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## DRUG STANDARDISATION

# Biochemical and Haematological Evaluation of Different Potencies of Homoeopathic Drug *Ricinus Communis*

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**Although the seeds and / or oil of *R.communis* have been reported to be highly toxic, these seeds are being used in nursing women to increase the flow of milk. There is therefore a need to generate data on the biochemical and haematological profiles. Four potencies (3x, 6x, 12x and 30x) of this drug were administered orally in daily doses of 0.1 ml, 0.2 ml and 0.5 ml/rat for 14 days. The biochemical and haematological profiles of animals were studied on 21st and on 28th day during post -treatment period. Preliminary studies carried out with 4 potencies of *R. communis* on biochemical ( serum glucose, serum cholesterol , serum triglycerides, serum total protein, serum albumin, serum urea and serum SGOT and serum SGPT levels) and on haemotological (haemoglobin, total R.B.C. and W.B.C and differential leucocytes counts) profiles showed variable effects of different potencies of *R. communis* but mostly within the normal range of healthy animals. Only one rat in 12x potency group showed spear/spindle shaped R.B.C. with very less haemoglobin content. Further study is needed to confirm the effect of 12x potency on haematological profiles. The effects of *R. communis* significantly reduced on body weights of rat while on while no apparent difference in behaviour of animals was observed during and 14 days post-treatment.**

**Key words:** ricinus communis, homoeopathy, potencies, biochemical and haematological profiles, albino rats.

## Introduction

Homoeopathic drugs are assumed to be safe for clinical use even when some of the mother tinctures originate from highly toxic materials but lack documentary evidence on scientific basis. There are reports that *Ricinus communis,* even in very low doses is highly toxic, 10-20 seeds can be fatal in adults and 05 (seeds) in children[1]. The most marked signs of intoxication are those of acute gastroenteritis. Rapid loss of water and electrolytes results in the risk of hypovolumic shock. Gastrointestinal bleeding, haemolytic anaemia, and hypoglycaemia are frequently seen[2]. In modern medicine, castor oil is used as a purgative and making contraceptive jellies and creams. A gel prepared from castor oil is a good protective in occupational eczema and dermatitis. Few drops of the oil are instilled in the eyes to cure conjunctivitis and soreness after removal of foreign body from the eyes [3,4]. Homoeopathic medicine prepared in different potencies (3x, 6x, 12x and 30x) is prescribed regularly by homoeopathic physicians for patients suffering from various ailments and to promote milk secretion in lactating mothers[5]. Its proving symptoms include anorexia with great thirst, burning in stomach, nausea, profuse vomiting, colic, incessant diarrhoea and purging. Rice water stools with cramps and chilliness is the characteristic symptoms[5]. In order to validate their safe use in clinical practice and to carry out their safety evaluation in experimental animals, it was considered necessary to have some preliminary idea on the biochemical and haematological profiles of this drug in experimental animals. Hence, the present study was undertaken to evaluate the effect of 3x, 6x, 12x and 30x potencies of *Ricinus communis* on the

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biochemical and haematological profiles in addition to the body weights and behaviour.

## Materials and Methods

### Drug

The different potencies (3x, 6x, 12x and 30x) of *R. communis* were prepared by M/S. Bahola Laboratories, Puducherry from a single batch of seeds supplied by Survey of Medicinal Plants and Collection Unit, Udagamandalam, Tamilnadu.

### Animals

Healthy albino rats of both sexes, weighing between 120-140 g were procured from M/S. Jagan animal's breeder & supplier, Hyderabad and housed (12 / 12 hrs, light/dark cycles, Room temp. 22 - 24 ºC.) in polypropylene cages (47 x 34 x 20 cm) lined with husk which was renewed on every alternate days. Animals were acclimatized to standard laboratory conditions for 15 days prior to the initiation of drug treatment and fed balanced pelleted diet and water *ad-libitum.*

### Reagents and chemicals

Readymade kits/ reagents for estimation of serum glucose, total serum cholesterol, serum triglycerides and urea (M/S. Excel Diagnostic Pvt. Ltd, Hyderabad), SGOT and SGPT (M/S Medsource Ozone Biochemicals), total protein and albumin (M/S Span Diagnostic, Pvt. Ltd, Surat) and for haematological parameters (M/S. Nice Chemical Pvt. Ltd., Cochin) were used. All other chemicals used in this study were of analytical grade. Alcohol was procured from M/S.Venkatesvara Winery & Distillery Pvt. Ltd., Nacole, Hyderabad and was distilled in our laboratory before use.

### Experimental design

The animals were weighed and marked on ear pinna for identification. A total of 108 rats were grouped into 6 batches of 18 each. Each batch was further divided into 3 subgroups of 6 each. The different potencies (3x, 6x, 12x and 30x) of *R. communis* were orally administered in doses of 0.1 ml, 0.2 ml and 0.5 ml per rat per day for 14 days. Thereafter, these rats were left for another 14 days without any drug treatment. The test potencies of *R. communis* and alcohol (91.5% v/v) were diluted with distilled water in a ratio of 1:10 or 1:4 so that each rat should not receive total volume of more than 2 ml per day. Two parallel controls were run. One received equivalent volume of diluted alcohol and other normal saline.

### Collection of blood sample

For studying haematological and biochemical profiles, blood was collected from 50% of the animals of each group on 21$^{st}$ day and remaining 50% of animals on 28$^{th}$ day of the initiation of drug treatment from the corneal plexus of the eye through heparinized coated glass capillaries into the non heparinized test tubes. Haematological profile was carried out immediately and serum was separated by centrifuging clotted blood at 5000 rpm for 10 min.

### Recording the body weights of rats

Body weights (g) of rats were recorded before the initiation of drug treatment and thereafter at weekly intervals during period of 28 days of experimental study.

### Estimation of biochemical parameters

The sugar (GOD-POD Method),[6,7] total protein (Modified biuret method)[8,9] albumin (Bromocresol green method)[10,11] total cholesterol (CHOD – PAP with LCF, enzymatic method)[12,13], triglycerides (GPO-PAP method)[14], serum glutamate oxaloacetate transminase ( SGPT) and serum glutamate pyruvate transminase (SGPT)[15] and urea (Berthelot method)[16] were measured in the serum of rats. The absorbance of the serum samples and the standard sample were measured on spectrophotometer (Systronic) at specified wave lengths for sugar (505 nm), total protein (578 nm), albumin (630 nm), cholesterol (500 nm), triglycerides (546 nm) and urea (570 nm) after calibrating it against their respective blank samples. For SGOT and SGPT estimations, absorbance of serum samples, standard, calibrator, and blank were measured at 505 nm against distilled water.

