The Results of Experimental Studies on the Determination of the Optimal Values of the Parameters of Levels Mounted on Vegetable Seeding Machine

[1]Tukhtakuziev Abdusalim	Doctor of Engineering, Professor, Scientific-Research Institute of Agricultural Mechanization. E-mail: abirasul_82@mail.ru,
[2]Ibragimov Abdirasuli Abdikarimovich	Doctor of Engineering, Senior Researcher, Scientific-Research Institute of Agricultural Mechanization, E-mail: abirasul_82@mail.ru,
[3]Khamidov Nurmukhammad Muxtarovich	Doctoral Student, Karakalpak Institute of Agriculture and Agrotechnology. E-mail: nurmuhammad.tsaunb@mail.ru
[4]Eshdavlatov Akmal Eshpulatovich	PhD, Karshi Institute of Irrigation and Agrotechnology at the National research University "TIIAME". E-mail: aeshdavlatov91@mail.uz

ABSTRACT

It is presented in the article that, the parameters of the levers to be installed in the horizontal furrow, which form a lump of comb maker, and which line the seeds of small seed vegetable crops to the top, that is, the height of their installation in comb maker, the direction of movement and the angle of installation in relation to the steep, as well as the geometrical dimensions of the the results of the multi-factor experimental studies on the determination of the optimal values that the case provides.

Keywords: Vegetable seeding machine, comb maker, alignment installed on the power, height of alignment installations on the pusher, angle of installation relative to the direction of movement, angle of installation relative to the upright, speed of movement, furrow height, width of furrow, tensile resistance.

Introduction

The Scientific-Research Institute of Agricultural Mechanization has developed a design of a seeder for sowing seeds of vegetable crops in one pass of the unit, sowing the seeds in a row on top of them expressions are derived [1,2,3].

This article presents the results of experimental researches to determine the optimal values of the parameters of the levelers installed on the seed drills, which provide the required level of work quality with low energy consumption.

Methods

Multi-factor experiments were conducted under the Hartley-3 plan [5.6,7] to determine the height of the alignment of the alignments, their angles of movement and installation of the cylinder over the cylinder, and the width and width of the top part of the cylinder, which is equipped with cylinders.

The height and width of the ridges formed by the ridges equipped with flatteners

were determined by means of a special rail divided into scales at a length of 2 m and every 50 mm after they passed. In this case, the rail was installed horizontally on the piles in a transverse direction, using a ruler with a length of 500 mm at a distance of every 50 mm to determine the vertical distance from its lower edge to the surface of the piles. Measurements were performed at 10 repetitions with an accuracy of ± 5 mm [4].

The traction resistance of a leveler equipped with levelers was determined by attaching strain gauges to its column.

Table 1 lists the factors, their definitions, change intervals, and levels.

The experimental data were processed according to the PLANEXP program developed in the experimental department of SRIAM. The Cochrane criterion was used to assess the homogeneity of the variance, the Student's criterion was used to assess the value of the regression coefficients, and the Fisher criterion was used to assess the adequacy of the regression models [8,9,10].

Results and discussion

The results of the experiment were processed according to the specified program and the following regression equations were obtained, which adequately represent the evaluation criteria:

- on the pile height (mm) formed by the pushers equipped with levelers:

$$Y_1 = 115{,}457 + 15{,}567X_1 - 7{,}333X_2 - 3{,}500X_3 - 4{,}500X_4 - 5{,}478X_1^2 - \\ - 1{,}375X_1X_2 - 0{,}958X_1X_3 - 1{,}708X_1X_4 + 1{,}856X_2^2 + 2{,}208X_2X_4 - \\ - 1{,}978X_3^2 + 2{,}125X_3X_4 + 2{,}522X_4^2 \quad (1)$$

- on the width of the top of the ridge (mm) formed by the ridges equipped with straighteners:

$$Y_2 = 333{,}357 - 34{,}567X_1 + 6{,}500X_2 + 39{,}833X_3 + 15{,}000X_4 + \\ + 26{,}875X_1^2 - 6{,}792X_1X_2 - 6{,}792X_1X_3 + 6{,}792X_1X_4 - 8{,}458X_2^2 - \\ - 6{,}875X_2X_3 + 7{,}042X_2X_4 - 8{,}458X_4^2 \quad (2)$$

