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SEEDER WITH DIFFERENT SEEDING APPARATUS IN MAIZE SOWING

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Abstract

TURAN JAN, VIŠACKI VLADIMIR, SEDLAR ALEKSANDAR, PANTELIĆ SANJA, FINDURA PAVOL, MÁCHAL PAVEL, MAREČEK JAN. 2015. Seeder with Different Seeding Apparatus in Maize Sowing. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 63(1): 137–141.

Precision sowing trend is development of technology of sowing maize. The advantage of planting corn with precision seeder includes saving seeds, fewer working hours, achieves more uniform spacing in the row and depth of planting, and for these reasons it follows that the crop will be uniform in height and strength, which is a prerequisite for high yields. It was performed a field testing of three seed in sowing maize at three different speeds of sowing. Tests were carried out to determine and compare the quality of three planters with under pressure. Seeders worked in similar conditions but third seeder noted presence of crust on the soil surface. They were tested at a speed of 6, 8 and 10 km/h. At a speed of 6 km/h all three planters worked with a coefficient of variation less than 25% and with values from 19.25 to 22.72%, which meets the criteria of quality planting. The percentage of pairwise from 1.66 to 2.64%. The percentage of empty spaces were from 4.24 to 4.93%. Proportion of seeds sown at a given space were from 92.5 to 94.09%, which is an indicator that sowing was successfully. No records are examined quality differences in sowing seed.

Keywords: planting, sowing quality, uniformity seeding, standard deviation, yield

INTRODUCTION

The advantage of planting corn precision seeder includes saving seeds, fewer working hours, achieves more uniform spacing in the row and the depth of planting, and for these reasons it follows that the crop will be uniform in height and strength of which is a prerequisite for high yields. To achieve a uniform depth of planting, sowing section in broadcast sowing machines must have a copy wheel that determines uniformity of sowing. Paris *et al.* (2003) are confident that the basic prerequisite for balanced growth and growth of plants is hiding in the seeds distribution uniformity. However, Bauer *et al.* (2002) aims to highlight the importance of tillage and sowing conditions because it is very important for seeding depth and spacing in the row between sown seeds. The same author points out that 50% of the influence on the yield of a uniform depth seeding and 50% uniformity of spacing seeding fine. So Gil and Karnas (1996) report that pneumatic drills have better results in sowing seeds in a row in relation to mechanical sowing unit. While Paris *et al.* (2003) argue that the height of seeding apparatus plays a major role in the uniformity seeding, Bauer (2002) remains on diggers as one of the factors of effective seeding. Current traditional corn seeders have copy function of field but the height of seeding aparatus caused by seeder construction and feeder (Tao *et al.*, 2012). Nielsen (2004) reminds that germination of maize from 90% and 95% without important role during the seeding takes adjustment apparatus and seeds sowing. Liu *et al.* (2004) show that is not significant uniformity of sowing in a row and between rows as a significant density or the number of plants per unit area. Lower plant density that is uniform in a row and between rows will never have a higher yield of large assembly plants no matter how the distribution of seeds in a row bad. He states that the quality of sowing actually plant density and this is the main factor of success sowing. In addition, quality of sowing depends on the setting and type of sowing apparatus. Nielsen (2006) concluded that yield depend on exploatations factor of corn seeders. Meši *et al.* (2008) emphasize that precision of mechanical sowing device depends more on the shape and uniformity of size and operating speed as compared to the mechanical-pneumatic. As a special influential factor, Meši (2000) defines the appearance of "working rhythm." This author explain that this unbalanced modes of seeders transmission elements, which are due to imperfections of the composition of elements and different wear during operation of the seeder. He referred to the processing systems that have a significant impact on the percentage of emerged plants (Meši *et al.*, 2010). On the uniformity of seed sowing distribution would be good if, except sowing apparatus depends from speed of sowing, seeders setting and functionality, field, seedbed preparation, shape and size of seeds (Findura *et al.*, 2008; Turan, 2011).

Panning *et al.* (2000) defines the difference between seeding in laboratory conditions and seeding in the open field. A significant number of factors affect on sowing in the open field while a negligible number of factors have an impact on seeding in the laboratory. Kostic *et al.* (2011) in testing the prototype opto-electronic control of sowing reports that a malfunction of said system was associated with the type of seed and not to speed of sowing. Errors ranged up to 4.5% in soybean, 0.92% in maize and in sunflower was 1.88%.

Coefficient of sowing precision is defined by ISO standard and includes ISO Miss index and ISO Multiples index. Smith *et al.* (1991) and Searle (2006) explain precision coefficient as a percentage of sown seed, which are located at ± 1.5 times from theoretical sowing spacing.

