

# The content of pro-health compounds and antioxidant properties of 65 potato cultivars characterized under the European project Ecobreed



**ecobreed**  
IMPROVING CROPS

**B. TATAROWSKA<sup>1</sup> and J. PLICH<sup>1</sup>**

<sup>1</sup>Plant Breeding and Acclimatization Institute – National Research Institute, Platanowa 19, 05-831 Młochów, Poland

**Introduction.** Potato is the fifth most important cultivated plant in the world, which delivers energy and some the nutrients. Knowing the composition of nutrients in potato tubers is a very important element of balancing a healthy diet. Potato tubers contain important levels of bioactive compounds and antioxidants, considered health-promoting components of the human diet, protecting cells and tissues from oxidative stress, and the onset of chronic diseases. Plant breeding has invested significant resources to select potato cultivars with a higher content of health-promoting compounds (Keutgen et al. 2019; Tatarowska et al. 2019). The aim of this study was to quantify the level of total carotenoids content (TC), vitamin C (VC) and their relation to total antioxidant activity (TAA) in tubers of 65 potato cultivars from 10 countries.

**Methods.** In experiment were used 65 potato cultivars come from the work collection created within the European project Ecobreed. All these cultivars were multiplied under field conditions. The trials were carried out for three years in the central part of Poland in Młochów. In these experiments a low- input system was applied. Pesticides were applied during the vegetation period, i.e. copper fungicides and pyrethrin (plant extract) against late blight and Novodor against Colorado beetle. All application times and dose were established in accordance with the recommendations on the labels of each plant protection product. The experimental design was a randomised complete block. In each of the two blocks (replications), the cultivars were planted in 60 hill plots. Tubers were planted at the end of April and harvested after about 130 days. The monthly average temperature and precipitation were collected from a weather station located near the experimental field. TC and VC were made spectrophotometrically with a UV-Vis HITACHI U-1900 spectrophotometer. TAA was evaluated by the FRAP and DPPH methods.

**Results.** The TC content revealed highly significant effect of year (Y), cultivar (C) and flesh colour (FC). The TC ranged from 101.5  $\mu\text{g } 100 \text{ g}^{-1} \text{ DM}$  (in cv. Kelly) to 715  $\mu\text{g } 100 \text{ g}^{-1} \text{ DM}$  (in cv. Mayan Gold) (Figure 3). The TC values were weakly correlated with years and higher in yellow-flashed potatoes than in white-flashed potatoes (319.9 vs 175.6  $\mu\text{g } 100 \text{ g}^{-1} \text{ DM}$  respectively). The VC content ranged from 1.0  $\text{mg } 100 \text{ g}^{-1} \text{ FM}$  (in cv. Bzura) to 14.8  $\text{mg } 100 \text{ g}^{-1} \text{ FM}$  (in cv. Twinner) (Figure 4). The VC were higher in yellow-flashed (6.5  $\text{mg } 100 \text{ g}^{-1} \text{ FM}$ ) than in white-flashed potato (5.8  $\text{mg } 100 \text{ g}^{-1} \text{ FM}$ ). The highest TAA were observed in cvs. Colleen, Basa, Triplo, Gatsby, Ditta, Twinner, Riviera, Michalina, Damaris, Belmonda, Ambo, Savinja, 12-LHI-6. For these cultivars, the FRAP values were 0.53  $\mu\text{mol TE } 100 \text{ mg}^{-1} \text{ DM}$  and DPPH 0.55  $\mu\text{mol TE } 100 \text{ mg}^{-1} \text{ DM}$ . The lowest TAA were observed in cvs.: Owacja, Mayan Gold, Kokra, Magnolia and Kelly. For them, the FRAP and DPPH values were slightly above 0.2  $\mu\text{mol TE } 100 \text{ mg}^{-1} \text{ DM}$ . The FRAP and DPPH assays indicate that TC in potato tubers contributes to their antioxidant activities. The correlation between TC and TAA measured by FRAP and DPPH was significant ( $r = 0.275^*$  and  $r = 0.283^*$ , respectively) (Figure 2). On the other hand, the concentration of VC in the potato tubers had no effect on TAA. The correlation between VC and TAA measured by FRAP was very low and nonsignificant ( $r = 0.113$ ) and DPPH ( $r = 0.024$ ) (Figure 1). Our research also reported that on TAA significantly influence has cultivars, but not the flesh colour.

