A C T A A L I M E N T A R I A P O L O N I C A

Vol. XV (XXXIX), No. 2 1989

ANDRZEJ DĄBROWSKI
JOANNA GAŁĄZKA
STANISŁAW ZALEWSKI

TECHNOLOGICAL PROPERTIES, NUTRITIONAL VALUE AND STORAGE PROPERTIES OF NEW PUMPKIN VARIETIES

Warsaw Agricultural University

Key words: pumpkin varieties, technological, nutritional and storage properties.

The purpuse of the investigation was to establish technological, nutritional and storage properties of three new pumpkin varieties developed genetically at the Faculty of Horticulture, Warsaw Agricultural University, as compared to those traditionally grown in Poland, Melon Yellow (Melonowa Żółta) variety.

MATERIAL AND METHODS

For technological properties we selected the following factors: fruit weight, shape coefficient, thickness and colour of skin and body, body structure, edible (body) yield. For nutritional evaluation we determined: dry matter, refractive index extract, total and reducing sugars, ash content and alcality, β-carotene, ascorbic acid and total vitamin C content. For storage testing we determined: total storage losses, share of spoilage and natural (transpiration) losses, maintenance of nutrients in the flesh during storage and changes in edible yield.

All investigated varieties came from Cucurbita Maxima gender:

— Melon Yellow (Melonowa Żółta) — traditionally grown,
— Vegetable (Warzywna 243),
— Fodder (Pastewna WPR — 182),
— Heterosis (Mieszaniec Heterozyjny F_1 (21/XII/16).

All constituents had been determined acoording to Official Polish Standard Methods (Polskie Normy). Samples of 50 pumpkin fruits of each were collected from an experimental farm in Wolica. Because of unusually bad weather conditions in 1985, crops were harvested after about a months delay, at the beginning of November. All pumpkin fruits in the storage experiment were kept in the basement on wooden perforated shelves in one lager, each pumpkin fruit separated from the others, at $10 \div 12$°C and $60 \div 80$ RH.

RESULTS AND DISCUSSION

Overal technological results collected in Table 1 show that investigated varieties vary significantly in weight, shape, colour and structure. Mellon Yellow and Heterosis produced bigger + heavier pumkin fruit (4-5 kg. each), while

Table 1. Technological characteristics of pumpkin varieties

Variety	Total weight in kg		Shape coefficient		Thickness (cm)		Colour		Body structure	Edible (body)
	range	mostly	range	everage	skin	body	skin	body		yield %
Melon Yellow	1.84-7.72	2-4	0.68-1.55	0.98	0.1-.02	1.5-6.0	yellow-orange	yellow	slightly fibrous	67.9±3.1
Vegetable	0.66-3.04	1-1.5	0.58-0.97	0.67	0.1-0.3	1.4-5.0	red-orange	orange-red	homogenous thick	70.5±3.3
Fodder	0.94-4.31	1-2	0.67-1.19	0.78	0.1-0.3	1.75-4.5	dark green with kork pimples	orange-red with greenish tint	homogenous	69.3±1.9
Heterosis	2.57-6.87	4-5	0.657-0.76	0.59	0.2-0.3	2.4-7.8	green with orange spots or reverse	yellow-orange	slightly fibrous	69.0±2.6

Table 2. Naturient content in 100 g of edible part (body) of pumpkins

Variety	Dry matter g	Ref. index Extract g	Reducing Sugars g	Ash g	Ash alcality cm^3 IN'HCL	β-carotens mg	Vitamin C mg	Ascorbic acid mg
Melon Yellow	6.12±0.12	5.0±0.1	3.59±0.01	0.42±0.01	5.52±0.03	1.12±0.19	8.75±0.25	5.00±0.25
Vegetable	13.22±0.04	9.4±0.1	2.74±0.04	0.80±0.02	7.52±0.05	7.56±0.34	20.10±0.60	16.85±0.30
Fodder	16.27±0.16	8.2±0.1	2.40±0.02	8.51±0.02	8.51±0.04	3.89±0.21	14.45±0.27	10.50±0.50
Heterosis	9.40±0.01	7.8±0.1	4.60±0.02	0.48±0.01		2.11±0.17	8.00±0.25	5.10±0.25

