Preservation of straw with fodder melons and gourds in the conditions of Uzbekistan

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Abstract. The results of the preservation of hay and silage with pumpkin and watermelon are presented, which can be used to feed livestock of all types and ages in the autumn-winter period when harvesting hay and silage for effective use in farms and personal subsidiary plots. Recommended for use as a succulent feed, especially in arid regions. It is recommended to be used in personal, subsidiary, peasant and farm enterprises during the autumn-winter feeding of livestock, as well as in educational processes in the field of animal husbandry. As a result of canning straw with edible watermelons and zucchini, significant changes in their chemical composition were also observed. There was no significant difference in dry matter content in all variants.

Keywords: watermelon, pumpkin, straw, fodder, haylage, productivity, Uzbekistan

1. Introduction
One of the important conditions for the successful development of the livestock industry is the creation of a solid forage base [1]. In this case, the cost of livestock products is determined by the cost of feed. The correct organization of the fodder base not only develops the industry, but is also the basis for growing cheap livestock products [2].

Juicy foods play an important role in the diet of the livestock. These nutrients are high in water but low in protein and minerals. The dry matter of the feed is well absorbed by animals, especially by cows, which increases milk yield [3].

The essence of the process of harvesting haylage and silage is that sugar in plants is converted into lactic acid under the action of lactic acid bacteria. This acid builds up in a certain concentration and prevents the development of decay and other bacteria that cause food spoilage. The preparation of haylage and silage takes place under anaerobic conditions [4].

In recent years, due to the expansion of grain fields in the country, most of the feed is wheat straw, which has a low nutritional value. Also, the lack of irrigated land does not allow the cultivation of high-yielding and nutritious food crops [5]. This new scientific technology will expand the possibilities for accelerating feed production and strengthening the feed base.

The area used for feed production in the country is limited, which requires efficient use of the existing area. It is known that part of the grain sown area is arable land. The lack of water when growing food crops in these areas negatively affects their productivity [6]. In arid lands, there is no possibility of replanting after grain. In arid lands, alfalfa is harvested only once after spring rains. However, the livestock population in our country is growing every year. Therefore, the effective use of
existing opportunities in animal husbandry requires an increase in the yield of forage crops, the creation of new varieties and hybrids, as well as the search for new sources of forage [7].

Our farmers have mastered the cultivation of watermelons, melons and zucchini in arid lands based on their many years of experience [8, 9], but in recent years the cultivation of watermelons, melons and zucchini for livestock has been forgotten [10]. However, in our country there is only one great opportunity to grow pumpkin, on the edges of cotton and grain fields [11].

At present, straw is the main feed for livestock, especially on arable land. More than 94% of the country's livestock is grazed on agricultural land [12]. There is little opportunity to improve the nutritional value of straw, which is one of the main nutrients on these farms. Therefore, the development of haylage technology by mixing watermelon or zucchini with straw will increase the use of drylands by planting watermelons in drylands [13], secondly, its digestibility will increase due to the splitting of fiber in the straw [14], and thirdly, this technology will be widely used in various livestock farms [15]. Fourth, organic food is grown without chemicals [16].

Thus, the development and scientific substantiation of the technology for making haylage from edible watermelon and edible zucchini - the most widely grown straw in the country - will play an important role in strengthening the fodder base and increasing the productivity of animal husbandry.

2. Materials and methods
Purpose of the study is to develop a technology for preserving a mixture of watermelon and pumpkin food crops with straw.

Information about edible watermelons and vegetable marrows and their cultivation. Since our research relates to melons, the watermelons and zucchini used in our experiments were selected from the collections of the Institute of Plant Breeding and the Research Institute of Vegetable, Potato and Melons [17, 18].

Pumpkin variety "Giant" was created by scientists from the Research Institute of Botany. The variety is mid-season; the vegetation period is 115-120 days. The tops are medium, the length of the main stem is 3-4 m, and the number of lateral horns and leaves is large. Fruits are round and oval, weighing 4.8–6.8 kg, some were up to 25 kg, and the skin is yellow, hard. The flesh is reddish yellow, tender, with a relatively low sugar content [19]. Productivity was 25-40 tons/ha (Figure 1).

