



Original Contribution

HAEMATOLOGICAL STUDIES ON JIMSON WEED (*DATURA STRAMONIUM*) INTOXICATION IN HORSES

R. Binev*, I. Valchev, J. Nikolov

Department of Internal Medicine, Faculty of Veterinary Medicine, Trakia University, Stara Zagora, Bulgaria

ABSTRACT

Laboratory monitoring of changes in some blood parameters in horses intoxicated with Jimson weed was carried out. It was established that the intoxication was accompanied by hyperchromaemia, erythrocytosis, leukocytosis, neutrophilia and regenerative shift, lymphocytopenia, aneosinophilia, increased haematocrit values and low erythrocyte sedimentation rate.

No changes occurred in the mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC).

The studied blood laboratory parameters returned to normal between post intoxication days 2 and 5.

The data presented could be used in the rapid and correct diagnostics and effective treatment of this intoxication.

Key words: intoxication, Jimson Weed (*Datura stramonium*), horses, haematological indices

INTRODUCTION

The Jimson Weed (*Datura stramonium*) is a widespread annual plant from the *Solanaceae* family (1, 2) In Bulgaria, it is most commonly encountered in maize and sunflower fields as a result of ineffective use of herbicides and inadequate mechanical soil cultivation. More rarely, it could be seen in uncultivated lands, meadows, pastures, alfalfa, cereals (wheat, barley etc) (3, 4).

The toxins in Jimson Weed are tropane belladonna alkaloids, which possess strong anticholinergic properties. These alkaloids include: hyoscyamine (leaves, roots, seeds), hyoscyne (roots); atropine (d,l-hyoscyamine) and scopolamine (l-hyoscyne), as well as sitosterol and proteins (2, 5). All parts of the plant are toxic, but the highest amount of the alkaloids is contained in ripe seeds (5, 6). They act as competitive antagonists of acetylcholine at peripheral and central muscarinic receptor sites (1, 5-7). Poisoning results in widespread paralysis of parasympathetic innervated organs (2, 5-7).

The wide distribution, the strong toxicity and the potential for occurrence in foodstuffs are responsible for the numerous

incidents in humans (8-14).

The cases of Jimson weed intoxication in animals are considerably less frequent – cattle (15, 16), swine (17 - 20), dogs (21, 22), sheep and goats (23) and poultry (3, 24). In horses, poisoning has occurred after ingestion of Jimson weed seeds (25-29).

In the literature, the possibility of intoxication after ingestion of silage containing Jimson weed is reported (1, 2, 16), but there are no communications on horses that have consumed the poisonous plant with maize, prior to its silaging.

This motivated our laboratory study on the blood changes occurring in horses after Jimson weed intoxication with regard to the rapid and correct diagnosis and prognosis and, consequently, effective treatment of this intoxication.

MATERIALS AND METHODS

In October 1999, three stallions were referred by the Clinic of Internal Diseases and Clinical Toxicology to the Faculty of Veterinary Medicine, Stara Zagora. The history revealed that 18 hours before, 34 horses, owned by the Horse Station of the Faculty of Agriculture of the Trakia University, were fed *ad libitum* with freshly harvested and chopped maize that was to be used for ensiling, heavily contaminated with young *Datura stramonium*

* **Correspondence to:** Rumén Binev, Department of Internal Medicine, Faculty of Veterinary Medicine, Trakia University, Student Campus, 6000 Stara Zagora, Bulgaria; Tel.: +359 42 699530, E-mail: binew@abv.bg

plants. All animals that ingested the forage manifested signs of intoxication to varying degrees; the animals referred to the clinic being those with the most evident clinical signs.

Examination in situ showed that the horses were aged between 3 and 14 years, with a live body weight of 400–600 kg, and were from various breeds (Trakehner, Hanoverian, Danube, East-Bulgarian, Arabian etc.) and types. The animals were from both genders: 18 mares, 12 stallions and 4 geldings.

Depending on the degree of clinical symptoms, the animals were divided into 3 groups:

- Group one (n=18) – horses with typical clinical symptoms: 9 stallions, 1 gelding, 8 mares, 3 of them pregnant.
- Group two (n=16) – horses with atypical symptoms: 3 stallions, 3 geldings, 2 pregnant mares, and 8 lactating dams (the suckling foals were not included in the group).

- Group three (n=18) – horses (owned by the Mounted police), housed in the same premises under similar conditions, but fed another forage, serving as controls.

