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Mini Review

Phytochemical and Pharmacological Studies of *Cressa cretica*-A Well-known Antioxidant

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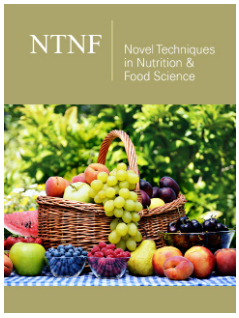

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Mini Review

Plant-derived antioxidants are molecules which donate electrons or hydrogen atoms. These compounds are able to form less reactive antioxidant-derived radicals, which are efficiently quenched by other electron or hydrogen sources to prevent cellular damage. Therefore, they help to delay and inhibit lipid oxidation, protect human cells against oxidative damage, leading to a reduced risk of several oxidative stress associated degenerative diseases, such as cancer, cardiovascular, or neurodegenerative diseases [1] and when added to foods tend to minimize rancidity, retard the formation of toxic oxidation products, help to maintain the nutritional quality and increase their shelf life [2].

Cressa cretica Linn. is a shrub belonging to the family Convolvulaceae which are weeds of pistachio orchards., distributed throughout middle east specially Iran, India, Timor, and Australia [3]? Very common along Abu Dhabi- Ras Al Khaima on raised sand and low dunes inland of sabkha; also, in plantations further east and north, always in sand [4]. Normally the whole plant is used as a tonic, stomachic, aphrodisiac, alterative and expectorant, and locally used for camel fodder (Fawzy Kotb, 1985). Boiled in water and taken internally as a tonic, aphrodisiac and expectorant. Dried leaves crushed with sugar taken as a treatment for jaundice [5-7]; (Figure 1).

Figure 1: Phytochemistry and Pharmacognosy

Phytochemistry and Pharmacognosy

Powdered plant material

The material consists of the pounded aerial parts. It is a dark yellowish-green coarse‹ gritty‹ heterogeneous‹ somewhat fine powder with some comparatively larger fragments. It has a pleasant slightly spicy to straw-like odour and a salty taste. Microscopically‹ the powder shows numerous covering trichomes of various types and different lengths, but they are mostly long conical‹ tapering or broad T-shaped ones, and the majority are detached from tissues while glandular trichomes with oval to rounded heads are normally attached. The powder also shows many green fragments of the leaves at different orientations exhibiting the characteristics observed in the fresh sample. Also shown are stem fragments of dark brown bark cells with their observable thick cell walls and also long compact vascular tissues with their narrow vessels and fibers (Figure 2).

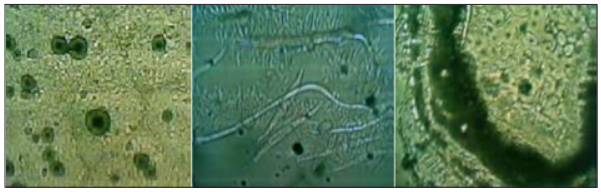

Figure 2: Parts studied: leaf and stem.

a) surface view of the leaf at the lower epidermis showing the intricate type of vascular network and some cluster crystals of calcium oxalate.

b) TS of the leaf at the lower epidermis showing long conical trichomes and T-shaped trichomes.

c) TS of the stem showing the different layers with the pith at the centre.

Chemical compounds

The isolation of syringaresinol-β-D-glucoside from *Cressa cretica* is reported. Coumarins‹ sterols quercetin and coumaranochromone glycoside [8]. N-Octocosanol‹ β-sitosterol‹ umbellierone‹ scopoletin‹ isopimpinellin‹ β-sitosterol D(+) glycoside and quercetin have been isolated [9]. The aerial parts revealed the presence of alkaloids‹ flavonoids‹ tannins‹ sterols and/or triterpens and coumarins [10]. The aerial parts of *Cressa cretica L.* yielded five flavonoids that were identified as: Quercetin; quercetin-3-β-O-D-glucoside; kaempferol-3-O-β-D-glucoside; kaempferol-3-O-α-L-rhamno-(1-+6)-β-D-glucoside; quercetin-3-O-α-L-rhamno-(1+6)-β-D-glucoside (rutin) [11]. Aquercetin glycoside detected [12]. B-sitosterol‹ its glucoside‹ n-octacosanol‹ umbelliferone‹ scopoletin‹ isopimpinellin and quercetin isolated B-sitosterol‹ its glucoside‹ n-octacosanol‹ umbelliferone‹ scopoletin‹ isopimpinellin and quercetin isolated [13]. The following chemical studies have been carried out on the aerial part of the plant *Cressa cretica*.

