ISSN: 2350-0328

International Journal of AdvancedResearch in Science, Engineering and Technology

Vol. 6, Issue 1, January 2019

Mathematic Analysis of Dimensions of Walnut

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ABSTRACT: In this article the dimensions of walnut have been analyzed due to mathematic statistic method and dimensions of walnut which can be seen a lot have been found. Further and even more importantly though, the walnut clemency device is expressed because of dimension which have been found.

KEYWORDS: Mathematic statistics, dimension, walnut, adaption.

I.INTRODUCTION

In industry, in order to provide in principle at work of techniques and technologies, machine and mechanisms will be automat zed. In construction, using the mathematic statistics the construction will be investigated with the theory method and the working share will be constructed depending on the working shares and dimensions of row–materials of construction for recycling and producing of the product. Especially, lots of unknown problems have been solved with mathematic statistic methods in food industry machines. On the below in order to provide the basic dimensions which are demanded for walnut have been analyzed for automation of walnut clemency process.

As we know, walnuts distinguish from each other with their dimensions. Today there are about 100 types of walnut have been found [1]. They must be cracked in order to separate from its shell and kernel in quality. Dimensions of nut demand for being changeable tweezers of walnut clemency device. First, the direct dimensions must be selected for cracking the nut in quality in walnut clemency device. Because of this, nuts will be separated to 26 – 28, 28 – 30, 30 – 32, 32 – 34, 34 – 36 and high of 36 mm in walnut seperator device. It can be difficult to provide dimensions of nuts in walnut clemency device. We eleminate accidental dimensions for being in measure with statistic divisions [2]. 100 nuts which are different types of sort have been selected and been measured with micrometer.

table 1.

25,01	28,45	30,31	31,48	33,43
25,24	29,20	30,35	31,54	33,46
25,48	29,23	30,37	32,00	33,50
25,52	29,35	30,38	32,04	33,55
25,63	29,40	30,40	32,07	33,59
26,00	29,48	30,45	32,08	34,01
26,15	29,56	30,48	32,10	34,08
26,28	30,00	30,54	32,13	34,15
26,44	30,01	30,57	32,14	34,19
26,52	30,04	31,04	32,15	34,25
27,05	30,07	31,07	32,18	34,29
27,08	30,08	31,13	32,20	34,45
27,47	30,09	31,15	32,30	34,52
27,54	30,10	31,18	32,35	35,08
28,04	30,13	31,20	32,40	35,23
28,05	30,15	31,24	33,04	35,44
28,10	30,17	31,30	33,15	36,02
28,24	30,20	31,33	33,20	36,18
28,30	30,23	31,35	33,28	36,20
28,37	30,25	31,40	33,31	36,28

Dimensions of selected walnuts (mm)

ISSN: 2350-0328

International Journal of AdvancedResearch in Science, Engineering and Technology

Vol. 6, Issue 1, January 2019

We eliminate accidental dimensions from dimensions of walnut in choice which is given and plan the direct dimension [2].

Table 2.

Int d	h_i	x_i	u_i	$u_i \times h_i$	$u_i^2 \times h_i$	W_i
25 – 27	10	26	-2	-20	40	0,1
27 – 29	11	28	-1	-11	11	0,11
29 – 31	28	30	0	0	0	0,28
31 – 33	26	32	1	26	26	0,26
33 – 35	18	34	2	36	72	0,18
35 – 37	7	36	3	21	63	0,07
	100			$A_u = 52$	$B_u = 212$	

$$u_i = \frac{x_i - c}{n} \quad (1)$$

Here:
C - the value in version which has the highest frequency in selected statistic divisions C = 30
n - step among the versions.
x_i - selected versions of dimensions of walnut
h_i - frequencies of suitable dimensions

$$A_u = \sum_{i=1}^{n} u_i \cdot h_i \quad (2)$$

$$B_u = \sum_{i=1}^{n} u_i^2 \cdot h_i \quad (3)$$

$$\bar{u} = \frac{A_u}{h} = \frac{52}{100} = 0{,}52 \quad (4)$$

Here:
h-common quality of selected walnuts h=100

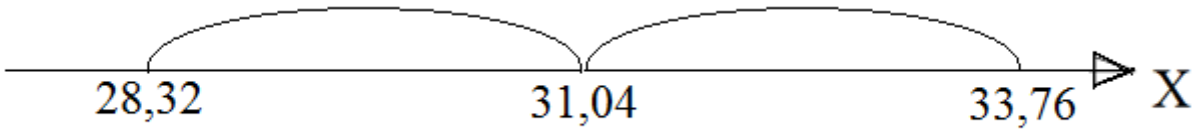
$$S_u^2 = \frac{B_u}{h} - \bar{u}^2 = \frac{212}{100} - 0{,}52^2 \approx 1{,}85 \quad (5)$$

