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**Original Research Article**

# The Clinical and Haematological changes in Rabbits exposed to *Melia azedarach* fruits under experimental conditions

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## Abstract

The study was conducted on 10 local breed rabbits, of 1-2 years age, of 1- 1.5 kg body weight .They were feed concentrated and green food, and left *ad libitum* for water, and kept in room of 20- 25$^0$C.The animals divided into two groups of 5 each. First as treated group received the plant in powder form mixed with the food at a dose rate of 5 g/ animal / day for three weeks, while the second left without exposure as a control group .The main dependent parameters in the study were, clinical parameters (body temperature, heartbeat, respiratory rate, body weight, in addition to monitor any abnormal signs appear on the animals. While the main haematological parameters were included, RBC count, WBC count, Hb concentration,PCV percentage, Red cell indices, bleeding time and clotting time.

The body temperature, respiratory rates, heart rate were increased. The body weight decreased.The bleeding time and clotting time were prolonged. The erythrocyte count, Hb concentration, and MCV values were decreased; PCV and MCHC did not showed any significant changes. The MCH increased. The total leucocytes count and the basophiles percentage did not showed any significant changes. The Heterophils and monocytes percentage increased .The lymphocytic and Eosinophil percentage were decreased during the study.
**Keywords:**Hematological, *Melia azedarach* fruit, Rabbits

## 1. Introduction

*Melia azedarach* (Sibahbah) belongs to family Meliaceae (Mahogony) subfamily Meloideae, which include 50 genus and 800 species [1]. The genus Melia contains 25 species [2]. In Iraq the plant has many names: Zanzalakht in Kurdish, lialic in Mosul and sibhabah in Baghdad[3][4],[5]. The plant is known to be toxic for human and animals[6][7],[8]. The fruit is more toxic than leaves and other parts of plant[8]. The oil of Sibhabah fruits used for burn, antihelminthcs, disinfectant for wounds, antipyretic emetic, release spasms and nervous pain[9]-[12]. Therefore we designed this study to observe the clinical and hematological changes in rabbits exposed to plant's fruits under experimental conditions.

## 2. Material and methods

The study was conducted on 10 local breed rabbits, of 1-2 years age, of 1- 1.5 kg body weight. Rabbits were feed concentrated and green food, and left *ad libitum* for water. They kept in room of 20-25$^0$C, with half day light. The animals were divided into two groups of 5 each. One as exposes received the plant as powder form mixed with the food at a dose rate of 5 g/animal/day for three weeks .the other left without exposure as a control group. The main parameters depended in the study include clinical parameters (body temperature, heartbeat, respiratory rate in addition to monitor the appetite, faeces, and any abnormal signs appear during the study). For haematological we collected blood sample in vials containing EDTA as anticoagulant and the main haematologicalparameters (RBC count, WBC count, Hb concentration, PCV, Red cell indices, Bleeding time and Clotting time) were observed[21]. The results were statistically analyzed according to Blood and Radostits[13].

## 3. Results

The study revealed that body temperature was significantly increased during the second week post exposure to plants at (P<0.01) in comparison with the pre - exposure value), and at (P<0.05) in comparison with the first week values. During the third week post exposure increased significantly at (P<0.01) in comparison with pre-exposure, first week, and second week post exposure (Table 1).

The respiratory rates showed a significant rise in the rate during the first week post exposure to plants at a level of (P< 0.01) in comparison with pre-exposure values. then it decreased during the second week post exposure, became significant at(P<0.05) in comparison with the first week, then it further decreased during the third week post exposure and was significant at a level of (P< 0.01) in comparison with first week, and (P<0.05) in comparison with the control group in the same week(Table 1).

Heart beats were significantly increased during the first week post exposure at a level of (P<0.05) in comparison with the pre-exposure levels.During the second week of the study, continued in rising and showed a significant difference at a level of (P < 0.01) in comparison with the levels during the first week post exposure, and continued to reach the maximum levels during the third week post exposure, showing a significant changes at a level of (P<0.01) in comparison with the value of 1st week (Table 1).The body weight did not show any significant changes during the study (Table 1).

