



**Vegetable Crop Research Department  
Kalocsa Research Station**

## **RESEARCH REPORT**

**2017**

**‘WATER RETAINER’ TREATMENTS  
IN INTENSIVE FIELD AND FOIL TENT GROWING OF PAPRIKA**

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# ‘WATER RETAINER’ TREATMENTS IN INTENSIVE FIELD AND FOIL TENT GROWING OF PAPRIKA

## **Experiment Objectives**

Testing the Water Retainer product called ‘the Water Retainer’ (hereinafter: the Water Retainer), as commissioned by Water&Soil Kft.:

1. Testing in intensive field growing of ‘Kaldóm’ paprika.
2. Testing in intensive under plastic growing ‘Szegedi-178’ paprika.

For the purposes of this experiment, the ‘treatment’ is defined as application of the Water Retainer in a dosage of 1 ml/m<sup>2</sup> while reducing the irrigation water by 50%. In under plastic growing, the treatment of the Water Retainer was done again by 50% (a dosage of 0.5 ml/m<sup>2</sup>) in the second half of the vegetation period at the end of July.

## **Materials and Methods**

### ***Experiment Site:***

Kalocsa, the field and polytunnel of Kalocsa Research Station of National Agricultural Research and Innovation Centre

### ***Growing Seedlings***

The seedlings of ‘Kaldóm’ and ‘Szegedi-178’ paprika varieties were produced in Kalocsa Research Station’s own polytunnels in 2017. During the growing of seedlings, we paid special attention to even plant growth and the ‘training’ of seeds to fit the date of bedding.

### ***Cultivation and Harvesting***

#### **Preparation of the field**

In 2016, the green crop was autumn wheat. During the autumn period, the field was not fertilized by manure; it was only deep tilled.

For the intensive field growing, beds with ridges and drip laterals were developed. These were covered with black plastic foil. The Water Retainer was applied directly before preparing the ridges in mid May 2017, as recommended, in a concentration of 1 ml/m<sup>2</sup>.

### Preparation of under plastic field

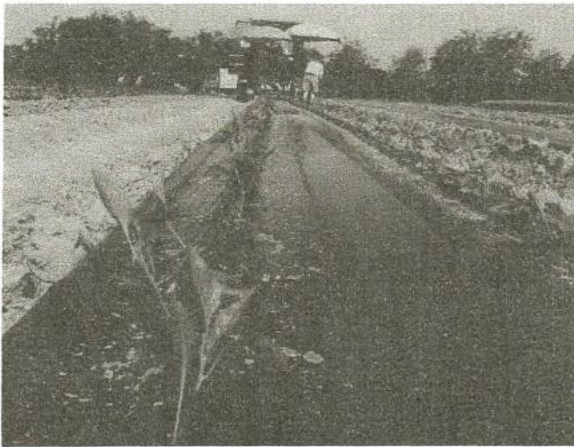
The under plastic field was prepared before the bedding of seedlings. Before placing the drip laterals, we used backpack sprayers to apply the Water Retainer on the ground surface; also as recommended, in a concentration of 1 ml/m<sup>2</sup>. The treatment was repeated in the second half of the vegetation period at the end of July, in a concentration of 0.5 ml/m<sup>2</sup>, applied using the same technology.

The seedlings forced in unheated polytunnel were bedded out in a twin row configuration by hand. This equalled 35 thousand plants per hectare.

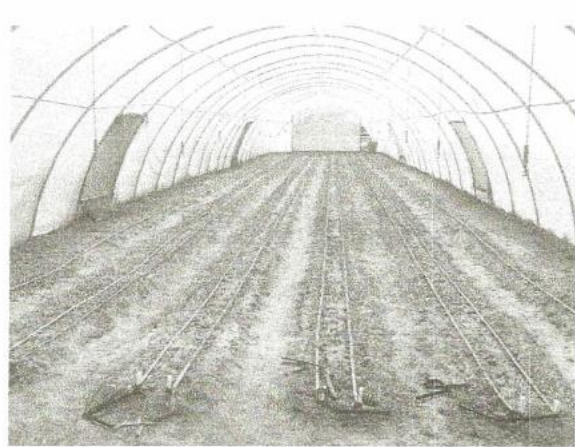
### Planting in the field

The seedlings on trays were bedded out by a suspended planting machine operated by the Research Station staff. The seedlings were bedded out in the about 50 cm-wide ridges, in twin row configuration. This equalled approx. 45 thousand seedlings per hectare.

