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On-farm assessment of landrace of tomato (*Lycopersicon esculentum* L.) under organic conditions in Hungary

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Landraces are an important cultural and economical heritage of agriculture. They have a low but stable yield and a great deal of adaptation against biotic and abiotic factors. Our aim is to test these varieties in organic farming, to see if there is a possibility for professional growing and market. In one season experiment in 2013 we tested four Hungarian tomato landraces on 17 farms. The assessment gave promising results: in some cases the landraces surpassed the conventional control in growth rate and even in yield.

Keywords: landrace tomato, on-farm, participatory research, organic production, *Lycopersicon esculentum* L.

1 Introduction

Landraces present a great value due to their genetic variability and adaptation. Since they usually do not meet the high requirements of intensive agricultural production, they have been mostly replaced by modern varieties. Although due to their favourable characteristics (disease tolerance, rich taste, good fruit content and a great variability in color and shape) there is a high chance that some of these tomato landraces can earn a place for themselves, especially in the organic farming. (Csambalik et al 2014; Divéky-Ertsey et al 2012; Pimentel et al., 2010; Terzopoulos and Bebeli, 2010; Vinha et al., 2014; Zeven, 1998).

In 2012 ÖMKi initiated a participatory-research program in order to test selected landrace tomato varieties under organic farming conditions. The aim of the study is to identify landraces that might have a good potential for market (re)introduction. Moreover, with the network we strive to improve production technology of participating farmers, and facilitate the professional cooperation and communication among them, researchers, advisors, and market players (Cseperkálóné Mirek and Divéky-Ertsey, 2014). In this paper we present results of the Central Hungarian Region from 2013.

2 Material and Methods

Certified organic farms received 20 transplants per landrace, while non-certified participants could test 5-5 transplants. Data assessment tasks were shared among farmers and researchers. Data collecting sheets were prepared and distributed, where farmers recorded simple scorings of growth rate, uniformity, agro-technical performance, as well as data on yield quality and quantity. 17 farmers from four regions of Hungary participated in the landrace tomato on-farm tests in 2013 (Central Hungary, South-Transdanubia, East-Central-Transdanubia, Central-Transdanubia). Landrace tomato seeds were received from the Plant Diversity Centre (NöDiK National Gene Bank). Landraces were selected according to the location of participating farms, i.e. landraces originally collected from the participating regions were placed in-situ again. Transplants for the trials were produced in the Organic Demonstration Farm of the Corvinus University of Budapest. Four landraces (Dány, Famos,

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Jászberény, Szentlőrinc-káta) and a control variety (Kecskeméti 549) were tested in seven farms located in the Central Hungarian Region.

3 Results

During the season farmers continuously measured the quantity of the yield for each picking, and they also grouped them in two different categories of quality: a (marketable and intact fruits), and b (nonmarketable, diseased and cracked fruits). Based on the collected data the total yield of each landrace (kg m²) is shown in Figure 1. These results indicate (supported by one year's data) that the tested landraces give similar yield as the control variety. Notable, that the landrace from Szentlőrinc-káta gave the highest yield. In addition, the yield of each landrace greatly influenced by conditions and technology on the farm (Figure 2).

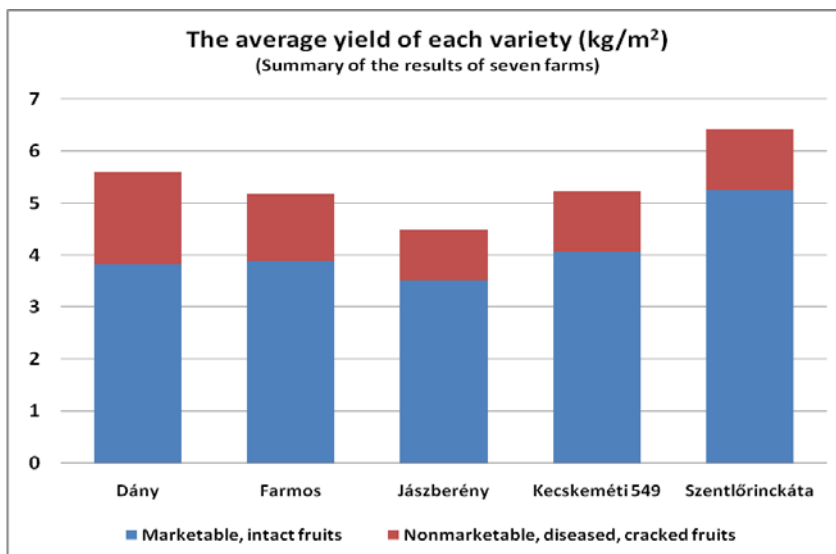


Figure 1 Average yield (kg m²) and marketability of the tested landraces in 2013 (n = 7)

