

Technical Aspects Regarding the Preservation of Dry Onions in Different Storage Conditions

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Abstract

Research refers to the ability to maintain the quality of dry onions in different conditions of temperature, the three varieties used in experimentation (De Buzau, Daytona and Countach) being stored after proper preparation at ambient temperature (+20...+22°C), refrigerated (+10...+12°C) and cold conditions (+3...+5°C). Storage life, the level of weight (mass) and decay losses and evolution of some chemical components determined from the 9 variants led to the conclusion that the best results were obtained by De Buzau variety for storage under ambient conditions and Daytona variety for storage under refrigerated and cold conditions. Moreover large differences between varieties and their behavior depending on storage conditions require choosing resistant cultivars and optimum storage temperatures according to destination and period of marketing or consumption.

Keywords: *dry onion, quality preservation, storage.*

INTRODUCTION

Maintaining the quality of horticultural products after harvest, pick still many problems especially for semi-subsistence farms, where the technical knowledge and the material are poor. This complex project of research on the possibilities of improving the technical and working in farms of this type provides study the technical aspects of storage in different storage conditions of some fruits and vegetables frequently grown (including onions).

Dry onion is a product with high resistance to prolonged storage. It is grown in almost all households and vegetable farms for their own consumption and / or for sale. The two main factors responsible for maintaining the quality of onions are: varieties resistance to storage and thermal conditions in storage areas.

Cantwell and Kasmire (2002) - consider that dry onion has a different capacity for storage that is directly connected with the pungent taste and soluble solids content. Such more pungent types of

onions, with more dry matter, keep quality longer. Authors also recommended as good temperature for storing onions +0...+5°C and +20...+30°C.

Jamba and Carabulea (2004) made a classification of varieties of onions in three categories (spicy, semi-spicy and sweet), with an average dry matter content of 15%, 8% and under 8%, also emphasizing the link of storage capacity with higher dry matter content. Moreover Dvornicov cited by the same authors, found that spicy varieties can be stored 6-10 months, the semi-spicy up to five months, and the sweet varieties up to three months.

Thompson and Crisosto (2002) show a group of horticultural products, including dry onions, that can be stored at room temperature in the household because do not lose moisture faster and shorter periods of time does not fade as other vegetables.

Recent research conducted by "Horting" institute has watched highlighting storage resistance of some varieties grown in our country and the

influence of temperature on the quality and duration of maintaining quality of dry onions. The results may be indicative benchmarks for semi-subsistence farms with onion in vegetable assortment.

MATERIALS AND METHODS

The study was taken in three varieties of onions grown in the same farm and placed in storage after the completion of start-up air drying, trimming and sorting, the preliminary phases of storage. Storing was carried out in three different conditions: ambient temperature (+20...+22°C), refrigerated spaces (+10...+12°C) and cold conditions (+3...+5°C). It covers such major environmental conditions in which the products in question may be kept in the household. Temporary storage after harvesting in different areas is carried out at ambient temperature, keeping the average in refrigerators or refrigerated rooms and long-lasting in cold storage facilities. The researches were determined the duration of preservation and level of weight (mass) and decay losses and the evolution of some chemical components during storage. The scheme of research organization that included nine experimental variants based on onion varieties and storage conditions is presented in table 1.

The main biometric data of onions are presented in Table 2 and the appearance of chosen varieties in Figure 1. The preparing stage of onions for research purpose is illustrated in Figure 2.

Tab. 1. The organization scheme of research with onions

| Variant | Variety | Storage conditions |
|---------|----------|-----------------------------|
| V1 | De Buzău | Ambient temp. (+20...+22°C) |
| V2 | - idem - | Refrigeration (+10...+12°C) |
| V3 | - idem - | Cold conditions (+3...+5°C) |
| V4 | Daytona | Ambient temp. (+20...+22°C) |
| V5 | - idem - | Refrigeration (+10...+12°C) |
| V6 | - idem - | Cold conditions (+3...+5°C) |
| V7 | Countach | Ambient temp. (+20...+22°C) |
| V8 | - idem - | Refrigeration (+10...+12°C) |
| V9 | - idem - | Cold conditions (+3...+5°C) |



Fig. 2. Experience with onions under preparation

RESULTS AND DISCUSSIONS

The level of weight and decay losses and sprouting during storage in different temperature conditions are presented in Table 3.