Table 1

Factors, their definition, intervals and levels of change

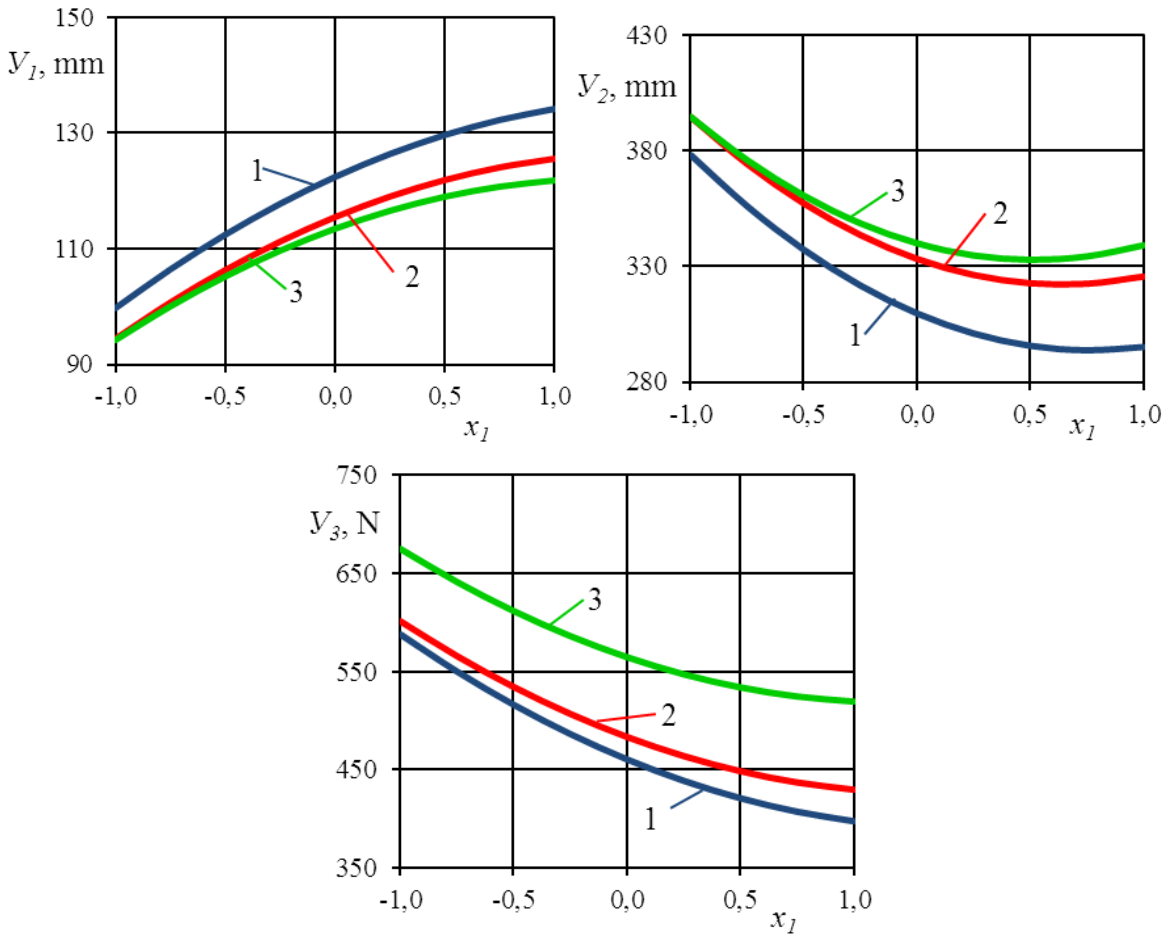
Factors and their units of measurement	Conditional designation	Phase intervals	Levels		
			lower (–1)	basic (0)	elevated (+1)
1. The height of the straightener to the comb maker installation, mm	X_1	20	100	120	140
2. Angle of installation relative to the direction of movement of the leveler, °	X_2	5	30	35	40
3. Angle of installation of the straightener relative to the seam, °	X_3	5	-5	0	5
4. Movement speed, km/h	X_4	1,2	5,2	6,4	7,6