### Study of haematological parameters

Hemoglobin content (g%), total R.B.C., total W.B.C. and differential leukocytes counts were made immediately after the withdrawal of blood[17].

### Studying the behaviour

As a part of study, the influence of 3x, 6x, 12x and 30x potencies of *R. communis* was observed between 10.30 A.M. to 4.00 P.M. every day during the period of drug administration and for two weeks post-treatment on the gross behaviour (alertness, passivity, sedation, spontaneous motor activity, maintenance of equilibrium posture, biting, fighting, facial movements), depth and rate of respiration, gross perception of heart rate and force of contractions and on mortality, if any, of the adult albino rats during the period of study as described earlier[18].

### Statistical analysis

The data were expressed as Mean ± S.E.M. The difference between mean values of groups were statistically analysed by Student's 't' test. The level of difference at *P*- Value < 0.05 was considered to be statistically significant.

## Results

### Effect of different potencies of *Ricinus communis* on biochemical profiles

Tables 1-3 show the effect of 3x, 6x, 12x and 30x potencies of *R. communis* administered orally in doses of 0.1 ml, 0.2 ml and 0.5 ml/ rat/day respectively for 14 days on sugar, total protein, albumin, total cholesterol, triglycerides, urea, SGOT and SGPT levels in the serum on 21$^{st}$ and 28$^{th}$ days of the experiment as compared to normal saline and alcohol (91. 5% v/v) administered rats.

The results showed variable effects of different potencies of *R. communis* on biochemical profiles. There was a significant decrease in total cholesterol concentration with alcohol (91.5% v/v) on 21$^{st}$ day ($p < 0.05$) and serum triglycerides concentration with 3x potencies on 28$^{th}$ day ($p < 0.001$) of study with 0.1 ml daily doses (Table 1) as compared to that of normal saline treated rats. Similarly, significant decrease in serum albumin (3x potency), ($p < 0.05$), serum triglycerides (6x potency) ($p < 0.001$) and serum total cholesterol (30x potency) ($p < 0.05$) with 0.2 ml daily doses; and decrease in serum albumin (3x potency) ($p < 0.05$) and increase in serum triglycerides concentration (3x and 30x potencies) ($p < 0.05$) with 0.5 ml daily doses were observed when compared with that of normal saline and alcohol (used as vehicle for preparing different potencies of medicine) treated rats (Tables 2 and 3).

### Effect of different potencies of *Ricinus communis* on haemotological profiles

Tables 4 - 6 show the effect of 3x, 6x, 12x and 30x potencies of *R. communis* administered orally in respective daily doses of 0.1 ml, 0.2 ml and 0.5 ml/rat/day for 14 days on haemoglobin content (g%), total R.B.C., total W.B.C. and different leukocytes counts on 21$^{st}$ and 28$^{th}$ day of the experiment as compared to normal saline and alcohol (91.5% v/v.) treated rats.

The results showed that there was no apparent effect on haemoglobin content and total R.B.C. count between drug treated and alcohol/ normal saline treated rats. However during microscopic examination, one rat in 12x potency group showed spear/spindle shaped R.B.C. with very less haemoglobin content. On the other hand, variations were observed with different potencies of *R. communis* on total leukocytes counts in few groups only as compared to normal saline or alcohol treated groups (Tables 4-6).

### Effect of different potencies of *Ricinus communis* on the body weights of rats

Figs 1-3 show the effect of 3x, 6x, 12x and 30x potencies of *R. communis* administered orally in respective doses of 0.1, 0.2 and 0.5 ml/rat/day for 14 days and thereafter for another 14 days of post-treatment on the body weights of rats in comparison to normal saline and alcohol (91.5% v/v.) administered control rats.

There was a progressive increase in the body weights of the adult rats administered normal saline which was significant after 28 days. The range of increase in the body weights of three saline administered control rats varied from 10.9 g to 16.7 g from their initial respective body weights taken before the initiation of the experiments (Figs. 1-3). On the contrary, the body weights of rats administered alcohol (91.5% v/v.) in daily doses of 0.1 ml/rat/day for 14 days did not change from its initial values (Fig. - 1), but there was a progressive decrease in the body weights of those rats who were administered alcohol (used as vehicle control) in daily oral doses of 0.2 ml and 0.5 ml for 14 days. The respective average decrease in the body weights from their initial value after 28 days was 8.3 g and 33.4 g (Figs 2 and 3).

Likewise, oral administration of *R. communis* in 3x, 6x, 12x and 30x potencies in daily doses of 0.1 ml, 0.2 ml and 0.5 ml/rat/day for 14 days and another 14 days of post-treatment also showed a decrease in the body weights of adult rats of varying degree from their respective initial body weight which was significant (Figs 1 - 3). However, the level of decrease in the body weights of rats did not co-related either with the different potencies of *R. communis* or the quantum of the respective potency used and varied from one group to other ( Figs 1-3).

