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## **THE SELECTED PROBLEMS OF THE STUDY ON THE QUALITY OF MINERAL FERTILIZER SOWING WITH DISC SPREADERS**

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**Abstract:** The aim of this study was the influence of working parameters of mineral fertilizer on quality of sowing. The application of fertilizers is conducted with a particular accuracy, mainly characterized by a variation coefficient connected with the surface irregularity (the longitudinal and transverse one in relation to the direction of the unit ride) of the distribution of a fertilizer dose on a field surface. The irregularity of fertilizer spread is a phenomenon which occurs in every case of fertilizer application, both by hand and a machine. Generally, two types of irregularity can be identified, i.e. the punctual and belt one (the transverse and longitudinal one). The punctual irregularity results from a random of fertilizer granules or grains sowed using any method and it is measured on definite, small areas. The belt irregularity results from diverse fertilizer mass distribution in transverse and longitudinal directions in relation to the movement of the distributor.

**Key words:** *mineral fertilizer, transverse and longitudinal distribution quality of sowing*

### **INTRODUCTION**

The growth of efficiency of husbandry in agriculture is connected with the improvement of the processes of agricultural production, which in turn is conditioned by the dynamics of introducing scientific and technological advancements - particularly the biological and chemical ones. These two categories of progress have a decisive influence on the level of agricultural production, and so does the progress in the mechanization of agriculture.

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The level of agricultural production is more and more conditioned by the application of industrial production means. The inappropriate use of such means can influence the quality of agricultural materials and pose a threat to environment. Therefore their application must be monitored.

On the units of sustainable agriculture are integrated fertilization plants. The basic function fertilization in the system covering on enabling in remunerative way of waited crops about desirable quality the achievement level the alimentary under the cultivation plant's needs be sustainable as well as the reduction to minimum of threats for natural environment, caused to transfer from soil the alimentary components to land waters [5].

The regular spread of fertilizer in essential way it influences on height on crop. The spread such as ecological aspect mainly also therefore, causing that wrong changes, that the excess of fertilizer be rinsed to surroundings, e. g. in soil waters [6].

## **MATERIAL AND METHODS**

The aim of this study was the influence of working parameters of mineral fertilizer on quality of sowing.

The effect of work of mineral fertilization machines depends on many various, interacting factors. The physical and mechanical properties of fertilizers are of major significance since large diversity of these properties creates difficulties in the designing and construction of fertilizer distributors, and also it influences the quality of sowing [1].

The application of fertilizers is conducted with a particular accuracy, mainly characterized by a variation coefficient connected with the surface irregularity (the longitudinal and transverse one in relation to the direction of the unit ride) of the distribution of a fertilizer dose on a field surface. The transverse irregularity of spread mainly depends on the type of distributing unit, the longitudinal irregularity, however, on the fertilizer dosing unit. The irregularity of fertilizer distribution on a field surface influences yielding of crops, including a fall in crops and the incomplete utilization of a fertilizer as well as the pollution of the natural environment [3].

## **RESULTS AND DISCUSSION**

The irregularity of fertilizer spread is a phenomenon which occurs in every case of fertilizer application, both by hand and a machine. Generally, two types of irregularity can be identified, i.e. the punctual and belt one (the transverse and longitudinal one). The punctual irregularity results from a random distribution of fertilizer granules or crystals sowed using any method and it is measured on definite, small areas. The belt irregularity results from a diverse fertilizer mass distribution in transverse and longitudinal directions in relation to the movement of the distributor. It is measured on large areas which are equivalent to the width of a sowing belt or a definite section of the distributor ride. This irregularity is measured using relative mean deviation or relative standard deviation, variation (irregularity) coefficient of fertilizer mass distribution. Many researchers claim that determining of longitudinal irregularity is inexpedient, because deviations from the mean distribution vary within a small range and the irregularity coefficient is small. For this reason, numerous methodological recommendations advise

to replace measuring of longitudinal irregularity with the measurement of fertilizer dosage irregularity on a sowing disc [8].

In aim estimating the basic working parameters fertilizers was marked spatial schedule sowed fertilizer, which represents of his pulp falling on individual of surface on seed belt quantity. Many kinds of spatial schedules of fertilizer exist (fig. 1). The most popular transverse distribution is (TRD), which performances of work of different models serve to comparing fertilizers [4].

