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RESEARCH ON THE BEHAVIOUR OF DRY ONION BULBS DURING STORAGE

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Abstract

Onion bulbs obtained from chives are suitable for storage, but the length of this period depends on a series of factors. Storage in undeveloped spaces is possible, however, only for a short time due to significant losses.

Key words: onion, storage, undeveloped spaces, ambiental factors, quantitative and qualitative losses

INTRODUCTION

The onion (Allium cepa), belonging to the Liliaceae family, is an economically important vegetable, placing 3rd in our country after cabbage and tomatoes.

Onion consumption is high in Romania, over 12kg/inhabitant/year in comparison to the European average (5-8kg/inhabitant/year).

It is cultivated for bulbes, leaves and false stemm, having nutritional, seasoning and medicinal value.

Onion has a complex chemical composition: water 86-89%, carbohydrates 7-10%, proteins 1,3-1,6%, calcium salts, potassium, magnesium, phosphorus, C, E, PP, B complex vitamins, as well as volatile substances called phytoncides with antiseptic action.

The therapeutic effect is due to the aromatic substances precursors, containing sulfur compounds with strong antibacterial and antifungal effects. Onion consumption is recommended in order to prevent aterosclerosis, coronary disease and lower the blood cholesterol levels. Onion and garlic extracts are recommended in treating diabetes, cancer and asthma.

Moreover, they inhibit more than 80 species of fungal pathogens (allicin), being used as a fungicide and fungistatic (R. Ciofu, 2004, Brewster J.L., 1994).

At the same time, onion cultures are described as economically efficient, with important incomes per unit area.

In our country, the production is mainly obtained from chives. By the end of the year, consumption is provided directly by the producers or from temporarily dried onion through simple procedures. Mechanically ventilated storages or cold storages will provide the onion supply for the following months, recording the smallest losses and ensuring good storage until next spring. Moreover, green onion is consumed between April and July.

Harvesting the bulbs for consumption is performed from the end of July to mid-August, after which the bulbs are left in the field for a couple of days in order to dry, then are cleaned from leaves, sorted and stored.

The optimal harvesting moment is of great importance and must be well established, in order to ensure a long-term storage. In this case, the bulbs should present the typical size and shape of the variety, with 2-3 characteristically colored protective layers, with 75% of the plants being laid on the ground and with yellowed leaves at the top. Harvesting should not exceed the first decade of August (Iordăchescu C., 1979, 1986) for the chives (Stuttgart Giant variety). *(sau for the onion chives?)*

If harvesting is delayed, the tunics lose their elasticity and the percentage of developed bulbs increases, with a higher risk of disease or premature start in the vegetation. The roots can remain partially functional in years with high humidity, with the existing risk of resuming the vegetative activity.

In order to be immediately consumed, harvesting can also be done in the stage of complete maturation, when the leaves are fully dried and laid on the ground. However, these bulbs cannot be well preserved.

The storage capacity is influenced by the culture conditions. Thus, only onion cultures obtained from chives or through direct sowing with a density of over 650 thousand plants/ha allow obtaining bulbs with high specific mass (density) of 65-70 g/piece, smooth and with an equatorial diameter of 40-60mm (Iordăchescu C., Nicoleta Mihăilescu, 1989).

Moreover, a fertilization threshold with N, O and K of 80:40:40 and the optimal version of 60:30:30 was established in order to ensure a proper storage. Research on this matter concluded that ammoniacal nitrogen and phosphorus fertilizations encourage the development of storage diseases (Rossier N., et al., 1994).

Bulbs intended for storage are type I quality. Bulbs out of vegetative state, soft, deformed or with flower stalks, with improper humidity or hot, muddy, double-bulbs, " glass neck " shape, generally speaking those atypical to the variety are excluded. Only bulbs with a diameter under 80 mm are included (Beceanu, D., 1994, 1998, 2002, 2003, Gherghi, A., et. al., 1981, 1984, 1989, 1994, Iordăchescu, C., 1986, Iordăchescu, C., et. al., 1985, Murtaza, Al., et. al., 1972, Potec, I., et. al., 1983, 1985).

MATERIAL AND METHOD

The research was conducted in Oradea.

A private land which was cultivated in the previous year with Solanaceae (peppers, tomatoes and eggplants) was used for the crop.

Land preparation started in the fall with the following: abolishing the previous culture, administrating fertilizers (manure) and deep plowing. In the spring, in order to crush the soil, a cultivator was used for multiple passes, after which the layers were established for the culture. In order to obtain a cleaner production, no chemical fertilizers were administred. Planting the chives in order to obtain the onion bulbs was carried out in the second decade of March, using the De Stuttgart variety.