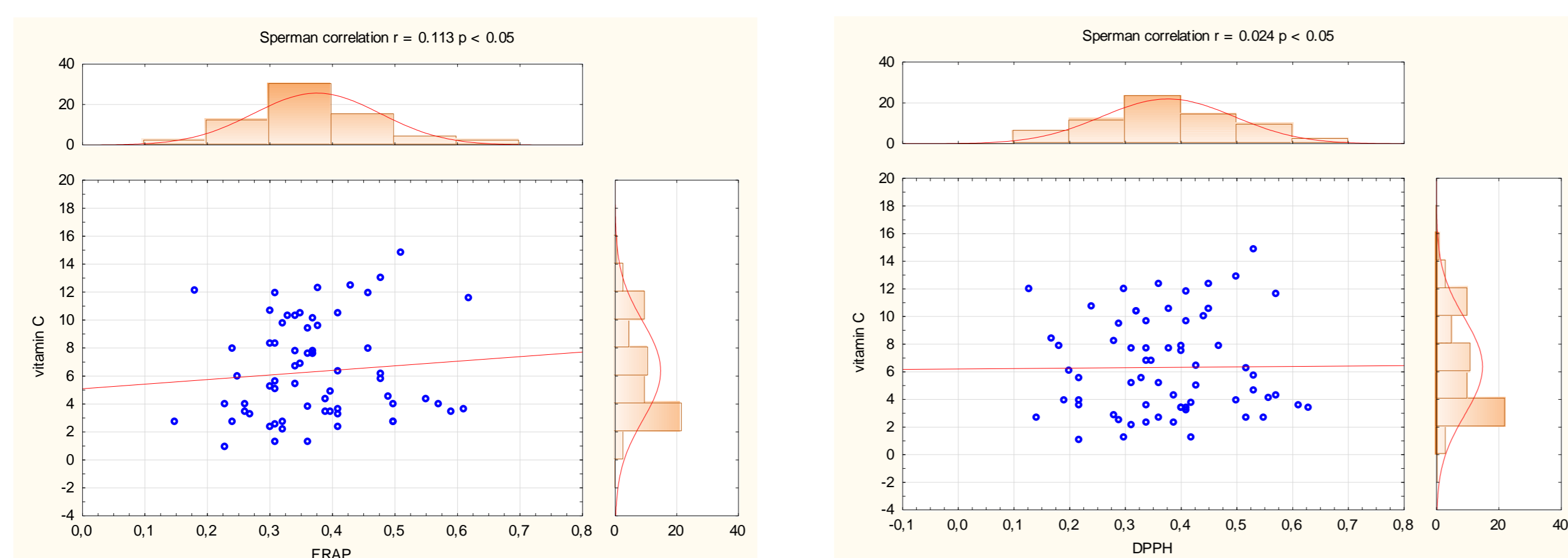


Figure 1. Figure 5. The relationship between TAA measured by FRAP and DPPH and the content of vitamin C in tubers of 65 potato cultivars.