The amount of seed sown in a row and the distance between the seeds are important factors in the production of which has an impact on the balanced growth and development of plants and stable yield. These parameters depend on the exploitation possibilities of planting seed unit. The quality and the planting is measured only after the germination and then is calculated as the density of the crop which is main factor of a successful and profitable production (Rahman and Singh, 2003).

Laboratory of mechanization in crop production, Department of Agricultural Engineering, Faculty of Agriculture, University of Novi Sad during the spring 2013th done with field test of three seed in sowing corn. Tests were conducted to determine and compare the quality of the three planters with under pressure sowing unit.

The study was conducted at the site of cadastral municipalities Bašaid, BanatskaTopola and Novo Milosevo.

The aim of the study was to determine the precision the sowing of seed corn production in conditions three pneumatic seed for sowing in broadcast.

The task is to examine in order to determine optimal parameters mode provides maximum precision distribution of seeds in row. Based on recorded parameters of sowing under field conditions provides an assessment and recommendation of optimal adjustment of the seeder on field.

MATERIALS AND METHODS

Sowing of maize was carried out on 18 April 2013th. Field are property of agricultural enterprises CoricAgrar doo Bašaid in Basaid. On the same day were evaluated and set seed sowing on three parcels. Sowing was performed with three different drills: A, B and C.

Seeding of *A* seeder is completed on the plot cadastre municipalities Bantaska Poplar (lot 1) and seeding of *B* seeder completed in KO New Miloševo (lot 2). Seeder C has performed an seeding at the part of the circuit Zabašće.

For all parcels following basic tillage, winter plowing and then closed furrow. In the spring, seedbed preparation was carried out which led to the creation of a very loose and crushed sowing layer. Immediately after seedbed preparation on all parcels, especially in the parcel Zabašće, were influenced by precipitation, in the form of exceptional rainfall intensity. Due to the high intensity of rainfall on the parcel form a solid crust which resulted in the seeding of corn. The parcel Zabašće, where the crust was thickest, they are breaking crust with roller. In addition, this parcel was characterized by great depression in the direction and transverse to the direction of sowing which had a huge impact on the quality of sowing. Preceding crop was corn. Soil moisture was adequate for planting, but with increased humidity in the depressions and furrows. During seeding was sunny with little wind and temperature was in the multi-year average for this time of year.

Tab. I shows technical characteristics of tested seeder. Number of rows and consequently working width is same for seeder A and C, 12 rows while seeder B have 8. Transport weight is approximately same for seed A and C. Power requirement ranges are from 65 kW to 90 kW as recommended by the manufacturer. The supporting beams with the seeder can be folded in order to maintain the transport width of 3 m. In all seeder folding with help of hydraulic cylinders and markers are also controlled via hydraulics.

I: *Technical features of the examined planter*

/	Details	Seeder A	Seeder B	Seeder C
1.	Type of seeder	broadcast pneumatic seeder		
2.	No. of row	12	8	12
3.	Carry bar	folding		
4.	Row spacing	0.7 m		
5.	Transport width	3 m	2.54–3 m	3 m
6.	Transport weight	2,460 kg	2,200 kg	2,400 kg
7.	Required power	90 kW	83 kW	65 kW
8.	Seed hopper capacity	430 dm³	280 dm³	300 dm³
9.	Height sowing mechanizam of land surface	~ 0.4 m	~ 0.4 m	~ 0.1 m
10.	Type opener and feeder	Double disc	Double disc	Double disc with furrow opener

a) b) c)

1: *Sowing planter units*

Fig. 1 shows the seeding units of tested seeder. All seeder is equiped with the double disk furrow like opener function. Seeder C also have furrow opener in addition to sowing section. All drills have seeding apparatus that works with under pressure. Sowing unit height is same for A and B seeder while the seeder C have closer from soil surface.

Testing and setting up experiments were performed at three operating speeds, 6, 8 and 10 km/h. Default distance of sowing was 22 cm. Tractor PTO speed was 540 min^{-1}.

RESULTS AND DISCUSSION

The analysis included all rows experiment each seeder. Analyzes included 12 rows of seeder A and C. The study included 8 rows of seeders B. It was conducted on the number of measurements from a minimum of 24 to a maximum of 36, which gives the statistical reliability and significance of the sample for evaluating actual density and distribution of seeded seeds.

The result for density and distribution of seeds by sowing maize are shown in Tab. II.

At a speed of 6 km/h all three drills are working with a coefficient of variation less than 25% and with values from 19.25 to 22.72 which meets the criteria of quality of sowing. The percentage of pairwise from 1.66 to 2.64. Indicator of good setting seed. The percentage of empty spaces from 4.24 to 4.93%. Proportion of seeds sown at a given distance from 92.5 to 94.09%, which is an success indicator of seeding. The success of seed significantly affects successful seedbed preparation. The results are shown in Tab. I.

Control in thefield concluded that the most difficult conditions were in the area where she worked Bašaid seeder C. The conditions in the areas of Banat Topola and Novo Miloševa were much more suitable for planting, which is also reflected in the process of of sowing.

