

TISZA WATER, AS IRRIGATION WATER, POLLUTED WITH VARIOUS COMPOUNDS

ANGÉLA KOVÁCS and MÁRIA MÉSZÁROS

Department of Biophysics, Attila József University, Szeged, Hungary.

(Received September 3, 1984)

Abstract

One of the greatest problems in our times is environmental protection, which affects agricultural and horticultural plant cultivation in a complex manner. The compounds getting into the river and canal waters are harmful to the plants in various ways by means of watering.

Introduction

The effects displayed on cultivated plants of polluted matter found in water systems have been studied by several authors, e.g. SHULKA *et al.* 1977, BEJAONI 1980, ALKA *et al.* 1981, KUMAR *et al.* 1983, WAGENER 1983, etc.

The compounds washed into the water system of the Lower Tisza region were studied at the time of watering during the period of sowing and in the case of plants later being in the state of vegetative growth. The degree of damage, tolerance, or wasting away of the plants could be concluded on the basis of the metabolic-indicators. With the adding of Faneron multimixture herbicide + glyphosate, chlorbromurone, common salt and inoxane, a sewage-germicide containing chlorine-iodine, were used in our laboratory experiments.

Materials and Methods

Our experiments were performed with musk melon, hybrid maize and horse-bean plants.

For preemergent treatment the seeds were germinated till the age of 5—6 days, in Petri dishes on filter-paper moistened with the solutions of the compounds, in 23 °C dark thermostat till the day of studying.

In the case of postemergent treatments 3 days old plants germinated under conditions similar to the former, but on filter-paper moistened with tap-water were treated with the adequate solution concentrations of the various compounds. Simultaneously the plants were placed in light thermostat of cc. 7000 lux illumination and grown till the day of studying in general till the age of 8, 9, 11 days. The controls were grown on tap-water in the case of both treatments.

The compound solutions used were: 2 ml herbicide mixture (brominephenoxy + terbutylazime + glyphosate), 0,5 g chlorbromurone (Maloran), 1 g sodium chloride in 1—1 liter tap-water, 0,5 ml inoxane (Incosan-W iodofor) germicide solved in sewage.

Studies were performed on growth, dry matter accumulation, ascorbic acid content, total soluble protein amount, development of peroxidase enzyme activity, total phenol amount as well as the changes in RNA values (Lowry *et al.* 1951, Lavee-Glaston 1968, Spies 1955).

The experiments were repeated 3—5 times.

Results and discussion

The results obtained for the preemergent treatment of the musk melon seeds are summarized in Table 1.

The sewage displayed greatest effect on the development of the seedlings, even with the presence of a certain amount of germicide. Negligible deviation was experienced in respect to ascorbic acid content, total soluble protein and total phenol amount compared to the control. Therefore the seedlings could not have been damaged.

The musk melon seedlings sustained the various compounds quite well under preemergent conditions.

The measurement data of the 8 days old postemergent-treated musk melon seedlings are summarized in Table 2.

With the exception of ascorbic acid, there was no such difference between the various indicators which would have indicated ageing and wasting away, respectively. However, the amount of ascorbic acid exhibited rather high value, referring to the revived processes. Only slight degree of deviation was observable between the various indicators.

Table 1. *Data of 5 days old musk melon seedlings receiving preemergent treatment*

Treatment	Length	Dry matter	RNA	Ascorbic acid	Total soluble protein	Peroxi-dase	Total phenol
	mm	mg/g fresh weight	γ/g fresh shoot	γ/g fresh weight shoot	γ/g fresh weight shoot	EU/g fresh weight shoot	γ/g fresh weight shoot
2 ml herbicide mixture/ 1 tap water	77	93	126	191	294	23	100
0,5 g chlorbromurone/ 1 tap water	89	92	133	193	330	23	94
1g NaCl/1 tap water	136	79	103	174	243	15	90
0,5 ml inox./1 sewage	166	95	112	159	243	20	112
tapwater control	65	100	105	160	240	18	96

Table 2. *Data from the shoot of postemergent-treated 8 days old musk melon seedlings*

Treatment	RNA	Ascorbic acid	Total soluble protein	Peroxidase	Total phenol
	γ/g fresh weight	γ/g fresh weight	γ/g fresh weight	EU/g fresh weight	γ/g fresh weight
2 ml herbicide mixture/ 1 tap water	195	260	285	37	120
0,5 g chlorbromurone/ 1 tap water	161	213	270	36	128
1 g NaCl/1 tap water	186	267	274	31	116
0,5 ml inox./1 sewage	110	373	233	32	120
tapwater control	124	168	257	28	111

The effect of the various agent solutions was also studied in the case of the hybrid maize seedlings, under preemergent conditions. The results are comprised in Table 3.

Table 3. Data of 6 days old hybrid maize seedlings receiving preemergent treatment

Treatment	Length	Dry matter	RNA	Ascorbic acid	Total soluble protein	Peroxi-dase	Total phenol
	mm	mg/g fresh weight	γ /g fresh weight shoot	γ /g fresh weight shoot	γ /g fresh weight shoot	EU/g fresh weight shoot	γ /g fresh weight shoot
	Shoot + root	Shoot + root	shoot	shoot	shoot	shoot	shoot
2 ml herbicide mixture/ 1 tap water	117	150	251	332	493	43	144
0,5 g chlorbromurone/ 1 tap water	101	277	338	338	532	44	119
1 g NaCl/1 tap water	118	138	257	298	467	54	117
0,5 ml inox./1 sewage tapwater control	101 139	118 121	259 235	318 351	490 503	52 39	428 120

The growth of the maize seedlings was in every case adequate compared to the control, slight lag was only detectable regarding the germicide + sewage variant. The dry matter accumulation was the greatest in the case of the seedlings treated with chlorbromurone. Parallel with the rise in RNA content, the amount of total soluble protein also increased to a considerable degree. The total phenol amount showed similar results in every treatment, it only increased to the quadruple of that in the control in the case of the inoxane-treated seedlings.

