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OPTIMIZATION OF THE PARAMETERS OF THE SEED POTATO IRRADIATION MODE WITH UVL THROUGH THE METHOD OF MATHEMATICAL PLANNING OF EXPERIMENTS

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Annotation: *This paper used the mathematical planning method of multi-factor experiments to determine the effect of UBN on DNA at the cellular level and the optimal values of the parameters studied in fundamental and one-factor experimental studies on the treatment of potato parenchyma with UBN.*

Key works: *Power of irradiation lamps, W; effect on seed potatoes; UB irradiation time, minutes; UB irradiation height, centimeters.*

In order to ensure the food safety of the agricultural population by increasing the quality indicators of the seeds of agricultural crops, including environmentally friendly, potato seeds, disease and pest-resistant seeds, and in the world for its consumers, quality potato cultivation, energy and resource conservation and high productivity agrotechnologies and technical means for their implementation, creation and implementation production occupy one of the leading places.

Based on the study, the following were selected as factors affecting the quality of work: the power of light bulbs, W; UV radiation time, minutes; UV radiation height, centimeters, factors listed in Table 1, their conditional definition, intervals and levels of changes are presented. Theoretical studies were determined on the basis of the results of a one-factor experiment. The influencing factors were conditionally defined as: X_1-power of lighting lamps, W; X_2-UV radiation time, min; X_3-height of UV radiation, cm.

Obtaining experimental results was conducted on the basis of UVL with wavelengths of $_{l}$ =253.71221 nm and $_{l}$ =300.03478 nm.

The main factors in obtaining results and their change boundary conditions:

Table-1

T/p	Naming of factors	Designation		Change values			Change interval
		Real	Encoded	-1	0	+1	
1	Power of lighting lamps, W.	P_1	X_1	30,011	60,132	90,143	30,021
3	UVL exposure time, min.	t_{ubn}	X_3	5	10	15	5
2	UVL emission height, cm.	H_{ubn}	X_2	20	30	40	10

In addition, the impact was carried out using lamps in obtaining the results of the experiment. Table 2 shows the influencing factors, their conditional definition, intervals and levels of change.

The main factors in obtaining results and their change boundary conditions:

Table-2

T/p	Naming of factors	Designation	Change limit			Change interval
			-1	0	+1	
1	Power of lighting lamps, W,	X_1	$P_{1,1}$=30,01 $l_{1,1}$=254 $P_{2,1}$=30,01 $l_{2,1}$=300	$P_{1,2}$=60,132 $l_{1,2}$=254 $P_{2,2}$=30,01 $l_{2,2}$=300	$P_{1,3}$=30,02 $l_{1,3}$=254 $P_{2,3}$=60,13 $l_{2,3}$=300	
2	UV exposure time,min	X_2	10	20	30	40
3	UV emission height cm	X_3	5	5	10	15

The effect of the factors on the evaluation criteria was assumed to be described by a second-order polynomial in the general case, and experiments were carried out according to the Hartley-3 plan and the result was obtained [3].

In this case, the weight of the seed potatoes planted in the spring and the number of tubers were taken as evaluation criteria for conducting multivariate experiments.

The data obtained from the experiments were processed according to the "PLANEX" program [3,4]. Cochran's criterion was used to evaluate the uniformity of variance, Student's

criterion was used to evaluate the value of regression coefficients, and Fisher's criterion was used to evaluate the adequacy of regression models.

a) Based on the results of the experiment, it was processed in the indicated order and the following regression equations were cited, which adequately represent the evaluation criteria i.e. the number of nodes:

- in terms of the number of fruits of seed potatoes that leave the roots, the slices are;

$$Y_1 = 43,5121-0,8141X_1+1,24521X_2+0,76113X_3-6,85934X_1X_1+0,49914X_1X_2- -0,26321X_1X_3-4,88634X_2X_2-0,213114X_2X_3-3,13333X_3X_3 \quad (1)$$

- large potato slices by the number of fruits obtained from the roots;

$$Y_2 = 11,66401-0,46421X_1+0,54234X_2+0,446014X_3-2,136231X_1X_1+0,22333X_1X_2- -0,3551236X_1X_3-2,1341101X_2X_2+0,63501X_2X_3-0,441132X_3X_3 \quad (2)$$

- average potato grains by the number of fruits from which the roots are obtained;

$$Y_3 = 6,146012-0,314214X_1+0,024214X_2+0,466321X_3-0,731124X_1X_1+0,0483214X_1X_2- -0,0384213X_1X_3-0,7310234X_2X_2-0,6030423X_2X_3+0,9692134X_3X_3 \quad (3)$$

the regression equations that adequately represent the weight of the nodes are:

- total removable potatoes by Root weight, kg;

$$Y_4 = 1,468124+0,005014X_1-0,030012X_2-0,022222X_3-0,360021X_1X_1+0,044423X_1X_2+ +0,01111X_1X_3-0,188214X_2X_2+0,011X_2X_3+0,014413X_3X_3 \quad (4)$$

- large potatoes, which are taken by weight of the roots, kg;

$$Y5=+0,9561224+0,005014X_1-0,030014X_2-0,022222X_3-0,3600244X_1X_1+ +0,044412X_1X_2+0,011123X_1X_3-0,18612323X_2X_2+0,0121233X_2X_3+0,0141234X_3X_3 \quad (5)$$

potatoes per medium olinad by Root weight, kg;

$$Y_6 = 0,678124+0,0044123X_1-0,033333X_2-0,0333333X_3-0,353133X_1X_1+0,0361223X_1X_2+ +0,01333211X_1X_3-0,1791234X_2X_2+0,01501214X_2X_3+0,020014X_3X_3 \quad (6)$$

Based on the regression equations (1) and (6) analysis, all factors had a significant impact on the evaluation criteria.