- on the traction resistance of the pushbutton equipped with rollers (N):

$$Y_3 = 483{,}479 - 86{,}100X_1 + 47{,}333X_2 - 34{,}667X_3 + 52{,}500X_4 +$$
$$+ 32{,}162X_1^2 - 9{,}125X_1X_2 - 10{,}625X_1X_3 + 9{,}042X_1X_4 + 14{,}163X_2^2 -$$
$$- 9{,}042X_2X_3 + 10{,}792X_2X_4 + 21{,}163X_3^2 + 9{,}292X_3X_4 + 28{,}996X_4^2 \quad (3)$$

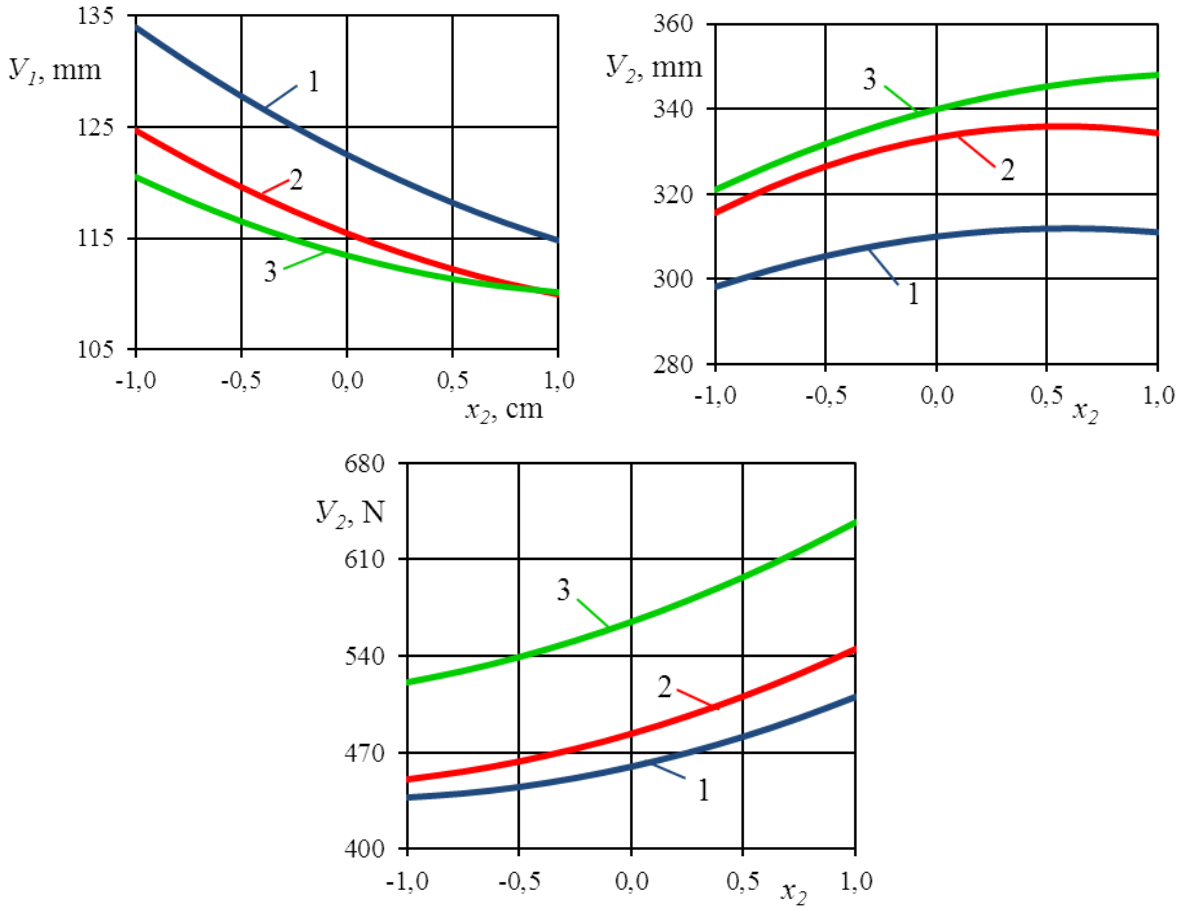
The analysis of the obtained (1)-(3) regression equations and the graphical correlations built on them (1-3 pictures) showed that all factors had a significant impact on the evaluation criteria.