### Effect of different potencies of *Ricinus communis* on behavior

There was no perceptible effect on the gross behaviour of rats administered orally 3x, 6x, 12x and 30x potencies of *R. communis* in doses of 0.1 ml and 0.2 ml/rat/day for 14 days as compared to normal saline treated group. However, adult rats when given 0.5 ml/ rat /day of all the four potencies of *R. communis*, started scratching their face with their forepaws within 2-3 minutes of drug administration and later by fore- and

**Table 1:** Effect of different potencies of Ricinus communis (0.1 ml/rat/day) on rat's biochemical profiles

| Groups | 21st DAY | | | | | | | | 28th DAY | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Protein g/dl | Albumin. g/dl | Sugar mg/dl | Cholesterol. mg/dl | Triglycerides. mg/dl | Urea mg/dl | SGOT U/l | SGPT U/l | Protein g/dl | Albumin. g/dl | Sugar mg/dl | Cholesterol. mg/dl | Triglycerides. mg/dl | Urea mg/dl | SGOT U/l | SGPT U/l |
| Control (Normal saline) | 6.83 ± 0.12 | 4.00 ± 0.12 | 70.5 ± 2.63 | 94.0 ± 1.15 | 95.2 ± 4.57 | 44.4 ± 1.04 | 30.0 ± 6.48 | 27.0 ± 7.00 | 6.90 ± 0.17 | 3.86 ± 0.15 | 77.9 ± 2.98 | 90.0 ± 1.15 | 102.3 ± 2.25 | 42.9 ± 2.70 | 27.3 ± 2.92 | 29.3 ± 7.06 |
| Vehicle (91.5% alcohol) | 6.60 ± 0.20 | 4.00 ± 0.11 | 75.4 ± 4.92 | 85.3* ± 2.60 | 101.7 ± 2.67 | 46.9 ± 2.74 | 23.3 ± 6.77 | 31.3 ± 6.18 | 6.77 ± 0.09 | 3.86 ± 0.14 | 76.1 ± 1.85 | 86.0 ± 1.15 | 94.9 ± 5.92 | 43.7 ± 2.79 | 24.0 ± 5.03 | 32.7 ± 7.22 |
| *R.communis* 3x | 6.40 ± 0.31 | 3.90 ± 0.17 | 75.0 ± 3.57 | 90.0 ± 2.00 | 79.9 ± 7.71 | 48.9 ± 3.19 | 28.0 ± 5.29 | 40.7 ± 7.54 | 6.90 ± 0.17 | 3.80 ± 0.09 | 76.2 ± 4.91 | 90.7 ± 1.76 | 78.4** ± 3.97 | 48.9 ± 1.27 | 23.3 ± 5.05 | 36.3 ± 10.33 |
| *R. communis* 6x | 6.73 ± 0.60 | 4.00 ± 0.05 | 75.0 ± 4.07 | 94.7 ± 1.45 | 86.3 ± 3.55 | 43.6 ± 2.57 | 23.7 ± 8.46 | 37.3 ± 10.60 | 6.8 ± 0.14 | 3.90 ± 0.17 | 80.1 ± 3.31 | 95.3 ± 2.90 | 88.4 ± 6.06 | 41.6 ± 1.89 | 23.3 ± 6.36 | 38.0 ± 8.62 |
| *R. communis* 12x | 6.70 ± 0.17 | 4.00 ± 0.05 | 75.3 ± 4.07 | 91.0 ± 3.21 | 84.7 ± 2.96 | 51.0 ± 3.96 | 21.3 ± 7.06 | 34.3 ± 8.20 | 6.87 ± 0.17 | 3.97 ± 0.12 | 75.6 ± 6.78 | 92.0 ± 2.08 | 85.0 ± 4.71 | 42.8 ± 2.57 | 20.7 ± 6.96 | 37.0 ± 10.11 |
| *R. communis* 30x | 6.83 ± 0.15 | 4.17 ± 0.38 | 70.3 ± 0.92 | 91.3 ± 1.73 | 77.8 ± 5.82 | 44.2 ± 1.47 | 24.7 ± 4.38 | 36.3 ± 9.96 | 6.70 ± 025 | 3.90 ± 0.15 | 81.7 ± 1.98 | 92.3 ± 1.45 | 86.6 ± 5.59 | 44.0 ± 3.06 | 26.3 ± 6.12 | 37.3 ± 7.52 |

Values differ significantly (p –Value* < 0.05, **< 0.001) between drug or vehicle/ normal saline administered rats.
$ Average values of 3 rats
Potencies of test drug and alcohol (91.5% v/v) were diluted in a ratio of 1:10 with distilled water in order to make the volume one ml.

**Table 2:** Effect of different potencies of *Ricinus communis* (0.2 ml/rat/day) on rat's biochemical profiles

| Groups | 21st DAY | | | | | | | | 28th DAY | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Protein g/dl | Albumin. g/dl | Sugar mg/dl | Cholesterol. mg/dl | Triglycerides. mg/dl | Urea mg/dl | SGOT U/l | SGPT U/l | Protein g/dl | Albumin. g/dl | Sugar mg/dl | Cholesterol. mg/dl | Triglycerides. mg/dl | Urea mg/dl | SGOT U/l | SGPT U/l |
| Control (Normal saline) | 6.87 ± 0.17 | 3.80 ± 0.11 | 72.0 ± 2.52 | 90.7 ± 1.76 | 73.0 ± 4.39 | 46.5 ± 4.33 | 24.0 ± 6.43 | 26.7 ± 9.26 | 6.73 ± 0.12 | 4.03 ± 0.28 | 76.8 ± 2.59 | 90.7 ± 2.29 | 101.3 ± 2.32. | 42.8 ± 2.78 | 28.7 ± 6.57 | 27.3 ± 4.62 |
| Vehicle (91.5% alcohol) | 6.50 ± 0.29 | 3.86 ± 0.15 | 72.9 ± 4.56 | 89.3 ± 1.76 | 107.3 ± 16.5 | 46.7 ± 2.74 | 24.0 ± 4.62 | 31.7 ± 5.78 | 6.57 ± 0.23 | 4.03 ± 0.12 | 74.4 ± 2.55 | 91.3 ± 1.78 | 89.7 ± 3.52 | 43.0 ± 2.81 | 23.3 ± 7.69 | 31.3 ± 7.06 |
| *R. communis* 3x | 7.20 ± 0.20 | 4.20* ± 0.05 | 82.1 ± 4.86 | 92.0 ± 1.15 | 87.8 ± 7.79 | 45.0 ± 1.06 | 24.0 ± 8.08 | 36.0 ± 11.35 | 6.9 ± 0.15 | 3.80 ± 0.11 | 77.5 ± 3.71 | 91.3 ± 2.40 | 87.8 ± 4.01 | 45.7 ± 2.75 | 25.0 ± 7.20 | 37.7 ± 10.68 |
| *R. communis* 6x | 7.23 ± 0.32 | 3.90 ± 0.14 | 75.5 ± 5.08 | 93.0 ± 2.12 | 81.1 ± 3.55 | 47.7 ± 3.38 | 24.7 ± 6.36 | 38.0 ± 10.15 | 7.0 ± 0.11 | 4.00 ± 0.22 | 78.5 ± 2.03 | 94.7 ± 0.88 | 74.7** ± 2.35 | 45.3 ± 2.74 | 25.0 ± 9.07 | 39.0 ± 10.78 |
| *R. communis* 12x | 6.6 ± 0.08 | 4.00 ± 0.11 | 74.9 ± 4.77 | 91.7 ± 3.18 | 78.5 ± 4.10 | 44.9 ± 2.18 | 22.0 ± 6.93 | 34.7 ± 9.82 | 6.70 ± 0.20 | 4.07 ± 0.12 | 73.7 ± 3.50 | 90.0 ± 1.15 | 89.8 ± 4.73 | 43.6 ± 2.69 | 22.0 ± 6.92 | 37.0 ± 9.54 |
| *R. communis* 30x | 6.8 ± 0.11 | 3.93 ± 0.09 | 71.6 ± 2.72 | 83.6* ± 1.45 | 83.6 ± 4.14 | 46.2 ± 3.14 | 27.3 ± 5.28 | 39.3 ± 7.54 | 6.57 ± 0.12 | 3.97 ± 0.24 | 76.8 ± 8.75 | 89.3 ± 1.76 | 79.4 ± 7.18 | 45.9 ± 0.88 | 24.0 ± 7.21 | 35.7 ± 7.54 |