Kuziboy watermelon: Late-ripening variety, growing season 120-130 days. The stem is large and long. The fruit is round, the surface is smooth, green, and sometimes dark, the edges on the surface are silent, thin, with little-known stripes, weighing 5-6 kg, and the skin is hard. The pulp is bright red, juicy, juicy, and sometimes fibrous, the taste is 3.5-4.7 points. It contains 7.2% dry matter and 6.8%
sugar [20]. Productivity was 35-40 tons/ha. Stores well in winter. This is suitable for long distances, drought resistant (Figure 2).

Nutritious pumpkin and watermelon seeds were brought from the collection of the Scientific Research Institute of Botany and the Scientific Research Institute of Vegetable Growing, Potato Growing and Melons. In mid-April, 0.15 hectares of courgettes and 0.10 hectares of watermelons were planted [21]. During the growing season of melons, the soil was cultivated 4 times, irrigated 3 times, fertilizing was carried out with mineral and local fertilizers.

For the technology of canning edible zucchini and straw watermelons, 250 quintals per hectare were collected from a hectare of zucchini grown on the experimental plot. The yield of the watermelon was 210 quintals.

![Kuziboy watermelon.](image)

Figure 2. Kuziboy watermelon.

In canned food, the amount of straw was the same, that is, 55%, and the ratio of watermelon to pumpkin together was 45%, and this ratio varied in different versions. Although the first reason we feed in this ratio is that straw is cheap feed, the cost of growing courgettes and watermelons is a little high, so a minimum amount of nutritious watermelons and courgettes was used, which made the average moisture content of the preservative 50-55%. The second reason was the desire to obtain economically cheap feed, and the third reason was that the haylage itself was well consumed by livestock, since this feed is middle between succulent and roughage [3].

3. Results and discussion

The canned food in special barrels was opened after 15-20 days and was found to be of good quality when checked for quality in terms of appearance, smell and color. Samples were taken from each of them and sent to a chemical laboratory to study their chemical composition (Table 1 and Figure 3).

| Variants | Ratio of canned straw, pumpkin and watermelon, % |
|----------|--------------------------------------------------|
| 1        | Straw 55 %, pumpkin 45 %                        |
| 2        | Straw 55 %, pumpkin 40 %, watermelon 5 %       |
The proportion of canned food unsuitable for human consumption was very small and ranged from 2.05% to 1.20% of the total. The data show that increasing the amount of watermelon in the diet leads to fewer unhealthy foods. This is due to the high sugar content of watermelon, as lactic acid bacteria thrive in such an environment.

Food preservation is a biological method based on the fermentation process of sour milk. In this case, acidic lactic acid bacteria break down the blood into lactic and acetic acids in an anaerobic (airless) state. All technological processes should be aimed at creating good conditions for fermented milk fermentation and eliminating harmful microflora. To do this, it is necessary to adhere to 2 basic conditions: to create an anaerobic environment, the canned mass must have a sufficient amount of sugar and moisture. The minimum sugar content is understood as the amount of sugar in the plant, which provides a pH in the mass of 4.0-4.2. The pH level of 4.0-4.2 stops the activity of various harmful microbes and ensures the normal functioning of lactic acid bacteria.

Melons play an important role in animal nutrition. They are eaten with appetite by livestock. High water content (70-90%) leads to poor storage. Watermelons and zucchini spoil especially quickly. Injured watermelons and zucchini can be stored in a dry, clean, unheated special place. The air temperature in warehouses must be at least 1-2°C. Storage of melons requires a lot of labor and money. Storing them with straw or other plants in trenches or barrels will result in more efficient use of the straw to improve livestock productivity.
Nutritious watermelons and squash are some of the most digestible foods around. Acid lactic acid bacteria reproduce well at temperatures from 50°C to 55°C. It grows especially well on well-tamped forage. Food canning is done "hot" and "cold". In "cold" canned food, the temperature usually rises to 30°C. In the "hot" method, the temperature rises to 50°C and losses during canning up to 40%. Therefore, the use of the "cold" method is effective [4].

To prevent the food from overheating, the canning process must be completed in 3-4 days, and the mass is tightly closed from open air and compacted well. The best material for sealing is plastic wrap.

The quality of the preservative depends on its smell, color and chemical composition. The quality of the finished preservative depends on the pH of the medium and the amount of organic acids. In a well-preserved mass, the amount of free acids is 2% and the pH should be close to 4.2.

Nutritious watermelon and zucchini are juicy foods and are included in the diet during the autumn-winter months. They are readily eaten by pets; they have high dietary properties and are rich in easily digestible carbohydrates, but relatively fewer proteins, fats and minerals, especially calcium and phosphorus, which are important. The digestibility of melons reaches 85-90%.