(1)-(3) regression equations and 1-3- as can be seen from the graphical links presented in the figure, the height of the straightener to the pushtooler, that is, with an increase in the factor X_1, the Y_1 criterion, that is, the height of the pushtooler, is increased, Y_2 and Y_3 criteria, that is, the width of the Pushto-top and the pull resistance of the Furrow-top decreased, the X_2 factor, that is, with an increase in the mounting angle relative to the direction of motion of the straightener, the Y_1 criterion decreased, The Y_2 and Y_3 criteria were increased while the Y_3 and Y_1 and Y_3 criteria were decreased with an increase in the pitch of the X_3 factor, that is, the pitch of the straightener relative to the steep, The Y_2 criterion was increased. X_4 is an increase in the speed of the factor, that is, aggregate movement. It has led to a reduction in the Y_1 criterion, an increase in the Y_2 and Y_3 criteria.



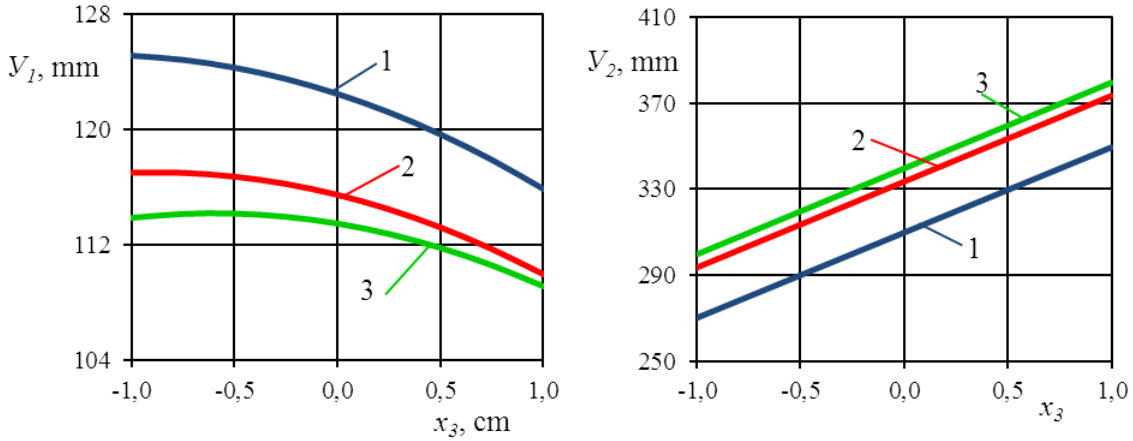
1,2 and 3-when the speed of movement is 5,2, 6,4 and 7,6 km/h respectively

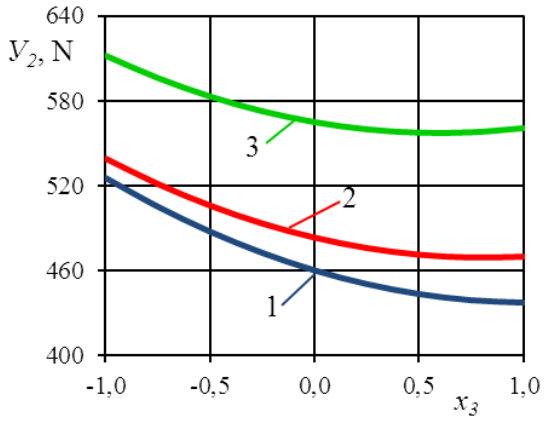
1-picture. U1, U2, and U3 criteria depend on the X1 factor graph of change in terms



1,2 and 3-when the speed of movement is 5,2, 6,4 and 7,6 km/h respectively

2-picture. U1, U2, and U3 criteria depend on the X2 factor graph of change in terms





1,2 and 3-when the speed of movement is 5,2, 6,4 and 7,6 km/h respectively

3-picture. U1, U2, and U3 criteria depend on the X3 factor graph of change in terms

(1) - (3) regression equations the criterion "Y1", that is, the height of the push in the range of 100-120 mm, the criterion "Y2", that is, the width of the furrow peak should be 350±20 mm, And the" Y3 " criterion was removed from the conditions of having a minimum value and the following values were determined, which ensure the fulfillment of these conditions of factors in the range of operating speeds of 5,2-7,6 km/h (Table 2).