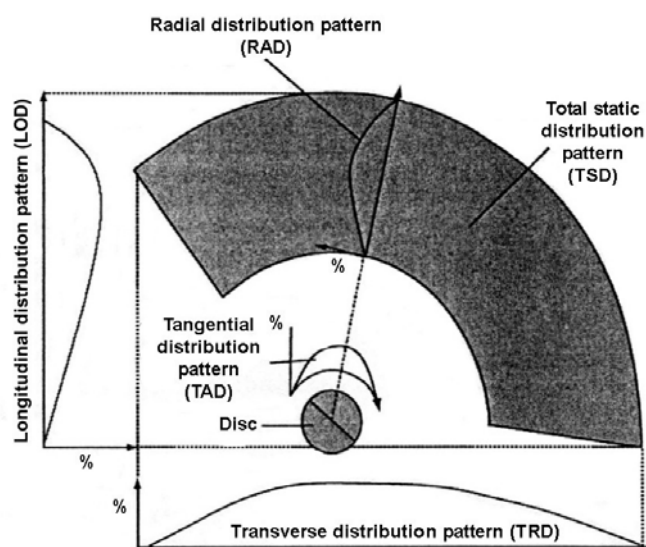


Figure 1. Types of fertilizer distribution patterns [4]

The question of distribution regularity is especially important in the case of applying various fertilizer doses, as it is practiced in modern precision farming in environment-friendly agricultural technologies. The basic criterion of evaluating the quality of fertilizer distributor work is the relative standard deviation of fertilizer transverse distribution. The transverse distribution is connected with the working width of a machine determined in such a way that allows for the overlapping of fertilizer spread belts from successive rides of a fertilizer distributor moving on the field in a sewing shuttle way. Another criterion is obtaining of the planned dose of fertilizer per 1 hectare, which is a variable in the function of the distance covered by a machine according to the plan of fertilization [9].

The distribution regularity is also affected by the shape of a distributing paddle, its height and place on the sowing disc (fig. 2).

It is also essential for the distributor to be appropriately leveled during the study because fertilizer particles are ejected from the disc onto the field on different perpendicular trajectories. Even with the discs deviation of  $5^\circ$  there are considerable differences in the quality of fertilizer distribution [10].

The working width and distribution regularity depends don't only from the fertilizer constructions, but and from physical properties of sowed fertilizer. So as to get optimum

values it complies individual adjustment of dosage point on disc and the adjust of sowing vanes [6].

