khan[2]

[1]Department of Pharmacology, Jinnah University for Women, Karachi, Pakistan
[2]Department of Pharmacology, University of Karachi, Karachi, Pakistan

Received: 23-03-2014 / Revised: 01-04-2014 / Accepted: 25-04-2014

ABSTRACT

The development of renal injury by use of xenobiotics is very prevalent. *Iyengaria stellata* (Børgesen) is a brown sea weed belongs to the class Phaeophyceae and family Scytosiphonaceae and its effects on renal function has been determined after 30 days once daily dosing to rabbits and the level of urea and creatinine was measured which showed increased level of urea after prolonged administration of *Iyengaria stellata* however this increase is insignificant and decrease in creatinine level after 30day ingestion of *Iyengaria stellata*, lead to the conclusion that *Iyengaria stellata* has nephroprotective effect.

Key Words: *Iyengaria stellata*, nephrotoxicity, urea, creatinine

INTRODUCTION

The nephrons are prone to toxic insults owing to its structural organization and function. Reports of nephrotoxicity inherent in complementary medicine utilization circumscribe all types of renal deterioration, ranging from electrolyte disturbances and proteinuria to acute and chronic renal failure, and death. In underdeveloped countries where intensive care and dialysis support is not feasible, fatality rate is high [1]. The development of renal injury by the use of xenobiotics encounters multiple mechanisms. Some drugs may cause decreased renal perfusion, interstitial nephritis, primary glomerulopathy and/or altered potassium homeostasis. A large number of drugs and chemicals impose their toxic effect on the renal tubular cell secondary to intracellular accumulation of concentrations substantially higher than in the plasma or in other tissues. Drug-induced interstitial nephritis is marked by inflammatory lesions of the renal interstitium developed after at least 7 to 10 days of therapy [2]. Renal injury may be reversible with a momentary rise of renal parameters urea and/or creatinine. These values may be increased either due to transient dehydration or renal failure. If the underlying etiology of the elevated BUN and/or creatinine levels is diagnosed earlier, and appropriate course of treatment has been provided, permanent renal damage may be prevented.

Iyengaria stellata (Børgesen) is a brown sea weed belongs to the class Phaeophyceae and family Scytosiphonaceae [3]. *Iyengaria stellata* contain saringosterol, loliolide, propyl-4-hydroxy benzoate, methyl-4-hydroxy benzoate [4], aminoacids, carbohydrates and vitamins [5,6,7], methyl n-pentadecanoate, methyl hexadecanoate, methyl-n-heptadecanoate, methyl octadecanoate, methyl 9, hexadecenoate and methyl 9, octadecenoate [8]. In addition to the cholesterol another new metabolite stellatol was also detected [9]. Electrolytes were also found, among which Na was found in highest quantity followed by K and then Ca. Cd was present in smallest amount, Co and Cr was slightly more and Cu and Pb were also present in average proportions [10].

Among the above constituents the monoterpene, loliolide and vitamins has intermediate antioxidant activity against important radicals as H_2O_2, DPPH free radical, intercellular ROS and cell shielding action against H_2O_2- induced cell destruction or apoptosis [11].

The *Iyengaria stellata* possess pronounced antidepressant and an anxiolytic property [12]. Chronic administration of *Iyengaria stellata* yields stimulant effects on hematopoietic system which is very beneficial [13]. In addition to this, *Iyengaria stellata* furnish antihyperlipidemic actions which may protect cardiovascular system. It might cause

***Corresponding Author Address:** Bushra Riaz, Assistant Professor, Department of Pharmacology, Jinnah University for Women, Karachi, Karachi- 74600, Pakistan. Email: doctor.bushra@hotmail.com*

hepatotoxicity after prolonged use but toxicity is less severe and reversible [14]. Its effect on renal system may be assessed by determining blood urea nitrogen and creatinine.

