SCIENTIFIC JUSTIFICATION OF THE MAIN WORKING PART OF THE RIBBED SHAFTS

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https://doi.org/10.5281/zenodo.10279760

Abstract. This article explores the possibilities of technology for working universal bite structure gear shafts to improve the process of biting dry fruits. The authors conducted experiments based on the size of each of the dry fruits to determine their optimal parameters, such as the diameter of the toothed shafts, the radius of the ribs and the main working material. The effect of the physical and mechanical properties of dry fruit on the efficiency of processing was also studied. Obtained result showed that bites of dry fruits universal structure help to increase the quality of the product and reduce damage to the kernels. The process of dry fruit bites can be improved by using the technology of universal bite structure gear shafts, which is an effective equipment. It is practical importance for buyers and consumers who can get the best quality product. The article also discusses how empirical expressions vary the bite quality of dry fruits and the degree of damage of the maggots in different surface-toothed shafts depending on the number of rotations they have. The correct selection of processing parameters allows you to achieve the best results in terms of yield and quality of dry fruit. In general, the use of a universal bite structure of dry fruits is an effective way to increase yields and improve the quality of products. Choosing the right bite parameters is very important to achieve the best results, since it is necessary to take into account the characteristics of each type of fruit.

Keywords: based on the results, universal bite, factors, output according, structured as follows.

1. Introduction

With the relevant decisions of the Ministry of Defense, the energy capacity (calories) of the mayors to provide personal content with three meals is distributed as follows: breakfast in the morning – 30-35%, lunch – 40-45%, dinner – 30-20%. So it follows that under different conditions, it is imperative to use dry fruits to provide the army with a product that gives the above calorie. It was said that the modern foreign army could provide up to 7 days of dry food when we studied the food mayor. So even in our conditions, it would be advisable to set the supply of dry food not for 3 days, but for 7 days [1, 2, 3].

Currently, on average, 38 tons of oil are used per year in the Tashkent city only. This means for every citizen there is at least 15 liters of oil per year. 60% (percent) of the people use sunflower oil, 35% choose cotton oil and only 5% choose other left oils. They include olives, flax, almonds, etc. For this reason, studies have found the main causative agents of various diseases among military personnel is the harmful elements contained in oil that we use daily. An unhealthy and non-trigger serviceman cannot be entrusted with the protection of the motherland [4, 5, 6].

Hot foods in the daily food diet of our military personnel are mainly constantly made from a kind of “cotton and sunflower oil”. In medicine, it has always been proven that the consumption of a type of oil product is harmful to human health. So, we must be able to effectively use techniques and technologies so that we can get oil from products rich in various useful elements [7, 8].

To solve this problem, we need to develop a universal oil extraction device and apply it for use in the armed forces and the people's food industry. Modern medicine claims that the most useful oil products are those found in dry fruits. These include almond and walnut kernels, apricot kernels, peach and cherry kernels, etc [9, 10].

In the world, large-scale R & D work is underway to expand the base of oil plant raw materials, enrich the composition of vegetable oils extracted from them with biologically active substances, obtain oils and extracts with therapeutic and preventive properties for the needs of the pharmaceutical industry, produce oil from almond kernels, walnut kernels, apricots, peaches, cherry kernels, etc., and make efficient for this direction, special attention is paid to the production of vegetable oil from non-traditional vegetable oil raw materials, research on their physical and chemical and quality indicators, analysis of the nutritional content of proteins, vitamins, semi-unsaturated fatty acids and squalidness’ necessary for the human body, application of technologies that ensure that their natural and biological properties remain unchanged when communicating vegetable oils to the consumer [11, 12].

The oil of cereals (apricots, grapes, cherries, peaches, plums) are obtained by the production of juice, jam, dried fruits and the processing of cereals, which are waste of the canning industry. These healing oils are mainly used in food production, as well as being an important raw material in soap production [13, 14].

In the world, modern technologies are used in the process of producing dry fruit products, as well as an important raw material in the production of soap. On the basis of which the production of high-quality products is relevant. “Worldwide, 737.8 million in 2019/20. tons of almonds, 727.1 million. tons of nuts and 748.4 million” considering that tons of apricot products are grown," the application and introduction of these products in technical means and promotion to the military sphere are taking a leading place in processing enterprises [15, 16].

