

R PROGRAMMING

Theoph DATASET

INTRODUCTION OF THE PROJECT

- In this project of R Programming, dataset of Theoph - Pharmacokinetics of Theophylline is taken.
- Theophylline is an anti-asthmatic drug.
- Here oral doses of Theophylline were given to 12 subjects and then serum concentrations were measured 11 times over 25 hours.
- It is a high Quality Dataset with 132 rows and 5 columns.
- Statistical Analysis such as Mean, Median, Mode, Variance, Standard deviation, Quantile is performed using Theoph Dataset in R Language.

INTRODUCTION OF THE PROJECT

- Data Visualization using Histogram and Bar Graph is performed using Theoph data set in R studio.
- Data Visualization is used to represent data in clear and visible Graphs and Structures.
- Statistical Analysis such as Mean, Median, Mode, Variance, Standard deviation, Quantile is performed using Theoph Dataset in R Language.

AIM OF THE PROJECT

- To implement Statistical Analysis using Theoph Dataset in rstudio.
- The aim is to find the maximum and minimum concentration of each dose of Theophylline with respect to time using Data Visualization.

DATASET DESCRIPTION

Theophylline is a methylxanthine drug used in therapy for respiratory diseases such as chronic obstructive pulmonary disease (COPD) and asthma under a variety of brand names.

This is an example of a laboratory pharmacokinetic study characterized by many observations on a moderate number of individuals.

The Dataset Theoph is an experiment on the pharmacokinetics of theophylline.

This dataset consists of 5 columns and 132 rows.

- FIVE rows in Dataset includes:

Subject :

In this column of dataset there are ordered levels from 1 to 12 and it is ordered by observing concentration of theophylline and it is categorized into non numeric vector.

Wt :

this column refers to weight of the subject in kgs.

Dose :

it contains information of supervision about dose of theophylline in Subject.

Which is measured in milligrams and kilograms.

Time :

Measurement of time in hours since sample was injected with theophylline.

conc :

Concentration amount of theophylline in milligrams and litres.

STATISTICAL ANALYSIS

MAXIMUM

- Finding Maximum for Wt, Dose, time, conc.

The screenshot shows the RStudio interface with the following details:

- Code Editor:** An R script named "Untitled1" containing the following code:

```
1 data(Theoph)
2 print(Theoph)
3
4 max(Theoph$Wt)
5 max(Theoph$Dose)
6 max(Theoph$Time)
7 max(Theoph$conc)
8
9
```
- Console:** Displays the output of the executed code:

```
R 4.2.3 · ~/R
> max(Theoph$Wt)
[1] 86.4
> max(Theoph$Dose)
[1] 5.86
> max(Theoph$Time)
[1] 24.65
> max(Theoph$conc)
[1] 11.4
>
```
- Environment:** Shows the "Theoph" dataset in the Global Environment, which contains 132 observations and 5 variables.
- Plots:** A blank plot area.
- Session:** Shows the current session information: R 4.2.3, 132 MiB, and the date/time: 08-12-2023, 14:41.

MINIMUM

- Finding Minimum for Wt, Dose, time, conc.

The screenshot shows the RStudio interface with the following components:

- Code Editor:** An untitled R script containing the following code:

```
1 data(Theoph)
2 print(Theoph)
3
4 min(Theoph$wt)
5 min(Theoph$dose)
6 min(Theoph$time)
7 min(Theoph$conc)
```
- Console:** Displays the output of the R session:

```
R 4.2.3 · ~/R
> min(Theoph$wt)
[1] 54.6
> min(Theoph$dose)
[1] 3.1
> min(Theoph$time)
[1] 0
> min(Theoph$conc)
[1] 0
>
```
- Data View:** Shows the "Theoph" dataset in the Global Environment tab, with 132 observations and 5 variables.
- Bottom Taskbar:** Includes icons for various Windows applications like File Explorer, Edge, and Mail, along with system status icons.

MEAN

- Mean refers to finding average of whole dataset by adding all numbers and then dividing them with total number of dataset.
- Finding Mean for Wt, Dose, time, conc.

The screenshot shows the RStudio interface with the following details:

- Code Editor (Untitled1):** Contains R code to load the "Theoph" dataset and calculate the mean for four variables: weight (wt), dose, time, and concentration (conc).

```
1 data(Theoph)
2 print(Theoph)
3
4 mean(Theoph$wt)
5 mean(Theoph$Dose)
6 mean(Theoph$Time)
7 mean(Theoph$conc)
```
- Console:** Displays the output of the R code, showing the mean values for each variable.

```
> mean(Theoph$wt)
[1] 69.58333
> mean(Theoph$Dose)
[1] 4.625833
> mean(Theoph$Time)
[1] 5.894621
> mean(Theoph$conc)
[1] 4.960455
>
```
- Environment:** Shows the "Theoph" dataset loaded into the Global Environment, with 132 observations and 5 variables.
- Plots:** No plots are visible in this screenshot.

MEDIAN

- After ordering the data the number which arrives in middle is median.
- Finding Median for Wt, Dose, time, conc.

The screenshot shows the RStudio interface with the following details:

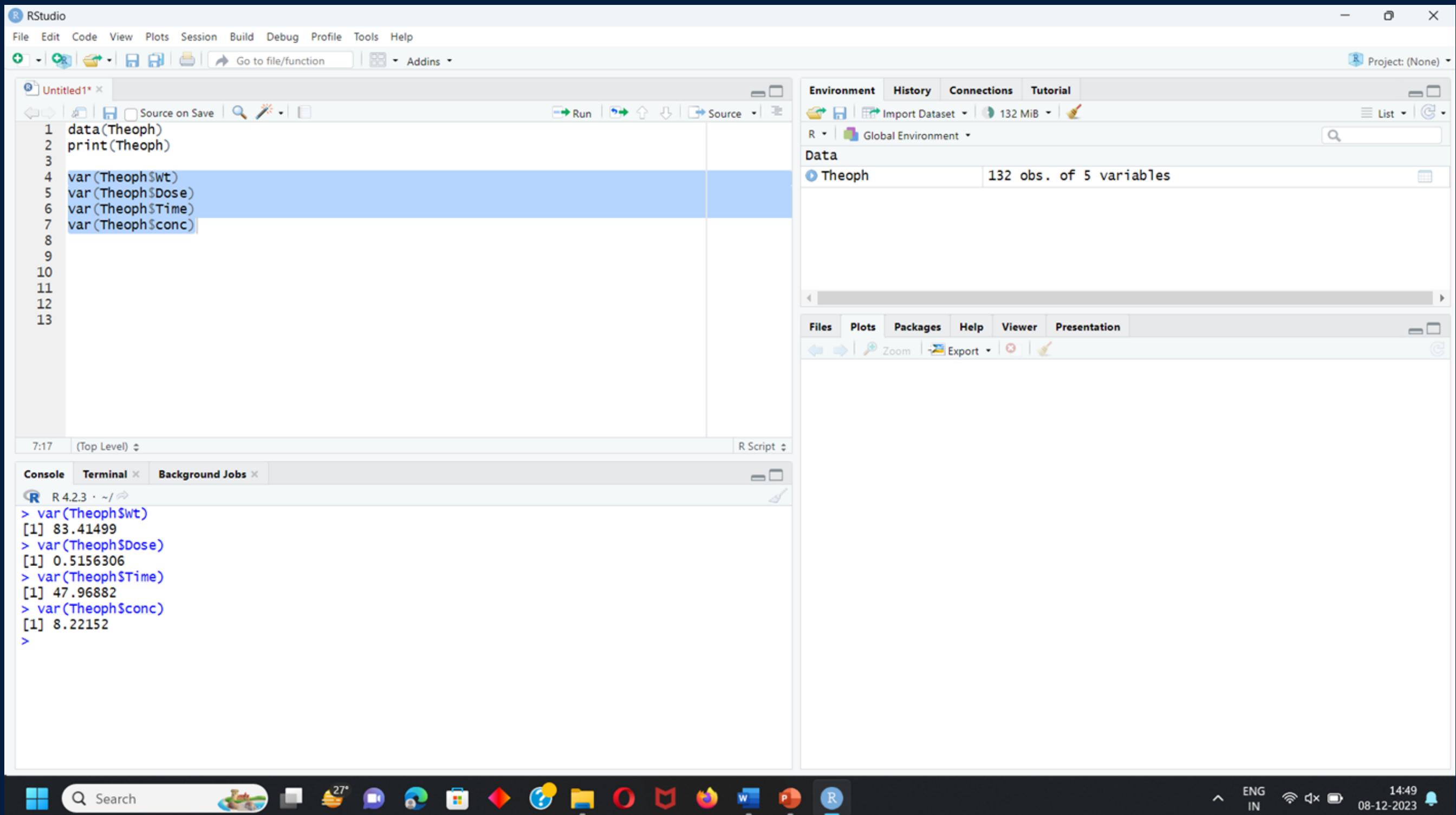
- Code Editor:** An untitled R script file containing the following code:

```
1 data(Theoph)
2 print(Theoph)
3
4 median(Theoph$wt)
5 median(Theoph$dose)
6 median(Theoph$time)
7 median(Theoph$conc)
```
- Console:** Displays the output of the executed code:

```
R 4.2.3 · ~/R
> median(Theoph$wt)
[1] 70.5
> median(Theoph$dose)
[1] 4.53
> median(Theoph$time)
[1] 3.53
> median(Theoph$conc)
[1] 5.275
> |
```
- Environment View:** Shows the "Theoph" dataset with 132 observations and 5 variables.
- Bottom Status Bar:** Shows system information including battery level (27%), network (ENG IN), and date/time (08-12-2023, 14:47).