Values differ significantly (p –Value* < 0.05, **< 0.001) between drug or vehicle/ normal saline administered rats.
$ Average value of 3 rats.
Potencies of test drug and alcohol (91.5% v/v) were diluted in a ratio of 1:10 with distilled water order to make the volume 2 ml.

**Table 3:** Effect of different potencies of *Ricinus communis* (0.5 ml/rat/day) on rat's biochemical profiles

| Groups | 21st DAY | | | | | | | | 28th DAY | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Protein g/dl | Albumin. g/dl | Sugar mg/dl | Cholesterol. mg/dl | Triglycerides. mg/dl | Urea mg/dl | SGOT U/l | SGPT U/l | Protein g/dl | Albumin. g/dl | Sugar mg/dl | Cholesterol. mg/dl | Triglycerides. mg/dl | Urea mg/dl | SGOT U/l | SGPT U/l |
| Control (Normal saline) | 7.04 ± 0.26 | 4.53 ± 0.24 | 72.5 ± 4.29 | 115 ± 7.64 | 101.2 ± 4.39 | 44.4 ± 2.22 | 24.7 ± 4.09 | 29.0 ± 5.20 | 7.03 ± 0.09 | 3.87 ± 0.18 | 73.1 ± 2.00 | 107 ± 2.40 | 96.7 ± 2.70. | 43.0 ± 1.72 | 25.3 ± 6.07 | 30.7 ± 7.84 |
| Vehicle (91.5% alcohol) | 6.93 ± 0.04 | 4.03 ± 0.14 | 75.0 ± 3.64 | 111 ± 2.33 | 91.1 ± 6.82 | 43.3 ± 2.68 | 27.3 ± 8.67 | 34.7 ± 9.26 | 6.93 ± 0.24 | 4.07 ± 0.24 | 73.3 ± 2.60 | 109 ± 5.46 | 93.5 ± 6.41 | 42.5 ± 2.54 | 26.7 ± 5.21 | 31.7 ± 5.24 |
| *R. communis* 3x | 6.80 ± 0.17 | 3.00* ± 0.28 | 88.1 ± 8.72 | 120 ± 2.61 | 112.8 ± 4.99 | 42.3 ± 0.39 | 26.0 ± 5.29 | 36.7 ± 7.31 | 6.70 ± 0.25 | 3.10 ± 0.29 | 84.3 ± 3.44 | 117 ± 3.71 | 118* ± 3.80 | 48.0 ± 1.44 | 26.0 ± 4.62 | 38.3 ± 7.80 |
| *R. communis* 6x | 6.80 ± 0.15 | 4.00 ± 0.40 | 76.0 ± 4.77 | 106 ± 2.40 | 112.6 ± 6.58 | 43.0 ± 0.90 | 21.0 ± 6.43 | 31.3 ± 9.03 | 7.20 ± 0.34 | 3.90 ± 0.18 | 84.3 ± 4.14 | 104 ± 1.86 | 109 ± 7.25 | 45.6 ± 1.85 | 24.7 ± 7.31 | 38.0 ± 9.54 |
| *R.communis* 12x | 7.00 ± 0.05 | 4.20 ± 0.14 | 73.1 ± 3.48 | 115 ± 7.64 | 115.7 ± 3.94 | 47.4 ± 2.57 | 23.3 ± 5.93 | 36.0 ± 8.14 | 6.63 ± 0.09 | 3.83 ± 0.15 | 79.0 ± 3.99 | 114 ± 2.33 | 102 ± 2.15 | 43.7 ± 2.78 | 24.3 ± 6.89 | 35.7 ± 11.05 |
| *R.communis* 30x | 7.23 ± 0.33 | 4.50 ± 0.51 | 76.4 ± 4.62 | 112 ± 2.31 | 113.0 ± 6.68 | 47.0 ± 1.33 | 23.3 ± 4.38 | 35.7 ± 7.52 | 7.07 ± 026 | 4.07 ± 0.27 | 74.3 ± 2.60 | 109 ± 2.08 | 107* ± 2.08 | 42.2 ± 2.20 | 26.7 ± 5.54 | 33.3 ± 10.12 |

Values differ significantly (p –Value* < 0.05) between drug or vehicle/ normal saline administered rats.
$ Average value of 3 rats.
Potencies of test drug and alcohol (91.5% v/v) were diluted in a ratio of 1:4 with distilled water order to make the volume 2 ml.