At the time of bedding the seedlings were in ideal condition.



Picture 1 - bedding 'Kaldóm' seedlings



Picture 2 - 'Szegedi-178' out-bedded physiognomy

### Weed Control

Weeding has been executed 4 times by a row crop cultivator, and 4 times by manual hoeing. Under plastic, weeding has been done every two weeks by manual hoeing.

## Treatments

‘Szegedi-178’ hot paprika variety (growing under plastic)

1. The Water Retainer applied: first on 6th June in a 1 ml/m<sup>2</sup> dosage, next on 27th July in a 0.5 ml/m<sup>2</sup> dosage. Compared to the control crops, 50% less irrigation water used during the vegetation period.
2. Control Crops

In case of the foil tent crops, the plants were irrigated by both clear water and liquid fertilizer in the first half of the vegetation period, but the treated area was irrigated by only 50% of the water and liquid fertilizer. In the second half of the vegetation period, in order to balance the nutrient supply, the control crops received 50% less liquid fertilizer, while the rate of irrigation water between the treated and the control crops remained the same: 50-100%.

‘Kaldóm’ sweet paprika variety

1. The Water Retainer applied in a 10 l/ha (1 ml/m<sup>2</sup>) dosage. Compared to the control crops, 50% less irrigation water used during the vegetation period
2. Control Crops

In case of the field crops, irrigation water and liquid fertilizer were used only once in equal amount. After having applied the liquid fertilizer, we irrigated both areas again, where the treated crops received 50% less irrigation water than the control crops.

Note:

For both irrigation and nutrient replenishment purposes, the filtered water from Vajas canal was used.

## Plant Protection

Field crops needed three different treatments against viral vector insects and pesticides. Pesticides of cypermethrin and indoxacarb active ingredients were used. Under plastic crops have not required any pesticide treatment because the crops were covered with a fine mesh screen.

## Phenology Measurements

Plant growth was measured by plant height, number of flowers and number of set fruits. Data tables are shown in Appendix 1 to 4.

### Harvest dates:

Szegedi-178: 19-20th September 2017

Kaldóm: 10-11th September 2017

## **Results**

During the 2017 vegetation period of paprika, extreme weather conditions occurred again, such as drought, prolonged heatwaves, and sudden heavy rainfalls followed by cold periods. Regardless of the adverse weather, pests and pathogens, due to the intensive field growing technology of paprika, the plants reached an even condition, which balanced out the loss of yield usually occurring due to traditional growing technology.

Based on the discussion with the representative of Water&Soil Ltd., harvest results refer to the first harvest of the treated sections.

Table 1: Harvest results (yield)

Treatment	Kaldóm (field) kg/section (150 m <sup>2</sup> )	Szegedi -178 (under plastic) kg/section (150 m <sup>2</sup> )
Treatment (50% irrigation water)	183	189
Control Crops	175	200

Having compared the Water Retainer treated section, which received 50% of the irrigation water, and the control section of the same varieties and growing technologies, no significant differences were found. Any differences between the varieties were probably caused by the characteristics of the varieties (Kaldóm - early, semi-determinate plant growth, Szegedi-178 - mid-early, indeterminate plant growth) and the different growing methods.

Parameter measurements were taken directly after harvest in the Research Station's laboratory. Dry content has been measured by using a drying oven and digital scales. Total pigment content has been measured by a Unicam spectrophotometer, and the data has been converted into the internationally accepted ASIA values. Germination potency data has been obtained after a two-week germinating period.