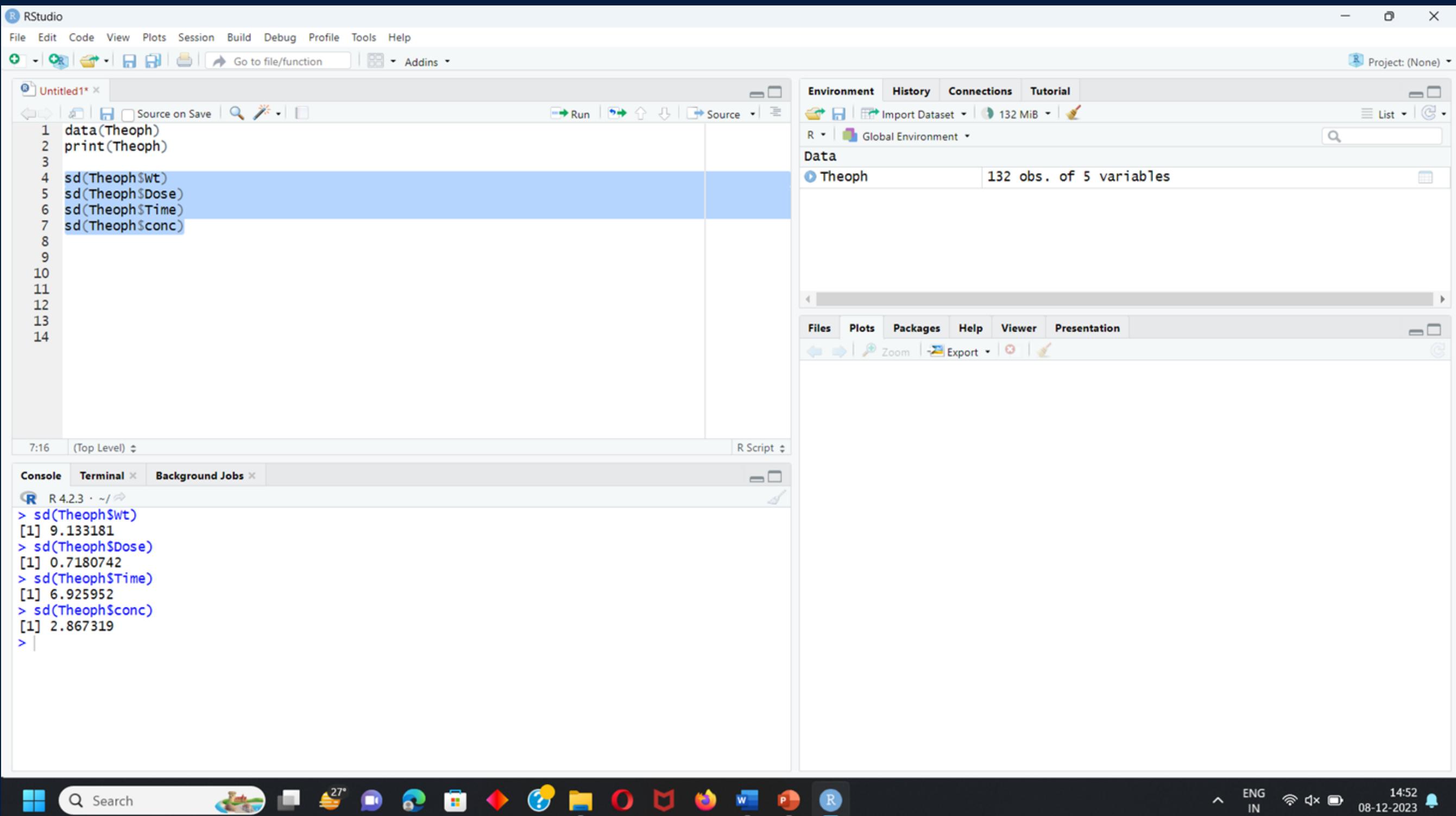
VARIANCE

- Measurement of number which differ from mean.
 - Finding Median for Wt, Dose, time, conc.



STANDARD DEVIATION

- It calculates deviation of value from mean value.
- Finding Standard Deviation for Wt, Dose, time, conc.



The screenshot shows the RStudio interface with the following details:

- Code Editor (Top Left):** An R script titled "Untitled1" containing the following code:

```
1 data(Theoph)
2 print(Theoph)
3
4 sd(Theoph$wt)
5 sd(Theoph$dose)
6 sd(Theoph$time)
7 sd(Theoph$conc)
```
- Console (Bottom Left):** The R console output showing the standard deviations for each variable:

```
R 4.2.3 · ~/R
> sd(Theoph$wt)
[1] 9.133181
> sd(Theoph$dose)
[1] 0.7180742
> sd(Theoph$time)
[1] 6.925952
> sd(Theoph$conc)
[1] 2.867319
>
```
- Data View (Top Right):** The "Data" tab in the Environment pane shows the "Theoph" dataset with 132 observations and 5 variables.
- Plots (Bottom Right):** A small preview of the plots tab is visible.

SUMMARY

- Gives whole summary of statical analysis
- Finding Summary for Wt, Dose, time, conc.

The screenshot shows the RStudio interface with the following components:

- Code Editor:** An R script titled "Untitled1" containing the following code:

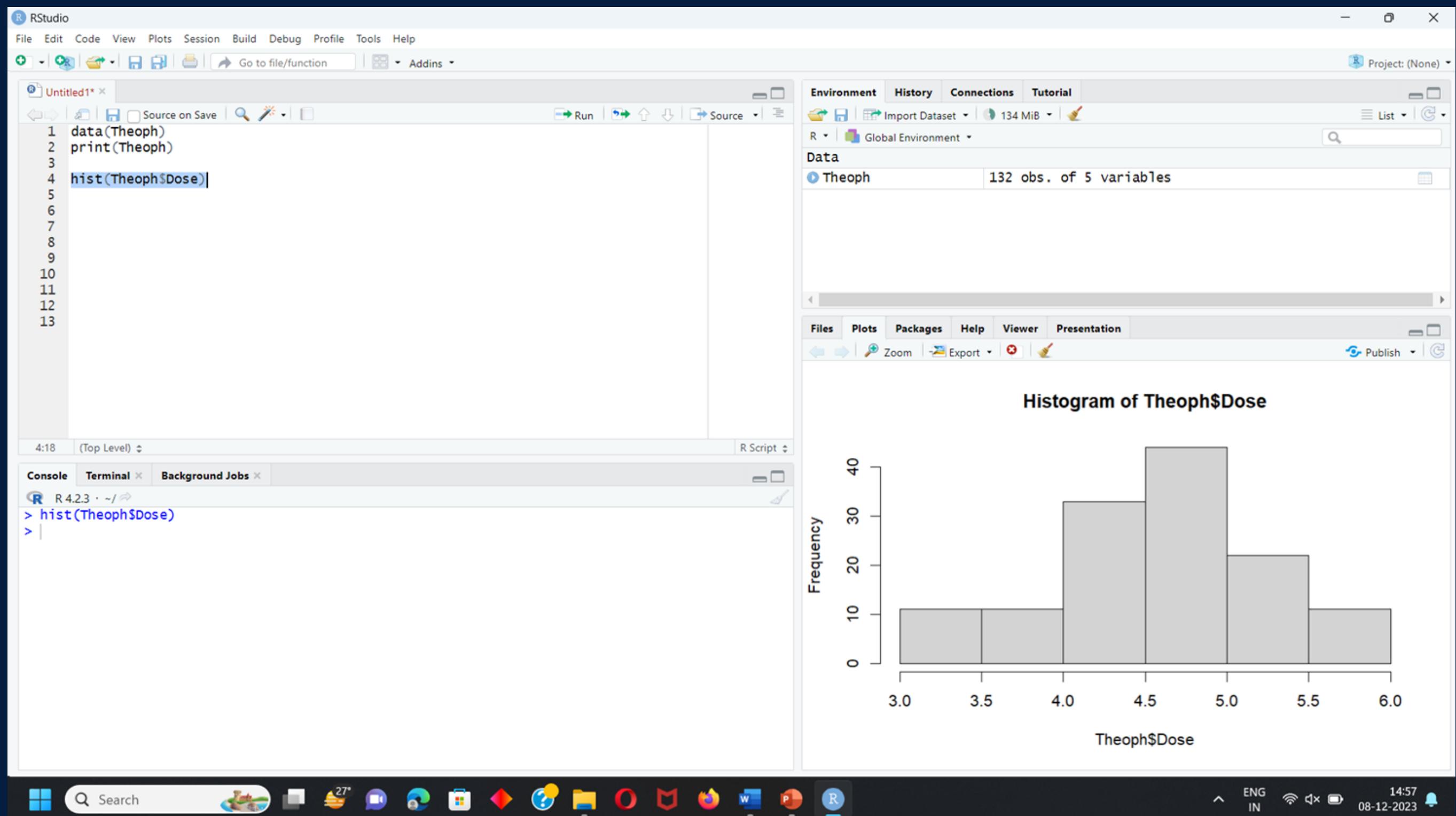
```
1 data(Theoph)
2 print(Theoph)
3
4 summary(Theoph$Subject)
5 summary(Theoph$wt)
6 summary(Theoph$dose)
7 summary(Theoph$time)
8 summary(Theoph$conc)
9
10
11
12
13
14
15
```
- Console:** Displays the output of the R code:

```
R 4.2.3  ~/R
> summary(Theoph$Subject)
 6 7 8 11 3 2 4 9 12 10 1 5
11 11 11 11 11 11 11 11 11 11 11
> summary(Theoph$wt)
  Min. 1st Qu. Median Mean 3rd Qu. Max.
 54.60   63.58  70.50  69.58   74.42  86.40
> summary(Theoph$dose)
  Min. 1st Qu. Median Mean 3rd Qu. Max.
 3.100   4.305  4.530  4.626   5.037  5.860
> summary(Theoph$time)
  Min. 1st Qu. Median Mean 3rd Qu. Max.
 0.000   0.595  3.530  5.895   9.000  24.650
> summary(Theoph$conc)
  Min. 1st Qu. Median Mean 3rd Qu. Max.
 0.000   2.877  5.275  4.960   7.140  11.400
>
```
- Environment View:** Shows the "Theoph" dataset in the Global Environment, which contains 132 observations and 5 variables.
- Bottom Taskbar:** Includes icons for various applications like File Explorer, Task View, and a system tray with battery, signal, and date/time information.