The bleeding time showed a non-significant increase during the first week post exposure to plant. During the second week post exposure reached, the level which was significantly higher than in pre-exposed period at a level of (P<0.05), during the third week post exposure to plant it reached the maximum levels, there was a significant difference at a level of (P<0.01) in comparison with the pre- exposed time and at a level of (P<0.05) in comparison with the first week post exposure level (Table 2).

The clotting time showed a significant increases during the first week post exposure at P < 0.05 in comparison with pre- exposure values, and (P< 0.05) in comparison with value of control group, then continued in significant rises during the second which was significant at a level of (P<0.05) in comparison with the pre- exposed time, and (P<0.01) in comparison with value of control group.During the third week post exposure to plant it increased more and was significant at P<0.05 in comparison with pre-exposure and (P<0.01) in comparison with control group(Table 2).

The total erythrocyte count decreased significantly during the first week post exposure to plant, which was significantly different at a level of (P<0.05) in comparison with pre- exposure value. During the second week post exposure, decreased more and was significant at (P<0.01) level in comparison with the pre- exposure level and during the third week, the level continued in decrease reached a which was significant at a level of (P<0.01) in comparison with the pre- exposure level (Table 3).

The haemoglobin values showed a significant decrease in level during the first week post exposure to plant which was significantly different at (P<0.01 ) in comparison with pre–exposure value. During the third week post exposure to plant which was significant at (P<0.05) in comparison with the pre- exposure time level (Table 3).

The packed cells volume did not showed any significant difference during the study.Mean corpuscular volume significantly increased during the first and second weeks of the study which was significant at (P<0.05) in comparison with pre- exposure.During the thirds week post exposure to plant, it was at (P<0.05) in comparison with pre- exposure and control group (Table 3).

The mean corpuscular haemoglobin was significantly increased during the second week post exposure to plant which was significantly different at a level (P<0.05) in comparison with pre- exposure values. During the third week which was significantly differ at a level of (P<0.05) in comparison with the pre- exposure level and with the level in control group at the same time (Table 3). The mean corpuscular haemoglobin concentration did not show any significant changes during the experiment.

The total leucocytes counts was significantly decreased during the third week post exposure to the plant, at a level of (P<0.05) in comparison with the level in pre- exposure time and the level during the first week post exposure. The level during the second week post exposure was not significantly decreased (Table 4).

The Heterophils percentage was significantly increased during the second, which was significant at a level of (P<0.05) in comparison with the pore-exposure time level. During the third week was significantly higher at a level of (P<0.05) in comparison with the pre- exposure time level, and at a level of (P<0.01) in comparison with the levels during the first week post exposure and control group (Table 4).

The lymphocytes percentage was not significantly increased during the first week post exposure. During the second week was significantly decreased at a level of (P<0.05) in comparison with the

value during the first week and at a level of (P<0.01) in comparison with control group. During the third week it reached the minimum level which was significantly differ at a levels of (P<0.01) in comparison with the values in pre- exposure time and the value during the first post exposure to plant (Table 4).

Eosinophils percentage during the second week showed a significant decreased at a level of (P<0.05) in comparison with the pre- exposure time level, and at a level of (P<0.01) in comparison with the level in first week post exposure. During the third week post exposure to plant the level although rise in comparison with the level in second week post exposure as, but still significantly lowered than pre- exposure time level and was significantly different at a level of ( P<0.01) in comparison with level during the seconds week post exposure (Table 4). The values of monocytes and basophils did not significantly differ during the study.