Table 2: Quality parameter results

Treatment	variety/examined part	pcs	moist weight (g)	dry weight (g)	dry content %	ASTA color value	raw seed sprout %
Water Retainer - 50% less irrigation water	Kaldóm exocarp	14	317.7	56.5	17.8	198	99
	Kaldóm powder	15	342.9	56.2	16.4	152	
Control Crops	Kaldóm exocarp	15	325.5	57.5	17.7	200	95
	Kaldóm powder	15	347.1	61.2	17.6	166	
Water Retainer - 50% less irrigation water	Sz-178 exocarp	15	278.2	44.3	15.9	187	96
	Sz-178 powder	15	278.2	44.9	16.1	161	
Control Crops	Sz-178 exocarp	16	302.1	49.9	16.5	190	97
	Sz-178 powder	16	331.2	53.0	16.0	141	

Due to early ripening, the field-grown Kaldóm variety had higher dry content and higher pigment content compared to Szegedi-178 variety. The field-grown Kaldóm in the treated sections received half the irrigation water than the control crops. This turned into an advantage when heavy rainfall hit in the end of July, and caused stress in the lower fields.

But within the same varieties, there were no significant differences found in dry content or total pigment content between the crops treated with the Water Retainer and 50% less water, and the control crops.

Germination potency values were equally high and stable in both the control and treated crops. High germination potency has a significance from a sowing-seed production point of view, since farmers prefer quickly sprouting sowing-seeds with a potentially high percent of germination.

## Summary

Based on phenological measurements and the resulting data shown in the tables, it can be ascertained that within the same varieties there are no significant differences between the main quality parameters and yields of the treated and the control, field or under plastic crops.

The results of our 2017 experiment also show exceptionally high germinating capacities of the seed samples.

The treatment is deemed effective both applied before the preparation of ridges and under plastic, and applied on the surface by means of other cultivator machinery.

Thus, by applying the Water Retainer, even half of the irrigation water used during the vegetation period and the other costs of irrigation application can be saved.

Kalocsa, 10th October 2017

*NAIK stamp*

*signature*

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Table 1 - Treated Kaldóm (Water Retainer and 50% less irrigation water) phenological data

	Height cm	Number of flowers pcs (11-07-2017)	Number of fruits pcs (11-07-2017)	Number of fruits pcs (22-08-2017)
1	60	2	4	18
2	50	3	5	22
3	58	2	5	10
4	45	set	3	15
5	58	set	6	13
6	57	set	5	9
7	58	4	6	7
8	55	2	5	17
9	56	1	4	13
10	47	set	3	17
11	60	b	5	21
12	58	b	2	18
13	55	b	5	13
14	45	1	4	7
15	53		3	17
16	42	2	3	12
17	52	3	5	8
18	53	2	6	17
19	43	set	5	28
20	48	1	5	9
21	58	2	5	10
22	45	1	4	16
23	60	2	5	34
24	50	3	5	21
25	49	2	4	8
26	48	2	4	15
27	45	2	4	16
28	43	2	3	15
29	40	1	5	16
30	60	3	7	13
31	48	2	5	16
32	60	3	6	17
33	59	2	5	7
34	60	3	7	25
35	58	2	5	28
36	62	2	7	24
37	59	1	5	12
38	55	2	5	8
39	60	3	6	14
40	60	3	7	23
41	55	2	6	7
42	50	1	5	17
43	50	2	6	14
44	48	2	5	17
45	45	1	4	8
46	48	2	4	16
47	45	1	4	10
48	47	1	5	17
49	45	2	5	13
50	45	1	5	15