**Table 4:** Effect of different potencies of *Ricinus communis* (0.1 ml/rat/day) on rat's haematological profiles

| Groups | 21st DAY | | | | | | | 28th DAY | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hb (gm) % | Total R.B.C. (mill./ cubic mm) | Total W.B.C. (number/ cubic mm) | Differential counts (%) | | | | Hb (gm) % | Total R.B.C. (mill./ cubic mm) | Total W.B.C. (number/ cubic | Differential counts (%) | | | |
| | | | | Polymorps | Lympocytes | Eosinophils | Monocytes | | | | Polymorps | Lympocytes | Eosinophils | Monocytes |
| Control (Normal saline) | 14.3 ± 0.60 | 4.8 ± 0.22 | 10200 ± 346 | 29.3 ± 2.35 | 65.3 ± 2.68 | 3.3 ± 0.33 | 2.0 ± – | 14.7 ± 0.17 | 4.9 ± 0.07 | 9733 ± 521 | 25.6 ± 0.88 | 69.3 ± 3.54 | 3.0 ± 0.58 | 2.0 ± – |
| Vehicle (91.5% alcohol) | 15.0 ± 0.29 | 5.0 ± 0.12 | 10133 ± 291 | 27.3 ± 1.20 | 66.6 ± 1.76 | 4.0 ± 0.58 | 2.0 ± – | 14.3 ± 0.44 | 4.7 ± 0.15 | 9333 ± 586 | 23.6 ± 1.33 | 71.0 ± 2.08 | 3.3 ± 0.88 | 2.0 ± – |
| *R.communis* 3x | 14.6 ± 0.34 | 4.8 ± 0.14 | 9200 ± 231 | 30.3 ± 2.61 | 64.7 ± 2.92 | 3.0 ± 0.58 | 2.0 ± – | 14.1 ± 0.21 | 4.7 ± 0.07 | 8800 ± 231 | 24.7 ± 3.19 | 70.7 ± 3.39 | 2.6 ± 0.34 | 2.0 ± – |
| *R.communis* 6x | 15.3 ± 0.17 | 5.1 ± 0.07 | 8933 ± 439 | 25.6 ± 1.45 | 68.3 ± 0.91 | 4.0 ± 0.58 | 2.0 ± – | 14.3 ± 0.33 | 4.8 ± 0.10 | 9533 ± 406 | 30.3* ± 1.20 | 63.7 ± 1.23 | 3.7 ± 0.34 | 2.3 ± 0.33 |
| *R.communis* 12x | 14.7 ± 0.17 | 4.7 ± 0.07 | 10200 ± 503 | 23.6 ± 2.24 | 71.3 ± 2.95 | 3.3 ± 1.23 | 1.6 ± 0.34 | 14.3 ± 0.44 | 4.7 ± 0.15 | 8400 ± 529 | 24.3 ± 2.97 | 69.6 ± 2.61 | 4.0 ± 0.58 | 2.0 ± – |
| *R.communis* 30x | 14.8 ± 0.17 | 4.9 ± 0.071 | 8200* ± 503 | 25.3 ± 2.42 | 68.4 ± 1.68 | 4.3 ± 0.88 | 2.0 ± – | 15.0 ± 0.58 | 4.7 ± 0.20 | 7066 ± 128 | 24.3 ± 3.76 | 70.0 ± 3.46 | 3.3 ± 0.33 | 2.3 ± 0.33 |

Values differ significantly (p –Value* < 0.05) between drug or vehicle/ normal saline administered rats
$ Average value of 3 rats.
Potencies of test drug and alcohol (91.5% v/v) were diluted in a ratio of 1:10 with distilled water order to make the volume one ml.

**Table 5:** Effect of different potencies of *Ricinus communis* (0.2 ml/rat/day) on rat's haematological profiles

| Groups | 21st DAY | | | | | | | 28th DAY | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hb (gm) % | Total R.B.C. (mill./ cubic mm) | Total W.B.C. (number/ cubic mm) | Differential counts (%) | | | | Hb (gm) % | Total R.B.C. (mill./ cubic mm) | Total W.B.C. (number/ cubic | Differential counts (%) | | | |
| | | | | Polymorps | Lympocytes | Eosinophils | Monocytes | | | | Polymorps | Lympocytes | Eosinophils | Monocytes |
| Control (Normal saline) | 14.7 ± 0.17 | 4.9 ± 0.22 | 9333 ± 240 | 26.3 ± 0.88 | 68.0 ± 1.15 | 3.7 ± 0.33 | 2.0 ± – | 14.5 ± 0.58 | 4.8 ± 0.20 | 9133 ± 333 | 25.0 ± 3.79 | 68.7 ± 4.06 | 4.0 ± 0.58 | 2.3 ± 0.33 |
| Vehicle (91.5% alcohol) | 15.0 ± 0.58 | 5.0 ± 0.20 | 9200 ± 503 | 30.0 ± 2.52 | 64.0 ± 3.06 | 4.0 ± 0.58 | 2.0 ± – | 15.2 ± 0.60 | 5.0 ± 0.22 | 9400 ± 462 | 27.4 ± 4.37 | 66.0 ± 5.03 | 4.3 ± 0.33 | 2.3 ± 0.33 |
| *R.communis* 3x | 14.5 ± 0.29 | 4.8 ± 0.12 | 8800 ± 577 | 25.0 ± 1.16 | 69.0 ± 0.58 | 4.0 ± 0.58 | 2.0 ± – | 14.5 ± 0.29 | 4.8 ± 0.09 | 9600 ± 416 | 24.7 ± 1.87 | 68.7 ± 1.16 | 4.6 ± 0.34 | 2.0 ± – |
| *R.communis* 6x | 2.0 ml | 4.9 ± 0.07 | 8800 ± 200 | 26.0 ± 0.82 | 67.3 ± 1.47 | 3.3 ± 0.33 | 2.6 ± 0.34 | 14.3 ± 0.44 | 4.7 ± 0.15 | 8600 ± 462 | 27.0 ± 2.30 | 69.3 ± 0.34 | 3.4 ± 0.34 | 2.3 ± 0.33 |
| *R.communis* 12x | 0.2 ml | 4.9 ± 0.14 | 10600* ± 200 | 26.0 ± 3.06 | 68.7 ± 2.73 | 3.3 ± 0.33 | 2.0 ± – | 14.8 ± 0.44 | 4.9 ± 0.19 | 8000 ± 1222 | 22.0 ± 4.00 | 72.7 ± 3.94 | 3.3 ± 0.88 | 2.0 ± – |
| *R.communis* 30x | 0.2 ml | 4.7 ± 0.135 | 8000 ± 833 | 25.4 ± 8.49 | 68.0 ± 0.88 | 4.3 ± 0.88 | 2.3 ± 0.33 | 14.1 ± 0.46 | 4.5 ± 0.15 | 7533 ± 636 | 28.6 ± 2.89 | 65.7 ± 3.29 | 3.4 ± 0.33 | 2.3 ± 0.33 |

Values differ significantly (p –Value* < 0.05) between drug or vehicle/ normal saline administered rats
$ Average value of 3 rats.
Potencies of test drug and alcohol (91.5% v/v) were diluted in a ratio of 1:10 with distilled water order to make the volume 2 ml.

