ABSTRACT

The commercial draft control systems engaged in today’s tractors are found to be inefficient in keeping the draft control in line with the slip. The existing draft control system forces the operator to control the depth lever frequently for achieving the optimum draft, resulting in poor efficiency. To overcome this problem, a microcontroller based automatic wheel slip control system was designed and developed for 2WD tractors. The system continuously measures the wheel slip in the field and communicates to the hydraulic system for depth adjustment if the wheel slip falls outside the desired range. The wheel slip was calculated using the actual and theoretical speeds of the tractor, computed by measuring the revolution per minute of front wheel and rear wheels respectively. This system can be installed on any make and model of 2WD tractor by uploading the rolling radii of front and rear wheels and depth constant \( d_k \) in the microcontroller via computer interface. The depth constant has been calculated through a separately developed computer program in which the input parameters are associated with the 3-point linkage geometry of a given tractor. The measuring efficiency of the slipmeter was found to be 99.2% with a maximum error of 0.22%. The developed system was installed on a test tractor and the performance was evaluated with different implements in varying field conditions. The performance data indicated a significant reduction in fuel consumption per hectare (20–30%), increase in field capacity (7–38%), and gain in tractive efficiency (4–10%) with slip control system over the existing draft control system. The slip control system is also expected to reduce the operator’s effort as it adjusts the depth control lever automatically as per the variation in the soil condition within the field.

Key words: wheel slip, slipmeter, slip control system, draft control system, microcontroller, depth control system, tractive efficiency, measuring efficiency.