a) Physicochemical Constants (%)

b) Loss of weight in drying at 105 °C : 8. 60

c) Absolute alcohol solubility : 3.20

d) Water solubility : 14.40

e) Successive extractives (%)

f) Petroleum ether (60-80 °) : 2.20

g) Chloroform : 1.70

h) Absolute alcohol : 15.70

i) Ash values (%)

j) Total ash : 23.70

k) Water soluble ash : 14.10

l) Acid insoluble ash (10% Hcl) : 0.80

m) pH values (aqueous solution)

n) pH of 1% solution : 6.816

o) pH of 10% solution : 5.577

TLC fingerprint of Petroleum ether (60-80 ° track 1) and Methanol extract (track 2)

Mobile phase Figures (1&2): Ethyl acetate, methanol, water (100:13.5:10);

C: Toluene, ethyl formate, formic acid (5:4:1)

D: Toluene, ethyl acetate (93:7)

Detection B: UV366nm

Derivatization A, C&D: Vanillin- Sulphuric acid-vis.

The pharmacological and toxicological information reported in the literature about the plant

Cressa cretica ethanolic extract produced contraction of the isolated guinea pig ileum and the effect was inhibited by the atropine treatment. However‹ the chloroform extract did not elicit any response of the muscle. Both ethanolic and chloroform extracts antagonized the effect of acetylcholine on frog's rectus abdominis muscle to the same degree (Figures 3-7). The contraction of isolated diaphragm of rat induced by electrical stimulation of phrenic nerve were also inhibited‹ almost completely‹ in the dose of 4mg of ethanolic extract; the effect of chloroform extract was found less than the ethanolic extract quantitatively (Tables 1 & 2). The stimulation of sciatic nerve with 3V stimulus produced an appreciable contraction of gastrocnemius muscle‹ but these contractions were found gradually decreased on successive stimuli after the addition of a single dose of 2mg of ethanolic extract or chloroform extract. These results suggest that both the ethanolic and chloroform extract possess significant neuromuscular blocking activity [14].

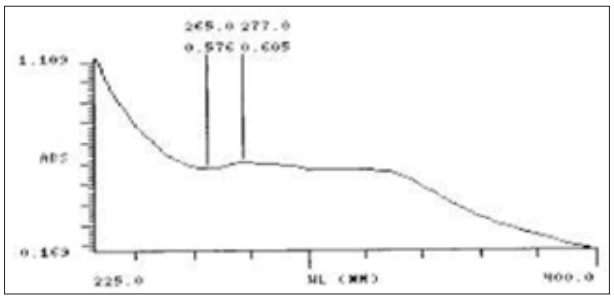

Figure 3: Intestinal Fluid simulated without pancreatic pH=7.5±0.1.

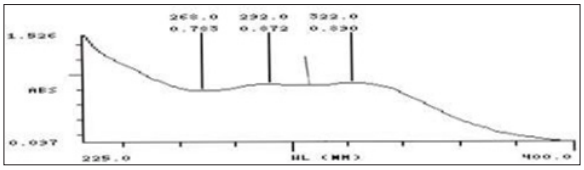

Figure 4: Fluid simulated without pepsin pH=1.2±0.1.

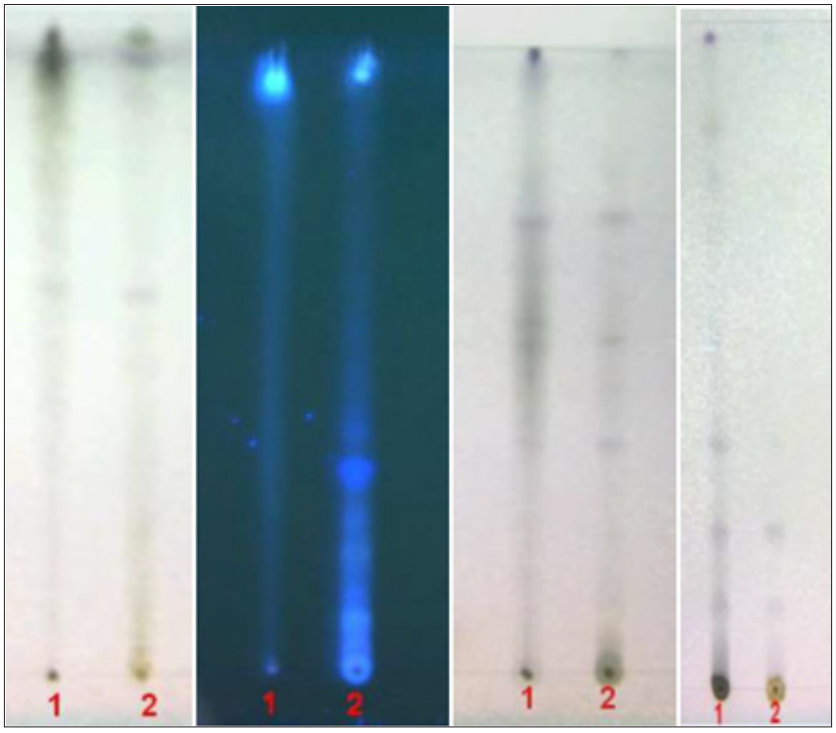

Figure 5.

