

# Analysis of Tyre and Tread Marks: A Prospective Study

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## Abstract

Tyre marks can signify the presence of the vehicle at the crime scene and are used as evidence which is of great help in identification of the preparator by placing suspect at the scene by matching the tyre with the tyre of suspected vehicle as it is difficult for two different vehicles to leave the same impression. Tyre marks impression are also helpful in hit and run cases as it provides the path and direction of the culprit arrival and departure from the crime scene it also provides the link between the vehicle the victim the crime scene and culprit and can be used for the reconstruction of crime scene. The purpose of this study was to analyze the characteristics of the tyre marks and classify them into the class categories to make it easy for the investigator to recognize the type of tyre marks with mere observation. For this study 100 samples were collected from two wheelers which includes front and rear tyre marks of bike and scooty, along with their "configuration, make, model and type of vehicle." It was observed that different manufacturing brands have different tread designs which make it easy to recognize the model of the tyre and the size that varies according to the vehicle.

**Keywords:** Tyre Marks; Classification; Tread Design.

## INTRODUCTION

Tyre marks are the prints or impressions of tyres on which vehicle was driven and is found at crime scene most frequently at the places of parking, hiding and the sites of disposal of incriminating evidence.<sup>1,2,3</sup> Mostly tyre marks are found imprinted on dust, wet soil, sand, slightly loose pitch specially in the summer. Sometimes these are formed when the vehicle passes over the liquid or powdered

surface to the plane surface. Such impressions can be collected by taking a scaled photograph of marks. The plaster of Paris cast can also be prepared when marks are found on wet area.<sup>4,6</sup> Tyre tread is the rubber on the tyre that makes contact with the surface, The larger the contact area the more is the grip. There are different parts of tyre treads like blocks, rib, sipes. Blocks are the raised blocks of rubber along the tyre circumference separated by grooves. Ribs are the segments of rubber that runs along the circumference of the tyre.<sup>7-10</sup> Sipes are slits cut across the tread blocks. Grooves are channels that run circumferentially and laterally over the tyre surface. There are mainly three type of tyre tread patterns: Symmetric, Asymmetric, Directional.<sup>7,8,10</sup> With the increase in the number of motor vehicle there is also increment in the hit and run case's where tyre marks provide significant evidence in these cases. Tyre marks examination is based on its tread width, tread pattern, tread length preferably.<sup>3,4,6,11,12,13</sup>

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The study was "Conducted know the Characteristics" of tyre and its correlation with tyre prints (patterns) and classify the different patterns into different categories.

## METHODOLOGY

### Sample Collection

100 Samples were collected on white glossy sheet by painting the tyre with black paint and rolling the vehicle over the sheet. Both the front and rear tyre marks was obtained by same method.

### Material Used

Glossy white sheet, Black paint, Brush, Vehicle tyre.

### Procedure

Vehicle was kept on main stand and half of the tyre was painted with the black paint with the help of paint brush, then the sheet was kept just beneath the tyre and the vehicle was moved to pass over the white sheet by leaving the prints on the sheet of paper.

The length for the print was 3 feet along with width were recorded. Configuration of the tyre was recorded and with the help of configuration, inner diameter of ring was also recorded. The rib pattern was observed along with the length of 15 cm and the pattern of the rib and its width were calculated and center line and lug were also examined using ruler and the configuration recorder.

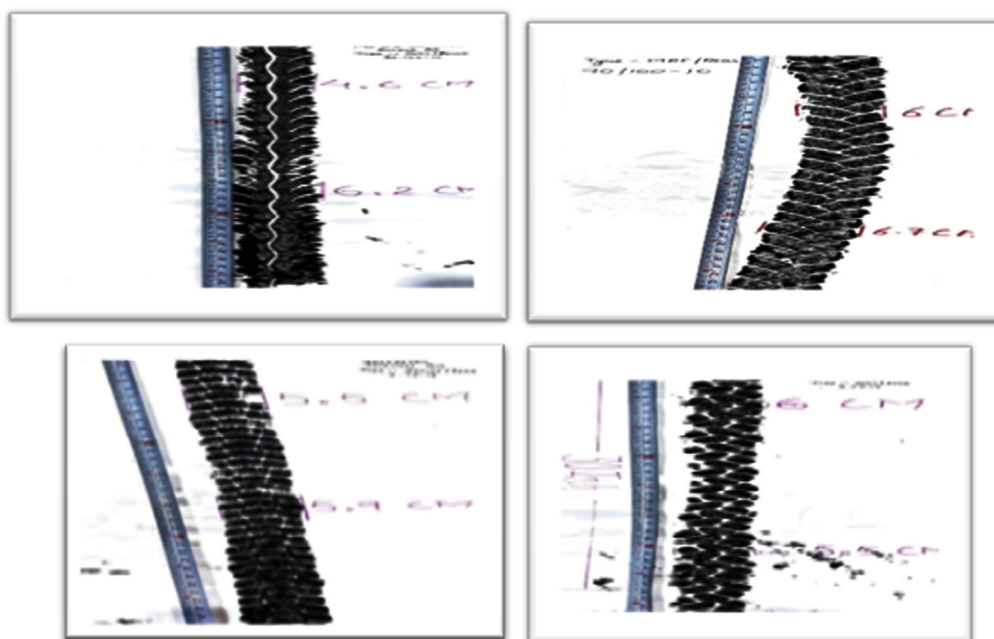


Fig. 1: Samples images of tyre marks

## RESULTS AND DISCUSSIONS

All 100 samples collected were divided into the manufacturing brand which are Ceat (37), MRF (31), TVS (19), Apollo (3), Euro grip (2), Kenda, metro polytan, maxxis, secure, JK, dragon pro, jumbo, Birla.