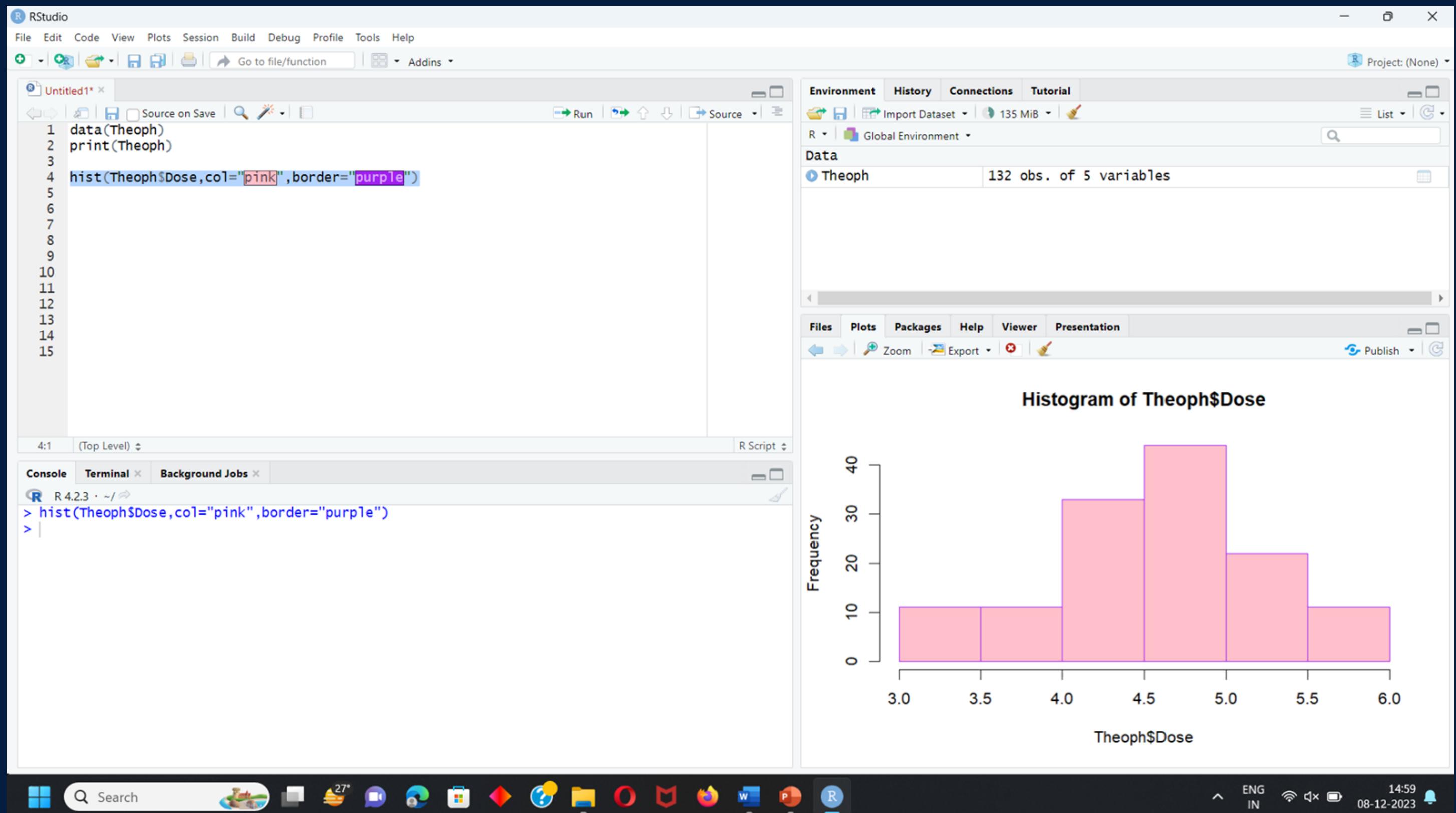
DATA VISUALIZATION

HISTOGRAM

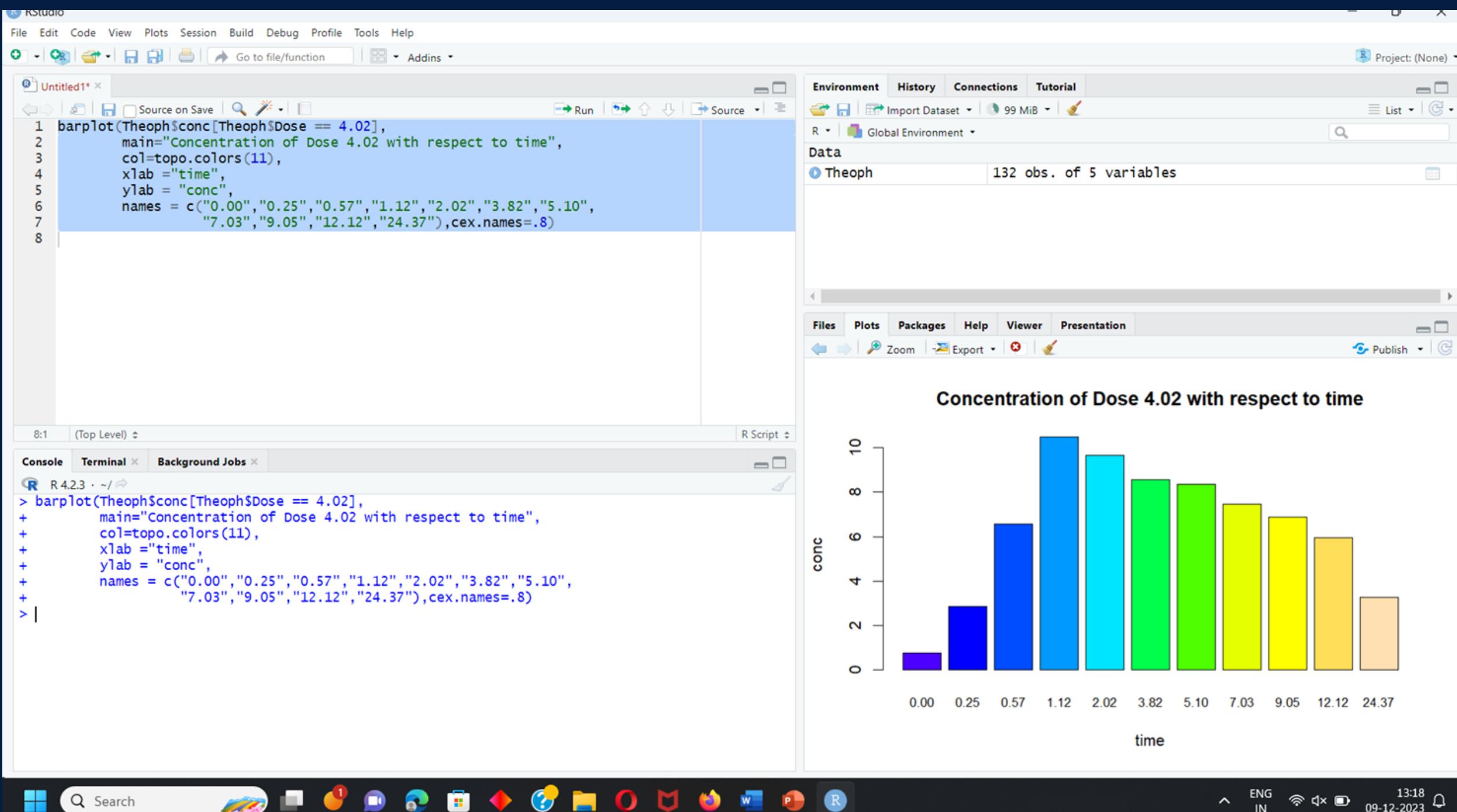
- Histogram for column name Dose is created.



