

A Research Work on Cardiotoxic Activity of Cassia Tora on Chicken Heart

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Abstract: *The emphasis on the use of medicinal plants had hitherto been placed on the treatment rather than prevention of diseases. Cardiotoxic agents are agents that have a strengthening effect on the heart or that can increase cardiac output. We have used chicken heart for our investigational studies. Our plant Cassia tora is a herbaceous annual herb. It is a dicot legume in the sub family Caesalpinioideae. This paper discusses the role, contributions & usefulness of Cassia tora plant in tackling the cardiovascular diseases.*

Keywords: Cardiotoxicity, Cassia tora

1. Introduction

Cassia tora is an herbaceous annual foetid herb. It is a dicot legume in the sub family Caesalpinioideae. Its name is derived from its Sinhala name 'Tore'. It grows wild in most of the tropics and is considered as a weed in many places. Its native range is probably South Asia. Its most common English name is Sickle senna.^(3,4,5,6)

Cardiotoxic agents are agents that have a strengthening effect on the heart or that can increase cardiac output. They may be cardiac glycoside, sympathomimetics, or other drugs. They are used after myocardial infarction; cardiac surgical procedure; in shock or in congestive heart failure. Cardiotoxic drugs exert a tonic effect by altering the transport of electrolytes across the myocardial membrane, causing in a decreased efflux of sodium and calcium and a decreased influx of potassium.⁽⁷⁾

2. Methodology

The Collection & authentication of plant material of *Cassia tora* is done by the botanist. The extraction of the leaves of the *Cassia tora* with water were carried out by soxhlet extraction technique. Also the preliminary phytochemical screening of *Cassia tora* is done using various phytochemical tests⁽⁸⁾.

Evaluation of Cardiotoxic Potential to study the effect of drugs on normal and hypodynamic chicken heart was done.

Principle: The myocardial contraction of normal heart takes place according to Starling's law of heart. According to this law cause of systolic contraction is directly proportional to fiber length in diastole. Since systolic contraction represents cardiac output and the fiber length in diastole indicates venous pressure, the law indicates that cardiac output (ie, stroke volume) is directly related to venous return or venous pressure during diastole. When the cardiac musculature fails to obey this relationship as in failing heart (ie, congestive heart failure) there will be decrease in stroke volume

(cardiac output) incomplete emptying of the ventricles during systole and enlargement of heart size due to residual blood in the heart at the end of systolic contraction. When the heart is in this state, ie inability to contract to physiological normal it is said to be a hypodynamic heart. Hypodynamic heart can be produced by perfusing the heart with thyroxine containing less quantity of calcium as this bivalent ion is essential for myocardial contraction.

Requirements

Animal organ – chicken heart

Drugs – digitalis (Digoxin stock solution 50 mg /ml)

Physiological solution : Modified tyrode solution

Procedure: Set up the perfusion of chicken heart with modified tyrode solution by stunning method. Record the effect of (0.1, 0.2, 0.4, and 0.5 ml) digoxin and calcium chloride (0.1, 0.2, 0.4, and 0.5 ml). Note the dose that gives an adequate response.

Replace the perfusion fluid with modified tyrode containing only ¼ th the calcium chloride as compared to that of normal tyrode. Note the changing the pattern of recording of the heart. When the heart is depressed markedly in presence of modified tyrode, administer Digoxin (0.1,0.2,0.4,0.5ml) and calcium chloride (0.1,0.2,0.4,0.5). Note the change in contractility. Fix the tracing and compare the responses of these drugs in normal and hypodynamic heart.⁽⁵⁾

3. Results and Discussion

Collection and authentication of plant material was done. Extraction of the *Cassia tora* leaves with water was carried out by soxhlet extraction technique. Preliminary phytochemical analysis for *Cassia tora* leaf powder by using water was reported.

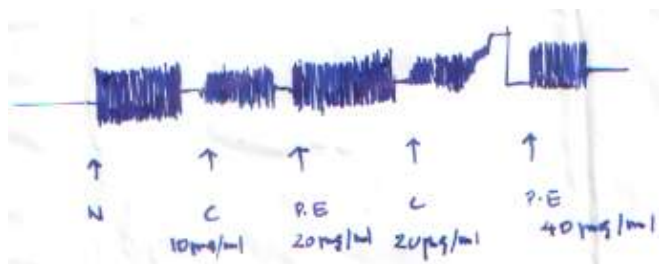
Evaluation of cardiotoxic potential

The cardiotoxic activity of the leaf extract of *Cassia tora* was studied by using modified tyrode solution on the isolated chicken heart. The responses were recorded on the kymograph.

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The graphical representation of cardiotoxic activity

The graph shows the potential cardiotoxic activity of our plant *Cassia tora* when incremental doses are added. *Cassia tora* showed significant increase in force of contraction. In isolated preparation of chicken heart the standard cardiotoxic drug digoxin is added and observed the increase in force of contraction. Addition of calcium on the chicken heart preparation increases the cardiac contraction. Later on addition of a higher concentration of calcium leads to cardiotoxicity and hence causes calcium reorg. Later addition of *Cassia tora* leaf extract in a higher dose, in the failing heart created a normal contraction and significantly increase cytosolic Ca^{2+} level similar to digoxin, which indicates that it can increase the force of contraction by increasing cytosolic Ca^{2+} level.

From this we identified that our plant has a cardiotoxic activity. *Cassia tora* showed increase in the force of contraction when compared to normal response.

4. Summary & Conclusion

Cardiotoxic drugs are those drugs which increase the force of contraction of failing heart, either normal or decrease heart rate and maintain effective circulation.

Cardiac glycosides and catecholamines have been used as the main therapeutic drugs in the treatment of congestive cardiac failure. However, the dangers of cardiac glycoside intoxication are well documented and doubts have been expressed about their long term effectiveness.

Our plant *Cassia tora* showed a significant increase in force of contraction in isolated preparation of chicken heart when compared to normal response. This indicates that *Cassia tora* possesses positive inotropic effect which can reduce the preload in heart.

Hypodynamic isolated heart preparation was used to evaluate cardiotoxic activity in heart failure like condition. In hypodynamic heart preparation, the heart was perfused with modified tyrode solution. *Cassia tora* showed significant increase in force of contraction compared to normal response in hypodynamic heart. This finding suggests that *Cassia tora* are effective in heart failure like condition in vitro.

Cassia tora can significantly increase cytosolic Ca^{2+} level similar to digoxin, which indicates that it can increase the force of contraction by increasing cytosolic Ca^{2+} level. Thus, *Cassia tora* has showed significant increase in force of contraction.

The present study revealed positive inotropic effect of *Cassia tora* leaves with no cardiac damage or other cardiac toxicity. Thus *Cassia tora* had been proved a potential cardiotoxic herb and could be choice of herb for the better and safer alternate of digitalis (digoxin).

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