**Table 1:Showed the changes in body temperature, respiratory rates, heart rates and body weight**

| Parameter | Group | Week | | | |
|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 |
| Body Temperature ($^0$C) | Treated | 37.55 ±0.19 | 37.1±0.36 | 38.34±0.25$^{a**b*}$ | 39.16±0.16 $^{abc**}$ |
| | Control | 37.55±0.19 | 37.85±0.32 | 37.02±0.36 | 37.17±0.18 |
| Respiratory rates (minute) | Treated | 104.7±8.38 | 205.6±24.74$^{a**}$ | 140 ±38.21$^{b**}$ | 145±10.89$^{b**}$ |
| | Control | 104.7±8.38 | 150±17.35 | 141±8.10 | 146.25±15.65 |
| Heart rates Beat / minute | Treated | 226.2 ±19.17 | 319.8 ±27.50$^{a**}$ | 347.6 ±22.25$^{ab**}$ | 398 ±37.03$^{abc**}$ |
| | Control | 226.2±19.17 | 221±14.36 | 281.5±33.09 | 282.5±41.70 |
| Body weight (Kg ) | Treated | 1.46±0.14 | 1.53±0.15 | 1.43±0.11 | 1.41±0.12 |
| | Control | 1.46±0.14 | 1.46±0.18 | 1.49±0.15 | 1.47±0.12 |

The values are expressed in Mean±SE;[a] mean significance in comparison with 0 time of treated group;[b] in comparison with 1[st]week;[c] in comparison with 2[nd]week;[A] significance in comparison with control group in the same week;[*] Significance at P < 0.05;[**] at P < 0.01.

**Table 2: Showing the bleeding and clotting time**

| Parameter | Group | Week | | | |
|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 |
| Bleeding time (Seconds) | Treated | 18.5±4.54 | 29±7.50 | 37.2 ±9.15 $^{a*}$ | 46 ±5.35$^{a**b*}$ |
| | Control | 18.5 ±4.54 | 30±7.90 | 25 ±6.12 | 28.75±9.43 |
| Clotting time (Seconds) | Treated | 33.2 ±5.39 | 50 ±9.51$^{aA*}$ | 59.6 ±11.10$^{a*A**}$ | 82 ±29.08$^{a*A**}$ |
| | Control | 33.2 ±5.39 | 18.75±2.39 | 20.25±8.26 | 21.75±13.90 |

The values are expressed in Mean±SE; [a] mean significance in comparison with 0 time of treated group; [b] in comparison with 1[st] week; [c] in comparison with 2[nd] week;[A] significance in comparison with control group in the same week. [*] Significance at P < 0.05; [**] at P < 0.01.

**Table 3: Showing: Erythrocyte count, Hb concentration, PCV, M CV, MCH, MCHC**

| Parameter | Group | Week | | | |
|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 |
| RBC X $10^6$ / µl | Treated | 5.45 ±0.60 | 4.09 ±0.29$^{a*}$ | 4.05 ±0.25$^{a**}$ | 3.81 ±0.15$^{a**}$ |
| | Control | 5.45±0.60 | 4.34±0.45 | 4.87±0.34 | 4.87±0.46 |
| Hb g/ dl | Treated | 13.18 ±0.86 | 11.5 ±0.38$^{a*}$ | 12.02±0.63 | 11.74 ±0.20$^{a*}$ |
| | Control | 13.18±0.86 | 12.07±0.56 | 12.25±0.67 | 12.55±0.70 |
| PCV% | Treated | 35.8±3.41 | 34±1.09 | 35.2±1.88 | 34.6±0.40 |
| | Control | 35.8±3.41 | 35.5±1.55 | 36±1.91 | 34.75±0.75 |
| MCV fl | Treated | 68.93±8.89 | 84.28 ±5.16$^{a*}$ | 92.97 ±6.63$^{a*}$ | 91.48 ±4.41$^{aA*}$ |
| | Control | 68.93±8.89 | 74.38±9.05 | 76.36 ± 13.14 | 73.36 ± 7.21 |
| MCH pg | Treated | 25.04 ± 2.98 | 28.52 ± 1.83 | 31.66 ± 2.31$^{a*}$ | 31.05 ±1.65$^{aA*}$ |
| | Control | 25.04±2.98 | 28.70±3.12 | 25.30 ± 5.63 | 26.24 ±1.97 |
| MCHC g/ dl | Treated | 36.94 ± 3.26 | 33.81 ± 0.13 | 34.03 ± 0.11 | 33.78 ±0.22 |
| | Control | 36.94 ±3.26 | 34.68 ± 0.66 | 34.01 ± 0.13 | 36.15 ± 2.16 |

The values are expressed in Mean±SE; [a] mean significance in comparison with 0 time of treated group; [b] in comparison with 1[st] week; [c] in comparison with 2[nd] week;[A] significance in comparison with control group in the same week. [*] Significance at P < 0.05; [**] at P < 0.01.

