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Performance evaluation of pneumatic seed metering device for paddy in puddle

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Abstract **:** The pneumatic seed-metering concept is based upon the air pressure developed on the inner surface of rotating cylindrical drum. One end of the seed tubes are fixed to the seed cups placed near top dead center and another end is open to the atmosphere in the furrow opener. The seed dropped in the tube at the interaction region of high and low pressure. The desired planting was achieved at injecting pressure of 1300-1350 N/m^2 and operating speed ranged from 0.228 - 0.338 m/s when the depth of seed placement was between 0.76-0.77 cm in puddle. No seed loss was observed through the cup holes during the lab test. The nozzles of the seed tubes were installed with flexible and straight cone to inject the seeds close in the hills in puddle. The increase in injecting pressure increased the depth of seed placement in puddle. The higher depth of seed placement decreased the germination.

Key words **:** Pneumatic planting, Seed metering, Seed placement depth

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Paddy (*Oryza sativa*) is a major food grain in India. The cultivated area under paddy is about 44.36 million ha with production of 84.87 million tones with productivity 1913 kg/ha (Anonymous, 2001). During the past decades, considerable progress has been made in developing the paddy planting technology but with limited success. The conventional method of paddy cultivation involves growing nursery and transplanting in the puddle; the seeding, manually in dry as well as in moist soil. An acute shortage of farm labours is experienced during transplanting season. Mechanical transplanting can help to alleviate the human drudgery. The labour shortage during transplanting season deprives the farmers to go for multi cropping where as the directly sown paddy ensure better yield, mature early, making multi cropping possible.

METHODOLOGY

Pradhan (1970), Anonymous (1970 and 1971) and Krishnaiah (1991 and 1999) developed manually operated pre germinated seeder, manually operated fast seeder and individual hopper seeder. The above units gave continuous drilling in rows but suffer from grain bridging in hopper. Further while planting in wet land, seed float and get displaced from rows. Though many bullock and power operated seed drills are available in the market, yet none gave the satisfactory result for paddy. Italian researchers tried to develop rice transplanters for working in flooded as well as dry soil conditions, in which a group of four row separated seedlings were placed between disks for transplanting. It required 15-20 days for nursery preparation which delay the transplanting. Due to their high operational cost, this machine did not gain wide acceptance.

Little work has been done on the pneumatic seed-metering device for planting paddy (Yadav, 1974 and 1979). The efficiency of the manually operated machine was low. No approach was made for the development of a pneumatically controlled seed metering device to inject the seed on the puddle land to avoid the grain metal friction practically zero. In order to resolve the above problems, further effort were essential to develop a pneumatic seed metering device for injecting paddy in puddle and to study the metering device in the laboratory to select the final design data and other relevant factors. The study was conducted at Central Institute of Agricultural Engineering, Bhopal, India to improve the various design parameters of pneumatic seed metering device for planting paddy in puddle.

Experimental test set-up for pneumatic seed metering:

The set-up for pneumatic seed metering for planting paddy was designed and fabricated. The pneumatic seed-metering concept was based upon the air pressure developed