$$\bar{x} = \bar{u} \times n + c = 0{,}52 \times 2 + 30 = 31{,}04 \quad (6)$$

$$S_x^2 = S_u^2 \times n^2 = 1{,}85 \times 2^2 = 7{,}39 \quad (7)$$

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 6, Issue 1, January 2019

$$S_x = 2,72$$

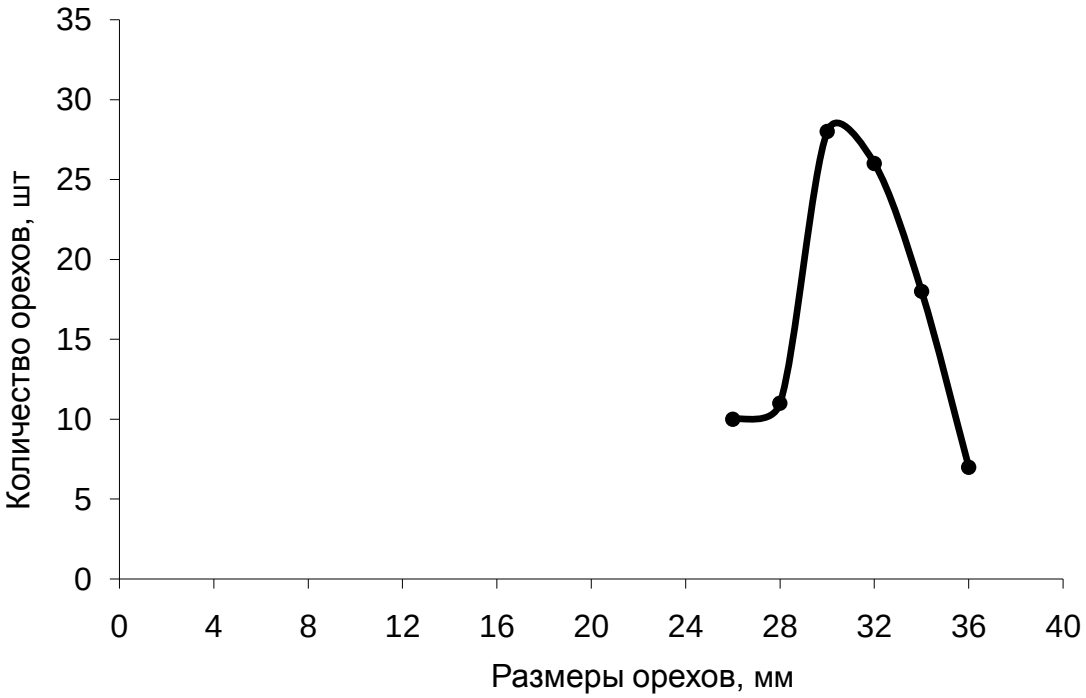


So, it is known from the divisions which is found, the direct dimensions of walnut will be between 28,32-31,04 and 31,04-33,76 mm. If the thickness of shell of walnut is been taken 1,5 mm, in this case two sides of walnut are 3 mm. As a result the surface which has found with the account of divisions s=2,72 mm walnut is been crecked without being pressed. Now, it is better to change the tweezers of walnut clemency device, which is being made from 28-31 and 31-34 mm.

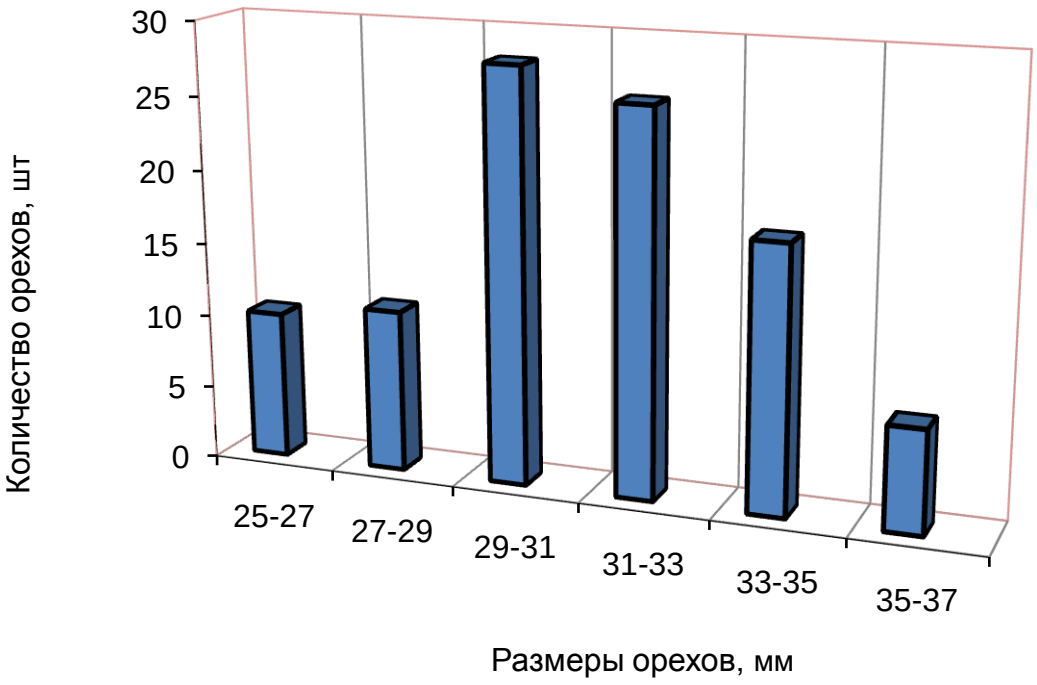
$$F(x)=\frac{h_i}{h}=\begin{cases} x<26; & 0 \\ 26<x\le 28; & 0,1 \\ 28<x\le 30; & 0,21 \\ 30<x\le 32; & 0,49 \\ 32<x\le 34; & 0,75 \\ 34<x\le 36; & 0,93 \\ x>37; & 1 \end{cases}$$

Selected empiric function for walnut

ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 6, Issue 1, January 2019



The polygon frequency for selected walnut



The histogram frequency for selected walnut

ISSN: 2350-0328

International Journal of AdvancedResearch in Science, Engineering and Technology

Vol. 6, Issue 1, January 2019

By the way of conclusion, these learned results and statistic information's have been analyzed due to the methods of theory which are defined during the process of measuring nuts. In this work defining and collecting are shown, in another work was creating the selected dimensions with the statistic way. It is know that, the tweezers must be created accordingly to these dimensions.

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