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Geometrical ground of activation of process of action of the new combined processing soil disk

This article deals with methods of designing and manufacturing workers of agricultural machines, namely, spherical disc harrows, which are convex-concave profil the disc and take on the disc is not more than half its length.

We described a new disk guns tasked factors increase compression and stretching of the selected disk cavities soil layer by performing channel compression and tension as two spherical zones that provide significant destruction of intra-soil relations between them. These factors largely determine the parameters and performance of the device. The specified task is achieved by cultivating in the disk geometrically composed of spherical zones, these zones together to form a radially concave-convex profile of the drive and the drive generators to take no more than half its length

Conclusions. Using the proposed combined disk special devices for soil cultivation will dramatically increase the technical and technological reliability of disk tools.
-working bodies disk type, stamping disks, spherical compression and tension zones, internal ground connections

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Quality planting potatoes and effect of seed dimensional parameters for work

This work deals with the impact of planting technique on potato harvest. It focuses on improving the quality and quantity of planted tubers in order to efficiently explore optimal solutions to increase economization of potato production with minimizing the production cost.

In assessing the work quality of two types of potato planters GRIMME and HASSIA on the harvest, we found that the quality of their work is about the same and is not dependent on the type and design of the planting system, but mainly is influenced by other factors:

- it is necessary to do at minimum a double seed sorting in order to improve the quality of the work of potato planter to minimize financial losses in planting and to increase the harvest;
- the working speed of the potato planter is important to achieve a well--proportioned distribution of tubers in the row;
- the quality of soil preparation before planting affects the harvest results and work of the planter.
potato cultivation, compositor mechanism, planting manners, separation, potato cultivation economy

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Качество работы картофелесажалки и влияние на нее размерных параметров семян

В статье рассматривается проблема влияния технологии посадки картофеля на его урожайность. Работа направлена на повышение экономической эффективности производства картофеля при минимизации производственных затрат путем улучшения качества посадочного материала.

Была произведена качественная оценка работы двух типов картофелесажалок – GRIMME и HASSIA. Определенно, что качество их работы примерно такое же и не зависит от типа и конструкции посадочной системы. Для улучшения качестваработы картофелесажалкии повышения урожайностиклубни должны проходить как минимум двойную сортировку.Также на качество работы посадочного агрегата влияет скорость картофелесажалки и качество подготовки почвы.

технология выращивания картофеля,посадочная система, эффективное картофелеводство, размер картофеля

Introduction. Under the present conditions when growing area of potatoes in Slovakia are significantly decreasing (11 000 ha, data from 2012) and potato becomes economically demanding crop, it is important to think about improving and increasing potato yields and in terms of planting.

The aim of this work is to compare the impact of technology on planters potato crop yields. Based on field measurements to evaluate the work of different types of planters with Spoon Planting control and the focus on remedial work planters, in terms of increase in potato production economy and minimize financial losses when planting potatoes.

For their assignments was elected farm SHR Ing. Juraj Máčaj, AGROMAČAJ Ltd. located in Kráľová pri Senci (Senec), which is one of the& the largest producers of potatoes in Slovakia.

Materials and Methods. Resolving of the work was carried out under the following methodology:

1) Evaluation of seed potato (variety, size settlement, tuber shape and degree of sorting seeds). Planted varietes were Mirabel and Dita. A variety of tubers Mirabel was pre-sorted by the manufacturer in two size fractions of 25-45 mm and 35-55 mm:

- to determine the dimensional characteristics of tubers were measured three basic features (length, width, thickness) with weight of tubers;
- measurement was carried out physically at each tuber individually by a caliper and a digital weight scale;
- minimal statistical sample set was 200 tubers;
- size of the measured parameters of the tubers (length, width, thickness, weight) was constructed the table in the programme Excel and then performed a statistical evaluation of the dimensional characteristics (mean, standard deviation, coefficient of variation, variance, minimum and maximum values, number of observations.) separately for each variety;
- construction of box plot of the size and weight characteristics for each variety;
- graphical evaluation of the tubers shape (percentage of tuber shape);
- determining the tuber shape coefficient according to ISO 5691.