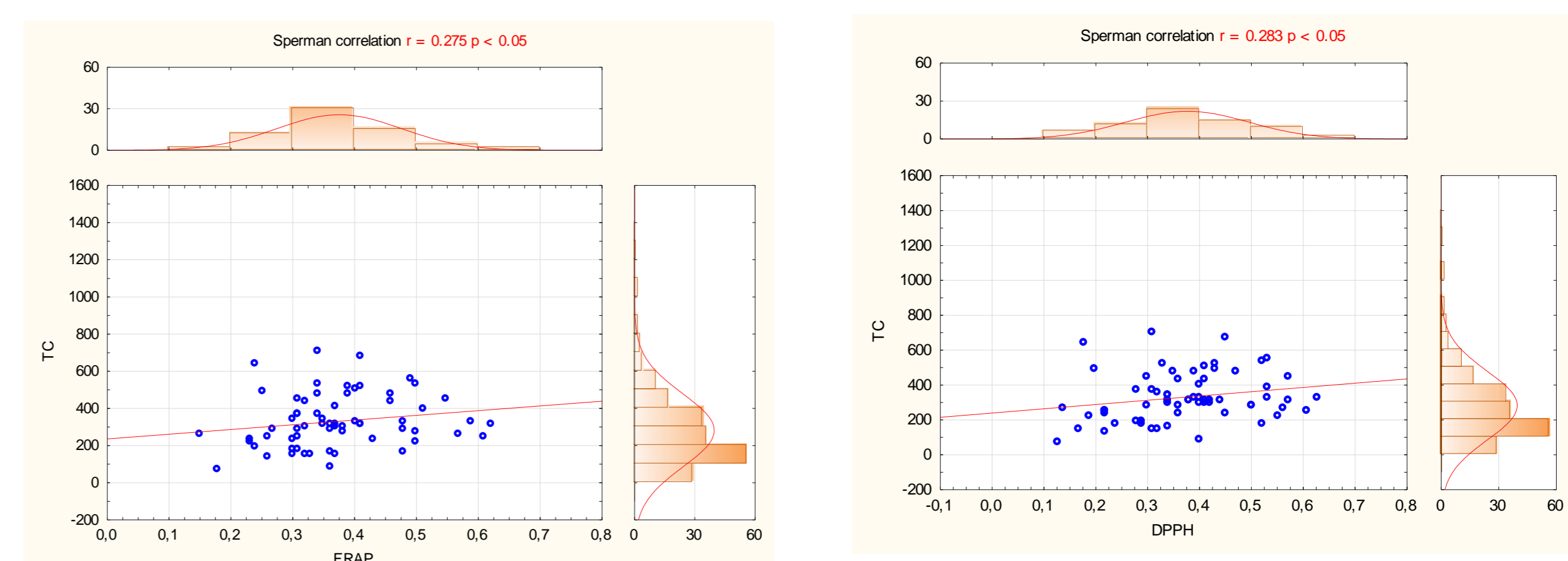


Figure 2. The relationship between TAA measured by FRAP and DPPH and the content of TC in tubers of 65 potato cultivars.

