

عنوان مقاله:

Design and Experimental Study of a Combined Pneumatic Plot Seed-metering Device for Cotton

محل انتشار:

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خلاصه مقاله:

This study presents a combined pneumatic seed-metering device (SMD) that could not only fill, carry, and meter seeds, but also switch quickly between seed-metering and seed-cleaning modes, and clean seeds thoroughly and rapidly. The seed-filling, seed-carrying, and seed-metering modes of the SMD were analyzed based on a theoretical kinematic model. Furthermore, a three-factor, three-level orthogonal test was conducted by using a performance test bench arranged for the SMD as well as Design-Expert software. The combination of parameters that led to the lowest mis-seeding rate (0.59%) was as follows: an air pressure of 2.67 kPa, a slot width of 2.83 mm, and a seed-metering speed of 20 r/min. The optimized scheme that resulted in a relatively low multiple-seeding rate (4.3%) and met other requirements at the same time was as follows: an air pressure of 2.35 kPa, a slot width of 2.78 mm, and a seed-metering speed of 20 r/min. A field test was subsequently performed by using a combined pneumatic plot cotton planter prototype. While the mis-seeding and re-seeding rates obtained from the field test were both somewhat higher than those obtained from the laboratory bench test, they still met precision planting requirements. The field test validated the accuracy of the theoretical analysis and bench test and served as a foundation for future prototype production and popularization.

کلمات کلیدی:

Combined pneumatic, Seed-metering Device, Orthogonal test, uniformity coefficient, seeding rate

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