

DETERMINATION OF THE TECHNICAL RIPENESS STAGE OF DIFFERENT POTATO VARIETIES ON THE BASIS OF THEIR PHYSICO-MECHANICAL FEATURES

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Increasing mechanization of potato cultivation leads to an increase of losses during harvesting and storage. The most common reason for tuber damages are static and dynamic loads. The number and character of the damages depend not only on the construction of harvesting machines and their work conditions, but also on properties of the potatoes themselves. The knowledge of potato resistance to damage will allow us to estimate the optimum harvesting period for particular varieties and to construct machines of a low percentage of tuber damages during harvesting and further processing.

The present investigations aimed at determining the susceptibility of some potato varieties to damages caused by static loads and at studying the tuber response to dynamic loads. The studies were not limited to dynamic measurements, best reflecting real conditions of harvesting, but also included static loadings, characteristic for the process of storage. Measurements of the increase in tuber weight with time were made in order to estimate the development stage of the potatoes studied.

METHODS

The purpose of field studies was to obtain potatoes for laboratory investigations as well as measuring the tuber growth rate. The dynamics of tuber growth for Sowa, Epoka and Sokół varieties was studied in seven terms, while for Krab and ZK 49385 ones in eight terms. The measurements were done at ten-day intervals beginning from July 19, 1974, for all the varieties. Tubers of 13 randomly chosen plants were dug out and weighed. The weight of tubers per one plant was calculated.

Laboratory investigations were performed on healthy potatoes of shapes and dimensions characteristic for the given variety. For each tuber

the same thermal and humidity conditions were created. Laboratory studies were carried out on the following days: I — Aug. 18, II — Aug. 28, III — Sept. 7, IV — Sept. 17, V — Sept. 27, 1974. On the last term only Krab and ZK 49385 varieties were studied. Three types of measurements were carried out:

- stress under the static penetrometer rod penetrating the tuber,
- tuber deformation with the static penetrometer rod,
- kinetic energy restitution coefficient.

The measurements were done in 25 repetitions.

CONDITIONS OF INVESTIGATIONS

The field studies were carried out in the period from July 19 to September 27, 1974, at Czesławice Variety Evaluation Experimental Station. The object of the studies were mid-early Sowa, Epoka, Sokół and late Krab and ZK 49385 potato varieties. The potatoes were grown in five 9.5 m × 5 m experimental plots. They were planted manually at a depth of 6—8 cm, with a row distance of 62.5 cm, and plant distances in the row of 40 cm. Flowering of Sowa Epoka and Sokół varieties began by the end of June and that of Kraba and ZK 49385 ones by July 10.

RESULTS

Results of the investigations carried out with a static spring penetrometer and with Shobs elastom ter are presented in Table 1. The results of the laboratory measurements were statistically analysed in order to estimate the variety differences in the value of the force needed to break potato skin and pulp, as well as changes occurring during measurements of the kinetic energy restitution coefficient. The analysis of variance was performed, treating the data obtained as single classification with Scheffe's confidence interval. The analysis was done separately for the mid-early and the late varieties.

Initial data:

- the minimum value of the force acting the penetrometer rod, at which tuber crush occurs,
- the value of pendulum reflection from the potato, expressed by the ratio $h_1 : h$ (in per cent),
- investigation term,
- potato variety.

From these data the analysis of variance was performed including the differences between the varieties in particular study terms, and those between the terms for each variety.

Table 1

Mean values of the force acting the rod of a static spring penetrometer, rod penetration depth and the kinetic energy restitution coefficient

