THE RESULTS CONCERNING THE INFLUENCE OF VARIETY AND THE MEASURES TO FIGHT AGAINST PESTS ON THE TOTAL YIELD OF WHITE CABBAGE (PART I)

REZULTATE PRIVIND INFLUENŢA CULTIVARULUI ŞI A MĂSURILOR DE COMBATERE A DĂUNĂTORILOR ASUPRA PRODUCŢIEI TOTALE LA VARZA ALBĂ (PARTEA I)

STOLERU V., MUNTEANU N., STOLERU Carmen-Maria, STAN T.
University of Agricultural Sciences and Veterinary Medicine Iasi, Romania

Abstract. *The cabbage crop is always under the incidence of a multitude of harmful organisms (weeds, diseases, pests) that can totally or partially affect the crop. Among these organisms, the pests are the ones that could generate the most important damages to the ecological crop of cabbage. The experiments that were made in the 2006 – 2008 period revealed that, no matter the crop system used, the pests that made the most important damages to the cabbage crop were: the cabbage flea beetle (Phyllotetra sp.), the cabbage fly (Delia brassicae), the cabbage moth (Mamestra brassicae) and the cabbage white fly (Pieris brassicae). Because of the fighting measures and means that are used, the cabbage white fly can be easily controlled using the same measures and means that are used for the cabbage moth.*
Key words: control pests, white cabbage, ecological system

Rezumat. *Cultura verzei se află sub permanenta incidenţă a unui complex de organisme dăunătoare (buruieni, boli, dăunători) ce pot afecta parţial sau uneori total cultura. Dintre aceste organisme dăunătorii pot produce cele mai mari pagube culturilor ecologice de varză. Din experienţele efectuate în perioada 2006 – 2008 dăunătorii care au produs cel mai ridicat grad de atac culturilor de varză, indiferent de sistemul de cultură au fost: puricii verzei, musca verzei, buha verzei şi fluturele alb al verzei. Datorită măsurilor şi mijloacelor de combatere folosite, fluturele alb al verzei poate fi controlat uşor prin aceleaşi măsuri şi mijloace utilizate pentru buha verzei.*
Cuvinte cheie: controlul dăunătorilor, varză albă, sistem ecologic

MATERIAL AND THE METHOD

The purpose of the experiences that were done was to study the influence of variety x pest fighting measures on the total production of white cabbage, that was obtained using an ecological system. To this end, there were done a series of experiences that had the following graduations: factor A – the variety; factor B – pest fighting measures.

In accordance with the scientific literature, the official list of varieties, and the common practices of harvesting for the North-East cropping region, the biological material consisted of: - the early crop: a_1-Timpurie de Vidra, a_2- Ditmark; a_3 - Golden Acre, a_4 - K001 F1; - the summer crop: a_1- Gloria; a_2 - Copenhagen Market; - the autumn crop: a_1- De Buzău; a_2-Braunschweing; a_3- Licurişcă (Lares).

For the three cropping systems, there was used the following graduation for the pest

fighting measures:

- the early crop: b_1-Neemazal T/S – 0.4% ; b_2 – the covering system ; b_3 - Neemazal T/S – 0.4% + Potassium soap 2%;
- the summer crop: b_1-Neemazal T/S – 0.4% + 1x*Trichogramma evanescens* (120,000); b_2 –the covering system + Neemazal T/S – 0.4% + *1xTrichogramma evanescens* (120,000); b_3 - Neemazal T/S – 0.4% + Potassium soap 2% + 1xTrichogramma evanescens (120,000) .
- the autumn crop: b_1 - Neemazal T/S – 0.5% ; b_2 - Dipel – 0.15%; b_3 - *Trichogramma evanescens* x 3 applications x 120,000 ex./ha.

The damages done by the cabbage crop pests were estimated by assessing the degree of attack that was done in the three crop systems. This was determined for each variety that was used and for the most important pests that make economical damages to cabbage crop in Iasi county.

The experimental field crops were managed in accordance to technological norms from the scientific literature (1, 4, 6).

Each year in autumn, the ground was fertilized using 25 t/ha of chicken compost well fermented, which was ploughed at 28-30 cm depth (2).

The harvesting was manually done, at the optimal moment of maturity for being consumed, starting with June 10 for early crop, continuing with August 2 for summer crop and September 16 for the autumn crop. There were done observations and biometrical determinations for experimental data collection, in accordance with experimental technically norms applied at polyfactorial experiments for cabbage crop. The experimental versions were compared to the mean of the experiment, using percentages and differences. The influence of experimental factors was estimated through the analysis of variance, using Fisher test (5). The significance of the differences was assessed on the basis of limited differences for three degrees of confidence (95%, 99%, 99.9%), using the student test (3).

RESULTS AND DISCUSSIONS

The degree of attack of the cabbage flea on the early crop had values between 0.8 at the K001 F1 hybrid, where the covering system (Agril) was applied, and 1.7 % at the Ditmark variety, where Neemazal T/S – 0.4% product was applied in the head binding phenophasis. The results shown in the table confirm the interpretation of the analysis of variance, through significant differences and distinct significant differences between the different factor combinations (table 1).

