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Ecological System of the Mixed Applications of Lactofol "O" With Pesticides in Tomato

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Abstract: In mid-early tomato growing, the mixed foliar dressing of Lactofol "O" with decreased pesticide doses (25%) (sencor, fusilade, cuprocin, ditan-M 45 and karate) caused positive weed control, insect and disease control with lower phototoxicity level. By separate or mixed application of Lactofol "O" (L."O"), the pollen fertility was increased. L. "O" application, in sequences and especially with decreased pesticide doses, the yield increased by 12.8-16.8%. The results showed that by foliar dressing the use of soil herbicides can be eliminated, and the nitrogen fertilizing dose can be decreased by 50 percent.

Key words: jana, pesticide, lactofol "O", sequencely, mixed application.

Introduction

The integrated systems of plant protection in tomato production were established on the basis of previous experiments, Velev (1980,1988), Valchev (1993) and Wilson (1973). Moreover studies with mixed mineral fertilizers and herbicides in tomato growing were carried out by Velev (1988).

The studies on foliar application of the suspension fertilizers with the mineral fertilizers and pesticides in the tomato production were carried out few years ago - Pavlova (1992), Velev (1993,1994).

The purpose of this study was to establish the conditions for the combined application of the suspension foliar fertilizer Lactofol "O" and the vegetative pesticides used in mid-early tomato growing to the weeds, diseases and insects growth in tomato, their productivity, the pollen fertility and some quality characters of their fruits.

Material and Methods

The field experiment was achieved on alluvial meadows light soil in the experimental station of the Agric. Inst. Plovdiv - during 1993-1995. The experiment was carried out with cvs Jana mid-early tomato variety adapted to the fresh market and the processing. The distance of the transplanting was 120+40/25 cm. The experiment was designed with five repetitions by field block randomising of the variants. The study used variants shown in table 1.

Tab. 1. General scheme of the experiment

	Kind of works
1	Control untreated, without any weed control
2	Untreated control, weeding + mineral fertilizing with nitrogen 60 kg/ha
3	Separate triple treating with Lactofol "O" 5+6+6 l/ha.
4	Separate treating with optimal doses of pesticides + preplanting application with 2.5 l/ha devrinol
5	Treating with Lactofol "O" in sequences 5+6+6 l/ha +25% decreasing the pesticides doses
6	Sequencely treating with Lactofol "O" 5+6+6 l/ha +12.5% decreasing the pesticide doses
7	Treating with Lactofol "O" in sequences + optimal pesticide doses
8	Mixed treating with Lactofol "O" - 5+6+6 l/ha +25% decreasing the pesticide doses
9	Mixed treating with Lactofol "O" - 5+6+6 l/ha +12.5% decreasing the pesticide doses
10	Mixed treating with Lactofol "O" + optimal pesticide doses

The yield and fruit morphology were determined. The data were analysed by ANOVA and the statistical significance by Duncan multiple range test. The fungicide, herbicide and insecticide effects were studied by standard methods.

Results and Discussion

The mixed application of Lactofol "O" with lower herbicide doses (variants 8,9,10) caused strong herbicide effect on the density of weed from 3.3 to 2.6 weeds/m² and decreased their fresh weight from 13.7 to 5.9 g/m² (table 2). This effect was higher in variant 10 with the optimal herbicide doses in comparison with the herbicide effect from the separate application of herbicides (var.4). Their mixed application with the lower doses had another priority in spite of the indicate variant (No 4) where the soil devrinol in dose 2.5 l/ha had been used. During the three experimental years the consecutive or the mixed application of Lactofol "O" with varied pesticide doses did not increase the phytotoxicity on the tomato plants. The index of the injury was between 2.79 - 6.54 when the value in the control variants was - 5.22 - 5.31 (table 3). The disease injury index was lower in variants with the mixed application of Lactofol "O" with pesticides from 10.24 to 12.04.