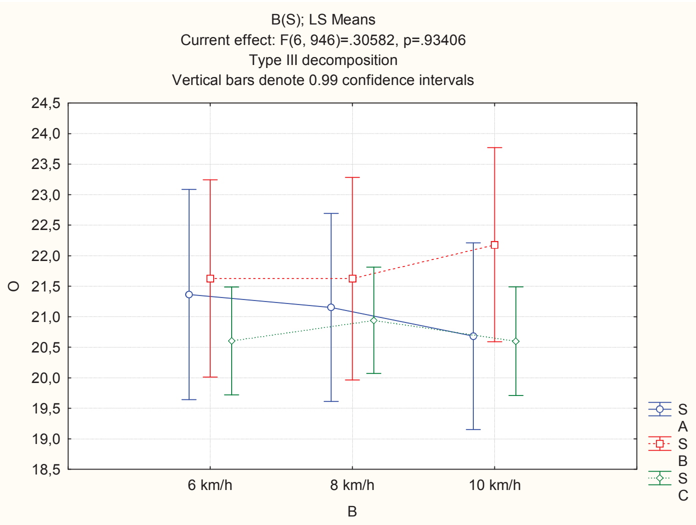
Basic statistical analysis for independent samples with 99% confidence gets the complete picture and insight into the curve of normal distribution spacing for of sowing some seeders when working in three different speeds. T-test for independent samples showed that there was no statistically significant difference in the work of these three seeders at speed 6 and 8 km/h. Seeder B at a speed 10 km/h showed a slight curve moving towards higher value spacing of sowing (pronounced right side of the curve).

Statistical analysis of the data obtained at three different sowing seeders at three different speeds is not defined by a statistically significant difference between the seeder and speed as a factor in the experiment.

Duncan's test used to determine their statistically significant differences between the seeder and their speed. Duncan's test was performed with

II: *Realized parameters of seeding for some hybrids and working speed (measured after emergence) from 100 m²*

Speed, km/h	Tested parameters	Seeder A	Seeder B	Seeder C
6	The percentage of double spaces	1.79	1.66	2.02
	The percentage of empty spaces	4.93	4.69	4.91
	Places with 0.5 and 1.5 of the theoretical distance (%)	93.28	93.65	93.07
	Achieved space	21.36	21.63	20.6
	Standard deviation	4.85	4.16	4.42
	Coefficient of variation	22.72	19.25	21.49
8	The percentage of double spaces	1.93	1.67	2.64
	The percentage of empty spaces	4.59	4.24	4.54
	Places with 0.5 and 1.5 of the theoretical distance (%)	93.48	94.09	92.82
	Achieved space	21.15	21.62	20.94
	Standard deviation	4.88	3.91	5.3
	Coefficient of variation	23.08	18.12	23.31
10	The percentage of double spaces	2.17	1.86	2.6
	The percentage of empty spaces	4.64	4.35	4.9
	Places with 0.5 and 1.5 of the theoretical distance (%)	93.19	93.79	92.5
	Achieved space	20.68	22.18	20.6
	Standard deviation	4.67	4.51	4.84
	Coefficient of variation	22.58	20.34	23.99



2: *Distribution of seeds for sowing seed drills*

a significance threshold of 99%. As none of the value of the parameter p is less than 0.01 can be with 99% certainty say that there is no statistically significant difference in treated seeder at given speeds.

Statistical analyzes influence sowing quality of all seedrs. Although there is no statistically significant difference noted the effect of speed on certain seeders. So, noted that the change in speed is the least effect on seeders B and C, while at seeders rate effect plays a major role with respect to all observed seeders. It should be noted that the speed factor has a high impact on the seeding of seeder.

Fig. 2 shows the distribution of seeded shift in all seeder depending on the speed of sowing. It is observed range distribution shift relative to the mean value.

CONCLUSION

The corn seeders meets the criteria of quality of sowing. Working on a bad prepared field as in case with seeder C that showed it can successfully perform the set of technological requirements in terms of quality and standards of sowing maize.

Seeders and tested worked without technical difficulties.

At a speed of 6 km/h all three drills are working with a coefficient of variation less than 25% and with values from 19.25 to 22.72 which meets the criteria of quality of sowing. The percentage of pairwise from 1.66 to 2.64 is indicator of good seeting of seeders. The percentage of empty places from 4.24 to 4.93%. Proportion of seeds sown at a given distance is from 92.5 to 94.09%, which is an successfully indicator of seeding. The success of seed significantly affects the successful seedbed preparation.

It is recommendation for detailed laboratory testing and exploitation. The aim is to define the modes and settings of the sowing unit, which would accommodate the conditions seeding and seed characteristics. This should be done for all row crops that are intended for seeders.

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