2) Verification of the quality of a planting machine work under field operating conditions:

- used planters were with spoon planting mechanism (4-line 34 of Grime and 2-line Hassia 242 S);
- measurement of the tubers deployment in the row was carried out at the specified conditions (operating speed, distance tubers in a row, interrow distance);
- measurement was carried out in the area of 10 m^2 diagonally. Each measured section was extended for additional 15 m section where the planter has reached the requiered speed and stabilize the reqiuered mode of technological operation;
- distance between tubers in a row was assessed by measuring the section by folding scale by measuring the distance of the centers of neighboring tubers to the longitudinal axis of the line;

- 200 measurements was performed for each planter;
- the measurement procedure for both types of planters was the same;
- real distance between tubers were tabulated and subsequently evaluated in the chart longitudinal uniformity of planting potatoes;
- graphical representation of the percentage distribution of tubers in different types of planters was divided into five classes (the required distance, double planting, a one-recess, recess double, triple recess);
- the control of potato tubers in soil was based on valid standards for testing planters according to STN 47 0138.

Results and Discussion. Within each field measurements made in year 2012, were first evaluated qualitative indicators typesetter Grimme 34 Z. Measured on the parcels with zero sloping. Planter was set to interline distance of 750 mm, the distance between tubers in a row was 270 mm, 100 mm planting depth, planters operating speed was 5.6 km h^{-1}. Planters spoons were intended for planting size fractions ranging from 35 to 55 mm.

Seed size was verified before the measurement in terms of methodology. According to the tuber planting shape coefficient, a variety Mirabel 35-55 is oval-shaped group of tubers. Shape coefficient of Mirabel tubers was 188.

Based on the measurement, it was found that 79.5% of tubers were planted in the requested distance, double planting consisted of 4.5%, a one-recess was 14% and double recess was 2%, three times recess doesn´t occured. Planter Grimme 34Z was working with the effective distance of tubers 260.5 mm and a standard deviation of 69.6 mm. Qualitative distribution of tubers by the planter into 5 classes is shown in Figure 1.

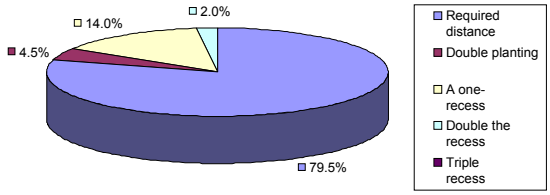

Figure 1 – Percentage distribution of tubers planted by Grimme 34Z

In a further aspect of field measurements was used Mirabel variety with fraction size from 25 to 45 mm. Planter was set to interline distance of 750 mm, the distance between tubers in a row was increased to 310 mm, 100 mm planting depth, working speed typesetter was increased to 6 km h^{-1}. Planters spoons remained unchanged for the fraction size in the range of 35-55 mm.

Dimensional variance of the thickness and width is relatively small. The third dimension the length is relatively higher variance is due to a varietal characteristic of tubers. High scattering length scattering caused by the high weight of tubers. The large range is due to the lack of separation of seed. Form factor Mirabel tubers 25-45 mm was 169.

Based on the measurements, it was found that 64% of tubers were planted at the required distance. Double planting occured in 26.5% of cases,. A one-recess occurred in 6.5% of cases. Double recess formed in 3% of cases. Triple recess hasn´t occurred. Grimme planter 34 Z worked with the effective distance of tubers of 286.3 mm and a standard deviation of 81.7 mm. Qualitative distribution of tubers, was divided into 5 classes and is shown in Figure 2.

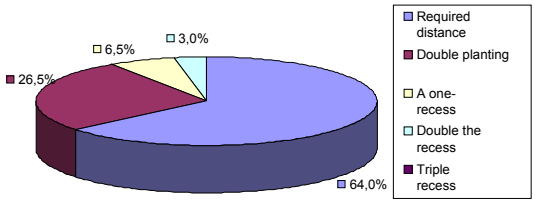

Figure 2 – Percentage distribution of planted tubers by planter Grimme 34 Z

The following qualitative assessment of planter Grimme 34 Z was made with variety Ditta. Measurement conditions (interrow distance, distance between tubers in a row, planter working speed, depth of planting, size of spoons) were the same as the variety Mirabel 25 – 45. Size factor for tubers Ditta is 181.