Tab. 2. Biometric data

| Variety | Length (height) (mm.) | Width (diameter) (mm.) | Shape index | Average mass (g/pcs) |
|----------|--------------------------|---------------------------|----------------|-------------------------|
| De Buzău | 55.81 | 58.70 | 0.95 | 101.92 |
| Daytona | 70.53 | 70.38 | 1.00 | 109.78 |
| Countach | 63.14 | 56,15 | 1.12 | 91.46 |



Fig. 1. Onion appearance at the starting of experiments

Tab. 3. Losses accumulated during storage period (%)

| Variety and other | Ambient | | | Refrigeration | | | Cold conditions | | |
|-------------------------|--|-------|-------|--|-------|-------|--|-------|-------|
| | Losses (%) | | | Losses (%) | | | Losses (%) | | |
| | weight | decay | total | weight | decay | total | weight | decay | total |
| De Buzău | 8.63 | 2.1 | 10.73 | 13.64 | 5.56 | 19.20 | 12.37 | 13.9 | 26.27 |
| Daytona | 9.41 | 3.1 | 12.51 | 14.02 | 0 | 14.02 | 10.94 | 2.8 | 13.74 |
| Countach | 7.66 | 5.6 | 13.26 | 23.42 | 10.4 | 33.82 | 18.83 | 22.2 | 41.03 |
| Mean | 8.57 | 3.60 | 12.17 | 17.02 | 5.33 | 22.35 | 14.05 | 12.97 | 27.02 |
| Storage time (days) | 100 for Countach 150 for De Buzau and Daytona | | | 180 | | | 210 | | |
| Degree of sprouting (%) | De Buzau - 32.4 Daytona - 26.0 Countach - 55.4 | | | De Buzau - 13.9 Daytona - 11.1 Countach - 66.7 | | | De Buzau - 22.2 Daytona - 11.1 Countach - 44.4 | | |

The data presented in Table 3 shows that in conditions of ambient temperatures, onions can be kept up to 100-150 days (depending on variety), with average total losses of 12.17%. De Buzau variety (V1) had the lowest total losses and Countach variety (V7) showed the highest values of total losses. Sensitivity of Countach variety marked by high level of decay losses caused disruption of



Fig. 3. De Buzau variety after storage under ambient conditions

storage after 100 days. De Buzau variety proved to have better resistance to storage mainly because of reduced decay losses. Appearance of De Buzau variety onion after 150 days of storage at ambient temperature is shown in Figure 3.

In refrigerated spaces onion was stored for 180 days with 22, 35% average total losses. In such conditions Daytona (V5), was the most resistant cultivar with 14.02% total losses. With low weight loss (below average) and no decay losses and

the lowest degree of sprouting this variety was much better than other varieties of experience. On second place was situated De Buzau variety (V2), with total losses below the average of the three varieties studied. Last place was occupied by Countach variety (V8) that cumulated the highest weight and decay losses.

In cold conditions, the average total losses raised to 27.02% after 210 days of storage. At low temperature onion behaved differently depending on the variety. Thus the variety Daytona (V6) were recorded the lowest weight and decay



Fig. 4. Daytona variety after storage under cold conditions

losses cumulating 13.74% total losses, the variety De Buzau (V3) had about twice as high and the variety Countach (V9) of approx. three times. Variety Daytona presented and the lowest degree of sprouting. An image detail of onion belonging to Daytona variety is shown in Figure 4.