Vegetable and Fodder varieties produced smaller + lighter fruit (1-2 kg each). The flesh (edible parenhymatic layer) of the Mellon Yellow variety was slightly fibrous, yellow, matching well with the yellow-orange colour of the skin; while the Vegetable variety body was firm, homogenous, with red-orange intensive colour matching the red-orange colour of the skin. Fodder variety body was homogenous with the red-orange colour contransting the dark green colour of the skin. The body of the Heterosis variety was slightly fibrous, intensly yellow, similiar to the Mellon Yellow variety, but contrasting in colour to the green-orange spolled colour of the skin. Edible yield was similar for all varieties and ranged from 68% for Mellon Yellow to 70.5% for the Vegetable variety.

Nutritional evaluation results (Tab. 2) show that all new varieties were better in this respect than traditionally grown Mellon Yellow variety. The Vegetable variety was nutritionaly superior due to a very high β-carotene content (7.6 mg%) and high vitamin C (20 mg%), dry matter and mineral content. Good in nutrint content was Fodder variety, which was the highest in dry matter (16.3%) and ash, and high in vitamin C and refractive index extract. The Mellon Yellow variety contained 3-7 times less β-carotene, 2-3 times less vitamin C and dry matter than the Vegetable and Fodder varieties. Nutritional value of the Heterosis variety was slightly better than Mellon Yellow, but significantly lower than the Vegetable and Fodder varieties. Heterosis was highest only in total and reducing sugars.

Thus, summing up technological features and nutritional aspects, it might be said that the Vegetable variety is similiar to the Fodder variety while the Heterosis variety is similiar to Melon Yellow.

Storage experiments have shown better keeping properties fo all new varieties over the traditionally grown Melon Yellow variety (Fig. 1, 2). The rate of spoilage and natural losses was about half that of the Melon Yellow variety, which after about 6 weeks of storage yielded only 40% sound (unspoiled) fruits and 30%

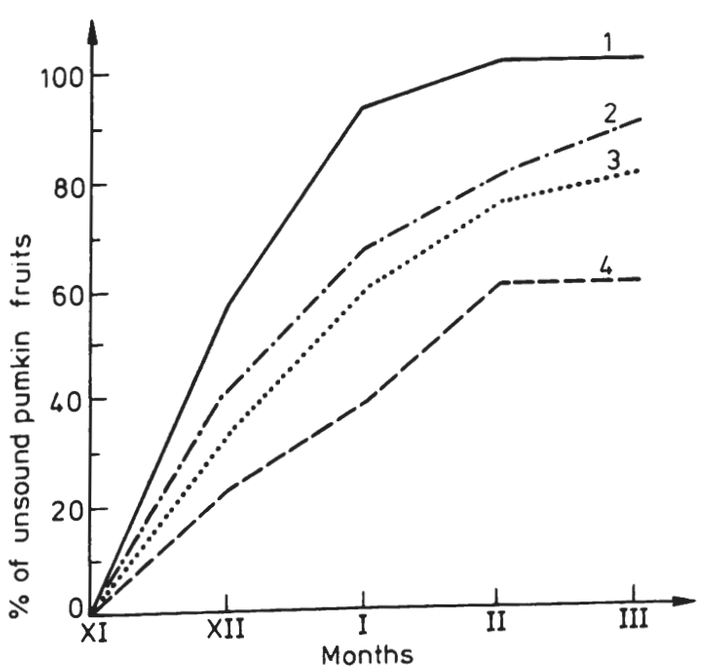


Fig. 1. % of unsound (spoiled pumpkin fruits in the course of strage experiment; 1 — Melon Yellow, 2 — Vegetable, 3 — Heterosis, 4 — Fodder