Blood Urea Nitrogen (BUN): The level of nitrogen present in the body in the form of a waste product called urea is denoted by the plasma urea nitrogen. BUN is employed to arbitrate the amount of excess nitrogenous wastes in the blood stream which should have been filtered out of the glomerulus in normal circumstances. This leads to raised level of nitrogen compounds in the blood because of failure of glomerular filtration in renal failure called uremia.

Serum Creatinine: The Creatinine in the serum is the metabolite of Creatine which is catabolized by the body for the sake of producing energy for the muscles. The renal system is normally capable of filtering significant quantities of creatinine daily. However, when nephron damage occurs, the creatinine will be accumulated; indicating decreased renal filtration of creatinine. The normal values of blood urea nitrogen and serum cratinine are 10-25 mg/dl and 0.7-1.4 mg/dl respectively.
The objective of this study is to explore whether the concerned algae have nephrotoxic potential or not, as it has various medicinal properties.

MATERIAL AND METHOD

The alga *Iyengaria stellata* was collected from Karachi coast of Arabian Sea. This was identied by Department of Botany, University of Karachi. The fresh alga was washed with water and dried under shade. When it was completely dried, it was subjected to extraction process. For the extraction it was soaked in ethanol (4.5 L) for a period of one month. The ethanol was evaporated under reduced pressure and the gummy mass obtained after filtration through filter paper ([9]. Ethanol extract of seaweed was suspended in distilled water (dist.H_2O) and administered orally at 10mg/200g body weight for 30 days to the animals of the test group [15]. The animals were maintained under constant environmental conditions 23 ± 2^oC. All animals were given standard diet prepared in the laboratory and water *ad libitum* for 30 days. Healthy albino rabbits of either sex weighing from 1500 to 2000 grams were selected. All animals were equally divided into two groups, one group served as control while other received adequate doses according to their body weight for 30 days. Each group contained 10 animals. Before administration of drug, apparent health of these animals was monitored during the conditioning period under the laboratory environments for a week before administration of algal extract specifically noticing loss of hair, diarrhea, edema, ulceration and lack of activity. Diet and water was provided *ad libitum*. . One group served as control while remaining was given *Iyengaria stellata* in the average dose of 100 mg/ 5ml. All animals received drugs orally. Body weight was monitored weekly.
Estimation of Urea: Urea in the serum was estimated by enzymatic colorimetric test [16].
Estimation of Creatinine level: Creatinine in the serum was estimated by Jaffe reaction method, photometric colorimetric test for endpoint measurement of creatinine [17,18].