Tab. 2. Weed density (number per m²)

No	weed number					fresh weight (g)				
	1993	1994	1995	mean	%	1993	1994	1995	mean	%
1	16.4	22.0	33.0	23.8	100	512	345	519	459	100
2	3.8	16.7	19.8	13.4	56.3	95	180	248	174	37.9
3	6.6	13.2	17.6	12.5	52.5	222	86	423	277	60.3
4	2.6	2.5	9.2	4.8	20.2	123	26	110	86	18.7
5	1.8	0.2	9.9	3.7	15.5	21	3	176	67	14.6
6	2.8	3.2	6.6	4.2	17.6	104	29	75	69	15.0
7	4.0	3.0	9.4	5.5	23.1	65	53	62	63	13.7
8	2.4	3.2	4.2	3.3	13.9	86	54	49	63	13.7
9	3.6	5.0	9.4	6.0	25.2	113	40	77	77	16.8
10	0.8	1.8	5.2	2.6	10.9	28	22	31	27	5.9

Tab. 3. Indexes of the pesticide, insect and diseases injuries on tomato plants

No	pesticide injuries				pest and diseases injuries			
	1993	1994	1995	means	1993	1994	1995	means
1	3.91	10.75	1.00	5.22	9.26	17.00	21.38	15.88
2	5.93	8.00	2.00	5.31	10.31	20.75	19.76	16.94
3	7.29	2.75	0.75	3.59	10.63	2.50	15.80	9.64
4	2.34	9.50	3.25	5.03	7.50	15.25	16.74	13.16
5	9.84	9.00	0.25	6.39	15.31	14.00	15.36	14.80
6	7.89	2.25	3.25	4.46	11.87	18.25	11.98	14.03
7	10.26	5.50	0.50	5.42	14.69	15.25	13.02	14.32
8	8.33	7.25	1.25	5.61	14.69	10.50	10.94	12.04
9	10.11	5.50	4.00	6.54	8.13	13.00	14.18	11.77
10	3.39	3.75	1.25	2.79	6.56	11.25	12.92	10.24

The average yields (table 4) in variants 7 and 8 (without any nitrogen application) were approximately equal to variant 2 with nitrogen fertilization (60 kg/ha) where the differences were not significant. There were no significant differences between the average yields in variant 7 - which included treating of Lactofol "O" in sequences after the optimal pesticide dose and var 8 - which included the 12% reduction of the pesticide dose. The established higher productivity of the mid-early growing determined the type tomato cvs. Jana during 1993 due to the favourable growing meteorological conditions.

The index of the plant productivity shown by the ratio between fruit number per plant and their weight had the same tendency (table 4). The values of this index from the variant 2 with weed control plus nitrogen fertilization (9.21) and variants 3 with individual application of Lactofol "O" (9.05) were higher than other variants with sequenced or mixed application of pesticides. The value of the index of the productivity during 1993 in variant 3,6,8 were higher than those from variants without the weed control and with the second control - including nitrogen application.

Tab. 4. The yield of tomato per ha and index of productivity

No	Total tomato yield t/ha						index of productivity			
	1993		1994		1995		mean	1993	1994	1995
1	88.15	g	50.07	c	44.97	bc	61.27	10.58	6.95	5.78
2	104.20	abc	54.35	bcd	54.30	a	70.95	12.17	7.62	9.21
3	106.44	a	54.85	cde	54.39	a	71.89	13.26	7.44	9.05
4	105.30	ab	60.12	abc	45.85	bc	70.42	11.99	8.74	6.96
5	94.02	ef	59.90	abcd	53.42	a	69.11	11.93	9.01	8.98
6	99.36	bcd	57.50	bcd	50.50	ab	69.12	13.26	7.7	7.79
7	99.46	bcd	59.30	abcd	50.82	ab	69.86	12.37	8.13	8.18
8	99.71	bcde	58.67	abcd	50.66	ab	69.68	13.05	8.27	8.50
9	92.88	fg	58.57	abcd	41.55	c	64.33	11.69	8.40	6.17
10	100.01	bcd	64.00	a	50.67	ab	71.56	11.48	8.87	7.42