In connection with the expansion of grain fields in order to provide the population of the republic with grain and grain products on a permanent basis, most of the feed consists of low-nutrient wheat straw. The development and scientific substantiation of a technology for canning straw, which is considered roughage, with edible zucchini and watermelon, plays an important role in strengthening the fodder base and increasing the productivity of animal husbandry.

Different variants for canning straw with pumpkin and watermelon have been developed. 15 samples were selected from the most optimal ones. Their nutritional value and metabolic energy in the diet have been studied in the CIS countries, dry matter, and crude protein, including digestible protein, crude fat, AEM crude fiber, as well as calcium and phosphorus [1-7].

As can be seen from the data in Table 2, as a result of canning straw with edible watermelons and zucchini, significant changes in their chemical composition were also observed. There was no significant difference in dry matter content in all variants. The amount of digestible protein increased with an increase in the amount of watermelon in the feed, including in variant 1, i.e. in the absence of watermelon, the digestible protein was 10.82 g, in variant 3 – 11.16 g, in variant 11 – 11.97 g, in variant 15 - it was 12.71 g. While the amount of fiber decreased in variants as an increase in the amount of watermelon, the amount of nitrogen-free extractive substances (BEV increased. In the 1st variant, the fiber was 179.0 g AEM 170.69 g, in the 5th variant 167.73 g and 176.23 g, in the 10th variant 153.40 g and 188.74 g, in the 15th – 154.77 g and 195.67 g, respectively. The amount of fiber decreased from variant 1 to variant 15 by 24.23 g or 13.5%, and the amount of BEV increased by 24.98 g or 14.6%. Based on these data, when we calculated the content of nutrients in the feed, it was observed that their amount also increased. In variant 1 there were 0.16 feed units, in variant 5 – 0.175 feed units, in variant 10 – 0.195 fodder units, and in variant 15 – 0.22 fodder units from variant 1 to variant 15, the content of fodder units increased by 0.06. An increase in the amount of nutrients and feed units with an increase in the amount of watermelon in canned feed can be explained by the creation of a good environment for lactic acid bacteria in the feed. Lactic acid bacteria are activated in a good environment and break down the fiber in the straw into starch and sucrose, which leads to a decrease in fiber and an increase in BEV [12-17]. This leads to better digestion of food in the body of livestock. At the same time, it leads to better eating and better digestibility.

Determination of the degree of consumption of canned feed was carried out on 5 heads of cattle. They were tested by giving them the food variants with the highest nutritional value. Each head of cattle in the experiment was weighed 3 kg of canned measles, and uneaten food residues were also weighed and the food consumed was calculated. The table shows that with an increase in the content of watermelon in canned food, the amount of undigested food decreased. In variant 1, the preservative content was 350 g or 11.7% uneaten feed with straw and zucchini, 180 g or 6.0% with 20% watermelon and 100 g or 3% with 31.5% watermelon. 3 percent means canned food is increasing. In cattle, the intake of these nutrients increased from 88.3% to 96.7% with an increase in the amount of watermelon.
Silage preparation is carried out by canning straw with nutritious zucchini and watermelon. Nutritious pumpkin and watermelon seeds were brought from the collection of the Scientific Research Institute of Botany and the Scientific Research Institute of Vegetable Growing, Potato Growing and Melons. Nutritious pumpkin and watermelon seeds were sown in mid-April on 0.15 ha of squash and 0.15 ha of watermelon. During the vegetation period of melons, the soil was treated 4 times, watered 3 times, applied mineral and local fertilizers.

For the technology of canning edible zucchini and straw watermelons, 400 quintals per hectare were collected per hectare grown on the experimental plot. The yield of the watermelon was 350 quintals.

14 theoretical variants for canning using this technology have been developed. According to the developed variants, food preservation was carried out on September 13 in special plastic barrels.

In canned food, the amount of straw was the same, that is, 35%, and the ratio of nutritious watermelons to courgettes together was 65%, and this ratio varied in different versions. The first reason we get feed in this ratio is that although straw is cheap feed, the cost of growing squash and watermelon is a little high. In these processes, the average moisture content of the preservative was 65-70% and the minimum amount of nutritious watermelon and vegetable marrow was used. The second reason was aimed at growing economically cheap feed; the third reason was that silage is a succulent feed that is well consumed by the livestock themselves.