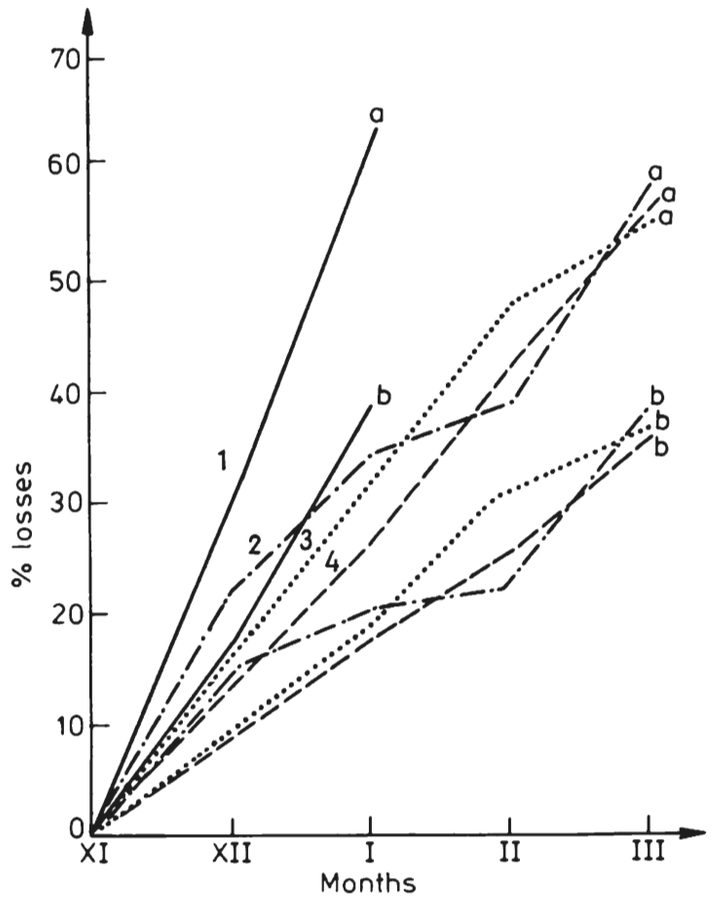


Fig. 2. Storage losses in % due to spoilage (b) and natural (c) (transpiration, respiration) process in the course of storage experiment; a — total losses (b + c), b — spoilage losses; 1 — Melon Yellow, 2 — Vegetable, 3 — Heterosis, 4 — Fodder

edible product. In January, the Melon Yellow variety maintained only 10% sound (unspoiled) fruits while at the same time all new varieties maintained 40-70% sound fruits, allowing for reasonable (up to 50%) edible yield in that month. Spoilage losses were 1.8-2 times higher than natural ones, reaching 35-40% for new varieties after 4 month of storage. Edible body yield (calculated from unspoiled fruits) ranged around 70% and did not change during storage. Thus it might be said that investigated new varieties have shown reasonably good keeping properties and can be stored until February, while the traditionally grown Melon Yellow variety was poor in this respect, and should not be stored beyond December because of high spoilage losses.

Changes in nutrient content during storage for all investigated varieties are shown on Fig. 3, 4 and 5. Dry matter content increased during the first month of storage and than decreased following different patterns for different varieties (Fig. 3). Refractive index extract followed changes in dry matter content. β-carotene content increased significantly during the first month of the experiment (25-180%); and than decreased, maintaining generally slightly higher values than in freshly collected pumpkins (Fig. 4). Vitamin C content showed a slight decrease for all new varieties and a strong decrease for the Melon Yellow variety (Fig. 5). Ash content and ash alkality increased correspondingly to natural losses (respiration and transpiration).

Regarding nutrient content changes it might be said that during the first month of storage, transpiration dominated over respiration in pumpkin fruits