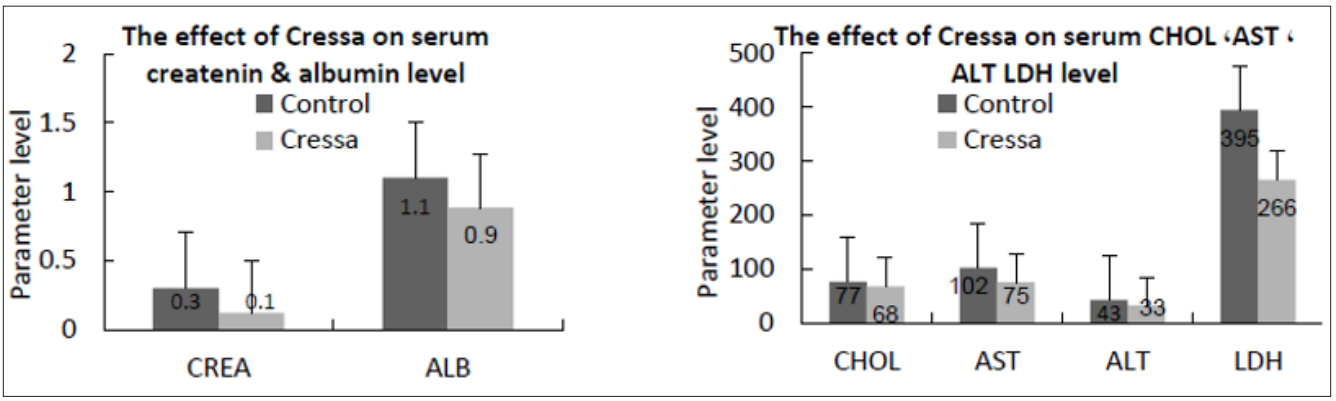

Figure 6.

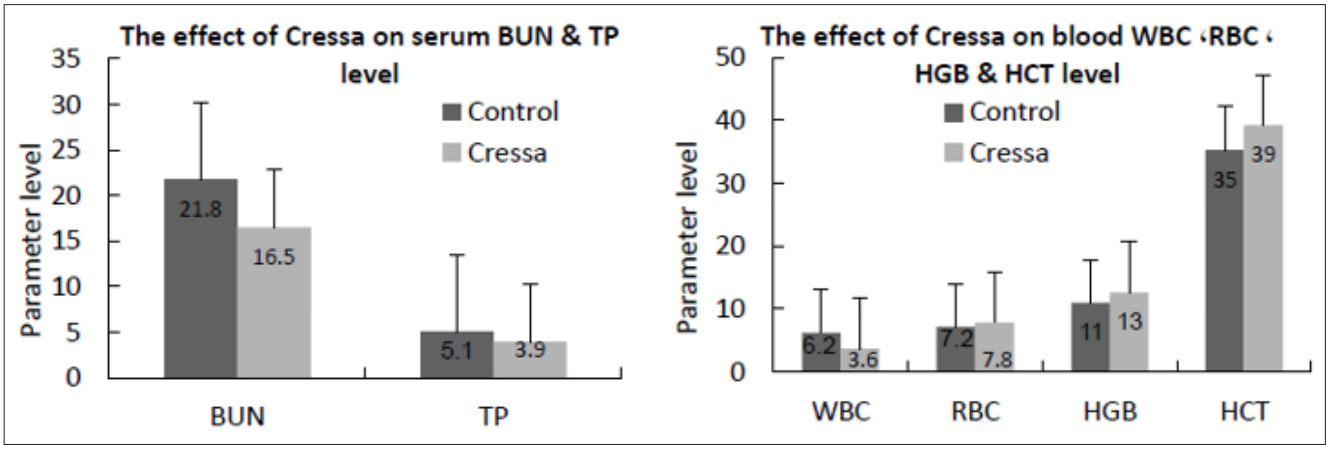

Figure 7.

Table 1: Elemental analyses.

