

# EVALUATION OF NEW TOMATO HYBRIDS (*SOLANUM LICOPERSICUM* L.) WITH RIN GENE AS TO THEIR YIELD AND SENSORY QUALITY

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## Introduction

The development and maintaining of the high quality of vegetables, including tomato, proves to be a difficult and complicated task. Changing conditions at the time of vegetation (light, frosts, drought, excessive rainfall) and the impact of after-harvest factors (transport, packaging, storage) significantly affect the quality (5). The quality of products is evaluated by the sensory analysis, which has proved to be one of the most reliable methods for testing organoleptic traits, particularly the aroma and texture of fruit (1, 2). Obtaining tomato hybrids with good quality fruits for prolonged storage is done by the means of breeding work using the improved lines with the *rin* (ripening inhibitor) gene. Lines with the *rin* gene cannot be directly used in the breeding of cultivars because their fruit during their maturation process become yellow or yellow-orange and are unpalatable (6). The taste of hybrid fruit obtained on the basis of the line with the *rin* gene is not always satisfactory (4, 3). Before the fruits of new tomato varieties can be introduced into the market, it is assessed for the quality of many traits, however, it is the consumers' opinion, especially that on the fruit taste, that determines the price and demand.

The present work aimed at assessing the yield of new tomato hybrids and the evaluation of fruit quality as to their sensory traits (aroma, texture and taste).



## Materials and methods

The new tomato hybrids 325, 330, 334, 336, 348 and two standard cultivars Adam F1 and Faustine F1 were used in this experiment. The experiment was arranged in a one-factor split-plot design with three replications during two years 2009 and 2010 on the experimental field of the Department of Plant Genetics, Breeding and Biotechnology at Wolica. Plants were planted in the field on 26 and 28 of May, respectively, at 50 × 70 cm spacing – 16 plants per plot. The cultivated plants were staked up, they were grown in two shoots and decapitated after 31 July. Plants were grown in grey-brown podsolic soil of IV evaluation class, in the first year after using green manure the plants were additionally twice foliar fertilized with Florowit. Protective treatments were performed in accordance to the recommendation of the Plant Protection Calendar OWK. During the period of water shortage plants were T-Tape irrigated. The N, P, K, Mg content of the soil was kept at the optimum level with fertilizers applied to equal the average to 150 kg N × ha<sup>-1</sup> (60 kg N side dressing), 60 kg P × ha<sup>-1</sup>, and 200 kg K × ha<sup>-1</sup>. Fruit harvest lasted from the middle of July in 2009 and 2010 until the middle of September. Fruits were picked up successively as they ripened, they were sorted and weighed thus determining the total and market yield (kg × 100 m<sup>-2</sup>) as well as fruit weight (g), number of locular cavities and the thickness of the pericarp (mm).

Sensory analysis was made by the scaling method. The trained panel of 10 persons evaluated tomato fruit samples according to their tough of skin, flesh texture, core size, juiciness of flesh, tomato smell, strange smell, taste (sweet, sour, typical tomato, strange) and overall quality.

Statistical analysis was performed using two-way analysis of variance. Detailed comparison of means was performed by the Tukey's test at the significance level of α=0.05.



## References

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## Results

Table 1. The evaluation of taste, smell and texture attributes in fruit from improved lines with the *rin* (ripening inhibitor) and red- fruit line

