

The main aim of this study was to determine the microscopic and macroscopic spray characteristics to study atomization of mechanical and solenoid injection systems in a specially designed and fabricated constant volume spray chamber. In order to obtain the macroscopic fuel spray characteristics, spray evolution was visualized. Spray visualization system composed of a high speed camera, white light sources and fuel injection system. Macroscopic spray parameters such as spray tip penetration, spray area and spray cone angle were analysed using spray images which were processed using Matlab. Microscopic spray characteristics were investigated for determining mean axial velocity of spray droplets and droplet size distribution using phase doppler interferometry (PDI). Effect of injection pressure and chamber pressure on macroscopic and microscopic spray parameters was investigated for fuels such as mineral diesel, Karanja biodiesel (KB100)/ blends (KB5, KB20) and Jatropha biodiesel (JB100)/ blends (JB5, JB20).

It was observed that with increase in fuel injection pressure, spray penetration increased while spray cone angle and spray area decreased. KB100 and JB100 were found to have highest penetration length and smallest spray area and spray cone angle followed by KB20, JB20; KB5, JB5 and mineral diesel. Moreover, the average axial velocity of spray droplets increased and spray droplet size decreased with increase in fuel injection pressure. With increase in initial chamber pressure, spray penetration decreased while spray cone angle and spray area increased. The spray penetration of mineral diesel was highest followed by KB5, JB5, KB20, JB20 and KB100, JB100. Similarly, the spray cone angle and spray area were highest for KB100, JB100 followed by KB20, JB20, KB5, JB5 and mineral diesel.