EXAMINING THE WORKING SPEED OF THE AIR-SUCTION PNEUMATIC SEEDER IN PLANTING CORN

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Abstract:*Planting represents one of the most important soil management operations in the corn production technologhnology,because in case eni drawbacks in planting take place , they cannot be compensated afterwards. The aim of work is to point out that the rate of corn grain yield (beside quality seeding material, time of planting, soil, climatic conditions) most of the times highly depends on the right choice of technical solution of the seeder and the possibility for conforming to the given planting norm at changing the working speed of the sowing aggregate. During the experiment, we monitored the work of the pneumatic seeder IMT-634-454 (air-suction pneumatic seeder) at a working speed ranging from 4 km/h to 10 km/h.The aim of research is to determine the optimal speed of the sowing aggregate in order to comply for qu for quality planting. The research program encompassed the evaluation of the planting depth, the achieved interspaces in the rows, the precision of the planting, the dynamics of the plants' motion, productivity, as well as the final result effect of the examined factors to the corn grain yield at various working speeds of the sowing aggregate. It is noted that the speed of the sowing aggregate significantly affects the quality of planting, where the largest deviations, comparing to the given norms of a quality planting, happen at working speed of 10 km/h, so that beside the fact that the most favourable effects are achieved at a higher speed the limiting factor for working of the examined seeder at higher speed achieved quality of planting.The first year of the research was very unfavourable in terms of climate comparing to the second year that was favourable, which reflected on the rate of the corn grain yield. The highest grain yield. was obtained in the more favourable year, at a speed of 4 km/h, because, at the same speed, the bigger set of plants was achieved, which is in the state of interaction with the favourable climatic factors and gave a result with the highest grain yields, whereas in the unfavourable year, at the same speed of 4 km/h, the attained grain yield was the lowest due to the interaction of the achieved number of plants per hectare with unfavourable climatic conditions..In exploitation examination of the seeder, the most favourable values are attained at a speed of 10 km/h, but there is a quality planting appearing as a limiting factor, which doesn't comply to the given criteria at higher speeds.Correct choise is not onli the sowing machine ,his way of work are important for increase grain yield. Therefore, by this examination, we come to a conclusion that the optimal working speed of the pneumatic seeder IMT-634-454 in planting corn is from 6 km/h to 8 km/h.On base of results we found that diference working speed of pneumatic sseeder are very important for precision sowing.*

Key words: *pnematic seeder,corn, working sped.*

INTRODUCTION

Corn has a great fertility potential and belongs to a group of plants that have the largest organic matter production per unit area. Growing corn is of great economical, organizational and soil management related significance and is one of the most important grain crops.

Due to its great economical significance, what is really important when it comes to corn is stable and reliable grain yields, which can be attained by quality planting and proper choice of hybrids. The fact is that most manufacturers think that they can attain great corn yields merely by choosing the right generic hybrid and think that by doing this they come to the basic solution in optimizing grain yields.

Hybrids' fertility is manifested only in cases where there are favourable conditions for growing. Planting through various technical operations has a significant role and effect on grain yields of crops, and especially with wide-row crops.

The basic goal in planting corn is attaining proportional investment of seed to an optimal depth and even distribution on the vegetation area. (TIL, 1986) claims that drawbacks in planting corn are seen in the plant arrangement on the field and in the row which can be optimized by using a pneumatic seeder and calibrated seed, as well as the proper speed in their work. (MEHANDZIC, 1990) Dealing with these problems, he singles out the precision of sowing with the air-suction seeders. Speed is of great importance, for sugar beet, soy and sunflower it should be 6-6.5 km/h and for corn no higher than 8 km/h. (RADOJA, 2003) cites that, in Central Serbia, at 90% of areas, people use mechanical seeders for planting corn. If corn is planted using mechanical seeder, the grain yield is lower for 996kg/ha comparing to planting calibrated seed with pneumatic seeder. (MALINOVIC 1998) singles out that success in planting largely affects grain yield, and drawbacks cannot be compensated with any soil management action. (MICIC 1989) states that any type of seeder whose speed exceeds 8 km/h can bring to an uneven distribution of the seed in the rows. Meteorological conditions in the year of examination are as well of great effect on corn grain yields. (STARCEVIC 1995) singles out that the differences in grain yields between favourable and unfavourable years number 40%. (JOVIN 1996) points out that in the years of more remarkable drought, better grain yields are achieved in the rarest set.