By days 1, 2, 3, 4, 5, 6 and 7 after the incident, blood was sampled from v. jugularis for determination of: haemoglobin content (HGB; g/L), red blood cell counts (RBC; T/L), haematocrit (HCT; %), mean corpuscular volume (MCV; fl), mean corpuscular haemoglobin (MCH; g/dL), mean corpuscular haemoglobin concentration (MCHC; g/dL) on an automated analyser (Cell dyn 4500, USA), the erythrocyte sedimentation rate (ESR; mm) on an automated analyser (Greiner bio one, Austria).

All results were statistically processed using the ANOVA test (Statistica software). The significance of differences was evaluated vs the control group for each time interval. The results were determined as statistically significant at the $p < 0.05$ level.

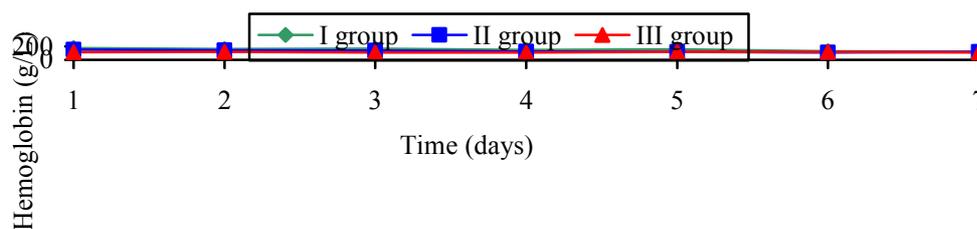


Figure 1. Changes in haemoglobin content in horses after intoxication with Jimson weed (*Datura stramonium*) (groups I and II) and controls (group III). ^a $p < 0.05$; ^b $p < 0.01$; ^c $p < 0.001$

RESULTS

The haemoglobin content (**Figure 1**) in group I was higher between post intoxication days 1 and 5 vs controls. The peak values in groups I and II were measured by the 1st day: 178.4±12.5 g/L ($p < 0.001$) and 154.7±10.3 g/L ($p < 0.01$) vs control determinations (112.4±9.2 g/L).

Red blood cell counts (**Figure 2**) in horses from groups I and II were elevated only during the first day: 13.12±1.12 T/L ($p < 0.01$) and 11.68±0.84 T/L ($p < 0.05$), respectively, compared to control levels

(8.45±0.62 T/L).

The average ESR values measured by the 15th min (**Figure 3**) in group I revealed a reduction during the first three days of the period of survey. The lowest values of this parameter were registered by post intoxication day 1 in groups I and II – 2±0.5 mm ($p < 0.001$) and 11±0.5 mm respectively ($p < 0.001$ than the control group – 35±4.5 mm).

The ESR determination by min 30 (**Figure 4**) in group I showed decreased values of the parameters from the 1st to the 3rd day. The lowest values were observed on the

1st day: 10±1 mm (p<0.001) and 18±2 mm 55±7 mm.
(p<0.001) in groups I and II than in controls –

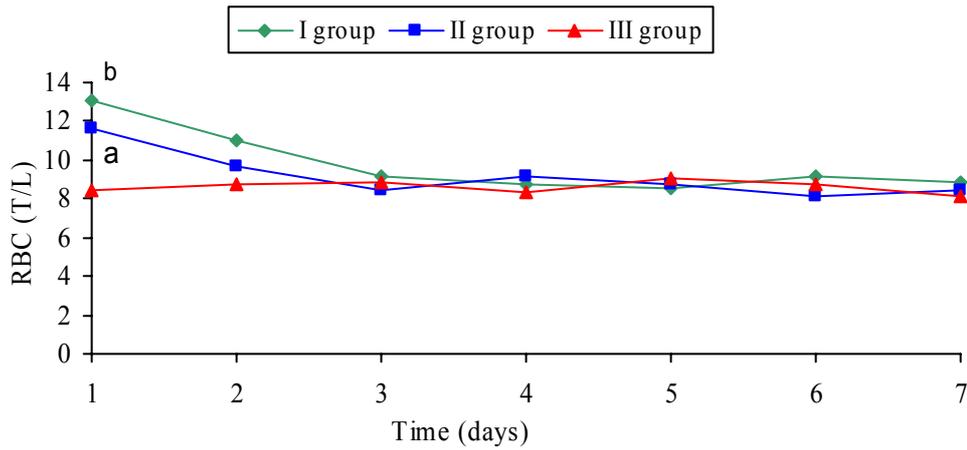


Figure 2. Changes in red blood cell counts in horses after intoxication with Jimson weed (*Datura stramonium*) (groups I and II) and controls (group III). ^ap<0.05; ^bp<0.01; ^cp<0.001