Based on the methodology, it was found that 75.5% of tubers were planted in requested distance. Double planting has occured at 6.5% of cases, in 15% of cases has occured a one-recess planting. Double recess planting was in 2% of cases. There was also a triple recess which occured in 1% of cases. Planter Grimme 34 Z worked with the effective distance between tubers of 280.5 mm and a standard deviation of 75.2 mm. Qualitative distribution of tubers, was divided into 5 classes, and is shown in Figure 3.

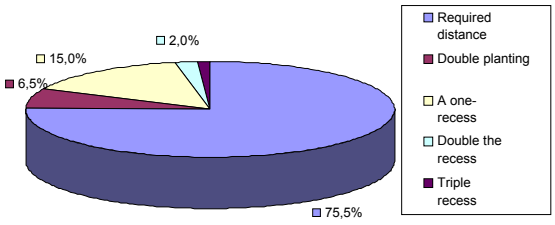

Figure 3 – Percentage distribution of planted tubers by planter Grimme 34 Z

Within each field measurements, other evaluated planter was Hassia 242S with planted variety Mirabel 35-55 mm. Characteristics of the measurement conditions are the same as in previous measurement.

According to the methodology of measurement, it was found that 74% of tubers were planted in requested distance. Double planting occured in 8% of cases, a one-recess planting occurred in 15.5% of cases, a double recess formed in 2.5% of cases. Triple recess has not occurred. Based on a verification of work in field conditions, we can conclude that the planter worked with the effective distance of 299.3 mm and a standard deviation of 80.6 mm. Qualitative distribution of tubers, was divided into 5 classes, and is shown in Figure 4.

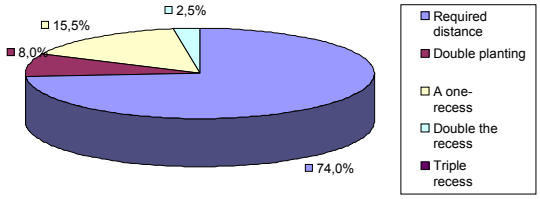

Figure 4 – Percentage distribution of planted tubers by planter Hassia 242S

By practical measurements we have evaluated the quality indicators of both planters. Quality of work we have characterized by the accuracy of planting, which is expressed by the standard deviation. When evaluating qualitative indicators of planters, the lowest average standard deviation of planter Grimme 34 Z was 75.5 mm and Hassia 242S had a standard deviation of 80.6 mm. When comparing the work of two types of planters. the Grimme and the Hassia, we can conclude that their work in field conditions on the plots has been greatly balanced.

When comparing the results of both size of variety Mirabel size fractions shows that seedlings Mirabel in size from 25 to 45 mm caused a significant problem when it was planted. The main reason was the wrong choice of typesetting spoons that were designed for fraction 35 - 50 mm. For this reason, there was a double scooping and thus a double planting. The operator tried to compensate it by increasing the distance between tubers in a row, which was from 270 mm to 310 mm. Exchanging spoons for smaller size fractions, or using adapters on spoons could significantly improve the quality of the machine and especially reduce the consumption of seed and operating costs for planting. We have found that it is very important to adjust the shape and size of the typesetting spoons to the size and shape coefficient of tubers.

Based on the findings, the statistical evaluation of the varieties shows that the seed was poorly sorted. Variance of thickness, width, length and weight has shown differences. Based on these findings it can be concluded that the seed has undergone only single sorting.

The measurement results show that working speed of planter also has a great impact on even distribution of tubers in a row. Measurement shows that at lower speeds, the number of tubers planted at the required distance with Grimme planter raised from 74% to 79.5%. The number of single-multiple, double and dual skips has also reduced. Uncaptured tubers by spoons are involved in the total omissions significantly. By increasing the operating speed in order to achieve a higher hourly performance, the quality of planting is reducing and thus the total yield.