Tab. 5. The effect of treatments on the pollen fertility and fruit morphology

No	pollen fertility		fruit morphology				
	%	weight (g)	index	size of fruit top (mm)	pericarp thickness (mm)	unfavourable tissues (mm)	Locules No
1	65.19	105.8	0.977	10.04	6.80	10.90	5.50
2	98.22	105.2	0.996	11.20	7.0	10.80	5.25
3	81.20	117.6	0.939	10.30	7.30	11.45	5.35
4	87.65	107.9	0.913	10.60	6.15	10.05	5.05
5	79.45	103.4	0.948	10.95	7.70	10.90	5.65
6	77.97	105.7	0.960	11.50	7.35	9.79	5.30
7	83.85	112.1	0.991	9.70	7.65	9.85	6.10
8	82.17	109.9	0.948	10.60	7.45	10.25	5.60
9	93.62	107.5	0.924	10.50	7.65	9.70	5.00
10	87.21	117.5	0.919	11.35	8.40	10.95	5.20

The pollen fertility and average fruit weight were positively affected with an individual, mixed and partial application of Lactofol "O" (table 5). The fruit shape was determined as the fruit index D1:D2 and the size of fruit top did not change by the treatments. The pericarp thickness of tomato fruits differed slightly and it determined the transport ability of the tomato fruits. These treatments did not increase the depth of the unfavourable tissue in the fruits and did not affect the locules number.

In the results of the balanced plant nutrition with macro and micro elements which the suspension fertiliser Lactofol "O" consists of, vigorous plant growth and healthy plants are promoted (Velev, 1993, 1994). The quantity and quality of tomato fruits increased after the mixed application of the suspension leaf fertilizer with pesticides. The yield from the consecutive application of pesticides with optimal doses (var 5) was equal to that from the variants with mixed application of Lactofol with 25% decreased pesticide doses (var 8).

The best vegetative growth and big tomato fruits weight caused higher index of the plant productivity (Valchev, 1993) and obtaining of standard yield when the foliar fertilizer Lactofol was mixed with pesticides. The higher

percentage of the pollen fertility and the vigorous plants positively affected the morphological characteristics of the tomato fruits and their best quality-average weight, fruit index, the size of the fruit tops, pericarp thickens, depth of the unfavourable tissue in the fruit and the locules number.

The mixing of Lactofol "O" and pesticide is possible without decreasing the weed and pest control effect. This practice also does not decrease the plant productivity. The experiment showed that pesticide doses can be decreased from 12.5 to 25% in this way and mineral nitrogen fertilization can be excluded. The soil preplanting herbicide can be eliminated.

Conclusion

In mid-early tomato growing, the mixed foliar dressing of Lactofol "O" with decreased pesticide doses (25%) (sencor, fusilade, cuprocin, ditan-M 45 and karate) caused positive weed control, insect and disease control with lower phototoxicity level. By separate or mixed application of Lactofol "O" (L."O"), the pollen fertility was increased. L. "O" application, in sequences and especially with decreased pesticide doses, the yield increased by 12.8-16.8%. The results showed that by foliar dressing the use of soil herbicides can be eliminated, and the nitrogen fertilizing dose can be decreased by 50 percent.

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EKOLOŠKI SISTEM ZAJEDNIČKE PRIMENE LAKTOFOLA "O" I PESTICIDA KOD PARADAJZA

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Rezime

Kod srednje-ranog gajenja paradajza, zajednička folijarna primena Laktofola "O" i smanjenih doza pesticida (25%) (senkor, fusilad, kuprikon, ditan-M45 i karate) pozitivno je uticala na suzbijanje korova, kao i na suzbijanje insekata i bolesti sa manjim nivoom fototoksičnosti. Primenom čistog ili mešanog Laktofola "O" (L. "O") povećana je plodnost polena. Postepeno i naročito primenom Laktofola "O" sa smanjenim dozama pesticida, prinos je uvećan za 12,8-16,8%. Rezultati su pokazali da se folijarnom primenom može eliminisati upotreba zemljišnih herbicida, a doza azotofiksatora se može smanjiti za 50%.