To change colour of histogram and add border to represent it more clearly

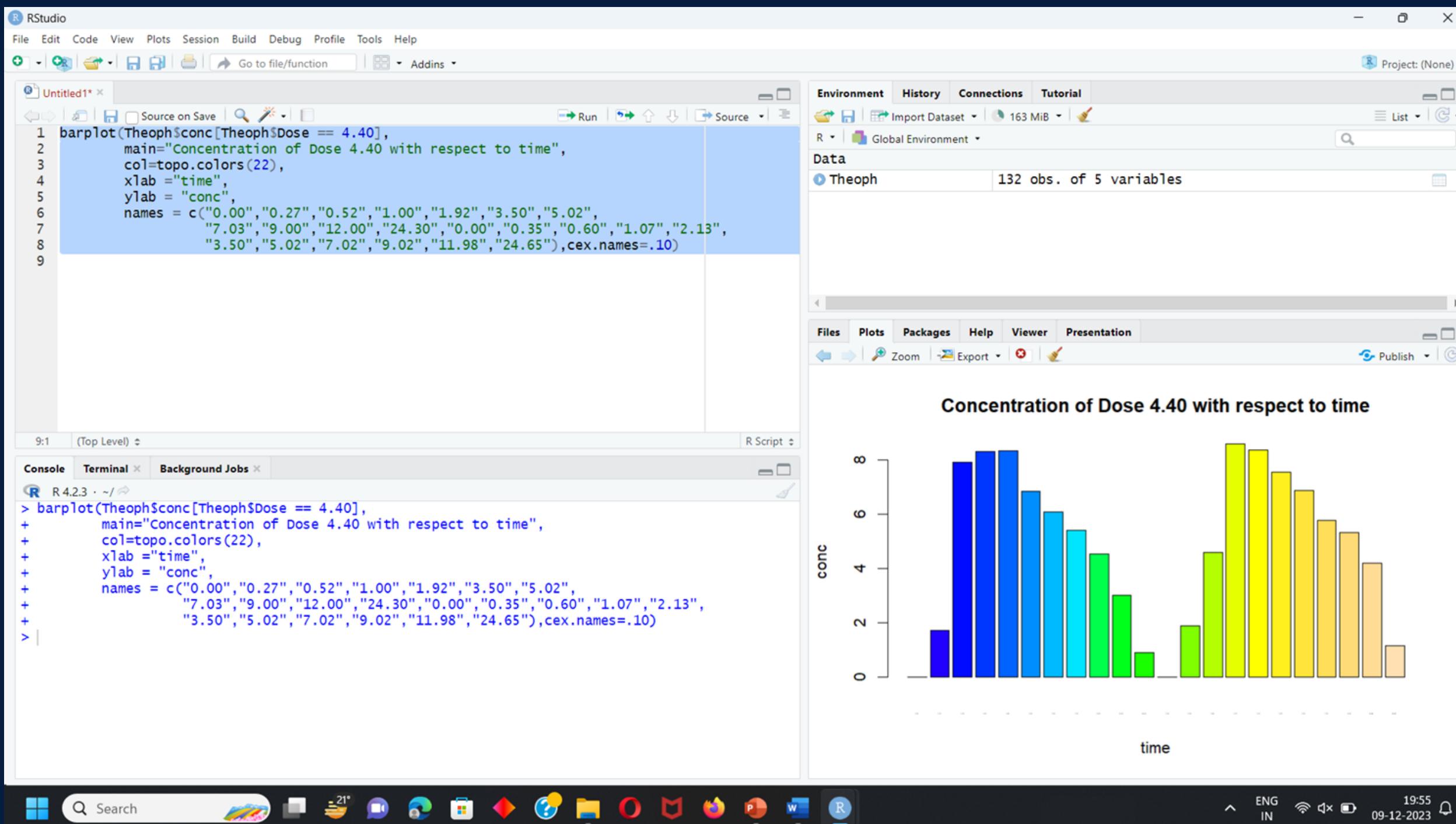


BARGRAPH TO EXAMINE CONC FOR DOSE 4.02 WITH RESPECT TO TIME



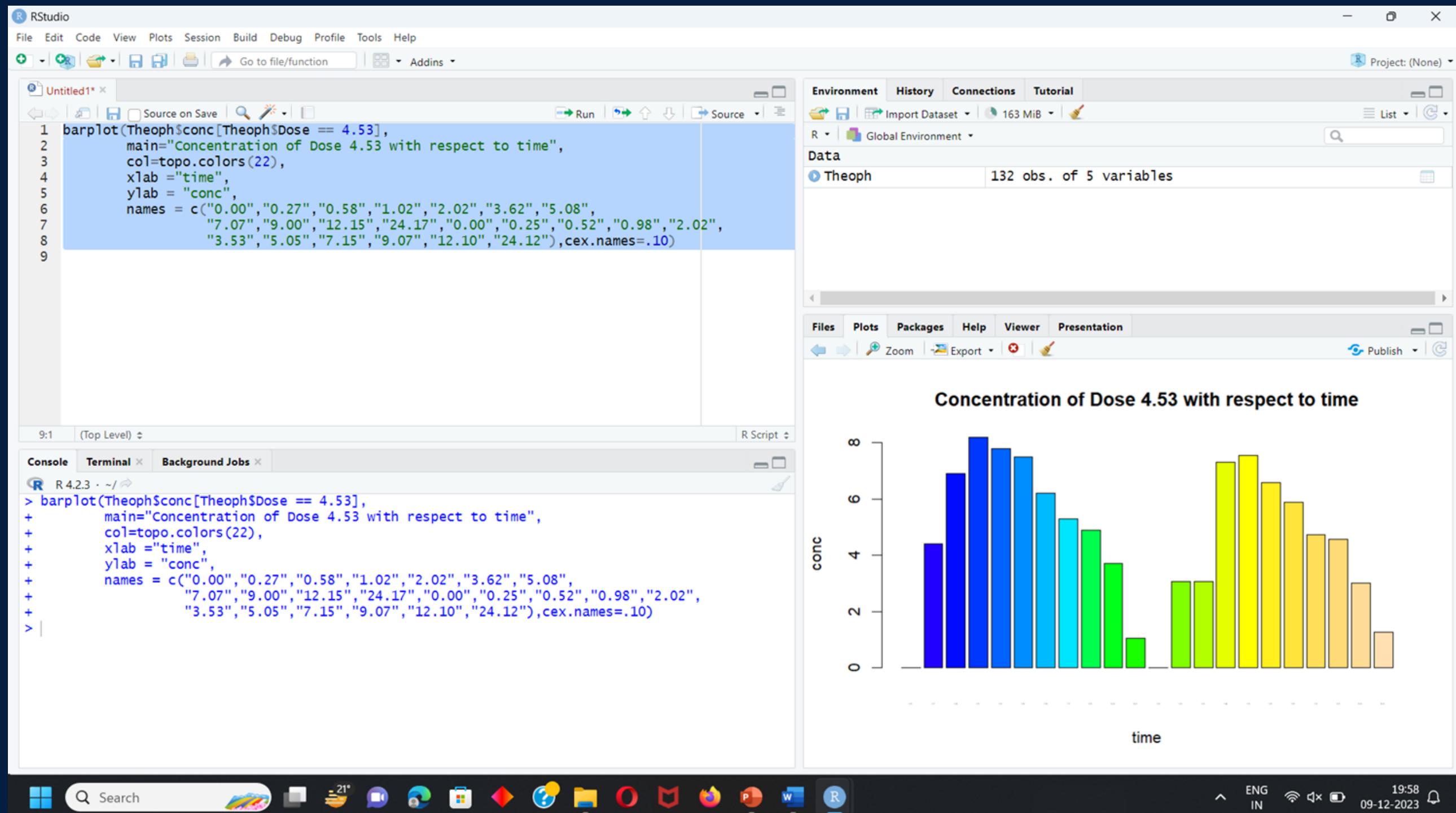
- The concentration of dose 4.02 Theophylline at different time is mentioned in bar graph.
- Maximum concentration is observed at 1.12.
- Minimum concentration is observed at 0.00.

BARGRAPH TO EXAMINE CONC FOR DOSE 4.40 WITH RESPECT TO TIME



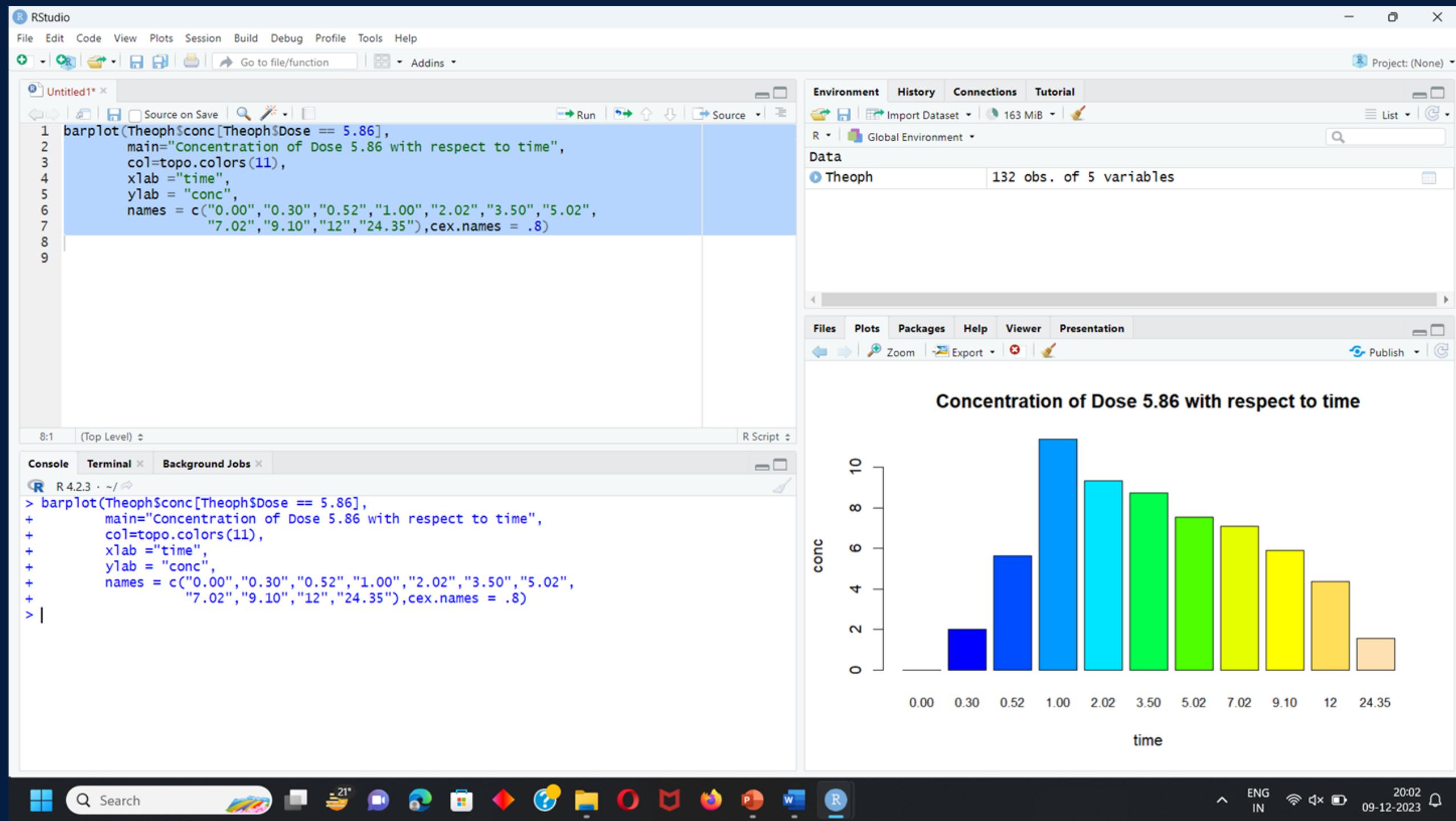
- The concentration of dose 4.40 Theophylline at different time is mentioned in bar graph.
- Maximum concentration is observed at 8.60
- Minimum concentration is observed at 0.00

BARGRAPH TO EXAMINE CONC FOR DOSE 4.53 WITH RESPECT TO TIME



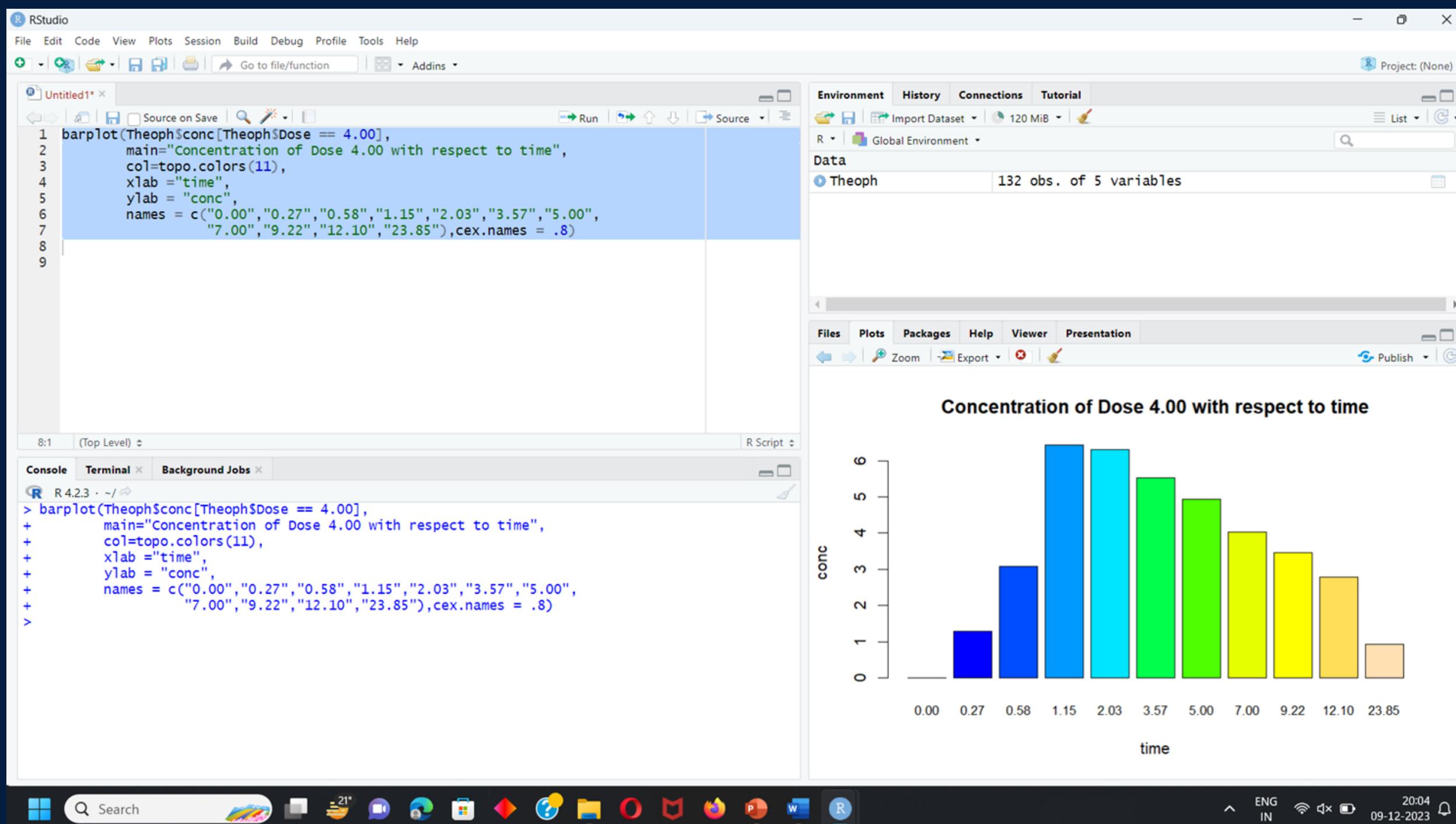
- The concentration of dose 4.53 Theophylline at different time is mentioned in bar graph.
- Maximum concentration is observed at 8.20
- Minimum concentration is observed at 0.00