Despite the achievements, in terms of quality of planting under field conditions, it should be noted that the first crucial problem is the size uniformity of planted material. Per hectare it consumes on average 2 - 3.2 t of planting material. With balanced size fractions consumption of seed from requiered amount is about 70%. Price of seed potatoes in 2012 was around € 0.48 per kilogram. If we consider the average consumption of seed 2.5 t per hectare, the purchase price of seed € 0.48 per kilogram, the price of potatoes seed per 1 hectare is € 1,200. At 30% of saved seed only 1 ha reduces the costs of 360 €. The company has grower acreage of potatoes about 400 ha. By planting sorted potatoes seed it can save more about 144,000 €. Unfortunately, in our country due to improperly sorted seed is planted more than 4 t ha $^{-1}$. This implies a need to improve the quality of planting by ensuring at least double or triple sorting of seed. By doing this we can significantly reduce the financial cost of planting. The cost of a double sorting of seed are negligible compared with the saved planting material.

Conclusion. During the evaluation the quality of work of two types of typesetting mechanisms, we concluded that the differences between planters are minimal. Quality of planters work, longitudinal distribution of tubers and harvest height is influenced mainly by:

- preparation of planting material in terms of its size and shape imbalances (size and shape factor tubers);
- working speed of planter;
- quality of soil preparation before planting;
- sloping of land;
- degree of seed germination (germ size);
- human factors (professional equipment operator);
- to a small extent it is affected by the construction of planter and by the wear of functional parts.

To increase production economy, in terms of composing techniques we suggest the following:

- provide at least double, sometimes triple seed sorting. Reduced yield is caused by missing trubers and low uniformity of spacing. It is very important that the seed size is balanced. Double or triple sorting will enhance the planting quality, higher yields and reduces the consuption of planting material per hectare. Separated, biologically valuable seed provide the basis for a highly effective way of growing;
- when planting, choose the optimal operating speed of the machine (up to 6 km h^{-1} or less). By increasing the operating speed it will lead to unbalanced distribution of tubers in a row, lossing tubers from planters spoons, which has an negative effect on the quality of planting and crop height;
- select the optimal shape of planters spoons (bowls), the size of seed potato tubers and shape factor, when neccessary use spoon attachments. Using inappropriately chosen planting spoons leads to double scooping of small seed, double planting or omissions and to a crop losses. The quality of the work of individual planters is virtually identical. Decisive is the preparation of planting material and size sorting. The shape of tubers significantly influences their uniformity of distribution in a row;
- ensure the quality of soil preparation, build quality (soft) subsoil under potatoes, which is enough cultivated. It is important that the tubers after the impact in a row remained on the position and prevent them from sliding. Focus on the separation of clods and stones. Properly prepared seed bed creates optimal conditions for the growth and development of the root system of plants and is one of the conditions for high yield and quality;
- consistently ensure compliance with the principles of agricultural engineering at planting (planting depth, proper configuration of the mode of operation);
- tell the operator the scientific and thechnical knowledges.

Establishment of quality planting material, compliance of agronomical soil preparation, seed preparation, proper adjustment of planting mechanism and a uniform distribution of the tubers in the soil are the essentials for a good harvest.

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Якість роботи картоплесаджалки і вплив на неї розмірних параметрів насіння

У статті розглядається проблема впливу технології посадки картоплі на її врожайність. Робота спрямована на підвищення економічної ефективності виробництва картоплі при мінімізації виробничих витрат шляхом поліпшення якості посадкового матеріалу.Була проведена якісна оцінка роботи двох типів картоплесаджалок - GRIMME і HASSIA. Визначено, що якість їх роботи приблизно така ж і не залежить від типу і конструкції посадкової системи. Для поліпшення якості роботи картоплесаджалки та підвищення врожайності бульби повинні проходити як мінімум подвійне сортування. Також на якість роботи посадкового агрегату впливає швидкість картоплесаджалки і якість підготовки грунту.
технологія вирощування картоплі, посадкова система, ефективне картоплярство, розмір картоплі

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