

**THE MODE OF ACTIONS OF THE MODIFIED  
ATMOSPHERES AND THEIR EFFICACY ON THE  
SUSCEPTIBILITY OF EGGS AND LARVAE OF  
RICE MOTH, *CORCYRA CEPHALONICA*  
(STANTON) (LEPIDOPTERA: PYRALIDAE)**

**By**

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**B.Sc. Agric. Sci. (Economic Entomology), Fac. Agric., Cairo Univ., 2003**

**M.Sc. Agric. Sci. (Economic Entomology), Fac. Agric., Cairo Univ., 2011**

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#### ABSTRACT

The rice moth *Corcyra cephalonica* attacks stored products in the tropics and subtropics. The biological parameters of reared *C. cephalonica* on semi artificial diet at  $30\pm 2^{\circ}\text{C}$  and  $65\pm 5\%$  R.H. were estimated. Eggs hatchability was 96% after incubation period ranged between 4-5 days. Identified larval instars were six with durations 4.16, 3.15, 3.02, 3.56, 3.57 and 5.99 days from 1<sup>st</sup> to 6<sup>th</sup>, respectively.

The susceptibility of newly laid eggs and larval instar (2<sup>nd</sup>, 4<sup>th</sup> and 6<sup>th</sup>) to modified atmospheres (MAs) containing 20%, 40%, 60% and 80% CO<sub>2</sub> or 97%, 98% and 99% N<sub>2</sub> (99% N<sub>2</sub> against 6<sup>th</sup> instar larvae only) was evaluated at 25, 30 and 35°C.

Hatchability and corrected mortality percentages of larvae were correlated positively with MAs concentration, temperature and exposure period. The MAs containing N<sub>2</sub> were more effective on eggs hatchability than MAs containing CO<sub>2</sub> specially at 35°C.

The 2<sup>nd</sup> instar larvae were more sensitive than the older instars at high temperature up to 30°C. Calculated LT<sub>95</sub> of treated 2<sup>nd</sup> instar larvae with 80% CO<sub>2</sub> was 8.3 h at 25°C decreased to 2.2 h at 35°C, while it was 15.2 and 86.3 h decreased to 8.3 and 59.6 h at treated 4<sup>th</sup> and 6<sup>th</sup> instars, respectively under the same conditions. The MAs treatments containing N<sub>2</sub> resulted shorter time to reach LT<sub>95</sub> especially at 98% and 35°C of treated 2<sup>nd</sup> and 4<sup>th</sup> instars recoding 7.9 and 82.8 h, respectively also for 6<sup>th</sup> instar treatment, increase the concentration from 98% to 99% N<sub>2</sub> decreased LT<sub>95</sub> from 102.9 h to 15.9 h at the same temperature.

Some physiological aspects (respiration rate and biochemical changes) of treated 6<sup>th</sup> instar larvae with LT<sub>50</sub> values of 60% CO<sub>2</sub> (39.3 h) or 98% N<sub>2</sub> (87.5 h) were evaluated comparing with untreated larvae to determine the mode of action of MAs.

Respiration quotient of treated 6<sup>th</sup> instar larvae with CO<sub>2</sub> and N<sub>2</sub> at LT<sub>50</sub> was 0.85 and 0.72, respectively, while it was 1.0 for untreated larvae.

Activity of Lactic dehydrogenase, Acid phosphatase, Phenoloxidase and Trehalase of treated larvae with 60% CO<sub>2</sub> or 98% N<sub>2</sub> was decreased in contrast with Malate dehydrogenase and Acetylcholine esterase activity which increased when compared with untreated larvae. Succinate dehydrogenase activity was increased with N<sub>2</sub> treatment and decreased at CO<sub>2</sub> treatment. Total proteins in the opposite of Triglycerides were decreased at both treatments, while Calcium ions were decreased at CO<sub>2</sub> and increased at N<sub>2</sub> treatments in comparison with control.