Tab.4. Level and evolution of chemical components in onion

| Var. | Variety | Storage temperature (°C) | Soluble solids (%) | Acidity (%) | Total sugar (%) |
|------|----------------------|--------------------------|--------------------|-------------|-----------------|
| | De Buzău - initially | - | 10.10 | 0.28 | 4.08 |
| V1 | - idem- | +20..+22 | 8.15 | 0.28 | 4.61 |
| V2 | - idem- | +10..+12 | 10.14 | 0.27 | 2.13 |
| V3 | - idem- | +3..+5 | 10.20 | 0.22 | 2.18 |
| | Daytona - initially | - | 8.70 | 0.25 | 3.23 |
| V4 | - idem- | +20..+22 | 7.45 | 0.27 | 3.48 |
| V5 | - idem- | +10..+12 | 7.64 | 0.13 | 2.36 |
| V6 | - idem- | +3..+5 | 6.20 | 0.26 | 1.78 |
| | Countach - initially | - | 7.00 | 0.25 | 2.55 |
| V7 | - idem- | +20..+22 | 6.60 | 0.25 | 1.96 |
| V8 | - idem- | +10..+12 | 6.64 | 0.18 | 1.83 |
| V9 | - idem- | +3..+5 | 7.20 | 0.25 | 2.29 |

Content and evolution of some chemical components during storage are presented in Table 4.

The data presented in Table 4 shows that initially the onions had 7.0 to 10.1% soluble solids content, from 0.25 to 0.28% titratable acidity and from 2.55 to 4.08% total sugar, depending on the variety. De Buzau bulbs had the highest content of soluble solids, titratable acidity and total sugar, while those of Countach variety were recorded the lowest values of all components.

Main chemical components evolution was different from an experimental variant to another. The content of soluble solids had a downward trend for all the varieties in particular to the onions stored in ambient conditions. Values lower than initial ones have been recorded also by Daytona variety (V5) and Countach variety (V8) stored under refrigeration conditions. Daytona variety, considered the healthiest (lowest decay losses) showed a decrease in soluble solids and total sugar content in refrigeration and cold storage conditions. For De Buzau onions the soluble solids content remained high in refrigerated and cold conditions (V2 and V3) and for Countach onions only in refrigerated conditions (V9).

Acidity of onions presented both slight increases and decreases depending on the variety and on storage conditions. The onion maintained in general the initial acidity content in ambient and cold conditions and presented mild reductions in refrigerated one, the lowest values being recorded by Daytona variety (V5) and Countach variety (V8).

On ambient conditions total sugar content was maintained at high values at De Buzau variety (V1)

and Daytona (V4) and had a decreasing trend at Countach variety (V7). In refrigerated conditions all varieties of onion were significant reductions of total sugar content. And in cold conditions onion from De Buzau variety (V3) and Daytona variety (V6) had total sugar content lower than initially, while the Countach variety (V9) maintained a high sugar content.

CONCLUSIONS

Maximum storage life of onions was 100-150 days under ambient conditions (depending on variety), 180 days under refrigeration and 210 days in cold conditions, with average total losses of 12.17%, 22.35 % and 27.02% respectively. Lowest spoilage losses were recorded at Daytona onion variety and largest at Countach onion variety. The best results were obtained in De Buzau variety for storage in ambient conditions and Daytona variety for refrigerated and cold storage. In these cases the high degree of health of onions resulted in maintaining the quality and prolong shelf life.

Evolution of some chemical components differs from an experimental variant to another. The content of soluble solids had at all varieties a downward trend especially for onions stored in ambient conditions. Acidity of onions presented both slight increases and decreases depending on the variety and storage conditions. Generally the onions maintained the initial acidity content in ambient and cold conditions and presented mild reductions in refrigerated ones.

In refrigerated storage conditions all varieties of onion had significant reductions of total sugar

content. And in cold conditions onion varieties De Buzau and Daytona had total sugar content lower than the initial one.

Large differences among varieties and their behavior depending on storage conditions require choosing resistant onions and optimal storage temperatures according to destination and period of marketing or consumption.

REFERENCES

1. Cantwell, I. M. and R.F. Kasmire (2002) - Postharvest Handling Systems, Postharvest Technology of Horticultural Crops (Chapter 35), Publication 3311, University of California, pg.438-440.
2. Jamba, A. and B. Carabulea (2004) - Tehnologie pastrarii si industrializarii produselor horticole, Editura Cartea Moldovei, Chisinau, pg. 212-213.
3. Thompson, F. J. and Crisosto H. C. (2002) - Handling at Destination Markets, Postharvest Technology of Horticultural Crops (Chapter 21), Publication 3311, University of California, pg.276.