**Table 6:** Effect of different potencies of *Ricinus communis* (0.5 ml/rat/day) on rat's haematological profiles

| Groups | 21st DAY | | | | | | | 28th DAY | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hb (gm) % | Total R.B.C. (mill./ cubic mm) | Total W.B.C. (number/ cubic mm) | Differential counts (%) | | | | Hb (gm) % | Total R.B.C. (mill./ cubic mm) | Total W.B.C. (number/ cubic | Differential counts (%) | | | |
| | | | | Polymorps | Lympocytes | Eosinophils | Monocytes | | | | Polymorps | Lympocytes | Eosinophils | Monocytes |
| Control (Normal saline) | 14.5 ± 0.29 | 4.6 ± 0.31 | 8800 ± 416 | 27.6 ± 1.40 | 67.0 ± 1.53 | 3.4 ± 0.34 | 2.0 ± – | 13.8 ± 0.17 | 4.5 ± 0.18 | 8300 ± 351 | 18.3 ± 1.86 | 75.0 ± 1.73 | 4.7 ± 0.34 | 2.0 ± 0.58 |
| Vehicle (91.5% alcohol) | 14.5 ± 0.29 | 4.9 ± 0.07 | 8800 ± 987 | 28.6 ± 2.03 | 65.4 ± 2.40 | 4.0 ± 0.58 | 2.0 ± – | 14.5 ± 0.29 | 4.8 ± 0.12 | 8267 ± 353 | 23.0 ± 1.73 | 72.6 ± 2.61 | 3.7 ± 0.88 | 1.7 ± 0.33 |
| *R.Communis* 3x | 14.3 ± 0.17 | 4.7 ± 0.10 | 7800 ± 347 | 28.0 ± 1.87 | 65.7 ± 2.89 | 4.3 ± 1.23 | 2.0 ± – | 13.5 ± 0.29 | 4.5 ± 0.12 | 6933 ± 376 | 20.3 ± 0.33 | 72.0 ± 1.16 | 5.4 ± 0.88 | 2.3 ± 0.33 |
| *R.Communis* 6x | 13.8 ± 0.33 | 4.7 ± 0.17 | 10733 ± 1213 | 23.0 ± 2.65 | 72.0 ± 3.00 | 2.7 ± 0.67 | 2.3 ± 0.33 | 13.8 ± 0.60 | 4.6 ± 0.21 | 7266 ± 751 | 18.7 ± 2.04 | 75.7 ± 1.47 | 4.0 ± 1.53 | 1.6 ± 0.34 |
| *R.Communis* 12x | 14.8 ± 0.17 | 4.9 ± 0.10 | 8067 ± 593 | 24.7 ± 0.91 | 70.0 ± 1.16 | 3.3 ± 0.33 | 2.0 ± – | 14.5 ± 0.50 | 4.8 ± 0.17 | 8666 ± 593 | 26.4* ± 0.33 | 69.3 ± 0.71 | 3.0 ± 0.58 | 1.3 ± 0.33 |
| *R.Communis* 30x | 15.0 ± 0.29 | 5.0 ± 0.12 | 8133 ± 1333 | 25.7 ± 1.78 | 68.3 ± 0.58 | 4.0 ± 0.58 | 2.0 ± – | 13.8 ± 0.15 | 4.5 ± 0.04 | 9266 ± 291 | 22.7 ± 2.35 | 68.0 ± 3.06 | 7.0* ± 0.58 | 2.3 ± 0.33 |

Values differ significantly (p –Value* < 0.05) between drug or vehicle/ normal saline administered rats
$ Average value of 3 rats.
Potencies of test drug and alcohol (91.5% v/v) were diluted in a ratio of 1:4 with distilled water order to make the volume 2 ml.