**Key words:** *Corcyra cephalonica*, Biology, Modified atmospheres, Mode of action

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## LIST OF ABBREVIATIONS

Abbreviations	Definition
MA <sub>s</sub>	Modified Atmospheres
MA <sub>1</sub>	20% CO <sub>2</sub> , 16% O <sub>2</sub> and 64% N <sub>2</sub>
MA <sub>2</sub>	40% CO <sub>2</sub> , 12% O <sub>2</sub> and 48% N <sub>2</sub>
MA <sub>3</sub>	60% CO <sub>2</sub> , 8% O <sub>2</sub> and 32% N <sub>2</sub>
MA <sub>4</sub>	80% CO <sub>2</sub> , 4% O <sub>2</sub> and 16% N <sub>2</sub>
MA <sub>5</sub>	97% N <sub>2</sub> and 3% O <sub>2</sub>
MA <sub>6</sub>	98% N <sub>2</sub> and 2% O <sub>2</sub>
MA <sub>7</sub>	99% N <sub>2</sub> and 1% O <sub>2</sub>
RQ	Respiration quotient (VCO <sub>2</sub> produced / VO <sub>2</sub> consumed)
Hypoxia	Modified atmosphere with low O <sub>2</sub>
Hypercarbia	Modified atmosphere with high CO <sub>2</sub>

# CONTENTS

	Page
<b>INTRODUCTION</b> .....	1
<b>REVIEW OF LITERATURE</b> .....	5
<b>1. Biological aspects of <i>Corcyra cephalonica</i></b> .....	5
<b>2. Effect of modified atmospheres on stored products insect pests</b> .....	7
<b>3. Effect of modified atmospheres on respiration and metabolism</b> .....	14
<b>4. Effect of modified atmospheres on physiological aspects of stored product insect pests</b> .....	16
<b>MATERIALS AND METHODS</b> .....	19
<b>1. Insect culture</b> .....	19
<b>2. The insect Biology</b> .....	20
<b>3. Modified atmospheres experiments</b> .....	21
a. Preparation of gas treatments.....	22
b. Tested MAs containing different concentrations of CO <sub>2</sub> and/or N <sub>2</sub> .....	23
c. Exposure periods.....	23
d. Treatments.....	23
<b>4. Mode of actions of the modified atmospheres</b> .....	25
a. Respiration experiments.....	25
b. Biochemical experiments .....	26
<b>5. Statistical analyses</b> .....	33
<b>RESULTS</b> .....	35
<b>1. Biological aspects of the Rice moth, <i>Corcyra cephalonica</i></b> .....	35
<b>2. Effect of modified atmospheres (MAs) enriched with CO<sub>2</sub> or N<sub>2</sub> on eggs and three larval instars of <i>C. cephalonica</i> at three different temperatures</b> .....	40
a. Effect of MAs on eggs .....	40
b. Effect of MAs on the second instar larvae.....	56

<b>CONTENTS (continued)</b>	<b>Page</b>
c. Effect of MAs on fourth instar larvae.....	71
d. Effect of MAs on the sixth instar larvae.....	86
<b>3. Mode of action of modified atmospheres enriched with CO<sub>2</sub> (MA<sub>3</sub>) or N<sub>2</sub> (MA<sub>6</sub>) on <i>C. cephalonica</i> larvae.....</b>	<b>103</b>
a. Effect of tested MAs on the respiration rates of 6 <sup>th</sup> larval instar .....	103
b. Effect of tested MAs on some enzymes activity of 6 <sup>th</sup> larval instar .....	106
c. Effect of tested MAs on total protein, triglycerides and the amount of calcium on 6 <sup>th</sup> larval instar .....	110
<b>DISCUSSION.....</b>	<b>113</b>
<b>1. Biological aspects of the Rice moth, <i>Corcyra cephalonica</i>.....</b>	<b>113</b>
<b>2. Effect of modified atmospheres (MAs) enriched with CO<sub>2</sub> or N<sub>2</sub> on eggs and three larval instars of <i>C. cephalonica</i> at three different temperatures.....</b>	<b>114</b>
a. Effect of MAs on eggs.....	114
b. Effect of MAs on 2 <sup>nd</sup> , 4 <sup>th</sup> and 6 <sup>th</sup> larval instars.....	116
<b>3. Mode of action of modified atmospheres (MAs) enriched with CO<sub>2</sub> (MA<sub>3</sub>) or N<sub>2</sub> (MA<sub>6</sub>) on <i>C. cephalonica</i> larvae.....</b>	<b>120</b>
a. Effect of tested MAs on the respiration rates of 6 <sup>th</sup> larval instar .....	120
b. Effect of tested MAs on the activity of some enzymes of 6 <sup>th</sup> larval instar .....	122
c. Effect of tested MAs on total protein, triglycerides and calcium ions of 6 <sup>th</sup> larval instar .....	130
<b>SUMMARY.....</b>	<b>133</b>
<b>REFERENCES .....</b>	<b>143</b>
<b>APPENDIX.....</b>	<b>157</b>
<b>ARABIC SUMMARY.....</b>	