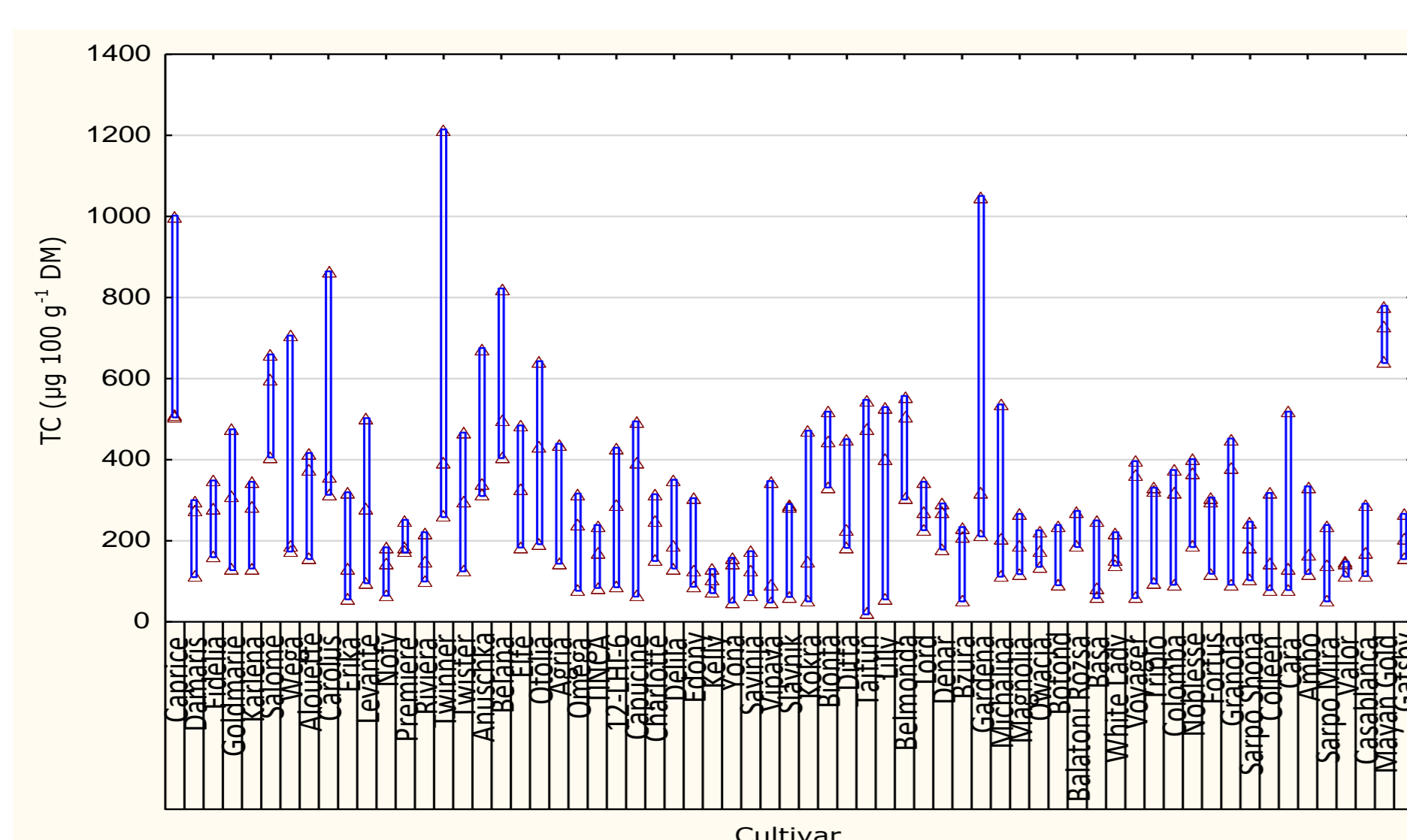


Figure 3. Mean values of total carotenoid content (TC) for 65 potato cultivars.

