

## Design and Developing the Infrared Sensor for Detection and Measuring Mass Flow Rate in Seed Drills

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**Abstract :** Multiple or miss sowing by seed drills is a common problem on the farm. This problem causes overuse of seeds, wasting energy, rising crop treatment cost and reducing crop yield in harvesting. To be informed of mentioned faults and monitoring the performance of seed drills during sowing, developing a seed sensor for detecting seed mass flow rate and monitoring in a delivery tube is essential. In this research, an infrared seed sensor was developed to estimate seed mass flow rate in seed drills. The developed sensor comprised of a pair of spaced apart circuits one acting as an IR transmitter and the other acting as an IR receiver. Optical coverage in the sensing section was obtained by setting IR LEDs and photo-diodes directly on opposite sides. Passing seeds made interruption in radiation beams to the photo-diode which caused output voltages to change. The voltage difference of sensing units summed by a microcontroller and were converted to an analog value by DAC chip. The sensor was tested by using a roller seed metering device with three types of seeds consist of chickpea, wheat, and alfalfa (representing large, medium and fine seed, respectively). The results revealed a good fitting between voltage received from seed sensor and mass flow of seeds in the delivery tube. A linear trend line was set for three seeds collected data as a model of the mass flow of seeds. A final mass flow model was developed for various size seeds based on receiving voltages from the seed sensor, thousand seed weight and equivalent diameter of seeds. The developed infrared seed sensor, besides monitoring mass flow of seeds in field operations, can be used for the assessment of mechanical planter seed metering unit performance in the laboratory and provide an easy calibrating method for seed drills before planting in the field.

**Keywords :** seed flow, infrared, seed sensor, seed drills

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