

Original Article

Cardiac Effect of Aqueous Extract of *Avicennia Marina* on Isolated Rabbit's Heart

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ABSTRACT

Objective: To find out the effect of *Avicennia marina* plant on the Isolated heart.

Design: Experimental interventional study.

Place & Duration: Study conducted at BMSI, JPMC, Karachi.

Subjects & Methods: An aqueous extract obtained from the leaves of traditional medicinal plant *Avicennia marina* (Mangrove) tested on isolated heart of Rabbit, using the langendorff heart preparation. Administration of extract into the retrograde perfusion solution induced cardio-activity in Vitro.

Results: Aqueous extract possessed positive inotropic and negative chronoscopic effect in langendorff method of heart preparation. Pre-treatment with atenolol and verapamil failed to antagonize / to modify the cardiac effect produce by aqueous extract. This showed that effect produced by extract is not mediated through beta adrenergic receptors or calcium channels.

Conclusion: Mangrove plant extract showed increased in force and decreases in rate of contraction of isolated mammalian heart, which was most probably not mediated by beta adrenergic receptors or calcium channels.

Key words: Mangrove, Cardio-activity, Atenolol, Verapamil, Heart, Langendorff.

INTRODUCTION

Avicennia marina, mangrove plant species belong to the family of Avicenniaceae¹. The word mangrove means tropical trees or shrubs growing in shore mud with many tangled roots above the ground². In Pakistan most abundant species of mangrove plant is *avicennia marina*. The plants are the assets of human being³. In the history of men, different species of the plant are being used for the

treatment of different diseases and origin of present medicines are primarily based on plants. Which have been later on, analyzed and active ingredients are synthesized. In Eastern, Ayurvedic and indigenous medicines the natural sources of drugs are used, which are mostly plants in origin. In the same way different parts of the Mangrove plants are also used indifferent parts of world for different indications as indigenous medicine. Medicinally mangrove plants are used as astringent⁴, as anti-diarrheal⁵, as anti-malarial⁶, as anti-hemorrhagic⁷, anti-diabetic⁸, anti-ulcer⁹, anti-viral¹⁰ and anti-bacterial effect¹¹. The literature does not cite any pharmacological study on heart effect; therefore we decided to study on this aspect.

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MATERIAL AND METHODS:**Plant material:**

Leaves of plants were collected from mangrove area near netti jetty bridge, Keamari, Karachi. The leaves were dried at room temperature under the shade for ten days, then grind in to fine particles using the vegetative grinder. Grinned leaves particles soak in distilled water for 48 hours and filtered. From filtrate water was evaporated by simple heating, the remaining residue was treated as aqueous extract¹². Stock solution were made by taking the 20-gram of aqueous extract and by adding 20 ml of distilled water, to make dilution of 01 g/ml solution. Stock solution was refrigerated and its serial dilutions were used in this experiments¹³.

Isolated perfuse rabbit's heart:

Experiment performed on isolated heart of healthy adult rabbits weighing 750 -1500 grams, kept under observation for a period of about 15-20 days prior to sacrifice. Preparation of isolated mammalian heart was based on langendorff methods^{14,15}. Ringer lock solution¹⁴ was used as a nutrient solution for retrograde perfusion to the isolated Rabbit's heart preparation.

Parameters:

In our experimental research work two parameters^{16,17} were selected.

- * Rate of isolated heart contraction as a rate of contraction.
- * Amplitude of isolated heart contraction as a force of contraction.

Drugs used:

Atenolol, Verapamil and aqueous extract of plant.

Data analyses:

Data was analyzed by simple mean and difference in mean, before and after drug / aqueous extract administration in retrograde perfusion solution. Difference / change in mean expressed in percentage (%).

OBSERVATION:**Recording:**

All data were recorded on grass polygraph model 7B, by means of force displacing transducer FT03C. Force displacement transducer was attached to the heart by means of heart clip and thread.

RESULT:

Six individual observations were recorded for drugs / extract as shown in table-1. Amplitude in mm and rate of contraction per 10 seconds were noted. In dose Strength of 10^{-9} g/ml, aqueous extract of mangrove plant possessed negative chronotropic and positive inotropic effect on isolated langendorff rabbit's heart preparation, as shown in table S.No: 01 (figure-1). Where as isolated perfused rabbit heart showed a standard behaviour against the standard known drugs like Atenolol^{17,18}, a Beta blocker, a sympatholytic drug induced a negative inotropic and chronotropic effect as shown in table S.No: 02 (figure-2). Where as Verapamil^{19,20}, a prototype calcium blocker drug, showed a negative inotropic and chronotropic effect as shown in table S.No: 03 (figure-3). The mangrove extract in a dose Strength of 10^{-9} g/ml, when administered with atenolol and verapamil, it produces the same response on isolated rabbit's heart as showed when given alone, i.e. negative chronotropic and positive inotropic effect as shown in table S.No: 04 (figure-4) and S.No: 05 (figure-5) respectively. Furthermore it is not assumed that from our observed data, neither atenolol nor verapamil modify or alter the effect produced by mangrove aqueous extract.