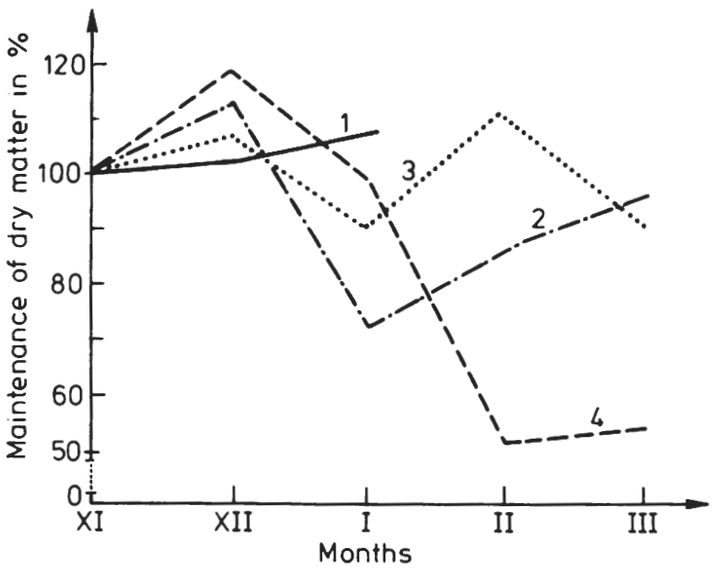
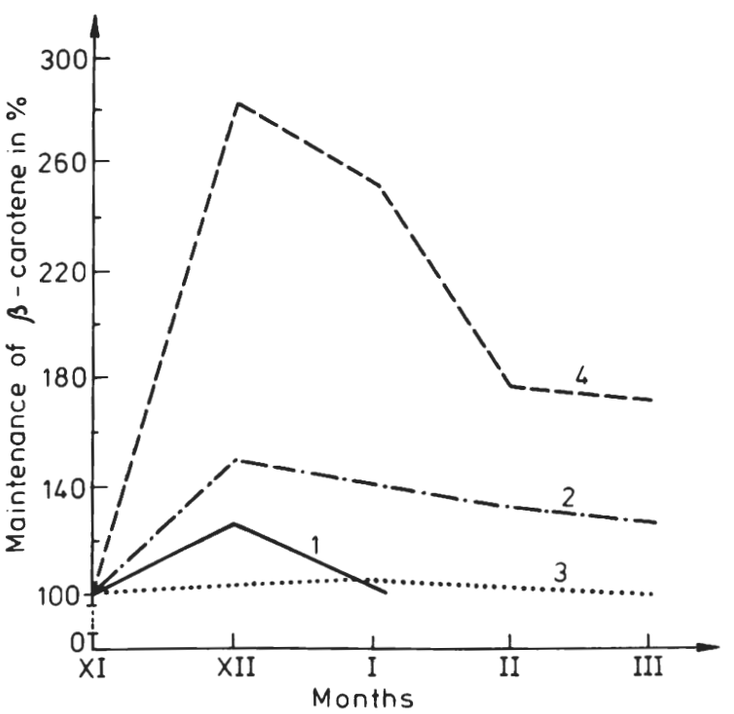


Fig. 3. Maintenance of dry matter content in investigated varieties during storage experiment; 1 — Melon Yellow, 2 — Vegetable, 3 — Heterosis, 4 — Fodder



Rys. 4. Maintenance of β-carotene in investigated varieties during storage experiment; 1 — Melon Yellow, 2 — Vegetable, 3 — Heterosis, 4 — Fodder

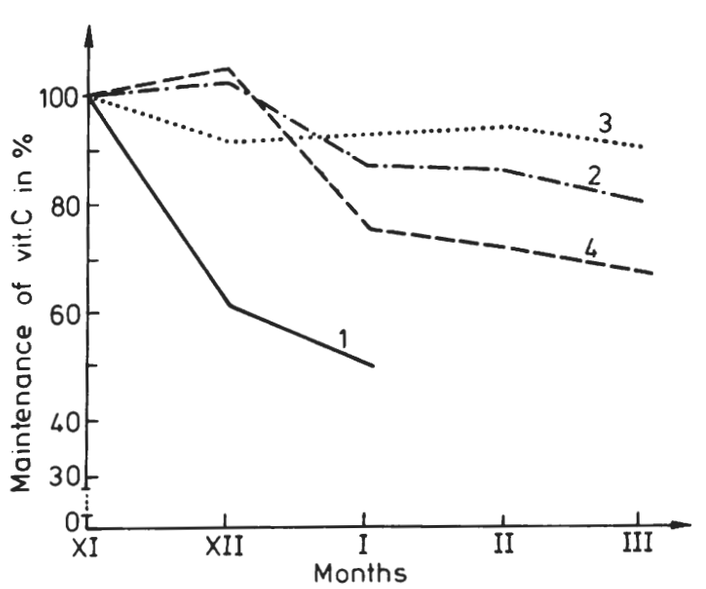


Fig. 5. Maintenance of vitamin C in investigated varieties during storage experiment; 1 — Melon Yellow, 2 — Vegetable, 3 — Heterosis, 4 — Fodder

causing an increase in some nutrients, and then in the following months this tendency diminishes or even reverts. A strong increase in β-carotene content during the first month of storage is known from the literature [6] and caused by the conversion of other forms of carotene into β-carotene.