Ash values (British Herbal Pharmacopeia-Reference)					
Assay and identification of element (AOAC International Reference)					
Apparatus	(AA-6800 Shimadzu-Flame method)				
Element	Std. conc. µg/ml(ppm)	Sample conc. mg/ml	Sample's absorbance	Actual conc. mg/ml	Actual conc. (%)
Cr	1،2،4	20.002	0.003	0.02155	0.02155
Zn	0.5،1،2	20.002	0.2484	0.1190350	0.0119035
Cu	0.5،1،2	20.002	0.0366	0.01746	0.001746
Fe	1،2،4	20.002	0.7358	1.410505	0.1410505
K	1،2،4	20.002	1.8931	1.071255	0.1071255
Pb	1،2،4	20.002	0.000	0.000	0.000
Cd	0.25،0.5،1	20.002	0.0002	0.000035	0.000035

1ppm conc. = 1µg/ml; Actual conc. (%) = Actual conc.(ppm)x0.0001 [1ppm=0.0001%]

UV Spectral studies.

Table 2: UV Spectral studies.

Ultraviolet Spectrum (USP reference)				
Apparatus	Milton Roy Spectronic Genesys 5 Spectrophotometer-Milton Roy			
Sample conc.(mg/ml)	Solvent	λ max(nm)	λ min(nm)	Abs.(λ max-λ min)
0.98	Intestinal Fluid simulated without pancreatic pH=7.5±0.1	277	265	0.605-0.576
1.014	Gastric Fluid simulated without pepsin pH =1.2±0.1	292 322	268 307	0.872-0.783 0.890-0.723

Cressa cretica plant was revealed as a weight reducing effect in animals [15]. On isolated rabbit heart، no significant effect of both ethanolic and chloroform extracts was observed. However، a fall in the blood pressure of anaesthetized rabbit by both the extracts was observed [16]. The fall of the blood pressure was blocked by atropine. The biochemical and hematological studies revealed that no significant changes in serum glucose، cholesterol and electrolytes levels. No appreciable changes in RBC، and WBC counts، hemoglobin levels، prothrombin time and fibrinogen levels were observed. The following pharmacological and safety evaluation studies were carried out on the aqueous extract of the plant (*Cressa cretica*) (Table 3).

Table 3.

Activity	Results			
	Strong	Moderate	Mild	Negative
Analgesic / writhing test	√			
Antidepressant				√
Anticonvulsant			√	
Anti-inflammatory	√			
Gastrointestinal activity				√
Effect on rabbit jejunum		√		
Effect on rat fundus				√
Effect on Guinea pig ileum			√	
Effect on Guinea pig tracheal chain				√
Effect on right rat atria	√			
Antithrombotic effect			√	
Studies on biochemical parameters	√			
Studies on hematological (RBC،		√		
HGB &HCT) increased↑				
Motor co-ordination (grip strength				√
& motor activity				
Rectal temperature				√
Body weight				√
Vital organs				√
Mortality				√
LD50=>5g/kg،p.o				

Result

Cressa critica plant extract produced a moderate inhibition of the isolated rabbit jejunum which revealed that the plant extract possesses pharmacological activity against diarrhea (Anti diarroheal activity/ antispsmotic activity/spsmolytic activity); showed mild anti-convulsion activity. The Effect on right isolated rat atria showed significant positive inotropic property on rat atria in vitro. Positive inotropic agents increase myocardial contractility، and are used to support cardiac function by increasing the strength of muscular contraction (Cardio tonic/cardioprotective effect/

myocardial stimulant)، having a tonic effect on the heart. The plant extract was found to decrease prothrombin time as compared to the control [17-20].

No broncho-dilatory effects were found on histamine- induced tracheal chain of the Guinea pig. The plant extract did not show anti-nociceptive activity and also devoid of antidepressant-like effect [21-23]. The plant extract tested on ear edema method for five days treatment failed to show significant anti-inflammatory activity. The LD50 of aqueous extract of plant was found to be greater than 10g/kg when administered once via gastric intubation in mice. (LD50 =>5g/kg، p.o.). Repeated dose toxicity studies; 1g/kg، p.o. /day for 15 days. No death was recorded from day 1 to day 10 of observation period. Following the plant extract administration at the dose of 0.5g/kg، 1g/kg b.w.، daily for 15 days (per os.) serum BUN، CREA، TP، ALB and AST were found significantly decreased. Whereas LDH، ALT and TBIL remained unchanged. No significant change was found in any other parameters studied، as compared to the control group. In the hematology studies the plant increased the blood RBCs، HGB، HCT and decreased the WBCs، while the other hematological parameters remained normal.

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