When determining the optimal values of the parameters, the regression equations (1) - (3) were solved on the PC "Intel i5" using the Excel program "search for a solution". The regression equations were solved under the condition that the number of potato tubers has a maximum value, and the values of the factors that ensure the fulfillment of this condition were determined. The obtained results are presented in Table 3.

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Acceptable values (by the number of nodes)

Table 3.

X_1		X_2		X_3	
Encoded	Natural , W	Encoded	Natural , cm	Encoded	Natural , m
1	$P_{1,1}$=30 $l_{1,1}$=254 $P_{1,2}$=30 $l_{1,2}$=300	-0,63512	23,65213	0,355621	16,777901
0	$P_{2,1}$=60 $l_{2,1}$=254 $P_{2,2}$=30 $l_{2,2}$=300	0,125	31,25	0,1172	15,5860
-1	$P_{3,1}$=30 $l_{3,1}$=254 $P_{3,2}$=60 $l_{3,2}$=300	0,051	30,50541	0,7788	18,8938

Using the above methods, the fruits of potato tubers were analyzed based on the (4) - (6) regression equations provided that the weight of the potato tubers had a maximum value, and the values of the factors ensuring the fulfillment of this condition were determined. The results obtained were listed in Table 4.

Acceptable total values (by weight of potatoes)

Table 4.

X_1		X_2		X_3	
Encoded	Natural W	Encoded	Natural , cm	Encoded	Natural , m
1	$P_{1,1}$=30 $l_{1,1}$=254 $P_{1,2}$=30 $l_{1,2}$=300	0,066321	30,6621	0,627034	18,135014
0	$P_{2,1}$=60 $l_{2,1}$=254 $P_{2,2}$=30 $l_{2,2}$=300	-0,051	29,49	0,5974	17,9870
-1	$P_{3,1}$=30 $l_{3,1}$=254 $P_{3,2}$=60 $l_{3,2}$=300	-0,226	27,73936	0,4914	17,4568

Figure 1. Dependence of factors X2 and X3 on the total number of potato tubers

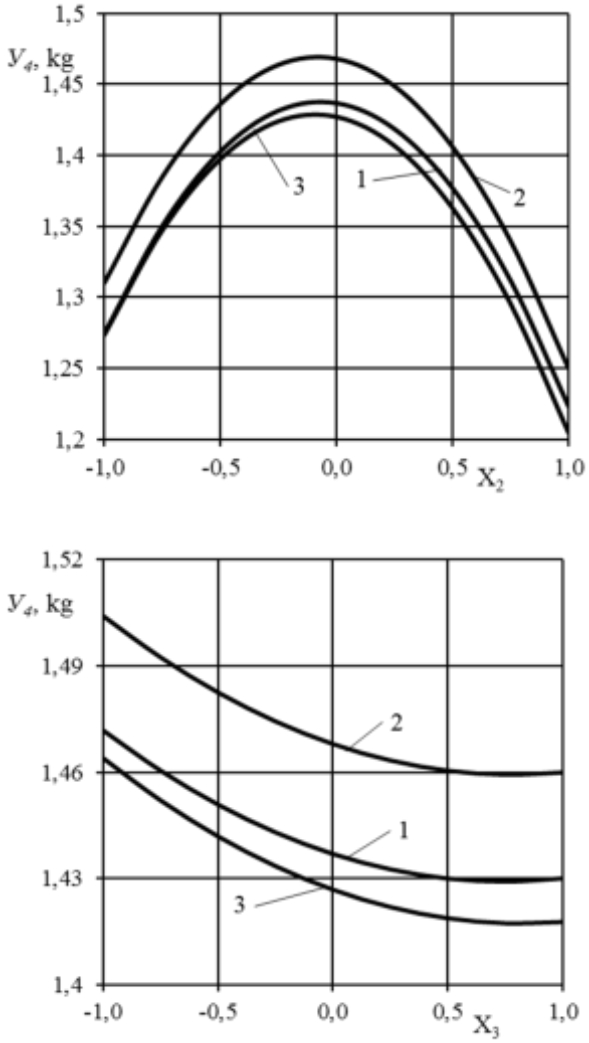

Figure 2 Dependence of factors X2 and X3 on the weight of common potato tubers

Based on the results obtained in one-factor field experiments under production conditions, the parameters of the optimal mode of electrotechnological processing of potato seeds into soil and plants in the spring and summer season were determined.

Table 3 and figures 3.1, 3.2, 3.3 show that the optimal values of the factors depend on the number of tubers of potatoes by factors X2 and X3 according to it, the optimal values are 15 minutes in terms of the duration of irradiation of potatoes before sowing seeds, and the distance from the luminaire to the potatoes is 31.25 centimeters, which is achieved at $P_{l=254}$ =60W+ $P_{l=300}$ =30W (irradiation dose 7.7+3.0 W/sm^2)

Table 4 and figures 3.4,3.5,3.6 provide acceptable mode values for the weight dependence of the tubers. This includes 17.9 minutes by irradiation time,the distance from the

illuminator to the seed potato29.5 cm (irradiation dose 7.7+3.0 W/cm2). The power of the lamps is achieved when at $P_{l=254}$ =60W+ $P_{l=300}$ =30W.

Summary. Based on one-factor experiments, a number of regression equations have been cited that adequately represent the criteria for evaluating potatoes planted using electrotechnology in the spring season and potatoes planted in the summer season based on electrotechnological processing as seeds-that is, the results obtained by the number and weight of tubers. In one-factor and multi-factor field experiments under production conditions, the following optimal mode parameters for the spring and summer season were shown to be electrotechnological processing of potato seeds into soil and plant: before planting seed potatoes, radiation in these optimal modes can be determined by 8.2 tons more yield per hectare under production conditions.

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