**Fig. 1.** Effect of different potencies of *Ricinus communis* (0.1ml/rat/day) on body weight of rats.

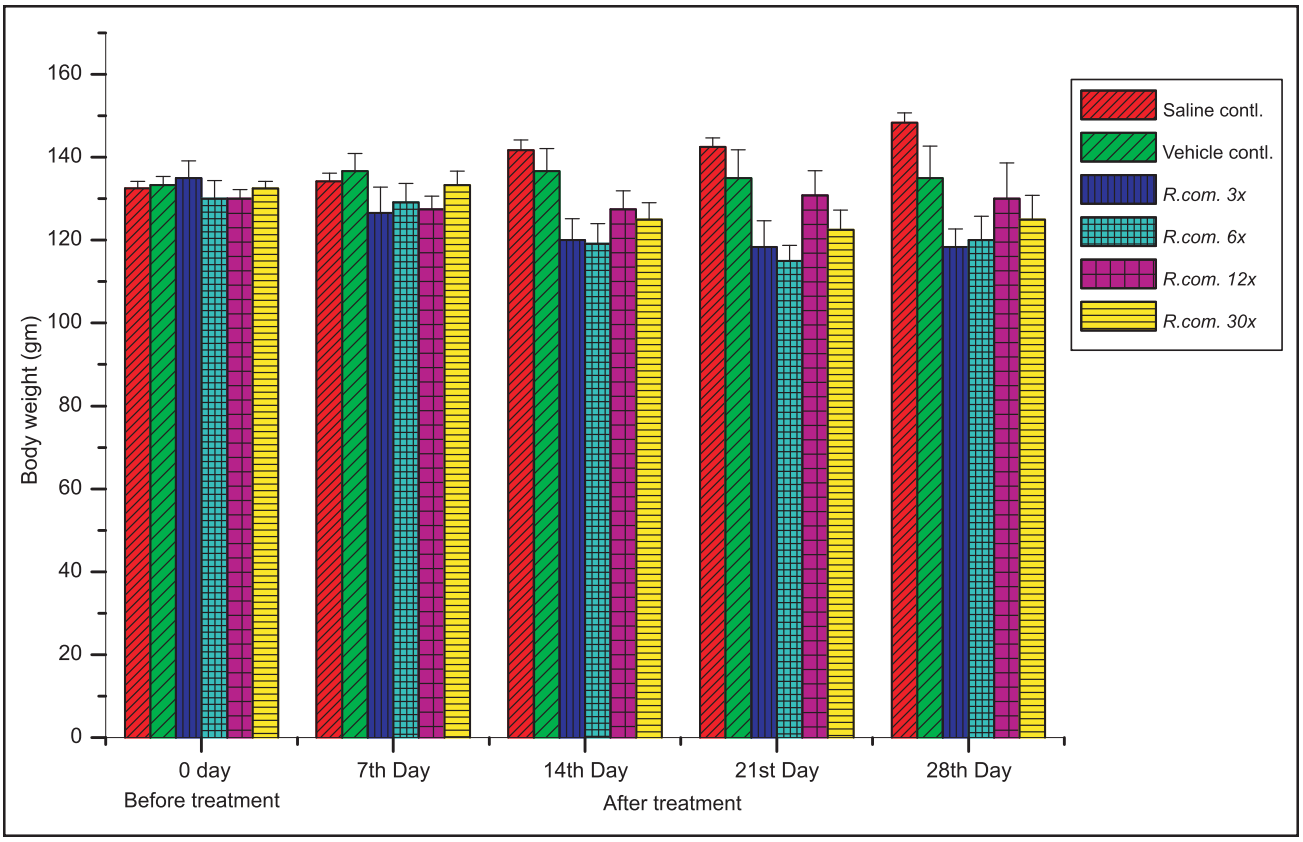



**Fig. 2.** Effect of different potencies of *Ricinus communis* (0.2ml/rat/day) on body weight of rats.

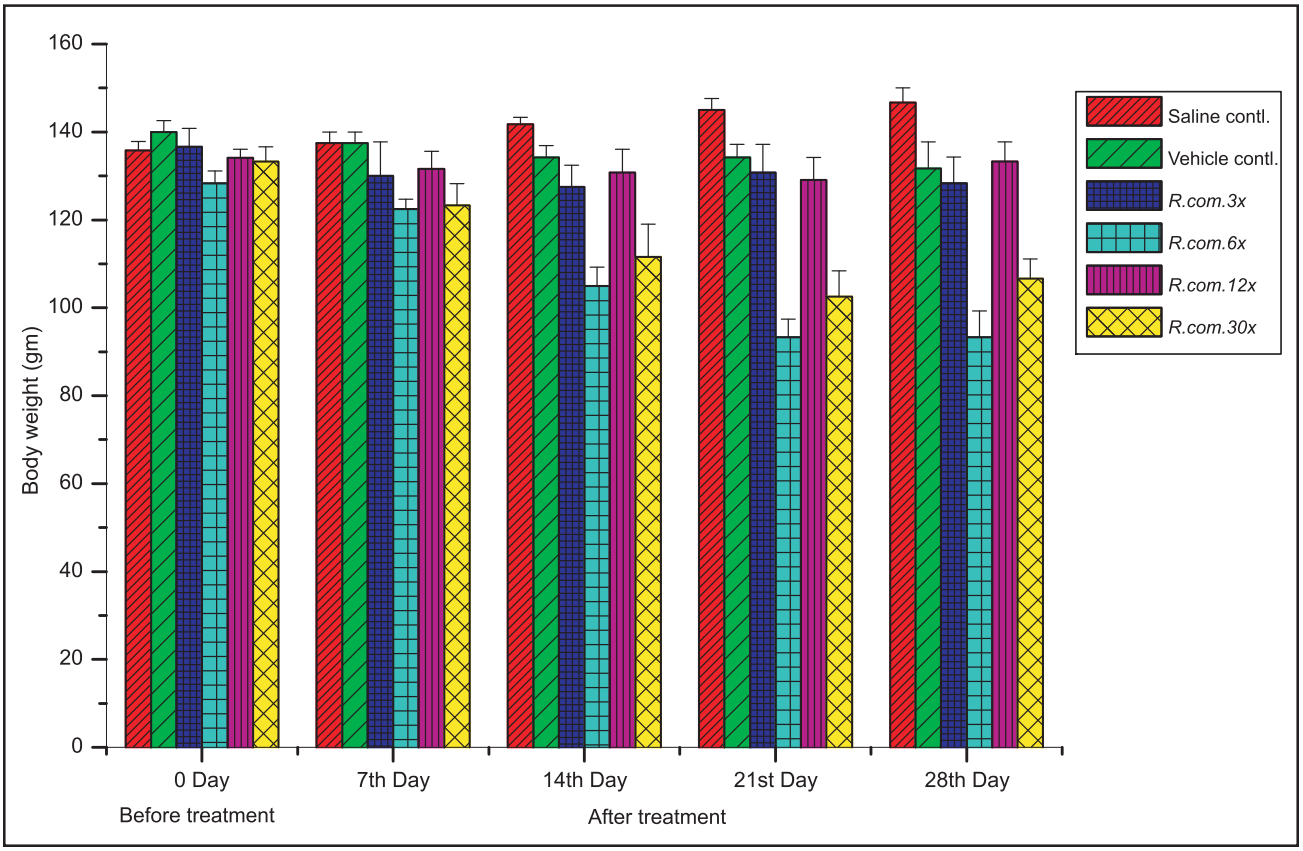
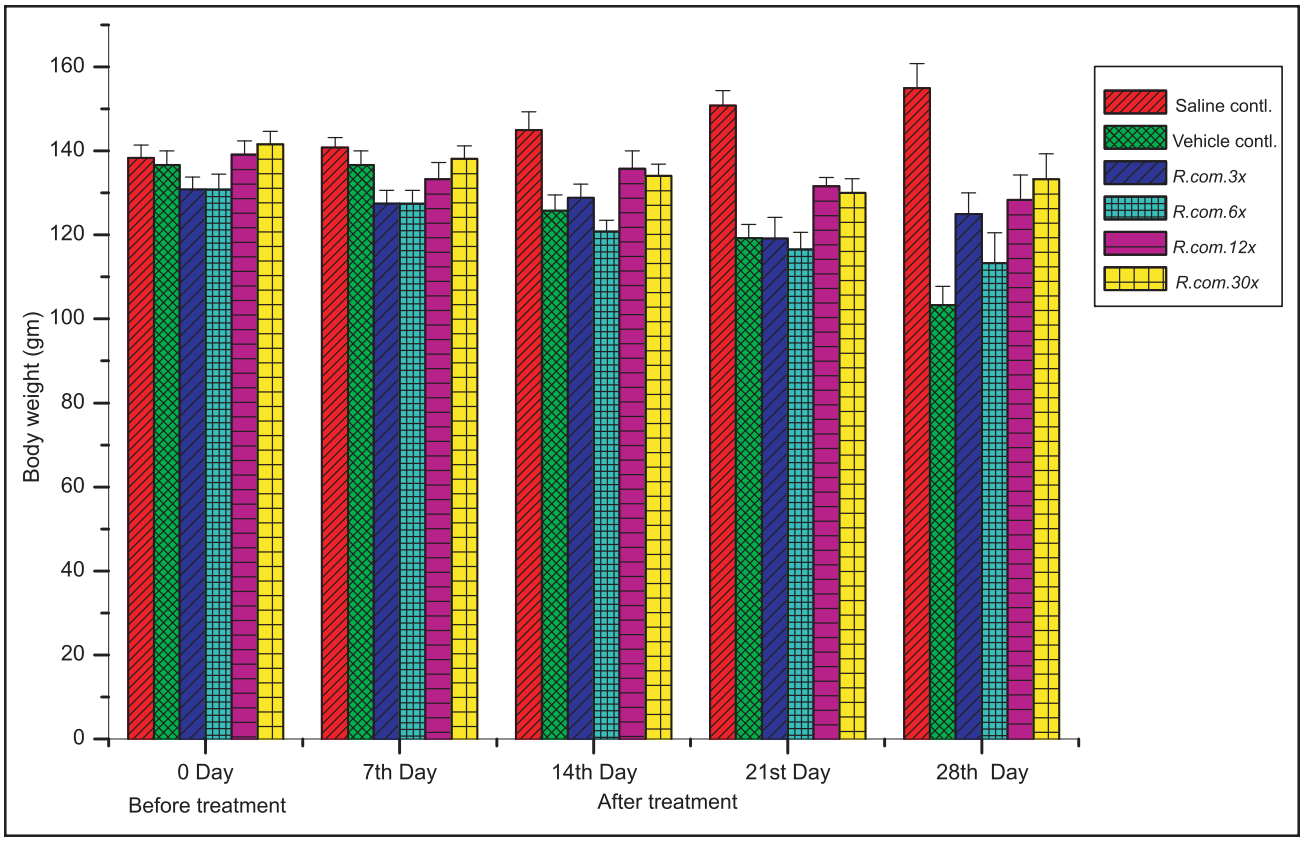