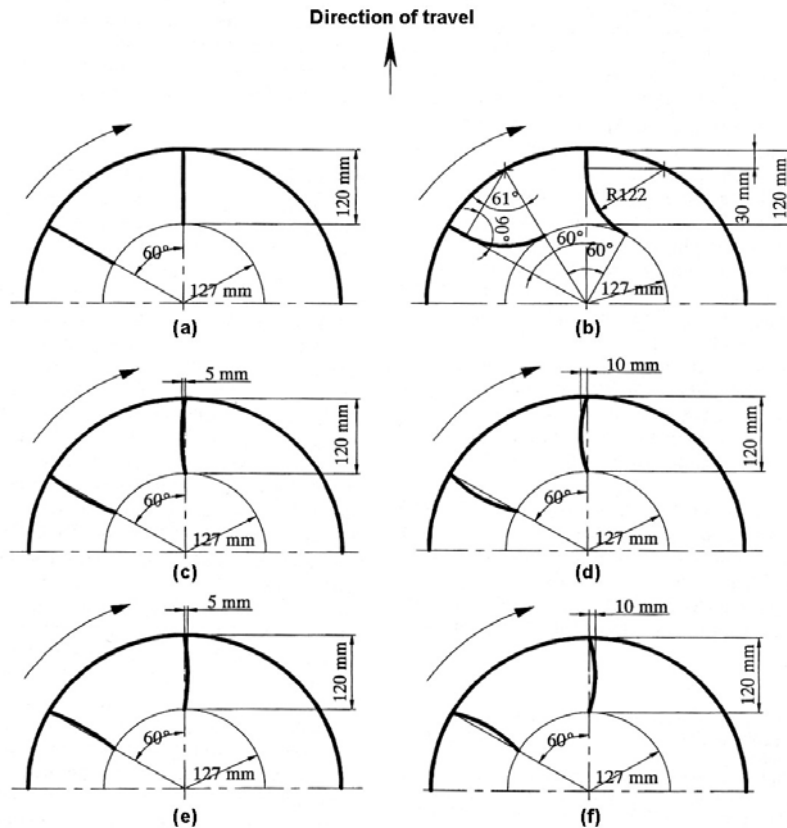


Figure 2. Vanes used in experiments [10]  
 (a) – straight, (b) – composite, (c) – forward-curved-5, (d) – forward-curved-10,  
 (e) – back-curved-5, (f) – back-curved-10.

On the efficiency fertilized also influences the disc rotation speed. The analysis of investigations over influence of the disc rotary speed of quality of sowing showed that that the increase crumbling with her growth follows together with the granules. This phenomenon it was should translate, that together with increase of rotary disc speed increase of strength of influence on granule of fertilizer the vanes follows also as well as the of friction counteracting resistance their sliding in decentralizing direction [7].

Universally applied in agriculture the disc fertilizers don't dump on rational fertilized plants and their applying state real threat for natural environment. It is considerably better solution applying pneumatic fertilizer which in connection with system of satellite location makes possible more effective the utilization from mineral fertilizers the components [2].

## CONCLUSIONS

The study has shown that the summary coefficient of superficial irregularity of fertilizer sowing on a field depends on the transverse, longitudinal as well as fertilizer dosage irregularities. Moreover, insufficient and excessive fertilization of field surface is an essential factor causing the reduction of crops. In the case of excessive fertilization of field surface there occurs incomplete utilization of fertilizer, which causes environmental pollution.

The study of the regularity of fertilizer dosing to the working unit of disc distributor has revealed that a fertilizer dose size per hectare, the way of its positioning as well as the degree of filling of the tank with fertilizer do not have a significant effect on the regularity of fertilizer dosing to the working unit of a disc distributor. In all the investigation combinations, the quantity of dosed fertilizer did not differ significantly from the planned dose. The coefficient of dosage irregularity, which indirectly determines the longitudinal quality of fertilizer sowing, remains within acceptable limits, which means that it has no effect on the quality of fertilizer distribution. Therefore, the coefficient of transverse irregularity, whose limiting value determines the acceptable working width of disc distributors, is of major significance in the process of fertilizer distribution.

The study of the influence of sowing discs parameters on fertilization effectiveness has shown that the physical and mechanical fertilizer properties including form, granulometric composition and looseness have a significant influence on the process of fertilizer sowing. A fertilizer dose has a minimal effect on the working width and the value of transverse irregularity coefficient of fertilizer sowing in the function of working width. The following factors have a significant influence on fertilization effectiveness: the diameter of sowing discs, the number and shape of paddles, discs revolutions and the height of discs mounting above the ground.

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## ODABRANI PROBLEMI ISTRAŽIVANJA KVALITETA RASIPANJA MINERALNIH ĐUBRIVA DISKOSNIM RASIPAČIMA

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**Sažetak:** Cilj ovog istraživanja bio je uticaj radnih parametara mineralnog đubriva na kvalitet rasipanja. Aplikacija đubriva izvodi se posebnom tačnošću, koja se najviše karakteriše koeficijentom varijacije u zavisnosti od nepravilnosti (longitudinalna i transverzalna u zavisnosti od pravca kretanja rasipača) distribucije norme đubrenja po površini parcele. Nepravilnost u rasipanju se javlja pri svakoj aplikaciji đubriva, kako pri ručnom, tako i pri mašinskom rasipanju. Generalno, mogu se definisati dva tipa nepravilnosti: tačkasta i trakasta (transverzalna i longitudinalna). Tačkasta nepravilnost je rezultat neujednačenosti granula đubriva ili semena, pri rasipanju ili setvi na bilo koji način, a meri se na maloj ograničenoj površini. Trakasta nepravilnost nastaje zbog različite raspodele mase đubriva u transverzalnim i longitudinalnim pravcima, u zavisnosti od pravca kretanja rasipača.

**Ključne reči:** *mineralno đubrivo, transverzalna i longitudinalna distribucija, kvalitet rasipanja*

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