

IMPROVING LONGITUDINAL SEED DISTRIBUTION FOR CONVENTIONAL GRAIN DRILLS

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Keywords: *conventional drills, seed distribution*

Abstract

The demand for uniform distribution into the soil of grain seeds and especially small grain seeds has increased during the last decade. Improvements had been made on the new metering devices, furrow openers and grain flow. The present research was focused on two major issues: a.) increasing grain flow uniformity out of the metering devices and b.) Improving seed distribution into the soil. Research was carried out in the Department of Mechanisation of the Faculty of Agriculture of the University of Agronomic Sciences and Veterinary Medicine of Bucharest and used a three row simulator of a conventional grain drill, made out of more than 90% of recycled components. The team comprised three students from Faculty of Agriculture in the final year, and this research was part of their final Diploma Project. All the research was supervised by Assoc.Prof. Dr. Cristian IACOMI, the Head of the Mechanization Department.

INTRODUCTION

Uniform soil seed distribution was, and is, a major target with all major manufacturers of conventional grain drills in the world. Usually, research was focused more on development of furrow openers and less on grain flow. The team of present research, three students in the final year of the Faculty of Agriculture, expressed their opinions to study both the flow of small grains (winter wheat) from the metering devices to the furrow opener and to study the changes of laying seeds into the soil. For this, the team decided to split the work into three major parts. One student manufactured the mini stand (simulator) of a conventional drill, one decided to study the flow of grains and the last one decided to change the application of grains into the soil. We must point out that the present research represented the quantification and contribution to the final Diploma Project of each of them.

MATERIAL AND METHODS

The simulator (Figure 1) was manufactured more than 90% of recycled components and copied entirely a real drill, except the fact that the seed bulk was designed to supply seeds for three rows instead of 29 or more rows. To simulate the passing over the field, the team used a fabric belt soaked in oil so the seeds could

be easily stuck. This was moved by an AC electric motor and covered two speeds (low speed and high speed). To simulate different seed rates, the metering device was actuated by a 12 V DC electric motor and through the help of various ratios obtained by a chain drive transmission it could be covered up to 6 different rates (Figure 2).

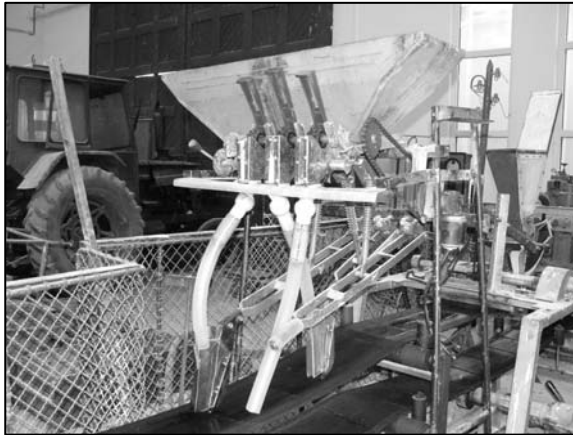


Fig. 1. Conventional three row drill simulator

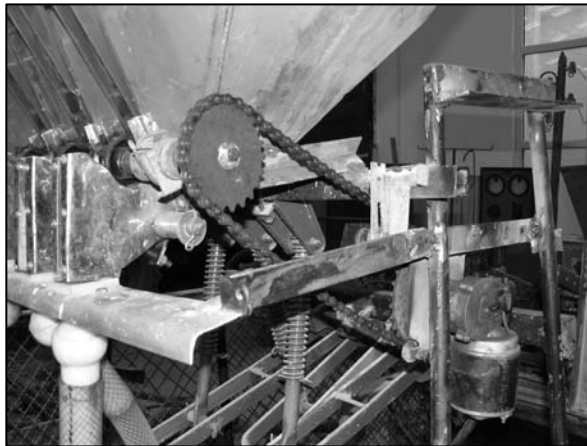


Fig. 2. Chain drive transmission

After each test, the stucked seeds were pictured and the team measured the quality of seed distribution on the belt and the number of seeds per meter. For each test

there were used just two furrow openers, one classic opener and the second one modified according to the protocols (Figure 3).