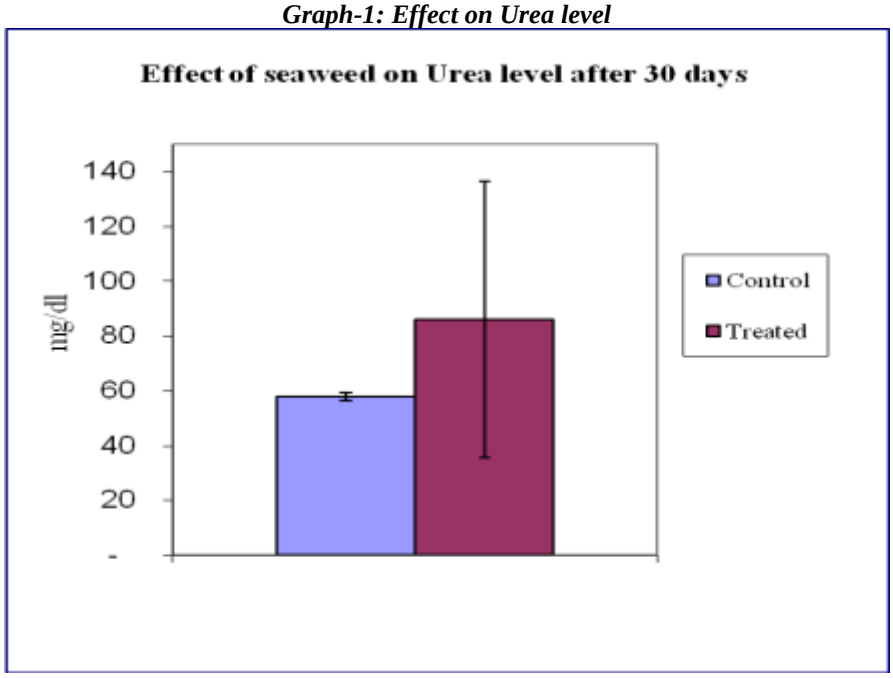
STATISTICAL ANALYSIS

All values are compared with the controlled and standard drug by taking mean of all of them and the significance of difference between means is determined by student significance t- test. Values of $P<0.05$ is considered as significant, $P<0.001$ as more significant and $P<0.0001$ as highly significant. All statistical procedure is performed according to the method of Alcarz and Jimenez [19].

RESULT AND DISCUSSION

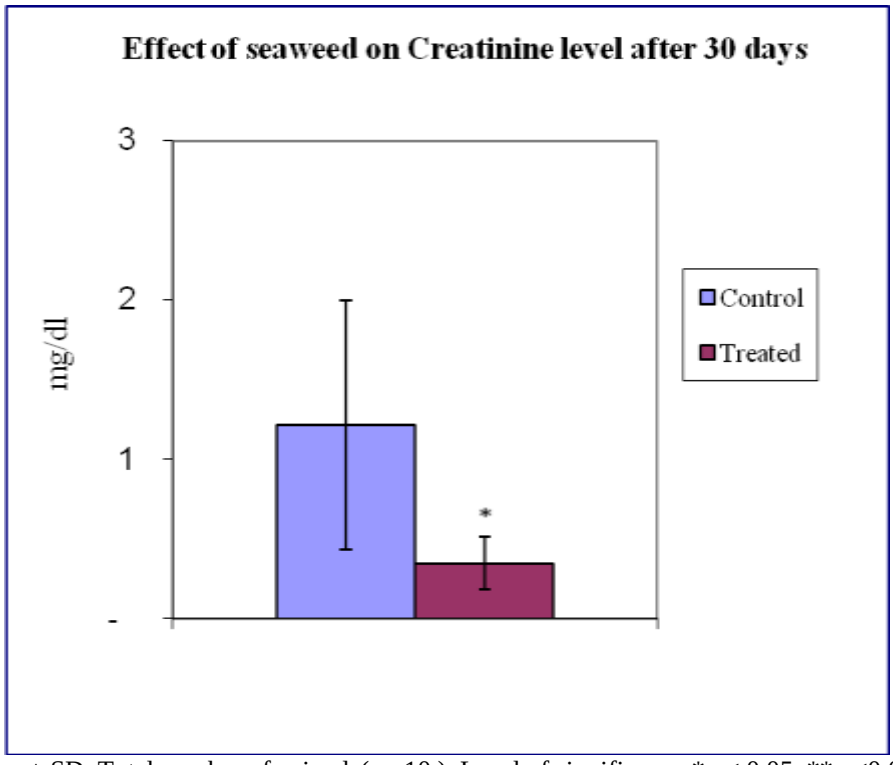
Results are shown in the form of graph 1, 2. The effect of the current brown algae on other biochemical parameters showed increased level of urea after prolonged administration of *Iyengaria stellata* however this increase is insignificant. The insignificant change in the plasma urea level suggests that *Iyengaria stellata* does not significantly affects the renal system. **Creatinine** is formed as a result of the metabolism of creatine phosphate in muscles. It is formed continuously and under normal conditions it is constantly filtered through the kidneys, so the elevated level of creatinine indicates the malfunctioning of kidneys. For this reason Creatinine clearance is used as a tool. for assessing the renal function and it also has a specific role in glomerular filtration rate [20]. Our results showed significant decrease in creatinine level after 30day ingestion of *Iyengaria stellata*, lead to the conclusion that *Iyengaria stellata* has nephroprotective effect. The presence of loliolide [4] and vitamins [5,6,7] which exert antioxidant effects and thus possess cytoprotective abilities [11] might be the possible explanation of its nephroprotective activity.