It is known that when dry fruits are damaged or split in two, and the collar on the top is damaged, the tongue quickly becomes unsuitable for consumption.

In addition, the cost of existing machines is expensive, the lightning-toothed shafts are not adjusted to fit the dimensions of dry fruit, the failure of the gear shafts to adjust correctly does not fully meet the quality level. In combination with this, the different sizes of dry fruits lead to damage to the kernels inside the process in which large-sized dry fruits are stung, while small-sized grains pass through the toothed shafts without being stung.

So, the R & D work dedicated to substantiating the parameters of the gear shafts of a dry fruit bite device with high performance, which allows you to bite dry fruits and extract their kernels, are relevant and important for the national economy of our republic. In the scientific and technical literature, data on the industrial extraction of cereals from dry fruits are not found, at the moment this process is carried out mainly by hand. Through this development, a universal device construction has been developed, which can be used in industrial and domestic conditions for stinging apricots and almonds, the bark of which has different shapes

and physicochemical properties, allowing to preserve the integrity of the stung maggot and increase the efficiency of work.

2. Materials and methods

We know that when separating dry fruits from their peel, it is imperative that they be applied in the food industry, or as long as possible when using them in the food diet of the armed forces, for long-term storage and for other purposes, the whole of the stinging kernels are important in technical terms, that is, not crushed.

And for this, we need to correctly select the material of the most convenient lightning gear shafts. Therefore, experiments were carried out on lightning - tooth shafts made of three different types of materials (Figure 1).

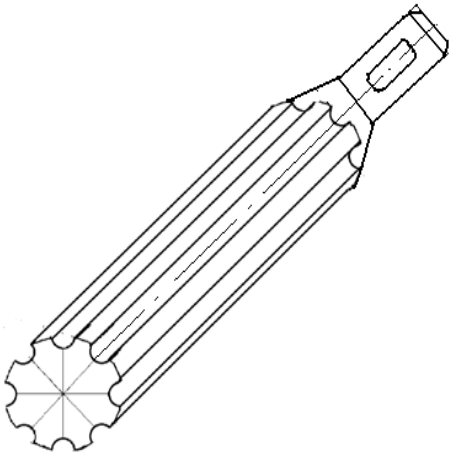


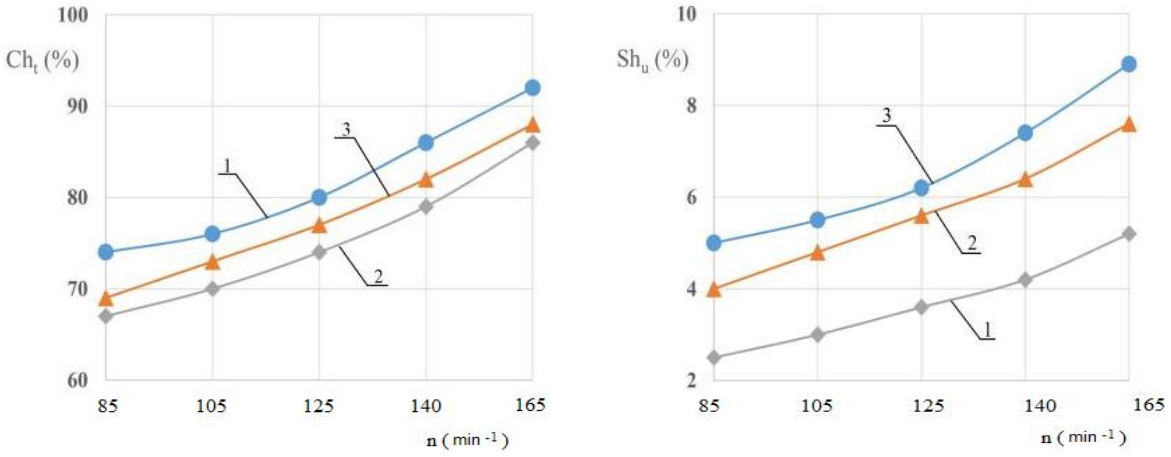
Figure 1. Working surface steel gear shaft drawing