In this research, the modified opener used an original design of a cone and tube device fixed in a classic opener wings, to narrow the channel of seeds but to properly keep the flow of seeds (Figure 3). The entire research used three different shapes of the tube, one vertical, one inclined and one under a narrow S shape.

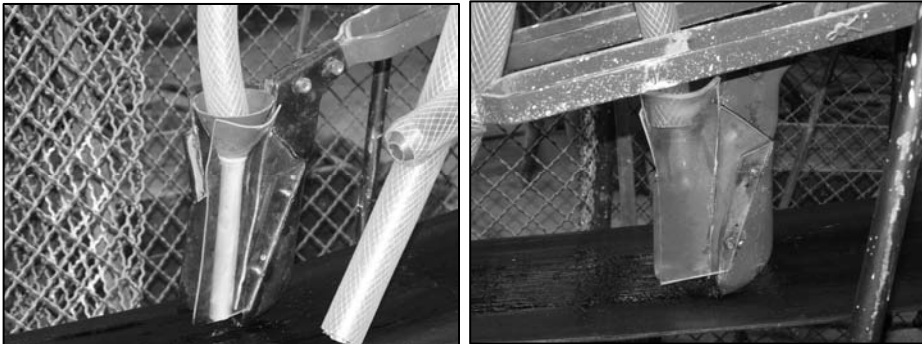


Fig. 3. Modified and classic opener

RESULTS AND DISCUSSION

The tests results for winter wheat seeds are shown briefly in table 1. After each test the stucked seeds were measured as they were spread over the belt (quality factor) and as number of seeds per meter (quantity factor).

Table 1

Longitudinal seed distribution specs

Trials	Band speed	Seed metering ratio	No. of seeds/ meter (classic/modified opener)	Quality factor (longitudinal distribution)	
				classic opener	modified opener
V1_1	Low	30/22	120/116	groups	improved
V1_2	High	30/22	95/89	groups	improved
V2_1	High	30/16	108/112	groups	improved
V2_2	Low	30/16	123/131	groups	improved
V3_1	Low	30/10	142/158	groups	improved
V3_2	High	30/10	134/126	groups	improved
V4_1	High	30/9	141/150	groups	improved
V4_2	Low	30/9	165/156	groups	improved

For each trial, a number of five tests were done. As shown in Figure 4 and Figure 5 the tests shown an improvement in the longitudinal seed distribution using various modified openers.

All tests showed that modified openers were keeping the seeds together and the gaps which appeared using the classical openers have had a trend to disappear, performing an improved distribution of the seeds.