When canned food is opened in special barrels after 15-20 days and checked for quality in appearance, smell, color, it turns out that the color is golden, the smell is pleasant and the quality is ready. Samples were taken from each of them and sent to a chemical laboratory to study their chemical composition. Rotten pumpkin and watermelon are not used in canning and silage from straw with edible pumpkin and watermelon. Chop them up, mix with straw and tamp. The better the silage, the better the quality of the silage and the less it will die. After gluing, the top is tightly closed with plastic wrap. The table shows that in the experimental variants, a very small amount of preservative, that is, about 400-700 g, was inedible.

| Variants | Straw | Pumpkin | Watermelon | Energy exchange, MJ | dry matter, g | Over-boiled protein, g | Raw fat, g | Cellulose, g | Nitrogen-free extractives (NFE), g | Calcium, g | Phosphorus, g | Feed units |
|----------|-------|---------|------------|---------------------|---------------|-----------------------|------------|-------------|----------------------------------|-----------|-------------|------------|
| IN %     |       |         |            |                     |               |                       |            |             |                                  |           |             |            |
| 1        | 55    | 45      | -          | 2.28                | 465           | 10.82                 | 0.720      | 179.0       | 170.69                                          | 1.8       | 0.67        | 0.160      |
| 2        | 55    | 40      | 5          | 2.35                | 465           | 10.89                 | 0.730      | 177.18      | 171.60                                          | 1.9       | 0.68        | 0.165      |
| 3        | 55    | 38      | 7          | 2.40                | 465           | 11.16                 | 0.744      | 172.5       | 173.49                                          | 1.9       | 0.67        | 0.168      |
| 4        | 55    | 36      | 9          | 2.43                | 465           | 10.99                 | 0.781      | 171.68      | 175.87                                          | 1.81      | 0.67        | 0.170      |
| 5        | 55    | 34      | 11         | 2.50                | 465           | 10.09                 | 0.815      | 167.73      | 176.23                                          | 1.9       | 0.68        | 0.175      |
| 6        | 55    | 31      | 13         | 2.57                | 464           | 11.08                 | 0.823      | 168.78      | 177.50                                          | 1.9       | 0.69        | 0.180      |
| 7        | 55    | 29      | 16         | 2.60                | 464           | 11.07                 | 0.832      | 167.85      | 178.07                                          | 1.93      | 0.67        | 0.182      |
| 8        | 55    | 27      | 18         | 2.68                | 464           | 10.02                 | 0.836      | 167.37      | 178.94                                          | 1.94      | 0.69        | 0.188      |
| 9        | 55    | 25      | 20         | 2.71                | 464           | 11.47                 | 0.846      | 158.06      | 183.63                                          | 1.90      | 0.70        | 0.190      |
| 10       | 55    | 24      | 21         | 2.78                | 464           | 11.43                 | 0.836      | 153.40      | 188.74                                          | 1.95      | 0.67        | 0.195      |
| 11       | 55    | 21      | 24         | 2.92                | 464           | 11.97                 | 0.813      | 166.88      | 190.20                                          | 1.80      | 0.69        | 0.205      |
| 12       | 55    | 20      | 25         | 2.93                | 464           | 11.91                 | 0.781      | 165.95      | 191.12                                          | 1.80      | 0.69        | 0.205      |
| 13       | 55    | 18      | 27         | 2.96                | 464           | 12.18                 | 0.743      | 162.69      | 192.90                                          | 1.90      | 0.69        | 0.207      |
| 14       | 55    | 16      | 29         | 3.07                | 464           | 12.47                 | 0.729      | 158.03      | 194.75                                          | 1.81      | 0.70        | 0.215      |
| 15       | 55    | 13      | 31         | 3.14                | 464           | 12.71                 | 0.725      | 154.77      | 195.67                                          | 1.90      | 0.67        | 0.220      |
As can be seen from the data in Table 3, as the composition of the squash increases, the content of nutrients also increases. But the difference between them is not that great. Dry matter also increased in proportion to the nutrient unit. In the variant with 35% straw and 65% zucchini, the feed unit was the highest, i.e. 0.18. The metabolizable energy was also higher than that of the other variants, at 2619 MJ in the variant consisting of straw and zucchini.