BARGRAPH TO EXAMINE CONC FOR DOSE 5.86 WITH RESPECT TO TIME



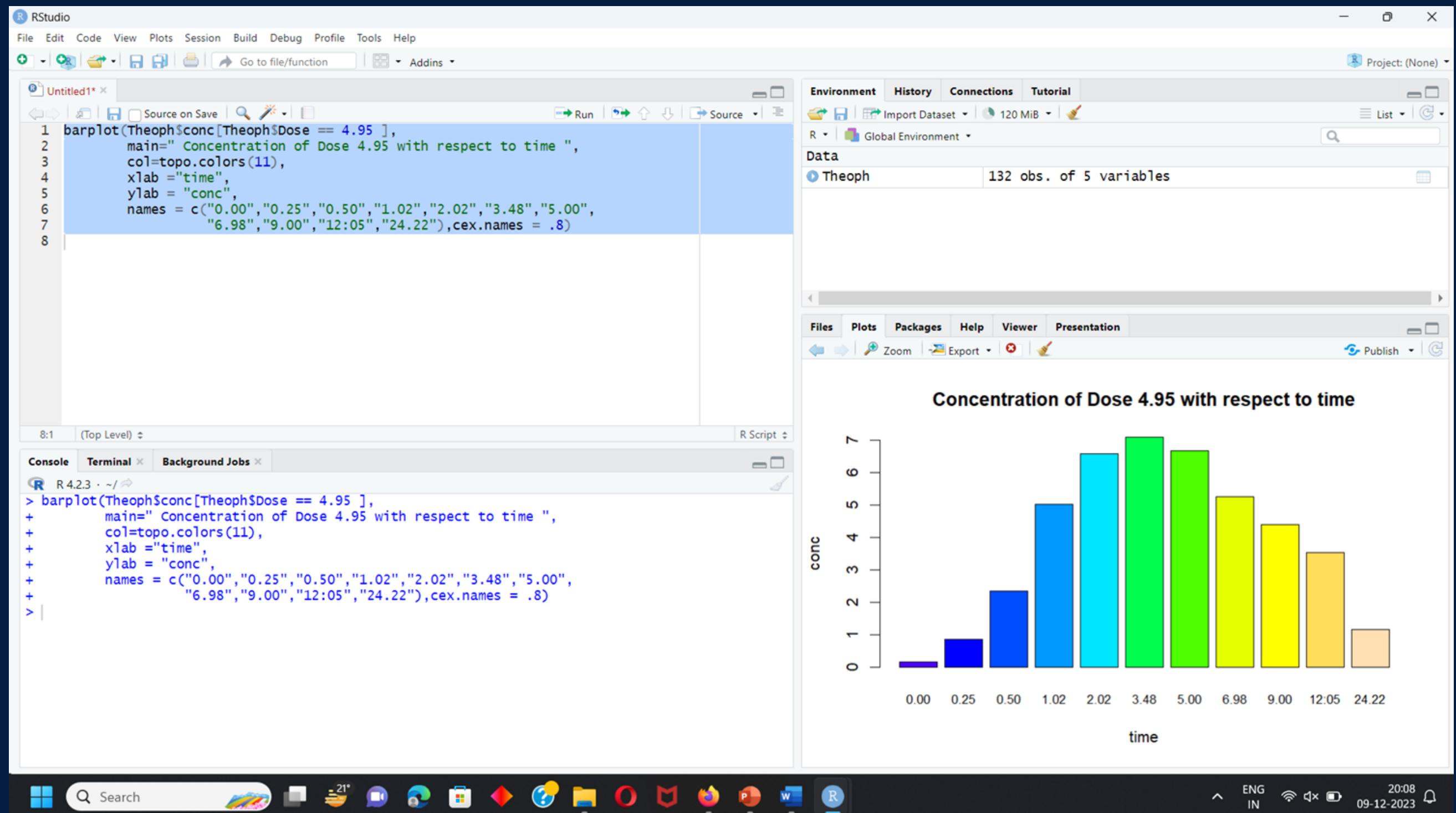
- The concentration of dose 5.86 Theophylline at different time is mentioned in bar graph.
- Maximum concentration is observed at 1.00.
- Minimum concentration is observed at 0.00.

BARGRAPH TO EXAMINE CONC FOR DOSE 4.00 WITH RESPECT TO TIME



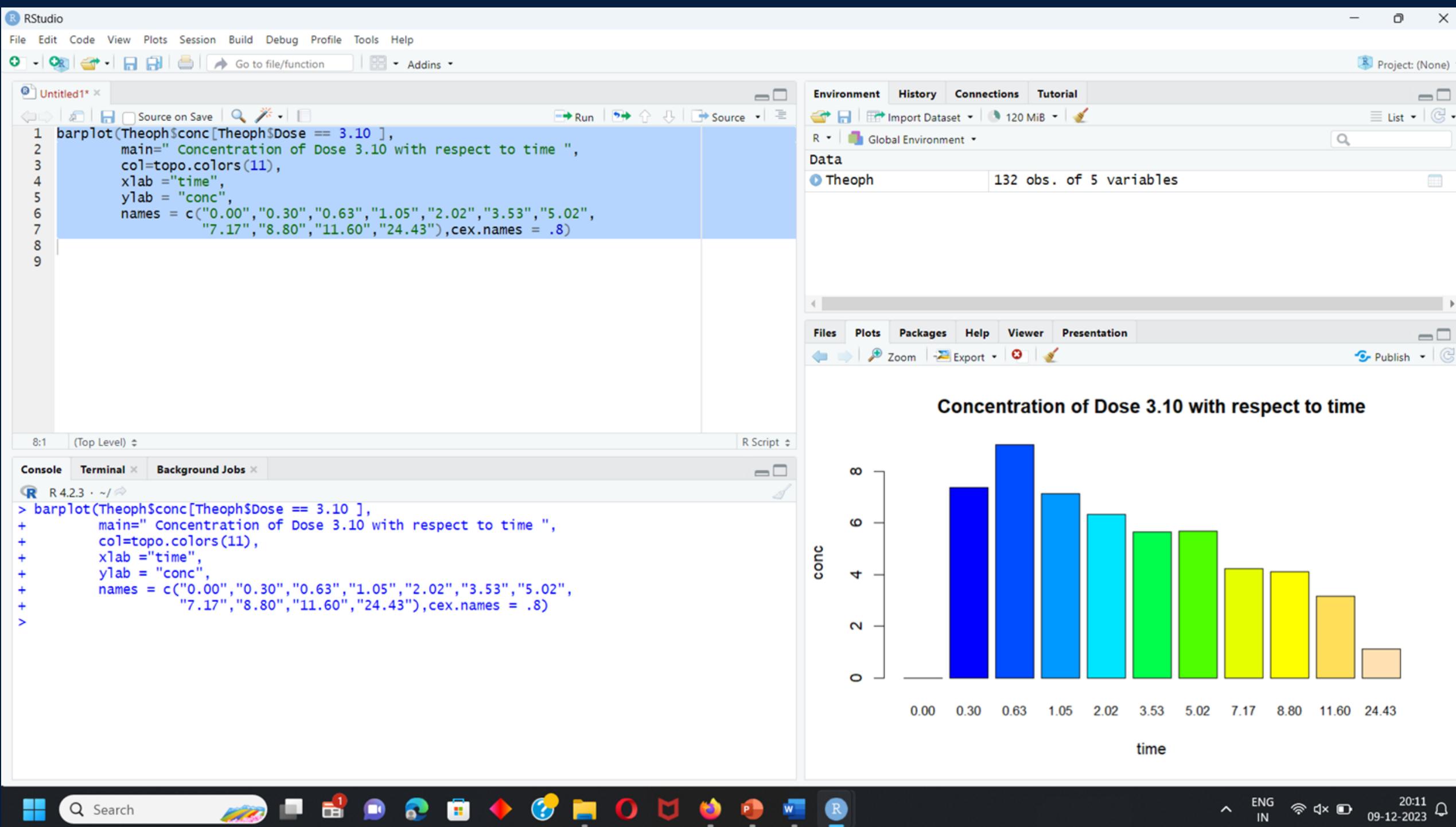
- The concentration of dose 4.00 Theophylline at different time is mentioned in bar graph.
- Maximum concentration is observed at 1.15.
- Minimum concentration is observed at 0.00.