**Fig. 3.** Effect of different potencies of *Ricinus communis* (0.5ml/day/rat) on body weight of rats.




hind paws. Thereafter, animals showed laboured breathing, stopped running within 7-8 minutes and became calm. They sat in one corner of the cage, but responded immediately to tapping the cage. Such effect lasted for about half an hour. Few animals lost their righting reflex for 20-25 minutes in 12x potency and some animals tried to escape the cage by walking on the wire-net fitted at the top of the cage before becoming drowsy.

Similar effects were also observed in those rats given equivalent doses of alcohol for comparison. The only difference was that above said effects were slightly less whereas normal saline treated rats remained active throughout the period of observations.

Though no accurate food and water intake of adult rat was measured but gross observations showed that food and water intake of alcohol and *R. communis* treated adult rats decreased as observed by the left out food and water on the next day in the feeding chamber and water bottles respectively. The anorexia so developed in adult rats could be correlated well with the decrease in body weights observed in these groups (Figs.1 - 3).

## Discussion

The results of present study showed variable effects of different potencies of *R. communis* on biochemical profiles (serum glucose, serum cholesterol, serum triglycerides, serum total protein, serum albumin, serum urea and serum SGOT and serum SGPT levels) which was not related to either potency or quantum of the drug administered. Likewise, studies carried out for haemotological profiles showed that there was no apparent effect on haemoglobin content and total R.B.C. count with different potencies of *R. communis* except that one rat showed spear/spindle shaped R.B.C. with very less haemoglobin content in 12x potency group during microscopic examination. On the other hand, variations were observed with different potencies of *R. communis* on total leukocytes counts in few groups only as compared to normal saline or alcohol treated groups (Tables 4-6).

The present results showed that there was a significant decrease in the body weights of rats administered orally 3x, 6x, 12x and 30x potencies of *R. communis* or alcohol for 14 days during the period of 28 days studies. The differences observed in the

body weights of drug or alcohol treated rats were significant when compared with the body weight of normal saline administered rats.

All the potencies (3x, 6x, 12x and 30x) of *R. communis* when administered in daily oral doses of 0.1ml and 0.2ml/rat for a period of 14 days did not produce any behaviour changes but when administered in daily doses of 0.5ml, rats started scratching their faces with fore paws within 2 - 3 min and later by fore and hind paws. Thereafter rats showed laboured breathing, stopped running within 7-8 min and became calm. Some rats sat in one corner of the cage but responded to the stimuli of tapping. The effect lasted for about 30 min. Only few rats lost righting reflex for 20 to 25 min in 12x potencies. Some rats also tried to escape from the cage by walking on the wire-net fitted on the top of the cage before becoming drowsy. All these effects were more prominent in the beginning of the studies and subsided slowly on the continuation of the treatment. Similar effects were also seen in those rats given alcohol in the same doses. The only difference was that above said effects were slightly less. On the other hand, control group given normal saline remained active throughout the day during the period of study.

It is concluded that different potencies of *R. communis* had variable effects on the biochemical and haematological profiles and decreased the body weight when administered daily for 14 days. The later effect persisted even after withholding the treatment for 2 weeks.

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