**Table 4: showing the total leucocytes count; and leucocytes pictures**

| Parameter | Group | Week | | | |
|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 |
| WBC $X10^3$/ µl | Treated | 5260 ± 644.35 | 5570 ± 262.05 | 4010 ±453.28 | $2980^{ab*}$±462.39 |
| | Control | 5260 ±644.35 | 5700 ±750.83 | 5225 ±919.35 | 5137.5±1191.70 |
| H% | Treated | 38.8 ±4.38 | 42.2±5.01 | $61.4^{a*bA**}$±4.44 | $66.4^{a*bA**}$±2.98 |
| | Control | 38.8±4.38 | 39.25±3.88 | 34.25±4.02 | 40.25±4.00 |
| L% | Treated | 49.6±2.56 | $51^{a*}$±4.70 | $36.4^{b*A**}$±4.75 | $26.4^{bA**}$±3.27 |
| | Control | 49.6±2.56 | 42.75±4.98 | 54±3.87 | 45.75±3.19 |
| E% | Treated | 8.3±3.40 | 2.8±0.58 | $0.2^{a*b**}$±0.20 | $1.8^{c**}$±0.37 |
| | Control | 8.3±3.40 | 5±0.70 | 2±0.28 | 3.25±0.47 |
| M% | Treated | 2.8±0.62 | 3.2±0.49 | 1.8±0.86 | 3±0.63 |
| | Control | 2.8±0.62 | 3.25±0.62 | 1.25±0.25 | 2.75±0.25 |
| B% | Treated | 0.5±0.24 | 0 | 0.2±0.20 | 0 |
| | Control | 0.5±0.24 | 0.75±0.47 | 0 | 0 |

The values are expressed in Mean±SE; [a] mean significance in comparison with 0 time of treated group; [b] in comparison with 1st week; [c] in comparison with 2nd week;[A] significance in comparison with control group in the same week. [*] Significance at $P < 0.05$; [**] at $P < 0.01$.

## 4. Discussion

The results revealed increased in body temperature, respiratory rate and heart beats, while body weight did not showed a change.

The respiratory signs can be attributed to the cyanogenic glycosides, as these compounds lead to liberation of hydrocyanic acid which is toxic to both human and animals, as it cause histotoxic anoxia and tissue asphyxia through inhibition of cytochrome oxidase enzyme system which is necessary for cellular respiration[13].In addition to the effect of methaemoglobinemia[14].Tachycardia, pulmonary congestion, dyspnea, accompanied by hypoxia as a results of occurrence of anemia, decrease Hb as a compensatory mechanism as it reflect a systemic reaction of increase respiratory rate, mean heart beat in addition to increase in body temperature[15].

The results of the study revealed a haematological changes represented by prolonged bleeding and clotting times, reduce haemoglobin concentration, and total erythrocyte count. MCV, MCH, and MCHC were increased; PCV and MCHC no changes.

In rabbit these can result from the haemolytic anemia of macrocytic normochromic type anemia, this can be attributed to the rapid hemolysis due to presence of saponin, triterpentines that lead to increase total leucocytes count associated with haemolytic anemia with increase in bone narrow activity[16]. As known the saponin compound can absorbed to blood circulation and lead to rupture of Cellular membranes of erythrocytes as a result of effect of this Compound on the phospholipids in the cell membranes[17][18]. WBC decreased, H% increased, L% decreased, E% decreased, M% and B% no change. The decrease in lymphocytes and increase in neutrophils numbers can be explain by decline in level of alpha/ beta interferon physiology[19][20] Increase in eosinophils especially in rats attributed to coumarin compounds which stimulate secretion of histamine that lead to increase eosinophils.[16],[21]

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