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Jarosław Plich

Plant Breeding and Acclimatization Institute – National Research Institute, Młochów Research Center, Platanowa Str. 19, 05-831 Młochów, Poland;
e-mail: j.plich@ihar.edu.pl

EVALUATION OF THE LENGTH OF THE VEGETATION PERIOD OF THE POTATO

ABSTRACT

Potato cultivars are classified into maturity groups according to the length of the vegetation period required to produce a harvestable product. Although accurate classification of potato cultivars to a specific maturity group is of great practical importance, there is no standard method to characterize the maturity type of potato cultivars. In this work, the method of evaluation of vegetation period routinely used at IHAR-PIB, Młochów Research Center is described.

Key words: maturity, assessment method, days of vegetation

INTRODUCTON

The potato originates from the Andean regions of South America and evolved short-day-dependent tuber formation as a vegetative propagation strategy. When introduced in temperate zones, wild potatoes will form tubers in the course of the autumnal shortening of day-length. Therefore, one of the most important traits leading to creating a European potato type was acclimation for tuberization in long-day conditions in the northern latitudes. Currently, modern potato cultivars are well adapted to long days of the temperate regions of Europe and North America, but significant differences in the maturity type are still observed as a consequence of various degrees of adaptation to the long-day conditions. Breeders can exploit the naturally occurring variation in the vegetation period to breed cultivars with various harvest times desired for specific markets (Gebhardt *et al.*, 2004; Kloosterman *et al.* 2013). Nevertheless, there is no

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standard classification scheme used by potato breeders to characterize the maturity type of potato cultivars (Haga *et al.*, 2012).

Potato cultivars are classified into maturity groups according to the length of the vegetation period required to produce a harvestable product. Physiologically, a potato crop is mature once tubers have finished bulking (growing in size) and the skin has set. The ability of potato tuber skin to resist abrasion during harvest is a common index for maturity, but monitoring the below-ground status of a plant part presents many challenges. As tuberization and tuber development are associated with changes at the level of the whole plant, potato plant maturity is typically evaluated by monitoring physiological changes in the potato vine. The conventional method of maturity type evaluation is based on visual observations made in the field at particular time intervals during the crop cycle (Haga *et al.* 2012, Khan *et al.* 2013).

At the Plant Breeding and Acclimatization Institute – National Research Institute, Młochów Research Center, the maturity type of all advanced breeding lines is routinely assessed according to the modified method described by Ratuszniak and Komorowska-Jędrys (1995).

PROCEDURE

Assessment of vegetation period length

Maturity is assessed as the length of the vegetation period and expressed as the number of days from planting to the natural death of the potato plant. As the length of the vegetation period can be modified by environmental factors (especially the weather conditions) it is highly recommended to include a standard cultivars with well-known maturity type into the experiment. To ensure high accuracy of assessments, at least a three-year experiment is required.

1) Potato clones/cultivars are usually planted in the last week of April on 15, 30 or 60 hill plots (depending on tuber availability) along with standard cultivars. Planting is performed according to the Randomized Complete Block design with 2 or 3 blocks (replicates).
2) From the middle of July until harvest, the physiological changes (senescence) of the canopy on each plot are evaluated once a week on a scale of 1–5. The following scores indicate:
   a) 5 – a fully green, flowering plant
   b) 4 – a green plant, yellowing of some lower leaves
   c) 3 – yellowing of some stems, the leaves are mostly yellow
   d) 2 – the stems mostly yellow, the leaves yellow or dry
   e) 1 – completely dry plants (some stems can remain yellow).
3) All plants of the same potato genotype usually represent a very similar level of senescence, but some small differences can be observed (at least 75% of the plants of the examined genotype on a plot should correspond to a particular score). For clones that finished vegetation before

harvest (score 1), the length of the vegetation period was assessed directly as the number of days.

4) For those clones still growing at harvest time, the last score from 2 to 5 is converted into days of the vegetation period by adding 7 days per 1 grade. This simulates further vegetation of potato plants beyond the date of the harvest (Plich *et al.*, 2016).

The maturity scale

Based on the calculated number of days of vegetation, the examined potato clones could be assigned to the following maturity groups:

1) First early – up to 95 days of vegetation
2) Early – 96 – 109 days of vegetation
3) Mid-early – 110 – 124 days of vegetation
4) Mid-late – 125 – 139 days of vegetation
5) Late – 140 and more days of vegetation.

Following cultivars grown in Poland are recommended as the standards for the respective maturity groups:

1) First early – Felka Bona, Lord, Denar
2) Early – Vineta, Owacja
3) Mid-early – Oberon, Glada
4) Mid-late – Jelly, Bryza
5) Late – Bzura, Jasia

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