Table 2 - Control Kaldóm phenological data

	Height cm	Number of flowers pcs (11-07-2017)	Number of fruits pcs (11-07-2017)	Number of fruits pcs (22-08-2017)
1	53	1	4	13
2	55	1	5	18
3	53	8	6	13
4	60	3	5	8
5	55	3	5	11
6	62	4	6	27
7	65	2	6	19
8	65	3	5	25
9	60	3	5	16
10	55	2	5	17
11	60	3	5	10
12	56	4	3	16
13	63	2	6	28
14	60	3	6	12
15	46	2	6	1
16	59	1	7	26
17	69	4	5	25
18	65	2	7	12
19	56	2	3	9
20	60	2	5	14
21	52	2	3	22
22	50	1	5	27
23	60	3	4	30
24	59	1	6	26
25	60	3	4	7
26	58	2	5	15
27	53	4	4	12
28	65	2	5	19
29	50	1	4	20
30	62	2	4	14
31	54	2	4	16
32	60	3	5	20
33	60	1	5	18
34	53	3	5	17
35	50	1	3	21
36	45	2	4	12
37	50	3	5	19
38	45	2	4	17
39	53	4	5	11
40	60	2	5	13
41	65	1	5	28
42	53	2	5	15
43	48	1	4	21
44	50	1	5	12
45	63	1	6	31
46	45	1	5	10
47	60	1	5	31
48	50	1	4	10
49	53	1	3	13
50	62	5	5	13

Table 3 - Treated Szegedi-178 (Water Retainer and 50% less irrigation water) phenological data

	Height cm	Number of flowers pcs (11-07-2017)	Number of fruits pcs (11-07-2017)	Number of fruits pcs (22-08-2017)
1	57	5	16	18
2	46	set	12	22
3	56	6	15	17
4	54	5	5	21
5	65	7	15	13
6	32	set	2	9
7	60	3	15	16
8	63	6	9	20
9	62	6	14	20
10	53	2	10	18
11	54	4	13	15
12	57	4	12	13
13	59	8	12	19
14	48	4	8	8
15	53	5	8	16
16	66	9	13	19
17	44	set	7	14
18	61	10	7	17
19	67	5	14	18
20	68	8	11	18
21	60	5	13	19
22	49	2	9	16
23	52	5	11	18
24	67	3	12	15
25	64	11	13	11
26	60	2	15	17
27	44	3	2	9
28	60	8	10	15
29	59	6	16	10
30	60	6	15	20
31	52	2	15	24
32	56	2	3	10
33	52	3	12	10
34	57	5	15	18
35	61	5	13	20
36	57	5	9	14
37	53	5	8	17
38	65	11	17	18
39	66	3	13	14
40	51	8	13	18
41	67	4	12	18
42	60	3	12	17
43	57	2	14	10
44	54	5	11	22
45	53	2	13	13
46	51	8	9	20
47	60	4	14	16
48	58	2	11	24
49	57	1	18	15
50	57	7	9	16

Table 4 - Control Szegedi-178 phenological data

	Height cm	Number of flowers pcs (11-07-2017)	Number of fruits pcs (11-07-2017)	Number of fruits pcs (22-08-2017)
1	53	3	10	15
2	50	2	9	10
3	40	0	6	10
4	40	0	5	12
5	42	1	66	16
6	45	4	13	20
7	50	set	10	14
8	50	set	10	20
9	48	6	12	20
10	49	set	12	22
11	47	3	10	13
12	60	2	10	22
13	56	4	8	16
14	58	3	12	18
15	58	4	12	10
16	59	4	17	33
17	75	5	14	24
18	50	2	6	12
19	63	8	13	20
20	52	2	10	19
21	49	6	17	22
22	49	1	9	17
23	64	5	13	30
24	55	2	11	20
25	48	0	4	13
26	50	6	11	22
27	49	3	8	14
28	55	7	15	17
29	63	3	7	15
30	57	4	11	9
31	47	3	5	7
32	55	2	13	20
33	60	5	6	14
34	59	6	3	10
35	57	6	7	16
36	56	4	11	20
37	60	8	7	16
38	55	3	11	20
39	56	10	15	22
40	56	5	15	20
41	50	4	6	14
42	58	5	7	16
43	56	6	10	16
44	46	3	8	16
45	62	3	10	18
46	52	3	8	15
47	65	7	17	25
48	63	8	13	20
49	62	4	15	21
50	60	3	12	20