Table 2

Optimal values of the straightener

V (X4)		h_n (X1)		γ (X2)		β (X3)	
Coded	Naturel, km/h	Coded	Naturel, mm	Coded	Naturel,grad	Coded	Naturel, grad
-1	5,2	-0,571	108,58	-0,278	33,6	-0,174	-0,9
0	6,4	-0,157	116,86	0,174	35,9	0,3075	1,5
1	7,6	0,174	123,48	0,288	36,4	0,3875	1,9

This means that push-ups equipped with rollers provide for planting seeds of vegetable crops at speeds of 5,2-7,6 km/h with low energy consumption of push-ups at the required level, so that the height of the installation of the straightener on the comb maker are 108,58-123,48 mm, the angle of installation relative to the direction of its movement should be 33º36'-36º24', and the angle of installation of the straightener relative to the steep-0º54'-1º54'.

Conclusion

According to the results of the conducted multi-factor experiments, the height of the installation of rollers on comb makers are 108,58,58-123,48 mm, in order to ensure the formation of the required level of furrow for the sowing of seeds of small seed vegetable crops with low energy consumption at the speeds of 5,2-7,6 km/h, the installation angle should be 33º36'-36º24' and the installation angle relative to the steep-0º54'-1º54'. In these values of the factors, the push height is 113,44-114,23 mm, the width of the top is 332,77-352,94 mm and the pull resistance is 498,09-561,6 N.

References

1. Ibragimov A.A., Karakhanov A.K., Abdurakhmanov A.A., Eshdavlatov A.E., Uteniyazov P.A., Khadzhiev A.A. Research results for a new onion seed drill // Agricultural machinery and technologies. – Moscow, 2020. Vol. 14 N 4. – pp. 12-16.
2. Ibragimov A., Karakhanov A., AbdurakhmanovA., Uteniyazov P. Justification of parameters of the rotary ripper for cotton rows // International journal of Mechanical Engineering. Vol.7 No1. 2022. – pp. 463-468.
3. Tukhtakuziev A., Ibragimov A.A., Khamidov N.M. Theoretical substantiation of the parameters of the leveling device of the seeder for sowing small-seeded vegetable seeds with simultaneous cutting of irrigation furrows // Bulletin of Karakalpak branch of Uzbekistan Academy of Sciences. – Nukus, 2021. – №2. pp. 18-23.
4. O'z DSt 3412:2019. Testing of agricultural machinery. Machines and tools for surface tillage. Program and test methods // Official edition. – Tashkent, 2019. – p. 52.
5. Abdusalim T. et al. The results of implemented researches on substantiation the parameters of the disc ploupher // Solid State Technology. – 2020. – T. 63. – №. 1s. – pp. 1618-1625.
6. Tukhtakuziev A., Abdulkhaev Kh. G., Barlibaev Sh.N. Determining the Appropriate Values of Compactor Paramaters of the Enhanced Harrow Leveller // Civil Engineering and Architecture. Vol. 8(3), pp. 218 – 223 DOI: 10.13189/cea.2020.080304.
7. Kutbiddin I., Abdunazarov Elbek K. S. Burying machine to pomegranate bushes // Journal of Critical Reviews. – 2020. – T. 7. – №.13. – pp. 1377-1381.
8. Kamilov N., Ergashev M., Abduvahobov D., Determination of parameters and operating values of organic fertilizer // Journal of Critical Reviews. – 2020. – T. 7. – №. 13. – pp. 1387-1395.
9. Augambaev M., Ivanov A.Z., Terekhov Yu.I. Fundamentals of planning a research experiment. – Tashkent: O'qituvchi, 1993. – p. 336.
10. Spirin N.A., Lavrov V.V. Methods for planning and processing the results of an engineering experiment. – Ekaterinburg: Ural State Technical University – 2004. – p. 257.