Table 4 contains the measurement data for the shoots of the 9 days old hybrid maize seedlings.

The revived metabolic processes could be concluded from the values of the peroxidase enzyme activity. In the case of postemergent treatment the shoot's ascorbic acid content, total soluble protein and total phenol amounts were raised by the herbicide mixture and chlorbromurone.

Table 4. Data from the shoots of postemergent-treated 9 days old hybrid maize seedlings

Treatment	RNA	Ascorbic acid	Total soluble protein	Peroxidase	Total phenol
	γ /g fresh weight	γ /g fresh weight	γ /g fresh weight	EU/g fresh weight	γ /g fresh weight
	2 ml herbicide mixture/ 1 tap water	254	816	606	50
0,5 g chlorbromurone/ 1 tap water	292	813	608	56	850
1 g NaCl/1 tap water	297	615	443	41	978
0,5 ml inox./1 sewage tapwater control	369 239	624 589	665 573	50 37	928 826

Table 5. Data of 6 days old horse-bean seedlings receiving preemergent treatment

Treatment	Length	Dry matter	RNA	Ascorbic acid	Total soluble protein	Peroxi-dase	Total phenol
	mm	mg/g fresh weight	γ /g fresh weight shoot	γ /g fresh weight shoot	γ /g fresh weight shoot	EU/g fresh weight shoot	γ /g fresh weight shoot
	Shoot + root	Shoot + root					
2 ml herbicide mixture/ 1 tap water	53	118	150	1041	812	20	445
0,5 g chlorbromurone/ 1 tap water	53	118	153	982	803	19	428
1 g NaCl/1 tap water	64	96	123	764	1067	18	413
0,5 ml inox./1 sewage tapwater control	70	99	104	656	945	17	449
tapwater control	65	99	104	522	955	18	396

Table 6. Data from the shoots of postemergent-treated 11 days old horse-bean seedlings

Treatment	RNA	Ascorbic acid	Total soluble protein	Peroxidase	Total phenol
	γ /g fresh weight	γ /g fresh weight	γ /g fresh weight	EU/g fresh weight	γ /g fresh weight
2 ml herbicide mixture/ 1 tap water	221	661	722	14	513
0,5 g chlorbromurone/ 1 tap water	232	756	851	19	490
1 g NaCl/1 tap water	231	535	859	16	647
0,5 ml inox./1 sewage tapwater control	223	500	1016	15	651
tapwater control	316	450	768	16	400

Table 5 shows the data of the 6 days old preemergent-treated horse-bean seedlings.

On the basis of the Table, it could be determined that these compounds were not harmful to the horse-bean seedlings, they only displayed harmful effect in higher amounts and greater salt concentrations.

The measurement data of the shoots of postemergent-treated 11 days old horse-bean seedlings are summarized in Table 6.

The herbicide of chlorbromurone effective agent proved to be harmful to the horse-beans. This conclusion could be drawn on the basis of the increase in the total phenol, total soluble protein, ascorbic acid amounts.

* * *

Our experimental plants reacted to the water-pollutant compounds in different manners. The concentration of the solution is of importance, since the minimal presence of the harmful compound cannot cause disturbance; only in case the irrigation water contains it in high concentration.

Különböző vegyületekkel szennyezett Tisza víz, mint öntözővíz

KOVÁCS ANGÉLA és MÉSZÁROS MÁRIA

József Attila Tudományegyetem Biofizikai Tanszék, Szeged

Kivonat

A kísérleti növényeink a vízben lévő vegyületek — Faneron multi keverék gyomirtó szer + glyfozát, klórbrómuron, konyhasó és klór-jód tartalmú szennyvízfertőtlenítőszer, inoxán — hatására eltérő módon reagáltak. Az oldat koncentráció lényeges, mert a károsító hatású vegyület minimális jelenléte zavarokat nem okozhat, csak abban az esetben, ha az öntözővíz töményen tartalmazza.

Засоренная различными химическими веществами вода реки Тисы, как поливная вода

Ковач А., Месарош М.

Университет им. Йозеф А., Кафедра биофизики, Сегед

Резюме

Испытуемые растения по различному реагируют на химические вещества, растворенные в воде — фанерон-глифозат, хлорбромурон, поваренную соль, содержащую хлор-йод, дезинфицирующие сточную засоренную воду, инноксан. Концентрация растворенных в воде веществ имеет существенное значение, поскольку минимальная концентрация вреда не приносит, но увеличение концентрации вредных веществ имеет вредное воздействие на растения.

Voda za navodnjavanje reke Tise zagadjena raznim jedinjenjima

KOVÁCS ANGÉLA i MÉSZÁROS MÁRIA

Katedra za biofiziku Univerziteta „József Attila”, Szeged

Abstrakt

Ogledne biljke su na uticaj herbicida — Faneron + glyfozát, hlorbromuron, kuhinjska so i inoxan-sredstvo za dezinfekciju zagadjениh voda sa hlor-jodidom, različito reagovalе. Koncentracija rastvora je bitan faktor, naime, rastvor čiji je uticaj štetan, u minimalnim količinama ne prouzrokuje smetnje. Oštećenja se javljaju samo u tom slučaju, ako se isti, u vodi za navodnjavanje, nalaze u zasićenoj koncentraciji.