## LIST OF TABLES

No.	Title	Page
1.	Incubation period and hatchability percentage of <i>C. cephalonica</i> eggs.....	35
2.	Head capsule measurement and duration of <i>C. cephalonica</i> larval instars .....	36
3.	Pupation percentage and pupal duration of <i>C. cephalonica</i> .....	38
4.	Some biological parameters of <i>C. cephalonica</i> adults.....	39
5.	Three way ANOVA parameters for main effects and interactions for egg hatch of <i>C. cephalonica</i> exposed to modified atmospheres containing CO <sub>2</sub> .....	40
6.	Hatchability percentages (Mean±SE) of <i>C. cephalonica</i> eggs exposed to modified atmospheres containing different concentrations of CO <sub>2</sub> combined with several exposure periods at 25°C.....	41
7.	Hatchability percentages (Mean±SE) of <i>C. cephalonica</i> eggs exposed to modified atmospheres containing different concentrations of CO <sub>2</sub> combined with several exposure periods at 30°C.....	43
8.	Hatchability percentages (Mean±SE) of <i>C. cephalonica</i> eggs exposed to modified atmospheres containing different concentrations of CO <sub>2</sub> combined with several exposure periods at 35°C.....	44
9.	LT <sub>50</sub> and LT <sub>95</sub> values, together with their confidence limits, for <i>C. cephalonica</i> eggs exposed to modified atmospheres containing different concentrations of CO <sub>2</sub> combined with several exposure periods at 25, 30 and 35°C.....	46

<b>No.</b>	<b>Title</b>	<b>Page</b>
10.	Three way ANOVA parameters for main effects and interactions for egg hatch of <i>C. cephalonica</i> exposed to modified atmospheres containing more N <sub>2</sub> .....	49
11.	Hatchability percentages (Mean±SE) of <i>C. cephalonica</i> eggs exposed to modified atmospheres containing two concentrations of N <sub>2</sub> combined with different exposure periods at 25°C.....	50
12.	Hatchability percentages (Mean±SE) of <i>C. cephalonica</i> eggs exposed to modified atmospheres containing two concentrations of N <sub>2</sub> combined with different exposure periods at 30°C.....	51
13.	Hatchability percentages (Mean±SE) of <i>C. cephalonica</i> eggs exposed to modified atmospheres containing two concentrations of N <sub>2</sub> combined with different exposure periods at 35°C.....	52
14.	LT <sub>50</sub> and LT <sub>95</sub> values, together with their confidence limits, for <i>C. cephalonica</i> eggs exposed to modified atmospheres containing two concentrations of N <sub>2</sub> combined with several exposure periods at 25, 30 and 35°C .....	53
15.	Three way ANOVA parameters for main effects and interactions for 2 <sup>nd</sup> instar larvae of <i>C. cephalonica</i> exposed to modified atmospheres containing CO <sub>2</sub> .....	56
16.	Mortality percentages (Mean±SE) of the second larval instar of <i>C. cephalonica</i> exposed to four MAs containing CO <sub>2</sub> combined with different exposure periods at 25°C. ....	57
17.	Mortality percentages (Mean±SE) of the second larval instar of <i>C. cephalonica</i> exposed to four MAs containing CO <sub>2</sub> combined with different exposure periods at 30°C.....	58