Concerning the degree of attack of the cabbage fly on the early crop, this had values between 7.8% at K001 F1 hybrid, where there was used a covering system (Agril) and 14.5% at the same variety, where Neemazal T/S – 0.4% product + Potassium Soap 2% were used in the head binding phenophasis .

The degree of attack of the cabbage moth was determined at larval stage in the harvesting phenophasis of the early crop and had values between 0.3% at K001 F1, Timpurie de Vidra and Ditmark varieties, where the covering system (Agril) was used, and 0.6% at Ditmark and Golden Acre varieties, where Neemazal T/S – 0.4% product was used (table 2).

Concerning the total production, this varied from 22.07 t/ha for the Ditmark variety, where Neemazal T/S – 0.4% was used in order to fight the complex of

pests, to 32.57 t/ha for the K001 variety, when covering (Agril) system was used as a protection measure. The production differences compared to the mean of the experiment varied from –4.69 t/ha (Ditmark x Neemazal T/S – 0.4%) to 5.81t/ha (K001 x covering system -Agril).

Table 1

The analysis of variance for the interaction of the factors variety x pest fighting measures, for early cabbage crop cultivated on ecological system

The cause of the variance	SP	GL	S^2
Total	364.2689	35	
Repetitions	0.793889	2	
Variety (A)	-12795.3	2	-6397.67
Fertilizer type (B)	8641.111	3	2880.37
Interaction AxB	4509.204	6	751.534
Error	8.499444	22	0.386338

The damages done by pests to the summer cabbage crops were estimated through the degree of attack done by cabbage fleas and moths.

The results from the table confirm the interpretation of the analysis of variance through distinct significant differences between the different factor combinations (table 3).

The degree of attack of the cabbage fleas on summer cabbage crops had values between 7.2 % at Copenhagen Market hybrid, where covering system (Agril) was used, and 13.7 % at Gloria variety, where Neemazal T/S – 0.4% product was used in rosette phenophasis (table 4).

The degree of attack of the cabbage moth was determined in larval stage in the rosette and binding phenophases. The degree of attack in the rosette phenophasis had values between 6.8 % at Copenhagen Market variety, where covering system + Neemazal T/S – 0.4% + 1 application x *Trichogramma evanescens* (120,000 ex./ha) were used, and 12.3% at Gloria variety, where Neemazal T/S – 0.4% + 1 application x *Trichogramma evanescens* (120,000 ex./ha) were used. The degree of attack in the head binding phenophasis had values between 8.7% at Copenhagen Market variety, where covering system + Neemazal T/S – 0.4% + 1 application x *Trichogramma evanescens* (120,000 ex./ha) were used, and 15.1% at Gloria variety, where Neemazal T/S – 0.4% + Potassium soap 2% + 1 application x *Trichogramma evanescens* (120,000 ex./ha) were used.

The total production varied from 32.13 t/ha at Gloria variety, when Neemazal T/S – 0.4% + 1 application x *Trichogramma evanescens* (120,000 ex./ha) were used to fight the complex of pests, to 37.83 t/ha at Copenhagen Market variety when we used the covering system as a protection measure + Neemazal T/S – 0.4% + 1 application x *Trichogramma evanescens* (120,000 ex./ha).

Table 2

The influence of pest fighting measures on total production (2006-2008) of early cabbage cultivated on ecological system

Nr crt	Variant	Pheno-phasis	Damages done by cabbage flea			Damages done by cabbage fly			Damages done by cabbage moth			Total production			
			Adult /pl.	GA %	sig. dif.	Larvae /pl.	GA %	sig. dif.	Larvae /pl.	GA %	sig. dif.	t/ha	% to mean	dif. t/ha	sig. dif.
1	a_1b_1	binding	55,2	1,5	xxx	6-7	8,5	ooo	-	-	-	23,97	89,57	-2.79	ooo
	a_1b_1	harvest	-	-	-	-	-	-	2-3	0,5	-				
2	a_1b_2	binding	25,1	1,1	ooo	5-6	8,9	ooo	-	-	-	26,07	97.42	-0.69	-
	a_1b_2	harvest	-	-	-	-	-	-	1-2	0,3	-				
3	a_1b_3	binding	39,4	1,3	-	7-8	10,2	-	-	-	-	25,23	94.28	-1.53	o
	a_1b_3	harvest	-	-	-	-	-	-	1-2	0,4	-				
4	a_2b_1	binding	57,1	1,7	xxx	7-8	13,2	xxx	-	-	-	22,07	82.47	-4.69	ooo
	a_2b_1	harvest	-	-	-	-	-	-	1-2	0,6	x				
5	a_2b_2	binding	27,1	1,2	-	5-6	8,6	ooo	-	-	-	24,57	91.81	-2.19	oo
	a_2b_2	harvest	-	-	-	-	-	-	1-2	0,3	-				
6	a_2b_3	binding	36,4	1,4	-	6-7	9,4	ooo	-	-	-	23,33	87.18	-3.43	ooo
	a_2b_3	harvest	-	-	-	-	-	-	2-3	0,4	-				
7	a_3b_1	binding	41,9	1,3	-	10-11	14,2	xxx	-	-	-	26,00	97.16	-0.76	-
	a_3b_1	harvest	-	-	-	-	-	-	2-3	0,6	x				
8	a_3b_2	binding	20,1	1,1	ooo	5-6	6,9	ooo	-	-	-	29,00	108.37	2.24	xx
	a_3b_2	harvest	-	-	-	-	-	-	1-2	0,4	-				
9	a_3b_3	binding	28,6	1,3	-	8-9	10,3	-	-	-	-	27,10	101.27	0.34	-
	a_3b_3	harvest	-	-	-	-	-	-	1-2	0,5	-				
10	a_4b_1	binding	36,7	1,2	-	8-9	12,4	xxx	-	-	-	30,10	112.48	3.34	xxx
	a_4b_1	harvest	-	-	-	-	-	-	1-2	0,4	-				