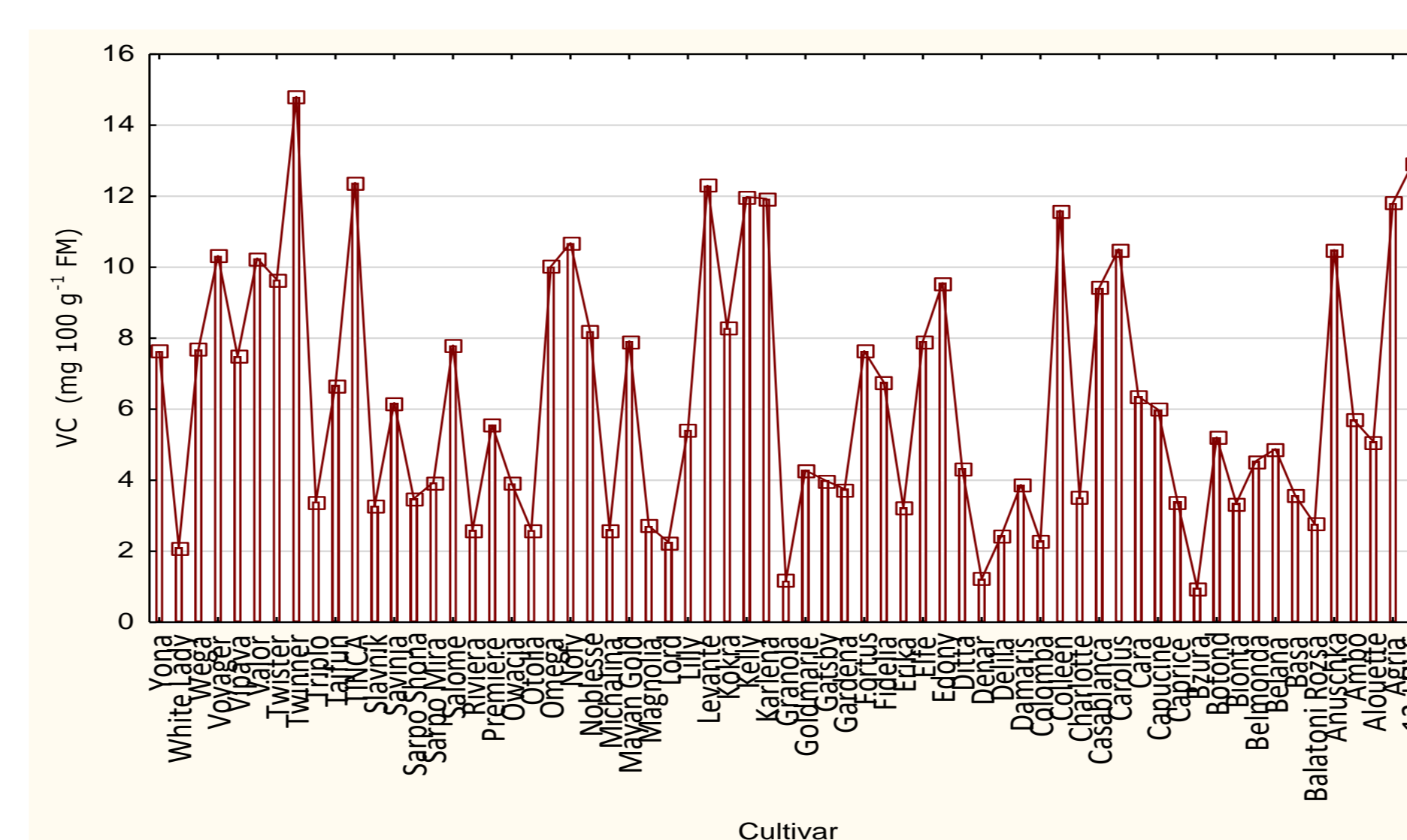


Figure 4. Mean values of vitamin C (VC) for 65 potato cultivars.