<b>No.</b>	<b>Title</b>	<b>Page</b>
18.	Mortality percentages (Mean±SE) of the second larval instar of <i>C. cephalonica</i> exposed to four MAs containing CO <sub>2</sub> combined with different exposure periods at 35°C.....	59
19.	LT <sub>50</sub> and LT <sub>95</sub> values of the second larval instars of <i>C. cephalonica</i> exposed to four MAs containing CO <sub>2</sub> at 25, 30 and 35°C.....	61
20.	Three way ANOVA parameters for main effects and interactions for 2 <sup>nd</sup> instar larvae of <i>C. cephalonica</i> exposed to modified atmospheres containing more N <sub>2</sub> .....	64
21.	Mortality percentages (Mean±SE) of the second larval instar of <i>C. cephalonica</i> exposed to MAs containing two concentrations of N <sub>2</sub> combined with different exposure periods at 25°C.....	65
22.	Mortality percentages (Mean±SE) of the second larval instar of <i>C. cephalonica</i> exposed to MAs containing two concentrations of N <sub>2</sub> combined with different exposure periods at 30°C. ....	66
23.	Mortality percentages (Mean±SE) of the second larval instar of <i>C. cephalonica</i> exposed to MAs containing two concentrations of N <sub>2</sub> combined with different exposure periods at 35°C.....	67
24.	LT <sub>50</sub> and LT <sub>95</sub> values of the second larval instars of <i>C. cephalonica</i> exposed to MAs containing two concentrations of N <sub>2</sub> at 25, 30 and 35°C.....	68
25.	Three way ANOVA parameters for main effects and interactions for 4 <sup>th</sup> instar larvae of <i>C. cephalonica</i> exposed to modified atmospheres containing CO <sub>2</sub> .....	71

<b>No.</b>	<b>Title</b>	<b>Page</b>
26.	Mortality percentages (Mean±SE.) of the fourth larval instar of <i>C. cephalonica</i> exposed to four MAs containing CO <sub>2</sub> combined with different exposure periods at 25°C.....	72
27.	Mortality percentages (Mean±SE.) of the fourth larval instar of <i>C. cephalonica</i> exposed to four MAs containing CO <sub>2</sub> combined with different exposure periods at 30°C.....	73
28.	Mortality percentages (Mean±SE.) of the fourth larval instar of <i>C. cephalonica</i> exposed to four MAs containing CO <sub>2</sub> combined with different exposure periods at 35°C.....	74
29.	LT <sub>50</sub> and LT <sub>95</sub> values of the fourth larval instars of <i>C. cephalonica</i> exposed to four MAs containing CO <sub>2</sub> at 25, 30 and 35°C.....	76
30.	Three way ANOVA parameters for main effects and interactions for 4 <sup>th</sup> instar larvae of <i>C. cephalonica</i> exposed to modified atmospheres containing more N <sub>2</sub> .....	79
31.	Mortality percentages (Mean±SE.) of the fourth larval instar of <i>C. cephalonica</i> exposed to MAs containing two concentrations of N <sub>2</sub> combined with different exposure periods at 25°C.....	80
32.	Mortality percentages (Mean±SE.) of the fourth larval instar of <i>C. cephalonica</i> exposed to MAs containing two concentrations of N <sub>2</sub> combined with different exposure periods at 30°C.....	81
33.	Mortality percentages (Mean±SE.) of the fourth larval instar of <i>C. cephalonica</i> exposed to MAs containing two concentrations of N <sub>2</sub> combined with different exposure periods at 35°C.....	81
34.	LT <sub>50</sub> and LT <sub>95</sub> values of the fourth larval instar of <i>C. cephalonica</i> exposed to MAs containing two concentrations of N <sub>2</sub> at 25, 30 and 35°C.....	83

