

ABSTRACT

Rice is the staple food of millions of people living in the east and south part of Asia. Sowing and planting operations in rice crop follows traditional methods in many parts of this region even though tillage and harvesting operations are mechanized to a great extent. Delicate nature of the seedlings makes development of the machines difficult. However a lot of effort is put on development of new machines. A knowledge of the forces acting on the machine members will be helpful in designing new models. In order to measure the forces acting on a fixed fork type transplanting finger during the seedling separation process a laboratory model transplanter was developed and it was equipped with transducers to measure the forces and the speed of rotation of the crank that give motion to the finger. Seedling mat attained proper amount of moisture after one hour after wetting. The nursery seed rate was varied from 0.35 to 1.15 kg/m² and seedlings of 10 to 20 days of age were used in the experiment. Planting velocity varied from 0.29 to 0.55 m/s. Average tangential force on the finger had minimum and maximum magnitude of 3.68 N and 4.70 N, respectively for 15 mm mat and 3.10 N and 5.32 N, respectively for 20 mm mat. However one millisecond peak value of the resultant forces had a maximum value of 28.3 N and 29.7 N for 15 mm and 20 mm mats respectively. Plant population of the mat varies from 0.944 to 2.208 number/cm² on 15 mm mat and from 0.970 to 2.258 numbers/cm² on 20 mm mat as the seed rate increased from 0.35 to 1.15 kg/m². The mass of root per unit area first increased upto a seed rate of 0.75 kg/m² and thereafter it remained nearly same from 0.75 kg/m² to 1.15 kg/m². For the 15 mm mat minimum root mass per area was 159.9 g/m² which increased upto 393.5 g/m² as the seed rate increased, whereas for the 20 mm mat it increased from 209.1 g/m² to 443.2 g/m² as the seed rate increased.

Keywords: Rice Transplanter, Fixed Fork Type Finger, Seedling Mat, Planting Velocity, Seedling Separation Force