To the beginning, the surface of the working organ is ЯМЗ-240Б experiments were carried out with the installation of threaded shafts made of branded rubber material. Here the diameter of the threaded shafts was taken as 135 mm, the interval between them as 10 mm. As a result of studies, it was found that the quality of the bites of dry fruits is greatly influenced not only by the material of the toothed shaft, but also by the number of revolutions per second. With the increase in the number of rotations of the toothed shafts, it was found that the quality of the bite of the dry fruits also increases. For example, when the number of revolutions of rubber-surface toothed shafts changed from 85 min^{-1} to 165 min^{-1}, the quality of the bite of the grains increased from 73% to 93% (2, figure a, curve 1). But there was also a 5.2% to 8.9% increase in lesion damage Rates (2, b - figure, curve 1). In this case, the number of revolutions of the toothed shafts in terms of damage to the maggots was 112 min^{-1}, while the quality of the bites of the dry fruits reached 78%.

Tooth shafts made of wood (board) have lower barring quality of dry fruit than steel-surface tooth shafts, and the number of rotations of tooth shafts varied by itself from 67% to 86% (2, figure a, Curve 2). We know that wooden surface toothed shafts have less quality of abrasion than rubber surface toothed shafts, and wooden toothed shafts keep working surfaces smooth over time.

Even in wooden-surface toothed shafts, it was found that changes in the degree of damage to the cores are similar to those of rubber-surface toothed shafts. When the number of revolutions of toothed shafts varied from 85 min^{-1} to 165 min^{-1}, the degree of damage to the shafts changed from 4.1% to 7.5% (2, b - figure, Curve 2). In this case, the number of rotations of toothed shafts is about 125 min^{-1}, and the quality of bites of dry fruits reaches 77%.

When the number of rotations of metal-toothed shafts varied from 85 min^{-1} to 165 min^{-1}, a 75% to 95% difference in the bite quality of dry fruit was observed (2, figure a, curve 3). In this case, the bite quality of dry fruits is 8% higher than that of wooden-surface toothed shafts, and 4% higher than that of rubber-surface toothed shafts.



a) **b)**

Figure 2. Variations in the bite quality (Ch_t) of dry fruit and lesion of the kernels (Sh_u) depending on the diameter of the toothed shafts (D) and the frequency of rotation (r), respectively.

In steel-surface tooth shafts, the degree of damage to the shafts was much less than in rubber and wood-surface tooth shafts, it was found that the number of rotations of tooth shafts increased from 2.5% to 5.1% when the number of rotations varied from 85 min^{-1} to 165 min^{-1}. In general, the degree of damage to the maggots in steel-surface toothed shafts compared to rubber and wood-surface toothed shafts began to decrease as the number of rotations increased.

3. Results and discussion

2a, from the analysis of the curves presented in figure a, one can conclude exactly that with an increase in the number of rotations of the toothed shafts, the quality of the bites of dry fruits also increases. The main reason for this is that dry fruits falling between them when the toothed shafts rotate quickly move at a certain speed, compressing between the toothed shaft ribs, and the bark of almonds or apricot kernels is easily stung. It follows that it is advisable to obtain a state in which the number of rotations has reached the maximum, but the degree of damage to the maggots has also increased if the number of rotations of the toothed shafts is higher than that of Judah. This means that in other studies it is also necessary to take into account this process.

In rubber and wood surface tooth shafts, the degree of damage and bite duration of the shafts is low compared to steel surface tooth shaft, due to the resistance of steel surfaces to friction coefficient. The Lightning tooth shafts can be explained by the high useful work coefficient. From these quotes and the curves depicted in Figure 2, as understood, steel - surface toothed shafts were obtained.

We cite the change in the quality of the bite of dry fruits and the degree of damage of the kernels in different surface-toothed shafts, depending on the number of rotations, with the following empirical links.