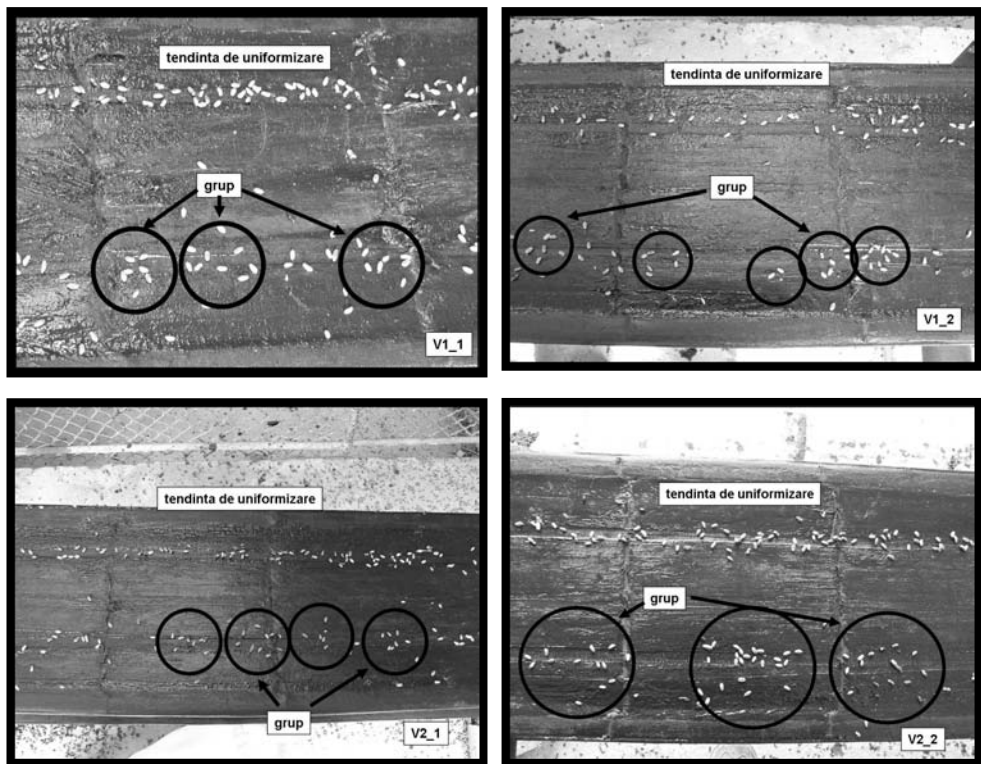
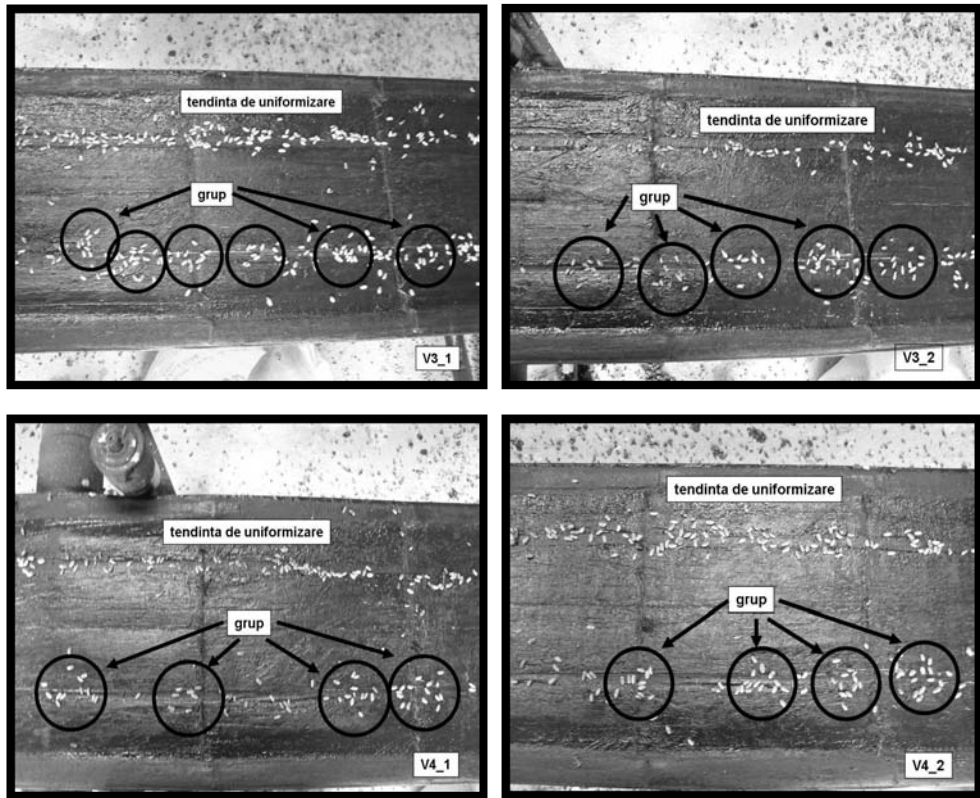


Fig. 4. Improvements in longitudinal seed distribution (trials V1_1, V1_2, V2_1, V2_2)



**Fig. 5. Improvements in longitudinal seed distribution
(trials V3_1, V3_2, V4_1, V4_2)**

CONCLUSIONS

1. Laboratory tests showed that it was possible to obtain a better longitudinal seed distribution into the soil for conventional grain drills, using modified openers.
2. No impediments and obstructions were observed in the seed flow from the metering device to the furrow opener.
3. The seed rates in various tests were kept within reasonable limits, without any exceptions.
4. Further tests will be done using different devices adapted for classical openers to show the influence of the shape of the narrowed channel on the longitudinal seed distribution.

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