TABLE-I
Rate (per 10 seconds) and Amplitude (in mm) of Contraction of Isolated Rabbit's Heart.
(N = 06)

S.No:	Drug * / Extract *	Rate of contraction of Rabbit heart per 10 seconds				Amplitude of contraction in millimeters (mm)			
		B.D MEAN	A.D MEAN	Change in MEAN	% Change	B.D MEAN	A.D MEAN	Change in MEAN	% Change
01	Extract	15.1666	142500	- 0.9166	6.0435 Decrease	4.8333	5.7500	+ 0.9167	18.9663 Increase
02	Atenolol	16.5000	15.8300	- 0.6700	4.0606 Decrease	27.3333	26.5000	- 0.8333	3.0486 Decrease
03	Verapamil	14.000	13 2000	- 0.8000	5.7142 Decrease	21.6000	20.6000	- 1.000	4.6296 Decrease
04	Extract + Atenolol	16.2500	11.4166	- 4.8334	29.7435 Decrease	27.5000	33.7500	+ 6.2500	22.7272 Increase
05	Extract + verapamil	14.1000	13.5000	- 0.6000	4.2553 Decrease	18.5000	21.9000	+ 3.4000	18.3783 Increase

B.D = Before drug, A.D - After drug. N-Number of observations, *=Strength of 10⁹ g/ml

Figure 1

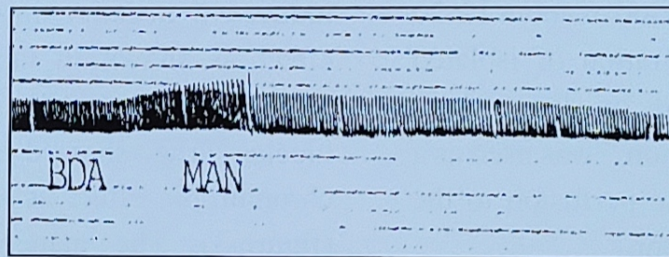


Figure 2

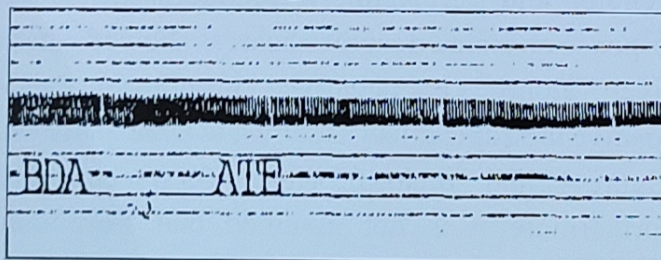


Figure 3

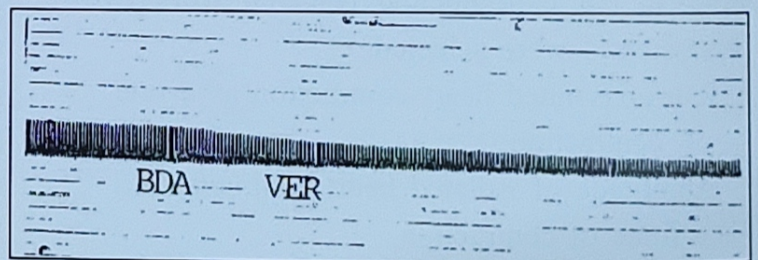


Figure 4

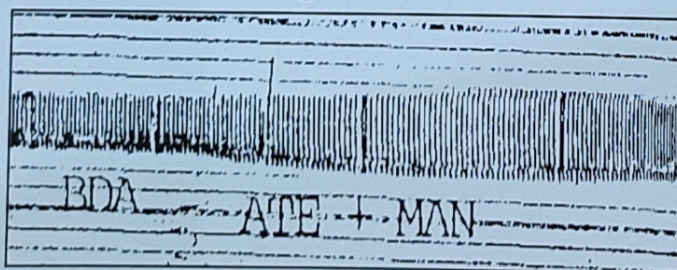
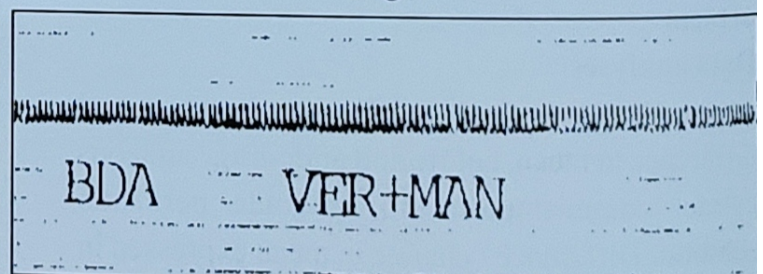


Figure 5



DISCUSSION:

As no any data is available, on the effect of mangrove plant on heart, so comparison is not possible on our observed / obtained data. In our observation extract showed biphasic response, in inotropic action, that is in initial phase we observed increase in inotropic effect and in later phase it showed decrease in inotropic effect, which is common occurrences in langendroff heart preparation¹⁵. The cardiac effect on isolated rabbit heart was observed in our basic research worked. Mangrove extract showed positive inotropic and negative chronotropic effect as shown in Table S.No: 01. Atenolol²⁰ and verapamil²¹ showed standard effect as shown in Table S.No: 02 and 03 respectively. We observed that atenolol and verapamil did not modify cardiac effect produced by Mangrove extract, as shown in Figure No: 04 and 05 respectively, these results suggested that extract does not act through the beta adrenoceptors or through the calcium channels. Digoxin has negative chronotropic and positive inotropic effect¹⁹. In our results, mangrove extract showed the similar cardiac effect as digoxin have. Hence it can be hypothesize that mangrove extract contains the cardiotoxic compound. The resemblance of effect of Mangrove extract and effect produce by Digoxin, indicates the presence of Cardio-active compound in Mangrove plant, which may be prove beneficial in the treatment of cardiac diseases such as congestive cardiac failure.

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