11	*a_4b_2*	*binding*	*21,6*	*0,8*	*ooo*	*6-7*	*7,8*	*ooo*	*-*	*-*	*-*	*32,57*	*121.71*	*5.81*	*xxx*
	a_4b_2	*harvest*	*-*	*-*	*-*	*-*	*-*	*-*	*1-2*	*0,3*	*-*				
12	*a_4b_3*	*binding*	*26,4*	*1,2*	*-*	*9-10*	*14,5*	*xxx*	*-*	*-*	*-*	*31,07*	*116.11*	*4.31*	*xxx*
	a_4b_3	*harvest*	*-*	*-*	*-*	*-*	*-*	*-*	*1-2*	*0,4*	*-*				
x	*Mean*	*binding*	*-*	*1,3*	*-*	*-*	*10,4*	*-*	*-*	*-*	*-*	*26,76*	*100*	*0*	*-*
	Mean	*harvest*	*-*	*-*	*-*	*-*	*-*	*-*	*-*	*0,4*	*-*				

Sig. dif. prod
DL5%=1,51 t/ha,
DL1%=2,05 t/ha,
DL0,1%=2,79 t/ha

Sig. dif. GA fleas
DL5%=0,11
DL1%=0,14
DL0,1%=0,19

Sig. dif. GA cabbage fly
DL5%=0,54
DL1%=0,73
DL0,1%=0,98

Sig. dif. GA cabbage moth
DL5%=0,19
DL1%=0,26
DL0,1%=0,36

Table 3

The analysis of variance for the interaction of the factors variety x pest fighting measures for summer cabbage crop cultivated on ecological system

The cause of the variance	SP	GL	S^2
Total	91.11778	17	
Repetitions	2.084444	2	
Variety (A)	72	1	72
Fertilizer type (B)	5.981111	2	2.990556
Interaction AxB	5.003333	2	2.501667
Error	6.048889	10	0.604889

Table 4

The influence of the pest fighting measures on the total yield (2006-2008) of summer cabbage cultivated on ecological system

Nr. crt.	Variant	Pheno-phasis	Damages done by cabbage fleas			Damages done by cabbage moth			Total production			
			adults /pl	GA %	sig. dif.	adults /pl	GA %	sig. dif.	t/ha	% to mean	dif. (t/ha)	sig. dif.
1	a_1b_1	rozetă	10-15	13,7	xxx	4-5	12,3	xx	32,13	91.51	-2.98	ooo
	a_1b_1	legare	-	-	-	4-5	13,7	xx				
2	a_1b_2	rozetă	5-10	8,9	o	1-2	8,9	-	34,00	96.84	-1.11	-
	a_1b_2	legare	-	-	-	3-4	11,2	-				
3	a_1b_3	rozetă	10-15	12,8	xxx	2-3	11,6	x	33,20	94.56	-1.91	o
	a_1b_3	legare	-	-	-	4-5	12,6	-				
4	a_2b_1	rozetă	5-10	10,4	-	3-4	9,6	-	37,50	106.80	2.39	xx
	a_2b_1	legare	-	-	-	4-5	10,1	oo				
5	a_2b_2	rozetă	4-8	7,2	ooo	1-2	6,8	ooo	37,83	107.75	2.72	xx
	a_2b_2	legare	-	-	-	3-4	8,7	ooo				
6	a_2b_3	rozetă	8-10	9,1	o	2-3	10,4	-	36,00	102.54	0.89	-
	a_2b_3	legare	-	-	-	4-5	15,1	xxx				
x	Media	rozetă	-	10,35	-	-	9,93	-	35,11	100	0	-
	Media	legare	-	-	-	-	11,9	-				

Sig. dif. prod
L5%=1,42 t/ha,
DL1%=2,01 t/ha,
DL0,1%=2,91 t/ha

Sig. dif. GA fleas
DL5%=1,19 t/ha
DL1%=1,69 t/ha
DL0,1%=2,45 t/ha

Sig. dif. GA cabbage moth (R)
DL5%=1,24 t/ha
DL1%=1,76 t/ha
DL0,1%=2,55 t/ha

Sig. dif. GA cabbage moth (L)
DL5%=0,95 t/ha
DL1%=1,36 t/ha
DL0,1%=1,96 t/ha