Line/Cultivar	Color intensity	Tomato smell	Strange smell	Core size	Tough of skin	Flesh hardness	Flesh texture	Flesh juiciness	Tomato taste	Sour taste	Sweet taste	Strange taste	Overall quality
L264 <i>rin</i>	1.46	3.12	0.22	4.42	6.14	5.31	5.54	3.49	2.71	1.96	2.61	0.38	2.99
L265 <i>rin</i>	1.10	2.85	0.58	3.58	7.14	5.71	4.30	3.12	2.10	1.65	2.49	0.56	2.20
L267 <i>rin</i>	0.96	2.79	0.27	4.31	6.62	6.66	5.22	3.40	1.82	1.62	1.53	0.80	2.21
L269 <i>rin</i>	1.15	2.64	0.46	3.25	6.31	6.00	5.51	2.73	2.04	1.55	2.64	0.29	2.59
L271 <i>rin</i>	2.83	2.59	0.28	3.75	6.42	6.61	5.08	4.04	2.20	2.08	1.86	0.31	2.56
L305	8.53	4.63	0.00	1.27	4.02	5.41	6.61	4.98	5.73	2.14	2.53	0.00	6.65
L328	7.30	6.06	0.00	2.25	4.88	5.29	5.00	5.46	4.78	2.40	2.06	0.28	5.50
L331	7.12	5.63	0.00	1.29	4.77	6.65	6.00	4.93	5.97	2.46	2.47	0.33	6.03
FaustineF1	6.49	5.64	0.10	1.34	4.10	5.21	5.75	5.20	5.45	2.65	1.87	0.06	6.00

Table 2. Characteristic of new hybrids tomato fruit in field production (2009-2010)

Hybrid/cultivar	Origin	Year of experiment	Yield (kg × 100m <sup>-2</sup> )			Fruit features	
			Total	Marketable	Fruit weight (g)	Number of locular cavities	Thickness of the pericarp (mm)
325 F <sub>1</sub>	L328 × L264 <i>rin</i>	2009	1292.0	1047.0	144.0	4.20	8.30
		2010	1104.0	763.0	141.0	4.60	8.10
		Mean	1198.0	905.0	142.5	4.40	8.20
330 F <sub>1</sub>	L328 × L269 <i>rin</i>	2009	1207.0	1067.0	107.0	2.80	8.30
		2010	1242.0	869.0	119.0	2.50	7.50
		Mean	1224.5	968.0	113.0	2.65	7.90
334 F <sub>1</sub>	L305 × L265 <i>rin</i>	2009	1521.0	1092.0	154.0	3.30	7.50
		2010	1269.0	1017.0	148.0	4.40	7.20
		Mean	1395.0	1054.5	151.0	3.85	7.35
336 F <sub>1</sub>	L305 × L267 <i>rin</i>	2009	1191.0	1120.0	159.0	4.50	6.80
		2010	1190.0	670.0	157.0	3.80	7.90
		Mean	1190.5	895.0	158.0	4.15	7.35
348 F <sub>1</sub>	L321 × L271 <i>rin</i>	2009	1287.0	944.0	147.0	5.00	6.20
		2010	1385.0	1042.0	153.0	4.00	7.20
		Mean	1336.0	993.0	150.0	4.50	6.70
Adam F <sub>1</sub> (standard)	SGGW	2009	1174.0	975.0	137.0	2.80	7.90
		2010	1313.0	1021.0	144.0	3.10	7.90
		Mean	1243.5	998.0	140.5	2.95	7.90
FaustineF <sub>1</sub> (standard)	Syngenta Seeds	2009	1302.0	1004.0	139.0	4.00	8.60
		2010	1532.0	1089.0	149.0	3.40	8.30
		Mean	1417.0	1046.5	144.0	3.70	8.45
NIR α = 0.01		2009	49.00	50.12	12.59	2.21	2.11
	2010	96.59	124.05	15.64	1.62	0.87	