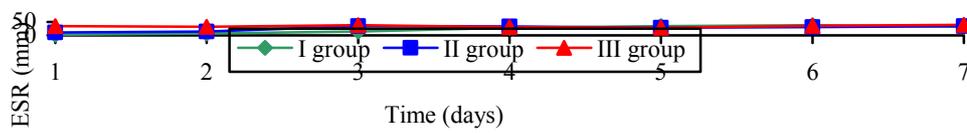


Figure 3. Changes in erythrocyte sedimentation rate (determined at 15 minutes) in horses after intoxication with Jimson weed (*Datura stramonium*) (groups I and II) and controls (group III). ^ap<0.05; ^bp<0.01; ^cp<0.001

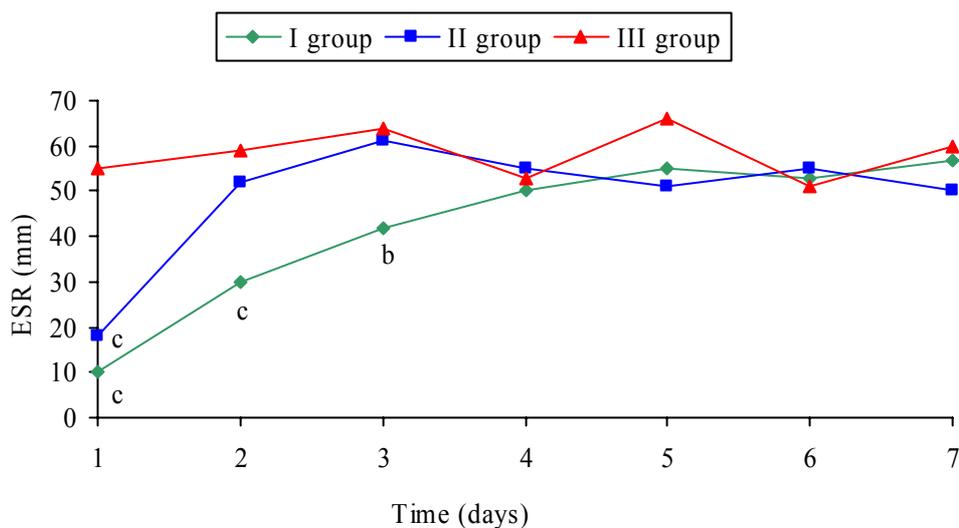


Figure 4. Changes in erythrocyte sedimentation rate (at 30 minutes) in horses after intoxication with Jimson weed (*Datura stramonium*) (groups I and II) and controls (group III). ^ap<0.05; ^bp<0.01; ^cp<0.001

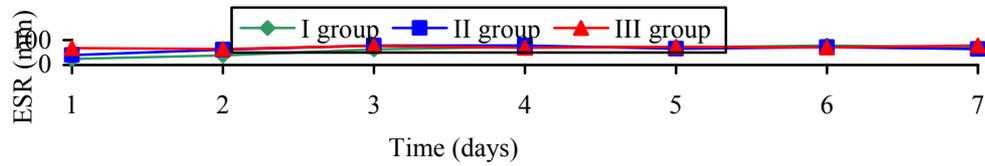


Figure 5. Changes in erythrocyte sedimentation rate (determined at 45 minutes) in horses after intoxication with Jimson weed (*Datura stramonium*) (groups I and II) and controls (group III). ^a $p < 0.05$; ^b $p < 0.01$; ^c $p < 0.001$

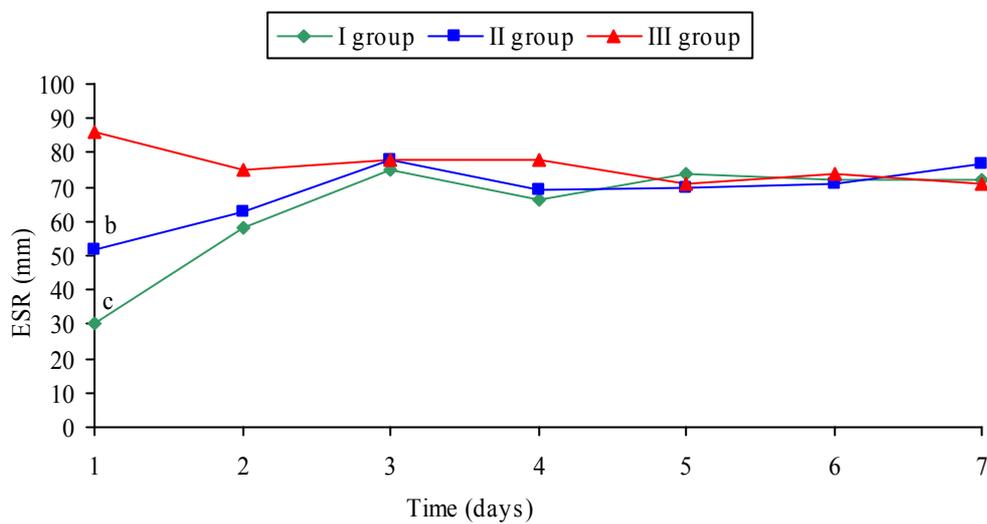


Figure 6. Changes in erythrocyte sedimentation rate (determined at 1 hour) in horses after intoxication with Jimson weed (*Datura stramonium*) (groups I and II) and controls (group III). ^a $p < 0.05$; ^b $p < 0.01$; ^c $p < 0.001$