MATERIAL AND METHODS

A two-year research on sowing corn in conditions of natural watering regime was made in Rasina district on the land of pseudogley type. Research encompassed the pneumatic seeder IMT-634-454. This is an air-suction seeder. During their work, researchers monitored the work of this constructive solution, at various speed rates- 4 km/h, 6 km/h, 8 km/h.

Table 1

Tehnical specification for the ehanined seeder

SPECIFICATIONS	IMT - 634 – 45 4
NO. OF ROWS	4
ROW SPACING	45 – 75 cm
SEED DISTANCE	8 – 36 cm
WIDTH IN TRANSPORT	3 m
DRAVING WHEELS	5-00 – 15
PLANTER MASS	580 kg
REQUIRED POWER	35 KW
SEED BOX CAPACITZ	25 lit.

In chart 1 you can see the technical data for the examined seeder. The researches include on-field and laboratory examinations, as well as exploitation examinations. The very program of the research included the evaluation of the planting depth.

Measuring was done after planting and after germination in the phase of 3-4 leaves (the average number is taken). Uniformity of the attachment of the in the horizontal projection was also measured. Moreover, the sprung plants were measured in length and width.

The dynamics of the plants' motion was evaluated according to the number of harvested plants and the difference between the number of plants after the germination and the number of harvested plants.

The effect achieved or productivity is measured as a product of working width, working speed and the coefficient of the usage of working time. Valuation of 0.80 has been taken as a value of the working time coefficient, according to the size of lots and the duration of spinning on the headland.

The research was made during the year 2000 and 2001. In 2000, the temperature conditions were more favourable because of the irregular distribution and smaller amount of rainfall.

Year 2001 was more favourable for growing and development of corn, but this resulted in lower corn grain yields in 2000. The choice of corn hybrids was made according to the representation of certain hybrids in the examined Rasina district, hence, NS-640 was chosen as the most remarkable one.

The applied soil management on the experimental lots was ordinary for regular production in this particular region.

RESULTS AND DISCUSSIONS

The analysis of the achieved results of the seed distribution in depth with function of motion speed of the examined seeder P- air-suction seeder IMT-634-454 is given in table 2.

Table 2

Seed distribution In depth

Operating speed km/h	Given Depth cm	Realiled the depth Of sowing (cm)			Difference between the given and achived depth (%)
		2000	2001	X	
4		5.30	5.10	5,20	+ 4
6	5	4.90	4,80	4,85	- 3
8		4,70	4,90	4,80	- 4
10		3,60	3,60	3,60	- 28
X		4,62	4,60		

The biggest difference from the given depth of planting of 5 cm is 3.6 cm, i.e. 28%, at a speed of 10 km/h, in both years, respectively, whereas minimum deviation appeared at a speed of 6 km/h and 8 km/h, achieving the depth for 3-4 % less compared to the given norm.

By analyzing the variance of the seeder given, we can conclude that there are significant differences depending on the variant of factor B (working speed), but there are no differences with treatments depending on factor A (year of research) and the interaction of A and B, so, the individual examinations are made at the level of significance 95% and 99% for the treatment during the variation of factor B (working speed) by determining with help of T-test on the basis of Least Significant Difference (LSD)

The obtained results indicate the statistically highly significant difference between the planting depth at a speed of 8 km/h and 10 km/h. The difference between the achieved planting depth at a speed of 4 km/h and 6 km/h is statistically significant, whereas the difference between the achieved planting depths at a speed of 6 km/h and 8 km/h is statistically insignificant.

The distance between the sown seeds in a row, using the examined seeder depending on speed (Table3).

Table 3

The distance between the sown seeds in a row

Operatin Speed Km/h	Given Space (cm)	Realiyed space in a row (cm)			Difference between the given and achived space %
		2000	2001	X	
4		24.10	24.50	24.30	- 6,53
6	26	26.10	25.80	25.95	- 0,19
8		27.00	26.30	26.65	+ 2,50
10		30.10	29.50	29.80	+ 14,61
X		26.82	26.52		

Analyzing Chart 3, it is noted that the smallest deviation in a row, comparing to the given interspace at a speed of 6 km/h (0.19 %), slightly larger deviation at a speed of 8 km/h (2.5 %), whereas the biggest difference is noted at a speed of 10 km/h. (14.16).

Examining the results of the variance analysis, we can spot a largely significant effect of the speed of the sowing aggregate and the effect of the year of examination on the achieved distance in a row, therefore- the individual test were taken, on the level of significance from 95% and 99%.