Graph-1: Effect on Urea level



Values are mean ± SD. Total number of animals (n=10). Level of significance * p< 0.05, ** p<0.001, *** p<0.0001

Graph-2: Effect on Creatinine level



Values are mean ± SD. Total number of animals(n=10). Level of significance * p< 0.05, ** p<0.001, *** p<0.0001

REFERENCES

1. Luyckx VA. Nephrotoxicity of alternative medicine practice. Adv Chronic Kidney Dis 2012;19(3):129-41.
2. Koren G. The nephrotoxic potential of drugs and chemicals. Pharmacological basis and clinical relevance. Med Toxicol Adverse Drug Exp 1989; 4(1):59-72.
3. Børgesen F. Some indian green and brown algae especially from the shores of the presidency of Bombay J Ind Bot Soc 1930; 9:151
4. Khan AM. Phytochemical and structural studies on the chemical constituents of Taxus wallichiana, Tanacetum gracile, Jolyna laminarioides and other marine algae. PhD thesis, University of Karachi: Pakistan, 2000.
5. Mehta BR, Parekh RG. Mannitol content in brown algae of the coast of Saurashtra. Bot Mar 1978; 21:251.
6. Qasim, Rashida. Aminoacid composition of some common seaweeds. Pak J Pharm Sci 1991; 4(1):49.
7. Qasim R, Barkati S. Ascorbic acid and dehydroascorbic acid contents of marine algal species from Karachi. Pakistan J Sci Ind Res 1985; 28: 129-133.
8. Usmanghani Ket al. Studies on the fatty acids of *Iyengaria stellata* (schytosiphonales, pheophyta) Bot Mar 1987; 30: 305.
9. Ali MS et al. Some chemical constituents from marine algae of Karachi coast (Arabian sea). Turk J Chem 1999; 23:181 - 183.
10. Rizvi MA, Shameel M. Estimation of elements in seaweeds of Karachi coast. Pak J Bot 2001; 33: 357–363.
11. Yang X et al. Antioxidant activity and cell protective effect of loliolide isolated from Sargassum ringgoldianum subsp. Coreanum. Algae 2011; 26(2): 201-208.
12. Riaz B et al. Neuropharmacological screening of the *Iyengaria stellata* revealed its memory boosting, anxiolytics and antidepressant effects. IRJP 2010; 3(10):90-94.
13. Riaz B et al. Hematopoietic effects of the brown algae *Iyengaria stellata* in albino rabbits, J Pharm Res 2013; 7(3): 215- 218.
14. Riaz B. Toxicological and pharmacological screening of seaweeds found at Karachi coast. MPhil thesis, University of Karachi: Pakistan 2013.
15. Ara J et al. Hypolipidaemic activity of seaweed from Karachi coast. Phytother Res 2002; 16(5):479-83.
16. Fawcett JK, Scott JE. A rapid and precise method for the determination of urea. J Clin Pathol 1960; 13:156-159
17. Popper HE, Mandel E and Mayer H. Zur Bestimmung des Kreatinin in Blut and Urin. Biochem Z 1937; 291:354, 1937.
18. Bartels H, Bohmer M, Heierli C. Serum Kreatininbestimmungohne Enteiweissen. Clin Chim Acta 1972; 37: 193-197
19. Alcarnz MJ, Jimenez HJ. Pharmacological evaluation of newly synthesized piperidinium derivatives for their analgesic activity. J Nat Prod 1989; 52: 1088.
20. Stevens LA et al. Assessing kidney function--measured and estimated glomerular filtration rate. N Engl J Med 2006; 354 (23): 2473–83.