In terms of the bite quality of dry fruits:

1. - for rubber surface gear shaft

Ch_t = 68,4000 - 0,0450n + 0,0013n^2, R^2 = 0,9985;

2. - for wooden surface threaded shaft

Ch_t = 55,2860 + 0,1264n + 0,0005n^2, R^2 = 0,9982;

3. - for steel surface gear shaft

Ch_t = 71,886-0,1986n +0,0018n^2, R^2 =0,9907.

In terms of damage to the joints:

4. for rubber surface gear shaft

Sh_u = 7,9600 - 0,0740n + 0,0005n^2 R^2 = 0,9930;

5. for wooden surface threaded shaft

Sh_u = 3,3343 - 0,0084n + 0,0002n^2, R^2 = 0,9779;

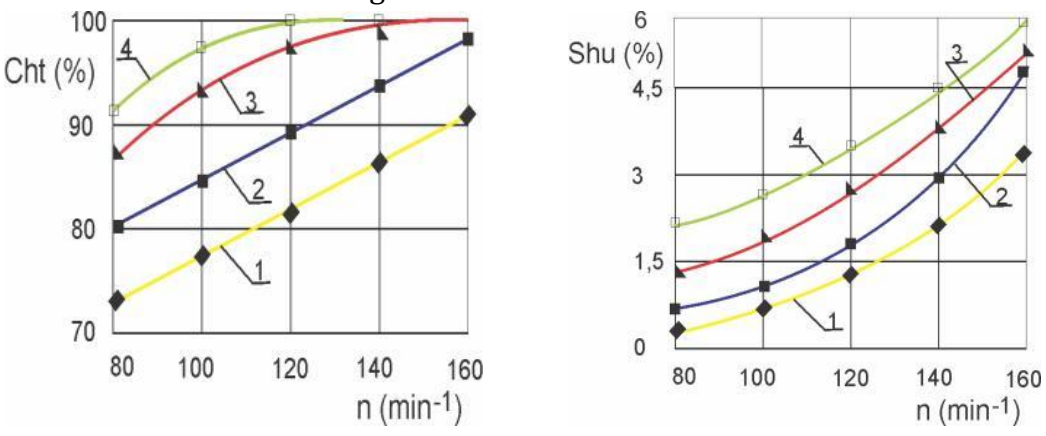
6. for steel surface gear shaft

Sh_u = 0,6886 + 0,0196n - 0,00005n^2, R^2 = 0,9768

We find that the above empirical expressions vary the bite quality of dry fruits and the degree of damage of the maggots in different surface-toothed shafts, depending on the number of rotations they have.

Based on the analysis of primary experiments, the bite quality of dry fruits has also improved with an increase in the number of rotations of toothed shafts. And the low bite quality did not rise by 90% when the circulation of toothed shafts was at a high level of 165 min^{-1}. If we reduce the number of revolutions of the gear shafts, that is, 125 min^{-1}, in order to reduce damage to the cores, then the quality of the bite was 83.9%. In this case, it is necessary to find favorable characteristics of the diameter and number of rotations of the gear shafts in order to increase the quality of the bite.

Through experiments, the diameter of the threaded shafts was made without 95, 115, 135, 155 mm, and experiments were carried out. The radius of the ribs of both toothed shafts was the same, that is, 14 mm, and the height raised from the diameter of the toothed shaft was made 4 mm, the interval between the toothed shafts was also 9.5-10 mm. The results that are characteristic are shown in Figure 3. below.



➢ **b)**

Figure 3. Depending on the bite quality (Ch_t) of the dry fruit and the damage to the kernels (Sh_u), the toothed shafts are toned based on diameter (D) and frequency of rotations (n)

1. D=95 mm; 2.D=115 mm; 3.D=135 mm; 4.D=155 mm.

From what was studied, it turned out that the bite quality of dry fruits increased with an increase in the number of revolutions of the shafts, regardless of the size of the diameter of the toothed shafts. For example, when the number of rotations in a 95 mm diameter toothed Val was selected 85 min^{-1}, the bite quality of dry fruit was 75%, while the number of rotations was 165 min^{-1}, the bite quality of dry fruit was 92.1% (3, figure a, curve 1).