Study term	Variety	Studies with a static spring penetrometer		Kinetic energy restitution coefficient $h_1 : h$ %
		force acting the rod kP	rod penetration depth mm	
I	Sowa	7.33	6.85	22.15
	Epoka	7.62	7.36	20.80
	Sokół	7.10	6.87	18.85
	Krab	6.27	7.39	20.45
	ZK-49385	6.29	6.39	21.10
II	Sowa	7.43	6.08	20.15
	Epoka	8.82	6.74	19.80
	Sokół	7.86	6.28	16.70
	Krab	7.33	5.73	19.80
	ZK-49385	7.41	6.00	20.10
III	Sowa	8.02	5.58	20.95
	Epoka	8.45	5.72	18.35
	Sokół	8.32	5.80	16.00
	Krab	7.35	5.25	19.30
	ZK-49385	7.79	5.75	18.20
VI	Sowa	8.37	5.35	18.55
	Epoka	8.61	5.37	18.50
	Sokół	8.45	5.62	15.50
	Krab	7.79	5.22	19.20
	ZK-49385	8.05	5.20	18.35
V	Krab	8.22	5.20	18.35
	ZK-49385	8.17	5.37	16.90

For all the varieties an increase in the value of the force causing skin and pulp rupture was observed. In the first study term significant differences occurred between the means of the subclasses of Sowa, Epoka and Sokół varieties. Epoka variety was characterized by the highest resistance. In the second study term Epoka and Sokół varieties exhibited similar resistance to compression, while the resistance of Sowa variety was significantly lower.

In the third term significant differences between mean values of the

subclasses of the studied varieties were observed. Higher differences in the crushing force occurred between Sowa-Sokół and Sowa-Epoka varieties. In the last study term the highest values of the crush-causing force were observed for Epoka variety and then for Sokół and Sowa ones.

In the first and the fifth study terms no significant differences between Krab and ZK 49385 varieties were found. In the second, third and fourth terms the means of the subclasses differed significantly.

Statistical calculations showed that the value of the kinetic energy restitution coefficient is characteristic for the particular varieties, and exhibits a tendency to decrease with time. In the particular study terms its value changed differently for the particular varieties.

CONCLUSIONS

1. The value of deformation formed during the investigations depends on the variety and tuber ripeness stage.

2. The value of the tuber crushing force increased with maturing. The mid-early varieties were more resistant to compression as compared with the late ones. The rod penetration depth during compression decreased with maturing.

3. Significant differences were found in the response to the action of the dynamic factor for the varieties studied. The kinetic energy restitution coefficient decreased for all the varieties with tuber maturing.

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OKREŚLENIE STOPNIA DOJRZAŁOŚCI TECHNICZNEJ RÓŻNYCH ODMIAN ZIEMNIAKÓW NA PODSTAWIE ICH CECH FIZYKOMECHANICZNYCH

Streszczenie

Stosowane dotychczas metody określania optymalnego terminu zbioru ziemniaków są subiektywne i mało precyzyjne. Istnieje zatem potrzeba zastąpienia tych metod innymi — wymiernymi, a zarazem względnie prostymi. Przeprowadzono badania na skonstruowanych urządzeniach pozwalających określić:

- 1) wartość sił niezbędnych do zdarcia skórki,
- 2) wytrzymałość na ściskanie,
- 3) określenie sprężystości.

Obiektem badań były odmiany ziemniaków: Sowa, Epoka, Sokół, Krab, ZK-49385.

Wyniki badań służyć mogą jako wskazówki dla hodowców w celu selekcji odmian, ponadto mogą być przydatne przy optymalizacji terminów zbioru mechanicznego.

Б. Белюга

ОПРЕДЕЛЕНИЕ СТЕПЕНИ ТЕХНИЧЕСКОЙ
ЗРЕЛОСТИ РАЗНЫХ СОРТОВ КАРТОФЕЛЯ НА ОСНОВЕ
ИХ ФИЗИКО-МЕХАНИЧЕСКИХ СВОЙСТВ

Резюме

Применяемые до сих пор методы определения оптимального срока уборки картофеля субъективны и мало точны. Поэтому следует заменить эти методы другими — измеримыми, и одновременно сравнительно простыми. Были проведены исследования на сконструированных устройствах, позволяющих определить:

- 1) величины сил, необходимых для устранения кожуры,
- 2) сопротивление газов, а также,
- 3) упругость.

Исследовались следующие сорта картофеля: Сова, Эпоха, Сокол, Краб и ЗК-49 385.

Результаты исследований могут послужить указанием для растениеводов при отборе сортов и устанавливают оптимальный срок механической уборки.

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