BARGRAPH TO EXAMINE CONC FOR DOSE 4.95 WITH RESPECT TO TIME



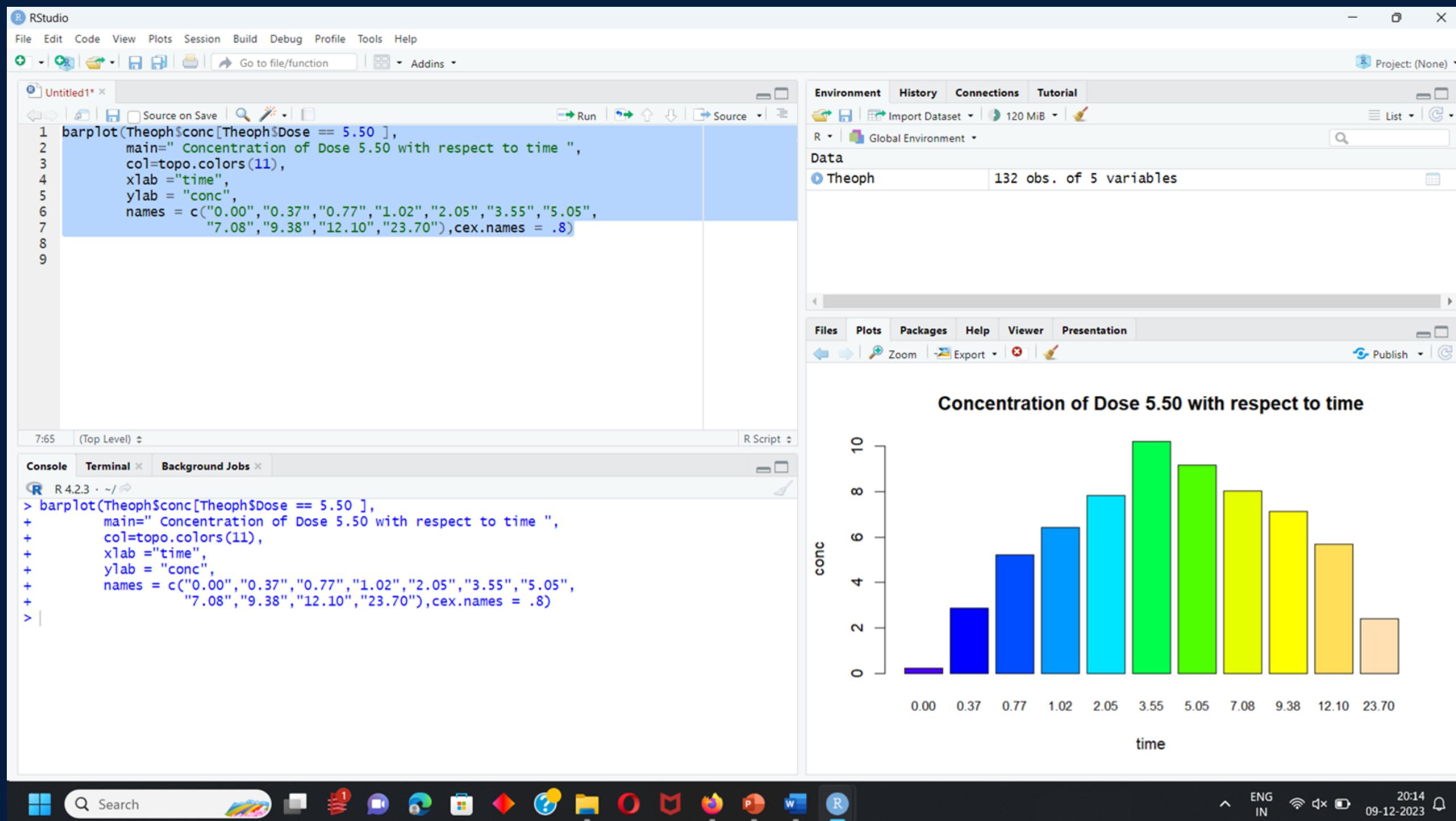
- The concentration of dose 4.95 Theophylline at different time is mentioned in bar graph.
- Maximum concentration is observed at 3.48.
- Minimum concentration is observed at 0.00.

BARGRAPH TO EXAMINE CONC FOR DOSE 3.10 WITH RESPECT TO TIME



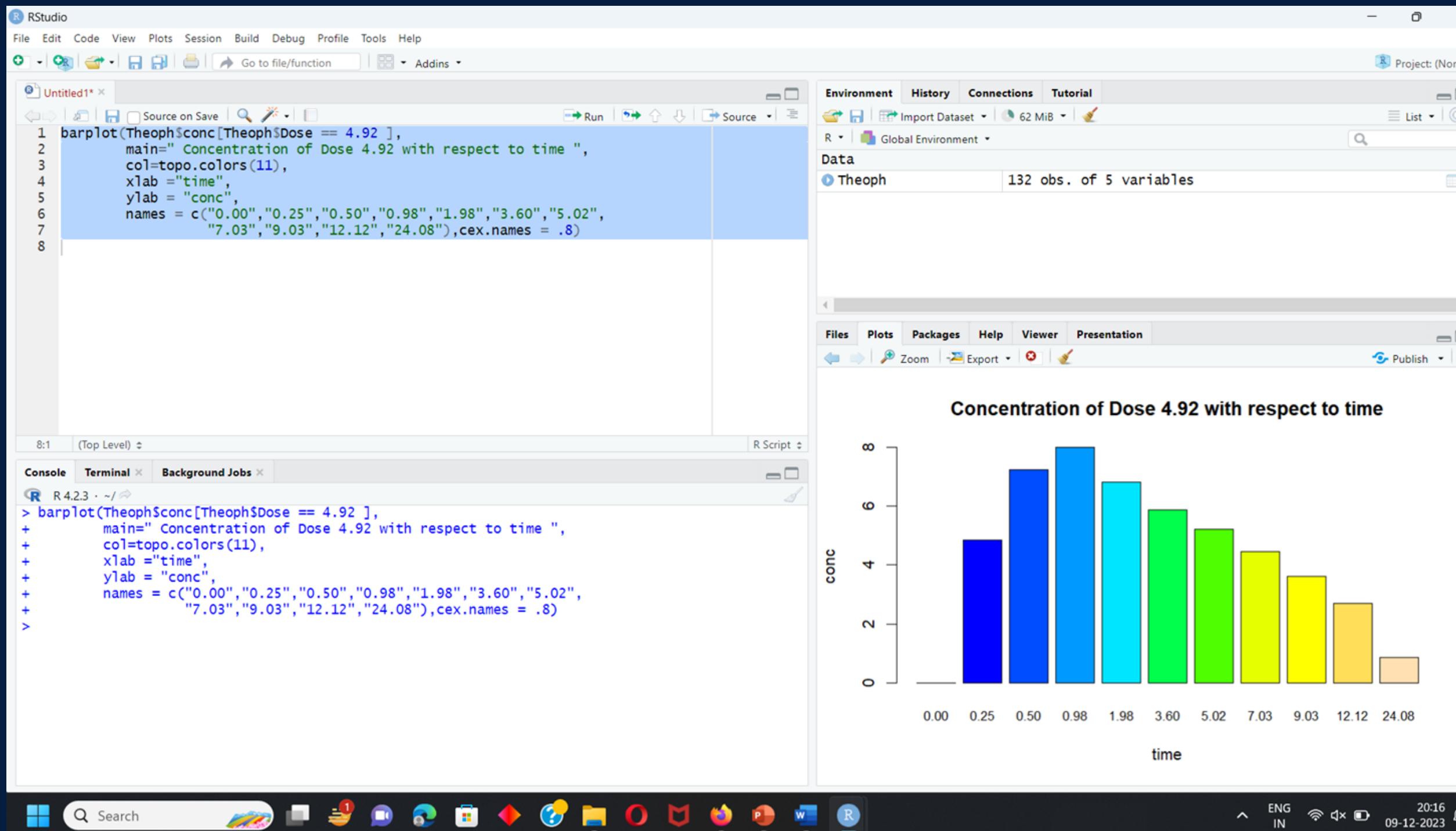
- The concentration of dose 3.10 Theophylline at different time is mentioned in bar graph.
- Maximum concentration is observed at 3.48.
- Minimum concentration is observed at 0.00.