Results of this research have shown that the Melon Yellow pumpkin variety traditionally grown in Poland is inferior to all new varieties in keeping properties and nutrient content. It can be stored only up to 2 months. Nutritionally superior is the Vegetable variety. It is very rich in β-carotene, rich in vitamin C and high in dry matter content. The Vegetable variety can be stored up to 4 months with relatively good maintenance of β-carotene, vitamin C and dry matter content. It maintain β-carotene very vell, but loses dry matter content during storage. It can be stored for 4 months. The Heterosis variety is similiar in weight, structure and colour to the Melon Yellow variety, but is much better in keeping properties and slightly better in nutrional value. It can be stored up to 4 months.

CONCLUSIONS

1. New varieties of pumpkin (Cucurbita Maxima) gender developed at the Department of Genetics, Faculty of Horticulture, Warsaw Agricultural University (SGGW) show better keeping properties and are higher in nutrient content as compared to the Melon Yellow pumpkin variety traditionally grown in Poland. Nutritionally superior is the Vegetable variety while Fodder and Heterosis shown the best keeping properties. All new varieties can be stored up to 4 months at 10-12°C and 60-80 RH, while Melon Yellow can be stored only up to 2 months in these conditions.

2. In 4 months storage, spoilage losses (42-43%) were twice as high as natural (transpiration/respiration) ones (20-24%). Edible yield was similiar for all investigated varieties, ranging around 70% and did not change during the course of the storage experiment.

3. Storage increased ash content and ash alkality and decreased vitamin C content in pumpkins, while β-carotene content, dry matter and refractive index extract increased during the first month of the experiment, and than decreased.

LITERATURE

1. Francis F. J., Thompson C.: Proc. Amer. Soc. Horticult. Science 1965, **86**, 451.
2. Horubała A.: Podstawy przechowalnictwa żywności. PWN, Warszawa 1975.
3. Lee C. Y. et al.: Handling carotenoids and vit. A value of fresh and canned winter squashes. Nutr. Reports International 1984, **29**, 129.
4. Lloyd A., Ryall M. S. et al.: Handling, transportation and storage of fruits and vegetables. Vol. 1. Vegetables and Melons. Wesport, Connectient the Avi Publishing Company Inc., 1979.
5. Shrana, B. R. et. al.: Indian Journal of Agricultural Sciences 1979, **49** (1), 31.
6. Smittle D. A. et al.: Horticulture Research 1980, **20** (1), 1.

Manuscript received: November 1987
Authors address: 02-975 Warszawa, Nowoursynowska 166

A. Dąbrowski, J. Gałązka, S. Zalewski

CHARAKTERYSTYKA TOWAROZNAWCZA, WARTOŚĆ ODŻYWCZA I WŁAŚCIWOŚCI PRZECHOWALNICZE NOWYCH ODMIAN DYNI

Instytut Żywienia Człowieka, SGGW-AR, Warszawa

Streszczenie

Przeprowadzono charakterystykę towaroznawczą oraz oceniono wartość odżywczą i właściwości przechowalnicze trzech nowych odmian dyni rodzaju Cucurbita Maxima, wyhodowanych w Katedrze Genetyki Wydziału Ogrodnictwa SGGW-AR w porównaniu z tradycyjnie uprawianą w Polsce dynią Melonową Żółtą. Stwierdzono dwukrotnie lepsze właściwości przechowalnicze wszystkich nowych odmian (rys. 1 i 2). Spośród nowych odmian jedynie Mieszaniec Heterozyjny przypominał wielkością, barwą i strukturą miąższu dynię Melonową Żółtą (tab. 1). Dynia Warzywna i Pastewna były mniejsze, intensywniej zabarwione i zawierały znacznie więcej składników odżywczych (tab. 1 i 2). Najlepszą wartością odżywczą charakteryzowała się dynia Warzywna (tab. 2), podczas gdy najlepsze właściwości przechowalnicze wykazywała dynia Pastewna i Mieszaniec Heterozyjny (rys. 1-5).