Among the 100 samples collected "Ceat" was the most used tyre brand followed by "MRF" and then "TVS" and others. Total thirteen different types of brands of tyre marks were collected.

Table 1: (common patterns found on tyres)

Brand	Rib pattern	Lug
Ceat	Rhombus, Triangle	Present
MRF	Rhombus, Quadrilateral	Absent
TVS	Square, Quadrilateral	Present
Apollo	Rhombus	Present
Birla	Straight line	Absent
Jumbo	Quadrilateral	Absent

table cont....

Kenda	Discontinues line	Absent
Eurogrip	Diamond	Absent
Secure	Pointed arrow	Absent
J.K	Irregular	Absent
Maxxis	Triangle	Absent
Dragon Pro	Curved arrow	Absent

### CEAT

Total 37 prints of ceat tyres were collected out of which 19 were of bikes and among that 9 were of front wheel and 10 were of rear wheel. 18 prints were of scooty out of which 5 were of front wheel and 13 were of rear wheel. Ceat tyres showed pattern of ribs having shape of triangle, rhombus, square, quadrilateral, zig-zag line, diamond, heart, discontinuous straight line. The most common pattern found on the Ceat tyres was the rhombus and triangle.

### MRF

Total 31 tyre of MRF category were recorded from out of which 12 were of bike and among them 5 were of front position and 7 were of rear position. 19 were of scooty from which 11 were of front position and 8 were of rear position. MRF tyres showed the patterns as hook, stairs, parallelogram, rhombus, quadrilateral, square, semi-circle, rectangle, diamond, oval, arrow. Various types of patterns were observed and in most common were rhombus and Quadrilateral in which lug was absent.

### TVS

Total 19 tyres of TVS were observed from which 7 were of bike and among them 2 were of front position and 5 were of rear position. 12 tyres were of scooty out of which 6 were of front position and 6 of rear position. TVS tyre showed patterns having shape square, quadrilateral, straight line, rhombus, pentagon, irregular, triangle, wave line, arrow, leaf, zig zag line. And most common were Quadrilateral and Arrow.

### Others

13 different brands were observed - Apollo, Birla, Jumbo, Kenda, Eurogrip, Secure, J.k, Maxxis, Dragon pro.

## TYRE USED COMMONLY

■ CEAT ■ MRF ■ TVS ■ OTHERS

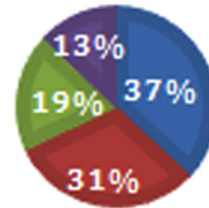


Fig. 2: Commonly used tyre marks

Out of all the models of tyre Ceat was the most used tyre in every vehicle.

## CONCLUSION

This study was done to create a database for the different make of tyre and to know their width and configuration. To establish a link between tyre marks to the tyre. This study included manufacturing brand, configuration, and width at two points of tyre. The tyre marks elements such as widths, tyre tread designs can be used to find out the probable tyre models involved. A database for the tyre prints was created and these can be correlated with the tyre marks found on the crime scene by doing a step-by-step matching.

## REFERENCES

1. Yin-Wei Wang, Journal of the Eastern Asia Society for Transportation Studies, Vol. 7, 2007, pp-41-51.
2. Bhupesh Kumar, International Journal of Recent Technology and Engineering, Vol-7, March 2019, pp-932-936.
3. R.F Lambourn, Journal of the Forensic Science Society, Vol. 29, November 1989, pp-371-386.
4. Wojciech Wach and Jakub Zebala, Journals energies, vol. 14, June 2021, pp-274-283.
5. D Colbry, J Luchini, Pattern recognition for classification and matching of car tyre, Tyre science and technology, Vol. 33, July 2003, pp-2-17.
6. M.J Thali, M Braun, W Brushweiler and R Dirnhofer, Matching Tyre Tracks on the Head Using Forensic Photogrammetry, Forensic Science International, Vol. 13, 2000, pp. 281-287.
7. Gueissaz, Massonnet, Genevieve, chemical Analysis of Tyre Traces in Traffic Accidents Investigation,

- Journal of Science and Medicine, Vol.2, December 2015, pp-99-108.
8. M.H Chernets, Problems of Vehicle Identification by Tyre Marks on The Soil, Law and Safety, Vol.2, February 2021, pp-111-115.
  9. G Beauchamp, D Thornton, N Rose, Tire Mark Striations, Sensitivity and Uncertainty Analysis, SAE International Journal. Vol.4, June 2016, pp-121-127.
  10. Ke Zhu, Uncertainty Analysis of Accident Vehicle Speed Based on Tyre Marks, Journal of Physics,= Conference Series, ICMMAP 2022.
  11. Dr. M.S Rao - Crime scene management, page no.293.
  12. Forensic identification training and consulting services, <http://www.forensic.com/>. (accessed march 23.2023).
  13. Tire guide Inc. <http://tireguides.com> (accessed May 23.2023).
  14. Different types of tyre tread patterns..www.tyreplus-me.com (accessed march 23. 2023).