BARGRAPH TO EXAMINE CONC FOR DOSE 5.50 WITH RESPECT TO TIME



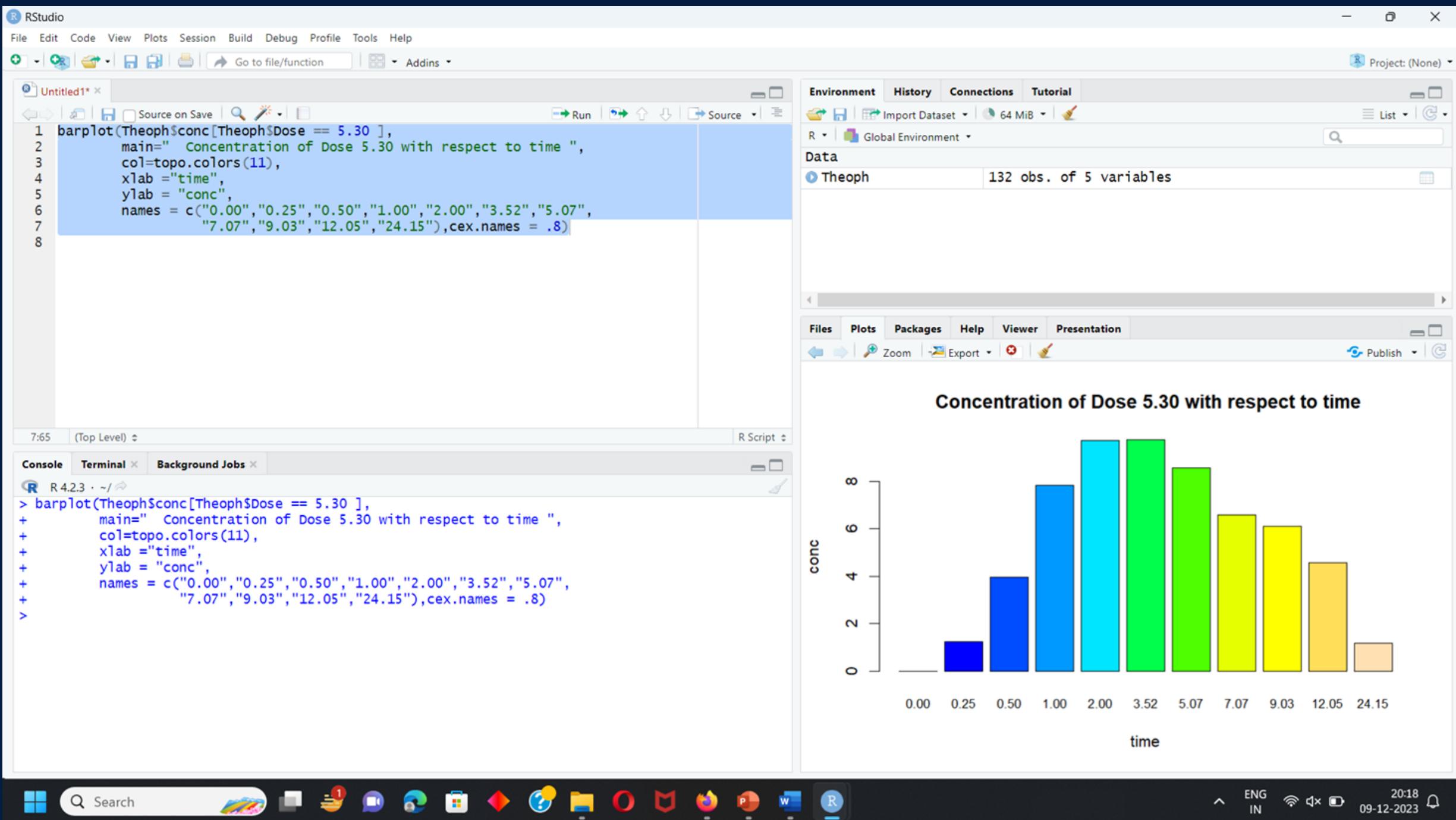
- The concentration of dose 5.50 Theophylline at different time is mentioned in bar graph.
- Maximum concentration is observed at 3.55.
- Minimum concentration is observed at 0.00.

BARGRAPH TO EXAMINE CONC FOR DOSE 4.92 WITH RESPECT TO TIME



- The concentration of dose 4.92 Theophylline at different time is mentioned in bar graph.
- Maximum concentration is observed at 0.98.
- Minimum concentration is observed at 0.00.

BARGRAPH TO EXAMINE CONC FOR DOSE 5.30 WITH RESPECT TO TIME



- The concentration of dose 5.30 Theophylline at different time is mentioned in bar graph.
- Maximum concentration is observed at 3.52.
- Minimum concentration is observed at 0.00.

CONCLUSION

DOSE 4.02

Maximum Concentration of Dose 4.02 is observed at time 1.12.

Minimum Concentration of Dose 4.02 is observed at time 0.00.

DOSE 4.40

Maximum Concentration of Dose 4.40 is observed at time 8.60.

Minimum Concentration of Dose 4.40 is observed at time 0.00.

DOSE 4.53

Maximum Concentration of Dose 4.53 is observed at time 8.20.

Minimum Concentration of Dose 4.53 is observed at time 0.00.

DOSE 5.86

Maximum Concentration of Dose 5.86 is observed at time 1.00.

Minimum Concentration of Dose 5.86 is observed at time 0.00.

DOSE 4.00

Maximum Concentration of Dose 4.00 is observed at time 1.15.

Minimum Concentration of Dose 4.00 is observed at time 0.00.

DOSE 4.95

Maximum Concentration of Dose 4.95 is observed at time 3.48.

Minimum Concentration of Dose 4.95 is observed at time 0.00.

DOSE 3.10

Maximum Concentration of Dose 3.10 is observed at time 0.63.

Minimum Concentration of Dose 3.10 is observed at time 0.00.

DOSE 5.50

Maximum Concentration of Dose 5.50 is observed at time 3.55.

Minimum Concentration of Dose 5.50 is observed at time 0.00.

DOSE 4.92

Maximum Concentration of Dose 4.92 is observed at time 0.98.

Minimum Concentration of Dose 4.92 is observed at time 0.00.

DOSE 3.50

Maximum Concentration of Dose 5.30 is observed at time 3.52.

Minimum Concentration of Dose 5.30 is observed at time 0.00.

CONCLUSION

Dose	Maximum	Minimum
4.02	1.12	0.00
4.40	8.60	0.00
4.53	8.20	0.00
5.86	1.00	0.00
4.00	1.15	0.00
4.95	3.48	0.00
3.10	0.63	0.00
5.50	3.55	0.00
4.92	0.98	0.00
5.30	3.52	0.00

- Maximum Concentration from all Doses is 8.60.
- Minimum Concentration from all Doses is 0.00.

THANK YOU