Changing the speed of the sowing aggregate affected the achieved distance in a row, so it is established there are considerable statistical differences appearing at a speed of 4 km/h comparing to speed rates of 6, 8, 10 km/h, as well as statistically highly significant differences at a speed of 10 km/h comparing to speed rates of 6 km/h and 8 km/h.

The differences between the given and the achieved number of plants (set) depending on working speed is shown in table 4.

Table 4

Differences between the given and the achived number of plants

Operating speed km/h	Given set of plants in 000	Realized set of plants in 000		
		2000	2001	X
4	59.27	59.27	58.30	28.78
6	54.73	54.73	55.37	55.05
8	52.91	52.91	54.31	53.61
10	47.46	47.46	48.42	47.94

At a speed of 4 km/h, we can see the larger set of plants comparing to the given one (6.87 %). The biggest difference between the given and the achieved frame is attained at a speed of 10 km/h. On average, per both years of research, the frame of the plants was 12.83% smaller, whereas these differences are slightly smaller at speed rates of 6 and 8 km/h (0.09-2.52%)

Analyzing the results of working productivity it is seen that the speed of the sowing aggregate considerably affects the attained effects. When it comes to projected effects the taken coefficient value of working time is 0.8. The least attained effect is, as expected, achieved at a speed of 4 km/h, whereas the biggest attained effect is achieved at a speed of 10 km/h (tab 5)

Table 5

Realized working productivity

Operating speed km/h	Projected working productivity ha/h	Realized working productivity ha/h		
		2000	2001	X
4	0.92	0.60	0.70	0.65
6	1.37	0.91	1.05	0.98
8	1.83	1.21	1.40	1.31
10	2.29	1.52	1.75	1.63

Results of the effect of the examined sowing aggregate through different working speeds on the achieved grain yield (tab 6). Analyzing the achieved results of the obtained grain yields, we can notice that there is a very significant effect of speed of sowing aggregate to the rate of the attained grain yields. The lowest grain yield is noted at a speed of 4 km/h (2,880 kg/ha) in 2000, whereas at a same speed of 4 km/h, there was the highest grain yield of 7,600 kg/ha in 2001. If we are to carry out an analysis on grain yields throughout the years of the research, we can notice that by increasing speed of the seeder, we optimize the grain yields, but only in the climatically unfavourable year of 2000, whereas comparing the grain yields obtained in 2001, which was more favourable in terms of climate, we can notice decrease of grain yields with the increase of speed of the examined seeder. Averagely, through both years of research, we can notice a decrease of grain yield with the increase of speed of the sowing aggregate. The year of the research also has a great impact on the level of grain yield, in correlation with the speed.

Table 6

Achived grain yields

Operating speed km/h	Realized working productivity (kg/ha)		
	2000	2001	X
4	2.880	7.600	5.250
6	3.400	6.400	4.900
8	3.600	6.100	4.850
10	4.000	5.000	4.500
X	3.470	6.275	

CONCLUSIONS

Based on these results we can conclude the following:

- It is established that the speed of the sowing aggregate (IMT-634-454) has a significant effect on the spatial distribution of seeds

- It is noticed that increasing the working speed during both years of the research results in decrease of the planting depth and that the smallest differences comparing to the given norm are achieved at speed rates of 6 km/h and 8 km/h

- When analyzing the given interspace of the plants in a row and the attained grain yield, we can spot differences, increasing the working speed results in widening the interspace between the plants. The largest deviations are noted at a speed of 6 km/h and 8 km/h

- It is particularly important for the even germination to appear after the planting and to form the adequate set of plants. The most favourable set of plants comparing to the given one is achieved at a working speed of 6 km/h and 8 km/h, whereas at a speed of 10 km/h, the achieved set was the worst.

- Analyzing the achieved effects the most favourable values are attained at a working speed of 10 km/h, yet the quality of planting appears as a limiting factor, which is, as we pointed out, worse at higher speed rates, so we came to a conclusion that, as for the effect, the optimal speed is 8 km/h

- The speed of the sowing aggregates has a significant effect on the number of plants per hectare and altogether with the meteorological conditions in the year of the research affects the attained grain yields

- According to the results of the research, it is indicated that planting corn is of a complex nature and includes a number of considerations for the given area of the research. According to our research, we recommend 6 km/h- 8 km/h as an optimal working speed for the seeder IMT-634-454, because only at this speed will it conform to the given norms of planting in the tolerant limits of variation.

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