Abstract

Three basic elements were developed and evaluated in laboratory and field: seedmetering device, disc coulter and a monitoring system, for seed quantity and seed spacing of a pneumatic planting system. In laboratory, trials were carried out to determine a) efficiency of cell fill under different conditions of impact, planting speed, and suction forces; b) maize stubble cutting efficiency of different disc coulters; and c) magnitude of soil reaction forces. Sensors to record the seed falling throughout the discharge were also developed and evaluated. The complete system was evaluated under field conditions to assess the efficiency of work quality, disc wear index and energy consumption. The developed maize seed metering device has a 100% ± 5% cell fill under impact conditions at a maximum speed of 1100 cells min⁻¹ (CPM) and suction pressures of 350 mm water; it is not recommended to use it at speeds higher than 1300 CPM. The disc coulters require at least 1000 N weight and soil resistance for penetration in the first 120 mm for a 100% efficiency of mulch cutting; efficiency dropped exponentially when disc diameter was reduced 50 mm. The prototype had field work quality above 85% with a power requirement of 26 HP; this performance is 15% higher than that of mechanical seed planters manufactured nationally.

Keywords

Pneumatic seeder, disc coulters, seed delivery sensors.