For 155 mm diameter tooth shafts, the bite quality was 93.1% when the number of revolutions of the tooth shafts was 85 min^{-1}, while the bite quality was 100% when the number of rotations was close to 115-125 min^{-1} (3, figure a, curve 4).

3, figure a. analysis of the lines of different directions in figure a expresses the fact that with an increase in the number of rotations of the toothed shafts, the bite quality of dry fruits also increases continuously. Because, when the number of rotations increases, the frequency of interaction of toothed shafts with dry fruits increases. The bite quality of dry fruits was 100% when the toothed shafts were 135-155 mm in diameter and the number of rotations was close to 120-145 min^{-1}.

It was such a law that was also found in the damage of dry fruit kernels (3, Figure b). When the diameter of the toothed shafts and the number of rotations increased, the incidence of damage to the shafts also increased. For example, toothed shafts had a diameter of 95 mm, while no damage to the shafts was detected when the number of rotations was 85 min^{-1}, while damage to the shafts was 4.4% when the number of rotations was 165 min^{-1} (3, Figure b, curve 1).

When the toothed shafts were 155 mm in diameter and the number of rotations was 85 min^{-1} when the damage to the shafts was 2.2%, the damage to the shafts increased to 7% when the number of rotations was set at 165 min^{-1}.

It is known from the justification of the different lines drawn in Figure 3. that the diameter of the threaded shafts must be taken small to minimize the amount of damage to the cores. And of course, along with this, the bite quality of dry fruits should also meet the quality requirements. It follows that in subsequent experiments, the diameter of the threaded shafts should be determined by 125-135 mm, the number of rotations-by 115-135 min^{-1} size.

It is permissible to specify the quality of the bite of dry fruits and damage to the maggots, respectively, depending on the diameter of the toothed shafts and the number of rotations they have, with the following empirical links:

In terms of the bite quality of dry fruits:

- for 95 mm gear shaft

$Ch_t = 59{,}7000 + 0{,}3157D$, $R^2 = 0{,}8848$;

- for 115 mm gear shaft

$Ch_t = 64{,}9000 + 0{,}3300D$, $R^2 = 0{,}9964$;

- for 135 mm gear shaft

$Ch_t = 56{,}7142 + 0{,}7845\ D - 0{,}0032$, $R^2 = 0{,}9812$;

- for 155 mm gear shaft

$Ch_t = 60{,}2081 + 0{,}6961D - 0{,}0028D^2$, $R^2 = 0{,}9962$.

- According to the damage of dry fruits:

- for 95 mm gear shaft

$Sh_u = 4{,}7865 - 0{,}0799\ D + 0{,}0005\ D^2$, $R^2 = 0{,}89861$;

- for 115 mm gear shaft

Sh_u = 4,2439 - 0,08285 D + 0,0006 D^2, R^2 = 0,9992;

- for 135 mm gear shaft

Sh_u = 3,1257 - 0,0410 D + 0,0003 D^2, R^2= 0,9855;

- for 155 mm gear shaft

Sh_u = 3,6748 - 0,0344 D + 0,0002 D^2, R^2 = 0,9841.

The above empirical expressions have the potential to predict the bite quality of dry fruits and the degree of damage of the maggots in the study of the diameter of the toothed shafts and the number of rotations.

4. Conclusions

In order to ensure that dry fruit has a high bite quality and the degree of damage to the kernels is low, lightning-toothed shafts must be made of steel-surface materials ribbed.

Toothed shafts increase the number and diameter of rotations and shorten the interval between them ensure that dry fruits increase the quality of their bites by up to 100%, toothed shafts decrease the number of rotations, diameter and increase in the interval between them reduce the damage of the maggots by up to 0%.

The number of rotations of toothed shafts was 125 min^{-1}, diameter 135 mm, the interval in the bite zone was 9.5-10 mm, when the radius of toothed shafts was made 15 mm, the bite quality of dry fruits was high, and damage to the maggots was low, the bite quality of dry fruits was 95%, and damage to the maggots was 5%.

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