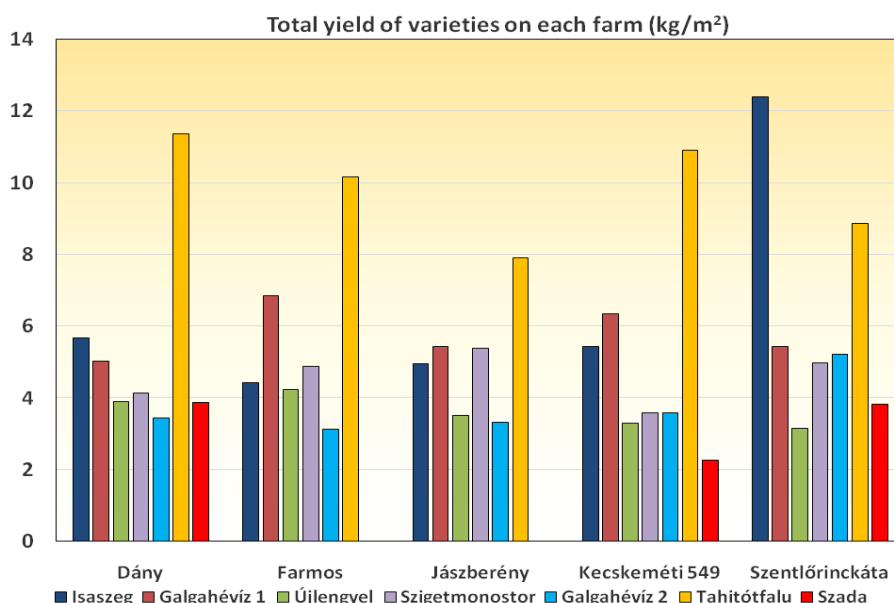


Figure 2 The total yield on each farm (kg m²)

In the end of the growing season farmers used a five-level scale to measure the growing capacity and uniformity of each landrace (Table 1).

Table 1 Vegetative characteristics of tested landraces based on the assessment of farmers

Name of variety	Growth rate (1: weak, 5: strong)	Uniformity of stock (1: not uniform, 5: uniform)
<u>Dány</u>	3,8	4,2
<u>Farmos</u>	4,0	4,0
<u>Jászberény</u>	3,8	3,0
<u>Kecskeméti 549</u>	3,0	4,0
<u>Szentlőrincákata</u>	3,8	3,3

The data recorded by the five-level scale shows that all the landraces had a higher growing capacity than the control variety, Kecskeméti 549. The landrace Dány showed the best uniformity.

The farmers used another five-level scale to score fruit and technological characteristics of each landrace: uniformity, hardness, appearance, shelf life, taste, technological performance and marketability. The processed results are shown in Figure 3.

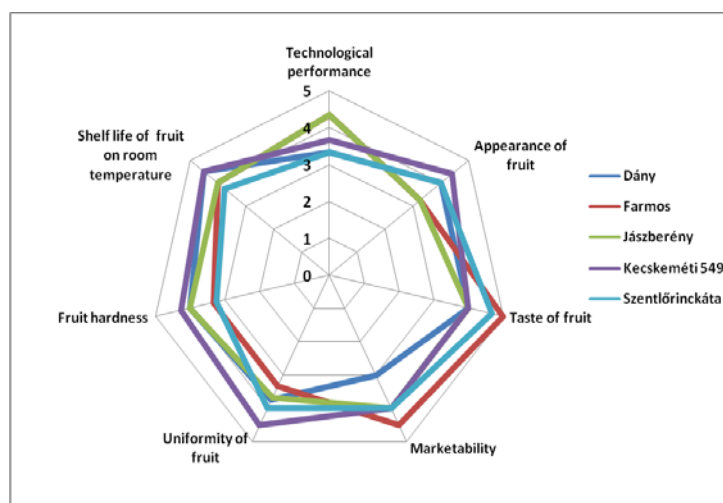


Figure 3 Technological assessment of the different landraces based on the growers marks

Based on the judgement of the farmers, the tastiest and most marketable landrace was Farmos, followed by Szentlőrincákata. The remaining three landraces received equal (good) scores. In the categories of fruit hardness and shelf life (which are highly correlated) the best landraces were Dány and Jászberényi. However, control variety Kecskeméti 549 received highest marks.

Based on technological performance Jászberény and Famos received an outstanding mark from the growers. On the other hand the appearance of the fruit of these landraces received the lowest scores. This is probably because the fruits have an elongated ovary mark, which is unusual, compared to traditional round tomatoes, and it makes the transportation harder as well. The appearance and uniformity of the fruit is the best in case of the Szentlőrincákata landrace. However, not surprisingly, the professionally bred control variety received higher scores in this respect. Summarising the seven parameters shows that in four categories

(appearance, uniformity, shelf life, and hardness) the control variety Kecskeméti 549 received highest scores from farmers. However, in each category some of the tested landraces performed equally or approximately equally well. Regarding taste, marketability, and surprisingly also technological performance, Famos, Szentlőrincskáta and Jászberényi respectively received higher or equal marks as the control. It is interesting to note the differences between farmer judgement of appearance and marketability of fruits (judgement of consumers).

4 Conclusions

All together four landrace tomato varieties (Dány, Famos, Jászberény, Szentlőrincskáta) and a control variety (Kecskeméti 549) were tested on seven organic farms in Central-Hungary during the 2013 on-farm experimentation year. Results show that under different on-farm conditions some of these landraces perform comparably, or in some aspects (taste, marketability) even better than the control variety. According to these results organic farming provides suitable conditions for these landraces, where they can perform competitively even in comparison to professionally bred varieties (Pimentel et al., 2005; Jasinski, 2010; Mitchell et al., 2007; Vinha et al., 2014). To further investigate the tested landraces, an exact trial was launched in 2015, where both tunnel and open field plots are used to measure a complex set of plant and fruit qualities. A further, final aim is the development of organic market products on the basis of our growing knowledge of the landraces.

5 Acknowledgements

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