<b>No.</b>	<b>Title</b>	<b>Page</b>
35.	Three way ANOVA parameters for main effects and interactions for 6 <sup>th</sup> instar larvae of <i>C. cephalonica</i> exposed to modified atmospheres containing CO <sub>2</sub> .....	86
36.	Mortality percentages (Mean±SE.) of the sixth larval instar of <i>C. cephalonica</i> exposed to four MAs containing CO <sub>2</sub> combined with different exposure periods at 25°C.....	87
37.	Mortality percentages (Mean±SE.) of the sixth larval instar of <i>C. cephalonica</i> exposed to four MAs containing CO <sub>2</sub> combined with different exposure periods at 30°C.....	88
38.	Mortality percentages (Mean±SE.) of the sixth larval instar of <i>C. cephalonica</i> exposed to four MAs containing CO <sub>2</sub> combined with different exposure periods at 35°C.....	89
39.	LT <sub>50</sub> and LT <sub>95</sub> values of the sixth larval instar of <i>C. cephalonica</i> exposed to four MAs containing CO <sub>2</sub> at 25, 30 and 35°C.....	91
40	Three way ANOVA parameters for main effects and interactions for 6 <sup>th</sup> instar larvae of <i>C. cephalonica</i> exposed to modified atmospheres containing more N <sub>2</sub> .....	94
41	Mortality percentages (Mean±SE.) of the sixth larval instar of <i>C. cephalonica</i> exposed to MAs containing three N <sub>2</sub> concentrations combined with different exposure periods at 25°C .....	95
42	Mortality percentages (Mean±SE.) of the sixth larval instar of <i>C. cephalonica</i> exposed to MAs containing three N <sub>2</sub> concentrations combined with different exposure periods at 30°C.....	97

<b>No.</b>	<b>Title</b>	<b>Page</b>
43	Mortality percentages (Mean±SE.) of the sixth larval instar of <i>C. cephalonica</i> exposed to MAs containing three N <sub>2</sub> concentrations combined with different exposure periods at 35°C.....	98
44	LT <sub>50</sub> and LT <sub>95</sub> values of the sixth larval instars of <i>C. cephalonica</i> exposed to MAs containing three N <sub>2</sub> concentrations at 25, 30 and 35°C.....	100
45	Metabolic rate (VO <sub>2</sub> and VCO <sub>2</sub> ) and respiration quotients (RQ) of the 6 <sup>th</sup> last instar larvae of <i>C. cephalonica</i> exposed to LT <sub>50</sub> of 60% CO <sub>2</sub> (39.3 h) or 98% N <sub>2</sub> (87.5 h)...	104
46	The necessary time to produce CO <sub>2</sub> curve to reach the peak (2000 ppm) during respiration measurement of the 6 <sup>th</sup> instar larvae of <i>C. cephalonica</i> exposed to LT <sub>50</sub> of 60% CO <sub>2</sub> (39.3 h) or 98% N <sub>2</sub> (87.5 h).....	104
47	The activity of some enzymes in 6 <sup>th</sup> instar <i>C. cephalonica</i> larvae exposed to LT <sub>50</sub> of MA <sub>3</sub> (39.3 h) or MA <sub>6</sub> (87.5 h)....	108
48	Total proteins, triglycerides and calcium in <i>C. cephalonica</i> larvae exposed to LT <sub>50</sub> of MA <sub>3</sub> (39.3 h) or MA <sub>6</sub> (87.5 h)....	110

## LIST OF FIGURES

No.	Title	Page
1.	The chimney glass cage.....	19
2.	Exposure chamber (Dreshel flask) .....	22
3.	Dreshel flask connected to the oxygen analyzer and CO <sub>2</sub> cylinder (a) or N <sub>2</sub> generator (b).....	22
4.	Q-Box RP1LP Low Range Respirometry Package (a) connected to animal chamber tube (b) .....	26
5.	Shape of <i>C. cephalonica</i> eggs.....	35
6.	Larval instars of <i>C. cephalonica</i> (0.65X) and their head-capsules width (10X). .....	37
7.	Pupa of <i>C. cephalonica</i> .....	38
8.	Adults female and male of <i>C. cephalonica</i> .....	39
9.	LT <sub>50</sub> (a) and LT <sub>95</sub> (b) values for eggs of <i>C. cephalonica</i> exposed to MAs containing different concentrations of CO <sub>2</sub> at 25, 30 and 35°C .....	47
10.	Toxicity lines for <i>C. cephalonica</i> eggs exposed to MAs containing different concentrations of CO <sub>2</sub> at 25, 30 and 35°C .....	48
11.	LT <sub>50</sub> (a) and LT <sub>95</sub> (b) values for <i>C. cephalonica</i> eggs exposed to MAs containing two concentrations of N <sub>2</sub> at 25, 30 and 35°C .....	54
12.	Toxicity lines for <i>C. cephalonica</i> eggs exposed to MAs containing two concentrations of N <sub>2</sub> at 25, 30 and 35°C .....	55