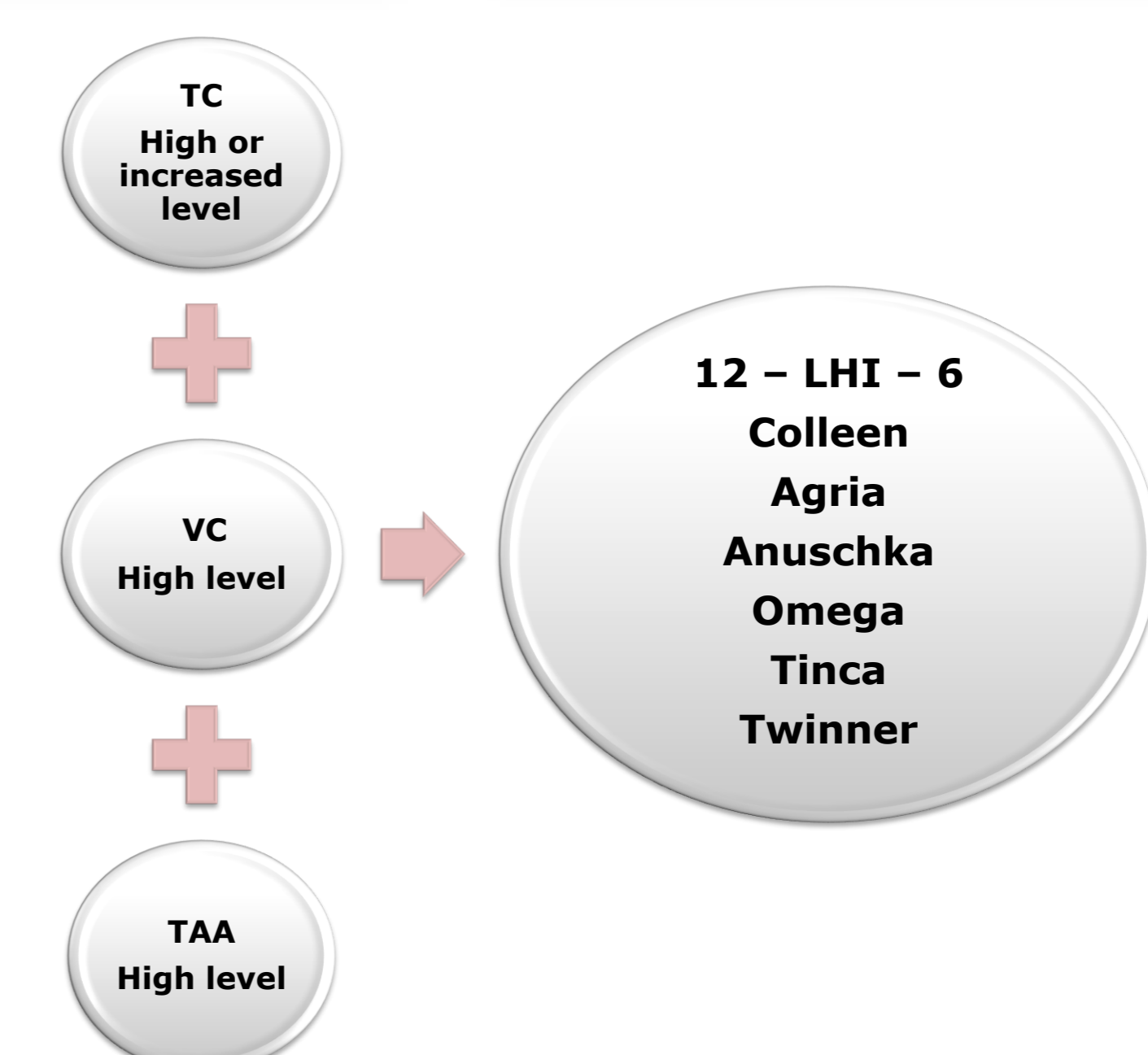


Figure 5. Cultivars with high or increased level of TC and with high level VC and TAA.

## Conclusion.

Potato is one of the most nutritious of all the world's starchy food crops with more protein, vitamins, minerals and is a good source of antioxidants and phytochemicals. As consumers become more aware of the relationship between diet, nutrition and health, potatoes have the potential to become an important source of bioactive ingredients, i.e. functional foods. Our results permit optimisation of the vitamin C and carotenoid content of the diet by using potato cvs. such as Twinner, Tinca, Levante, Kelly, Karlena, Agria and Colleen with high-vitamin C and by using potato cvs. such as Otolia, Bionta, Anuschka, Belmonda, Carolus, Gardena, Salome, Belana, Twinner, Caprice and Mayan Gold with high carotenoids content. Obtained results showed how breeding efforts have influenced the biofortification of these important phytonutrients in the potato tubers cultivars registered in European markets.

Corresponding author:

**Name: Beata Tatarowska**

**e-mail [b.tatarowska@ihar.edu.pl](mailto:b.tatarowska@ihar.edu.pl)**



Funded by European Union  
Horizon 2020  
Grant agreement No 771367

ECOBREED project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 771367. The content of this paper reflects only the author's view and the European Union Agency is not responsible for any use that may be made of the information it contains.