Table 3. Variants for canning.

| Variants | Straw | Watermelon | Pumpkin |
|----------|-------|------------|---------|
| 1        | 35    | 20         | 45      |
| 2        | 35    | 45         | 20      |
| 3        | 35    | 40         | 25      |
| 4        | 35    | 5          | 60      |
| 5        | 35    | 35         | 30      |
| 6        | 35    | 25         | 40      |
| 7        | 35    | 15         | 50      |
| 8        | 35    | 0          | 65      |
| 9        | 35    | 10         | 55      |
| 10       | 35    | 30         | 35      |

The experiments were carried out on one-year-old bulls, which were fed with 3 kg of canned food. According to the data, the amount of uneaten nutrients in canned foods increased from 100 grams to 150 grams with an increase in zucchini that ranged from 3.3% to 5% in percentage terms.

The economic efficiency of the study. When preparing haylage from canned straw watermelons and vegetable marrows, the yield amounted to 300 quintals of marrow for 1 year and 250 quintals of watermelons. Then the yield from 1 hectare of zucchini will be 30 tons, watermelons - 25 tons. A total of 55 tons of vegetable marrows and 30 tons of straw will be preserved. If the total weight of feed is 85 tons, the unit of pre-preservation of that feed is 0.94 to 11.9 tons per unit of feed, which is an average of 0.18 after canning and multiplied by 85 tons to 15.3 tons, constitutes a unit of feed. The difference is 3.4 tons of feed units. From these data, it can be seen that by increasing the feed unit during canning, 22% more nutrients are obtained.

When harvesting silage by canning straw with edible watermelon and zucchini, 400 tons of watermelon and 350 tons of watermelon were obtained from zucchini in 2 years. At that time, the yield per hectare was 40 tons of pumpkin and 35 tons of watermelon. A total of 75 tons of zucchini and 40 tons of straw can be canned. If the total feed weight is 115 tons, the unit for pre-canning these nutrients is 16.1 tons per unit of 0.14, which is an average of 0.17 units after canning, and 19.5 tons if we multiply that by 115 tons. Forms a feed unit. The difference was 3.4 tons of feed units. From these data, it can be seen that by increasing the feed unit during canning, 21% more nutrients are obtained.

For the technology of canning edible zucchini and straw watermelons from a hectare of zucchini grown on the experimental plot, 400 quintals per hectare were collected. The yield of the watermelon was 350 quintals.

To strengthen the fodder base of animal husbandry, the availability of high-quality haylage and silage for 15-20 days by preserving straw with nutritious zucchini and watermelons is scientifically substantiated.

It was noticed that as the number of squash in the feed of canned hay increased, the feed unit also increased. In variant 1 there were 0.142 feed units, in variant 5 – 0.153 fodder units, in variant 10 – 0.169 fodder units, and in variant 14 – 0.182 fodder units. From variant 1 to variant 14 unit, the content of feed units increased by 0.04.

The degree of preservation of feed for cattle with canned watermelons and vegetable marrows increased from 95.0% to 97.3% with an increase in the number of vegetable marrows.
The cost of 1 kg of pumpkin and watermelon was 137 UZS, the cost of straw - 84 UZS, the cost of 1 kg of canned food - 110 UZS. As a result of canning, the cost of 1 kg of preservative was 87 UZS due to an increase in its nutritional value by 21%.

The results of preserving hay and silage with pumpkin and watermelon show what can be used to feed livestock of all types and ages in the autumn-winter period when harvesting hay and silage for effective use in farms and personal subsidiary plots. Recommended for use as a succulent feed, especially in arid regions. It is recommended to be used in personal, subsidiary, peasant and farm enterprises during the autumn-winter feeding of livestock, as well as in educational processes in the field of animal husbandry.

4. Conclusions
Canned hay and silage with pumpkin and watermelon can be used to feed livestock of all types and ages in autumn and winter by preparing hay and silage for effective use on farms and private farms. It was recommended for use as a succulent feed, especially in arid regions.

Based on the results of the study, the following recommendations were developed:
- Scientifically substantiated strengthening of the fodder base in animal husbandry by harvesting high-quality haylage in 15-20 days by preserving straw with edible pumpkin and watermelon;
- The average unit of pre-canning of edible watermelon, zucchini and straw was 0.14 units, and the unit of finished canned feed was from 0.16 to 0.22. The amount of fiber has decreased, and the amount of digestible protein and non-nitrogen extractives (AEM) has increased.

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