Maintenance was done through destroying the weeds, loosening the soil through manual plowing, weeding and applying phytosanitary treatments against diseases and pests (manna, alternariosis, bacterial and gray rot, onion fly). Moreover, the culture was watered when necessary.

Harvesting was performed manually, during the first decade in August, on dry weather. Following this, the bulbs were gathered in piles and remained in the field for 2 days, after which were placed in the barn to dry. Prior to their placement, a sorting was performed simultaneously with a conditioning operation. Thus, inadequate specimens were excluded (undeveloped or deformed bulbs, those affected by diseases or parasites) and the dry leaves and mud were removed. The onions were placed in the barn in a layer 30 cm thick. The storage time was a month, which allowed the drying process to continue and a constant humidity was reached in the onion bulbs. In the first decade of September, the bulbs were transferred to a closed warehouse to be protected from the weather. Here, they were stored in P boxed stacked in 2 rows. The environmental factors (temperature, relative air humidity and air circulation) were solely controlled through ventilation, mostly done at night. It is worth mentioning that the walls were thermallt isolated, thus large temperature changes and frost were prevented.

The boxes were periodically checked in order to detect the eventual outbreaks of diseases.

With the current storage and climatic conditions between autumn-spring 2019, the onion was not affected by frost. Onions have a freezing point of -1.1^0C.

The bulbs were stored until the end of January, when the first signs of sprouting appeared. They were sorted before being given to consumption.

Following sorting, unsuitable specimens were removed: sprouted, those affected by diseases.

Qualitatve and quantitative losses when storing onion bulbs are illustrated in table 1.

Table 1

Losses recorded on stored onion bulbs

Type of storage	Storage period months	Losses in weight %	Losses through rotting %	Qualitative losses %	Total losses %
Barn with natural ventilation	5,5	14,6	5,2	6,0	25,8

RESULTS AND DISSCUSIONS

While studying the behaviour of onion bulbs during storage, it was concluded that, when stored in close barns where climatic factors were only conducted through ventilation, the first signs of sprouting appeared after 5.5 months of storage.

Following the analysis regarding the percentage losses after the storage period, it was concluded that they reffered to weight, rotting and qualitative. Qualitative losses represent the percentage of sprouted bulbs and dehydrated ones.

Weight losses are due to the fact that optimal values for the environmental factors could not be ensured: temperature, relative air humidity and circulation. Thus, the respiratory activity of the bulbs intensified, especially during the last third of the storage period, when their turgescence began to decrease. It was during this period when signs of disease began to appear: soft, watery, glasst-looking bulbs of different colours (gray, yellow-green). All these simptoms are due to development of diseases: gray rot (Botrytis allii), manna (Peronospora destructor), wet rot (Pseudomonas cepacia), both from the fields and storage spaces.

Thus, losses of 25.8% of the bulb mass were recorded. The highest losses recorded reffered to lost weight 14.6%, followed by the qualitative ones (dehydrated and sprouted bulbs) 6%, and then tose determined by the development of diseases 5.2%.

To conclude, storing onion bulbs in closed, undeveloped spaces is possible, together with a significant reduction in the retention period. Due to the fact that the management of ambiental factors can only be done through ventilation, favourable conditions for sprouting and the development of pathogens are created. As a result, this method is recommended for households, where small quantities of bulbs are involved, so that the consumption is gradual and a repeated sorting is also performed.

Of course, in order to extend the retention period, the use of spaces equipped with means to adjust the climatic factors is recommended.

CONCLUSIONS

The following conclusions can be drawn:

1. Onion bulbs intended for storage are those obtained from chives
2. The bulbes intended for storage must fulfill certain quality standards.
3. The culture technologies greatly influence the bulbs quality and the storage period.
4. During storage, significant losses were recorded
5. The highest losses are those in weight, due to the intensification of metabolic processes in the bulbs and their tendency to resume their vegetative activity during the last storage period, following a temperature rise in the storage spaces.
6. There were also considerable losses recorded due to the development of pathogens, especially during the last storage period and related to the environmental conditions, when temperature rised. Moreover, once the metabolic processes in the bulbs increased, they became vulnerable to various pathogens.
7. Storing onion bulbs in undeveloped spaces is possible for a time, however, much shorter when compared to other preserving methods.
8. Extended research is recommended on the behaviour of different onion varieties in storage spaces.

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