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Construction of an experimental plot seeder of wheat planting and compare it by imported one

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Introduction

Researchers frequently include multiple cultivars and fertility levels in field experiments. Therefore, the experiments sowing operation must represent a considerable saving in time and labor, compared to hand sowing. Greater flexibility in experimental design and setup could be achieved by equipment that enables quick changes in the cultivar and fertilizer rates from one plot to the next. A satisfactory seed drill must distribute a given quantity of seed evenly over a predetermined length of coulter row, the coulters must be spaced at exact intervals and depth of sowing must be uniform. In a self-propelled type of plot seeder, no coulter should run in a wheel track as the compaction of the soil can cause observable differences in vigor between plants in such a row and those in un-compacted rows. The machine should sow in succession from a try in which a series of seed pocket separated clearly and must be put into distributer funnel by an assistant operator. The length of gap being varied according to the nature and purpose of the plot.

The objectives of this experiment were 1- to design and construct a local self-propelled plot seeder and 2- To compare it with the imported (Wintersteiger) plot seeder in cereal breeding programs.

Materials and Methods

A small-plot seeder was designed and constructed to meet this objective. The unit consists of the following basic components: a toolbar for pulling a set of six blade coulter, an air compressor for lifting and putting down the openers and metering transmission drive wheel, an operators chair and work rack, one belt seed distribution. A cone-celled and rotor seed distributor is used for seed distribution to the openers. The cone system is connected to the gearbox and allows for great flexibility in changing cultivars, crop species, and plot length. This is driven by the separate drive wheel. The cone-celled distributor sows all the seed of the sample in making one complete turn. The spinner can be equipped with a 4 or 6 outlet delivery head, depending on row spacing. The planter is fitted with hoe openers. Alternatively, spear-point openers have sometimes been used under conventional tillage systems. Seeding depth control was achieved by an adjustment screw handle. The plot seeder is being moved by a 9.6 kW engine, and has been successfully used in applications. Field experiment established by using 4 plot length (2, 3, 4 and 6) with 4 replication by the constructed plot seeder and imported plot seeder. Crop measurements were planted height, spike m^{-2}, seeds/spike, Thousand kernel weight, Biological and grain yield, harvest index and drill measurements were seeding depth, uniformity of row spacing in action, seed counter performance, power requirement, slippage evenly of rows after planting.

Results and Discussion

Results showed that there were significant differences between the plant emergences. The emergencies were higher in plots, which planted by the new plot seeder. The differences between seed distribution of openers were insignificant, but the variances of new plot seeder and imported plot seeder were 0.267 and 1.05 respectively. Mean planting depth of plots planted by the Wintersteiger plot seeder was 0.8 cm shallower than the adjusted planting depth while mean planting depth in plots planted by constructing machine had only 0.01 cm variation.

Results of variance analysis revealed that effect of treatments on wheat grain yield and yield components was significant. So that, highest grain yield (4216 kg ha^{-1}), biological yield (8704 kg ha^{-1}), number of spikes per square meter (649spike), obtained from a plot which planted by constructed plot seeder. Increasing yield of treatments which planted by constructed plot seeder might be because of increasing the number of spikes per square meter in those treatments. The mean of spike per square meter in plots of new planter was 691 spikes which were116 spike more than plots planted by imported plot seeder.

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Conclusions

The constructed plot seeder had up to 18500$ cost reduction. The seeder was able to distribute the different type of seed to the seed tubes uniformly in laboratory tests, nevertheless it is necessary to test the constructed plot seeder in field condition by using different seed type and conducting new research project. Advantages of this planter include less variation of seed fall down in different coulters, perfect planting depth control, separate wheel for adjusting planting length, minimize the slippage of planter driven wheel and proper utility in different field condition. According to effects on crop parameters the constructed plot seeder had relative priority to imported one. In addition easily accessories supply and cheaper prime cost are profit of the designed and constructed plot seeder.

Keywords: Coefficient of horizontal uniformity of seeds, Plot seeder, Precision planting, Wheat

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