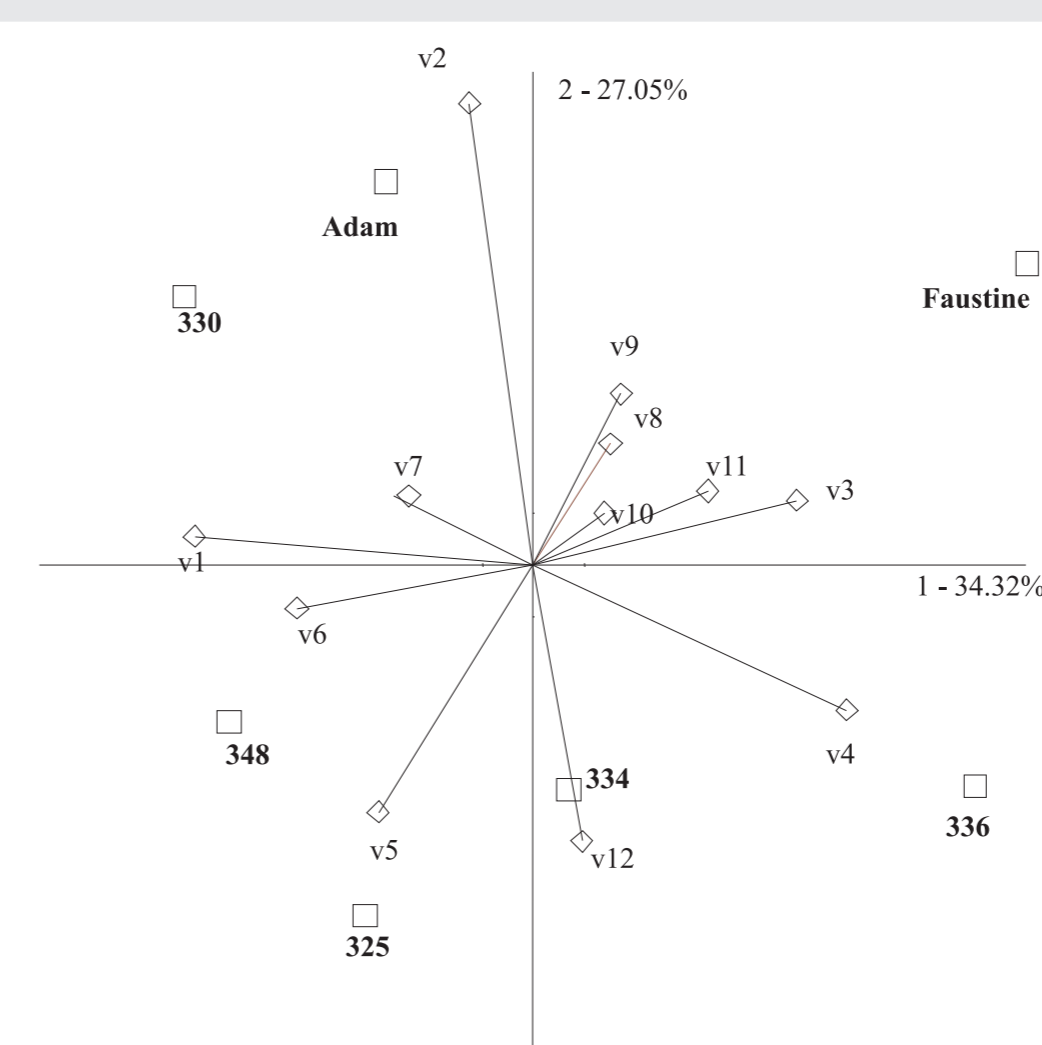


Figure 1. PCA projection of similarities differences and of sensory quality of fruit tomato (2009-2010).

The hybrids and cultivars of tomato: 325, 330, 334, 336, 348, Adam F<sub>1</sub>, Faustine F<sub>1</sub>. Attributes evaluated (vectors): v1 – tomato smell, v2 – strange smell, v3 – core size, v4 – tough of skin, v5 – flesh texture, v6 – flesh hardness, v7 – juiciness of flesh, v8 – tomato taste, v9 – sour taste, v10 – sweet taste, v11 – strange taste, v12 – overall quality.



## Conclusions

- New tomato hybrids with the *rin* gene yield at a similar level as standard cultivars. They also receive similar values of such traits as fruit weight, pericarp thickness and the number of locular cavities in the fruit as compared to fruits of standard cultivars.
- Fruit of parental forms with the *rin* gene received low values of the notes of colour intensity, small, flesh juiciness and taste and high values for the core size and skin hardness – negative traits in the assessment of fruit quality as compared to those values obtained for the lines of red-coloured fruits.
- The assessment of sensory quality of fruits of new tomato hybrids was at a comparable level with the assessment of the standard cultivar fruits. These fruits received high notes for fruit fleshness, flesh juiciness and overall quality but lower notes for tomato smell and taste as well as sweet taste.