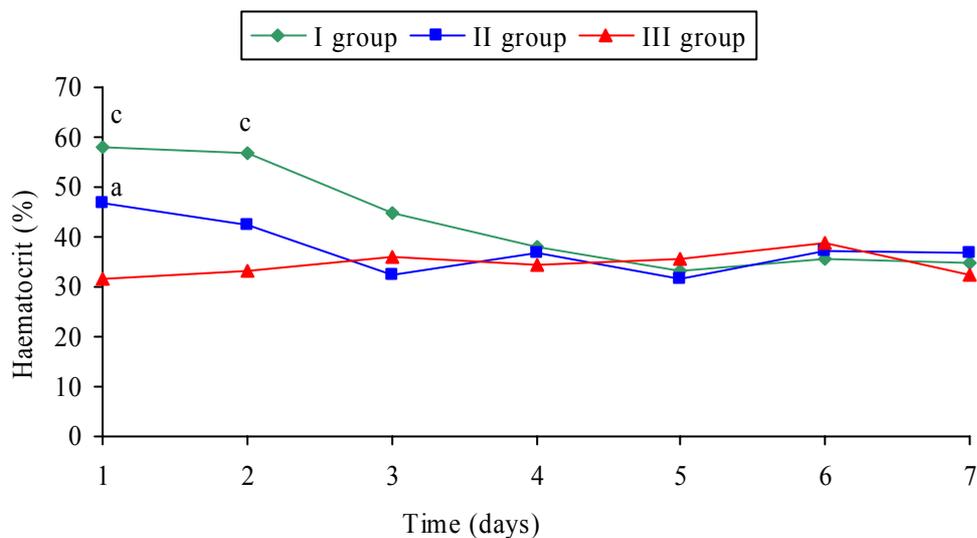


Figure 7 Changes in haematocrit content in horses after intoxication with Jimson weed (*Datura stramonium*) (groups I and II) and controls (group III). ^a $p < 0.05$; ^b $p < 0.01$; ^c $p < 0.001$

The tendency towards lowering of ESR was still present in measurements on min 45 (**Figure 5**). The lowest values by day 1 were 25 ± 3 mm in group I ($p < 0.001$) and 40 ± 5 mm in group II ($p < 0.001$). The control levels at this time interval were 68 ± 5 mm.

The ESR values by hour 1 (**Figure 6**) showed low ESR only by post intoxication day 1 in both groups: 30 ± 5 mm ($p < 0.001$) and 52 ± 5 mm ($p < 0.01$), respectively, vs controls of 76 ± 6 mm.

Haematocrit (**Figure 7**) in horses from group I increased on post intoxication days 1 and 2. The highest levels were those of day 1 – 58.2 ± 6.2 % ($p < 0.001$). In group II the increase was observed only on day 1: 46.8 ± 5.3 % ($p < 0.05$ vs controls – 31.8 ± 3.6 %).

Significant changes in the mean corpuscular volume, mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration were not found out ($p > 0.05$).

DISCUSSION

The toxic effect of Jimson weed was characterized by changes in the values of studied haematological parameters – increased haematocrit, hyperchromaemia, erythrocytosis, leukocytosis, neutrophilia, lymphocytopenia, aneosinophilia and low ESR.

Our data about the increased haematocrit were probably connected with the absence of thirst observed during the study and other authors as well (10, 16–20, 25–28). High haematocrit levels were responsible for measured higher RBC counts and haemoglobin content in intoxicated horses. Our studies gave evidence for a rapid dynamics of ESR lowering. The observed changes could be related to the simultaneous increase in biliary pigments in blood (bilirubinaemia) and increased haematocrit values (9–11, 15–19, 23, 25–28).

CONCLUSIONS

1. The intoxication with Jimson weed in horses was characterized by changes in some haematological indices – hyperchromaemia, erythrocytosis, increased haematocrit values, low erythrocyte sedimentation rate.
2. The normalization of parameters after 4-5 days was indicative of the favourable issue of the intoxication.

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