

ASSESSMENT OF POTATO TUBERS FOR THE RESISTANCE TO DAMAGE

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There are many methods of the assessment of tuber firmness as well as a considerable confusion about what is right. Before we go into technical details let us look first at the traits in general. It is an effect of genetical and environmental factors interaction.

Genotype (genes 1,2,3... n) + environment (factors $a,b,c...n$) = firmness. That means each gene and each environmental factor affects (to a variable extent) the end effect. The end effect is dependent on genotype and environment. From this we can draw an important conclusion: a method is the better, the smaller differences (the smaller effects of different factors) can detect. A method should detect variability and not stability. A method which would give absolutely the same results on different genotypes in different environments would be absolutely useless! Detection of variability is one of the general requirements of a method. The other one we want to mention is "typicalness" of conditions. Let us see the typicalness as a compromise between necessity and possibility (between nature and a man). It is well known that the firmness is affected by temperature, which changes during the growth of a tuber, during storage a.s.o. Damages can arise if a tuber falls from the height of, say, 3 m on smooth concrete, from a lesser height on a sharp surface, if a heavy stone falls on it, if it gets under a wheel or it is being cut by a share. What of these is typical? It is possible to lift potatoes so carefully that no damage would occur — by slowing down the speeds, by the softening of hard surfaces with rubber, picking by hand a.s.o. But the question is whether it is necessary, whether it pays off, whether it is typical? Every factor, of course, is typical in a certain range of variation. In short we take as typical: impact, friction, elevators speed about 2 m/sec., time of lifting, full maturity, temperatures of 5—15°C (in Poland). Not typical are: cutting, pure pressure, testing in winter a.s.o.

Methods of assessment of potato tuber firmness have been based on the following principles:

- 1) running a sample of potatoes through a digger or grader,
- 2) exertion of pure pressure (penetrometers),
- 3) dropping of tubers from a certain height on a certain base,
- 4) measurement of elasticity,
- 5) cutting of flesh,
- 6) exertion of friction leading to skinning,
- 8) impact to produce blackspots and mechanical damage.
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Our method belongs to the 8th group. Tubers are hit with a steel ball of 15 mm in diameter, 200 g in weight, from the height of 15 cm. The hitter is a pendulum with the arm 30 cm long. Sufficient length of the arm is needed to make negligible the variation arising from different sizes of tubers. This is because tubers are put between a support and a hitter. Putting the tuber behind the support, which is necessary if elasticity is measured, requires an unhandy heavy weight for fixing the tuber.

An impact of these parameters differentiates the genotypes with regard to:

- 1) firmness of periderm,
- 2) firmness of outer cortex,
- 3) firmness of deeper tissue (size of necrosis and cracking),
- 4) tendency to discoloration.

Hit tubers should be left for a few days for development of all effects of impact. The effects are being observed on a cross-section. Depending on the purpose of study some modifications can be made, i.e. in screening of breeding stocks in an early stage of selection, tubers can be hit from double height and a standard blow can be exerted only on those which withstood the first one well. In the study of susceptible genotypes the height should be lowered to provide the better differentiation.

The method is simple and easy. Two persons can evaluate a few hundreds of samples per day.

Typicalness of conditions and simplicity speak in favor of this method. Evaluation of another methods in terms of typicalness and simplicity we leave to the Reader.

One can assume that the firmness of tissue depends on the chemical composition of cell walls, their structure, amount, and on the force of cell binding. We have selected clones 4 resistant to damage, 4 susceptible ones and have compared them in regard to the content of: cell walls,

crude fiber, cellulose and pectin substances. The degree of esterification of pectin substances was also determined. The clones tested did not differ in the composition of cell walls, but in the amount of them. Resistant clones had average of 1.57 and the susceptible ones 1.06% of cell walls in the fresh matter. It might mean, at similar dry matter content, that cell walls of resistant clones are thicker or the cells are smaller. The pictures from scanning microscope (700x) revealed that cellulose fibres in resistant clones form thicker bundles (strings), while the cell surface of susceptible clones is smooth. The esterification of pectin substances was higher in resistant clones.

The discoloration of bruised tissue is probably a secondary effect of the release of destructive hydrolytic and oxydative enzymes from cell organella and walls as a result of lipid film breaking by a mechanical shock. Necrotization of bruised tissue is accelerated in higher temperatures and under higher oxygen pressure.

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OCENA ODPORNOŚCI BULW ZIEMNIAKA NA MECHANICZNE USZKADZANIE

Streszczenie

Zaleca się oceniać tę cechę w typowym zakresie czynników: w stadium pełnej dojrzałości, w czasie zbioru, w temperaturze 5—10°C, przez uderzenie. Parametry uderzenia należy dobrać do materiału i celu badania. W selekcji ziemniaków przydatne okazało się uderzenie o parametrach: ciężar 200 g, średnica stalowej kuli 15 mm, wysokość spadania 15 cm. Ramię bijnika wahadłowego winno mieć co najmniej 30 cm długości. Wyróżniano: wytrzymałość skórki i skrajnej kory pierwotnej, wielkość nekroz, ciemnienie i pęknięcie.

Rody odporne zawierały więcej ścian komórkowych.

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ОЦЕНКА УСТОЙЧИВОСТИ КАРТОФЕЛЯ К МЕХАНИЧЕСКИМ ПОВРЕЖДЕНИЯМ

Резюме

Рекомендуется оценивать этот признак в типичных пределах факторов: в фазе полной зрелости, во время уборки, в температуре 5-15°Т, через ударение. Параметры ударения надо подобрать для материала и цели исследования. Для селекции картофеля пригодным явилось ударение о параметрах: вес 200 г,

диаметр железного ударного шара 15 мм, высота падения 15 см. Плечо маят-
никового ударника должно иметь длину не менее 30 см. Выделяли: прочность
кожуры и крайней первичной коры, величину некроз, потемнение и трещины.

Прочные сеянцы содержали больше клеточных стенок в клубнях.

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