CONTENTS

and a second sec	Page
I-Introduction.	1
II-Review of Literature.	5
1-Efficacy of controlled atmospheres of various carbon	
dioxide concentrations on stored product pests.	5
2-Efficacy of controlled atmospheres of very high	
nitrogen content/or pure nitrogen on stored product	
pests.	33
3-Efficacy of phosphine on stored product pests.	36
4-Efficacy of combinations of phosphine and carbon	
dioxide against stored product pests.	62
III-Materials and Methods.	73
1-Insects.	73
2-Insect cultures.	73
3-Methods of obtaining the developmental stages of the	
various insect species.	77
4-Preparation of the test-insects for various treatments.	78
5-Gases used.	78
6-Exposure procedure of the insects inside the bins.	79
7-Purging of the gases inside the bin.	79
8-Determination of gas concentrations.	80
9-Bioassay tests.	81
10-Calculation of the joint action of the combined	220724
treatments.	82
11-Statistic analysis.	82
IV-Results and Discussion.	83
1-Efficacy of controlled atmospheres (CA) of certain	
carbon dioxide concentrations against the tested	
insect species at various grain temperature.	83
1.1.Efficacy of CA of 30 ± 5% CO ₂ at grain	1
temperature of $26 \pm 2^{\circ}$ C.	83

1.2 E'ffingers of CA co	Page
1.2. Efficacy of CA of 60 \pm 5% CO ₂ at grain temperature of 26 \pm 2°C.	
1.3. Efficacy of CA of 30 \pm 5% CO ₂ at grain	89
temperature of $15 \pm 2^{\circ}$ C.	
1.4. Efficacy of CA of $60 \pm 5\%$ CO ₂ at grain	94
temperature of $15 \pm 2^{\circ}$ C.	
1.5.Efficacy of CA of 80 \pm 5% CO ₂ at grain	100
temperature of $15 \pm 2^{\circ}$ C	105
2-Efficacy of controlled atmospheres (CA) of high	105
nitrogen content (99% N ₂) against the tested insect	
species.	110
2.1. Efficacy of CA of 99% N_2 at grain temperature of	110
20 ii 2 C.	110
2.2.Efficacy of CA of 99% N ₂ at grain temperature of	110
21 ± 2 €.	116
3-Efficacy of 100 ppm phosphine against the various	110
insect species at $26 \pm 2^{\circ}$ C, $55 \pm 5\%$ R. H. and	
varying exposure periods.	126
4-Efficacy and combined action of phosphine with	
carbon dioxide against the tested insect species at varying temperatures.	
4.1.Efficacy and combined action of 100 ppm PH ₃ with	131
$30 \pm 5\%$ CO ₂ at grain temperature of 26 ± 2 °C and	
varying exposure periods.	
4.2. Efficacy and combined action of 100 ppm PH ₃ with	131
$60 \pm 5\%$ CO ₂ at 14 ± 1 °C	
3. Efficacy and combined action of 100 ppm PH ₃ with	134
$00 \pm 3\%$ CO ₂ at $18 \pm 2\%$	W 0.000
.4. Efficacy and combined action of 100 ppm PH ₃ with	143
$00 \pm 3\% \text{ CO}_2$ at $20 \pm 1\%$	
.5. Efficacy and combined action of 100 ppm PH ₃ with	14.
$00 \pm 3\% \text{ CO}_2$ at $24 \pm 2\% \text{ C}$	1.4
.6. Efficacy and combined action of 100 ppm PH ₃ with	14:
$60 \pm 5\%$ CO ₂ at 26 ± 2 °C and	14
	1.4

	Page
4.7. Efficacy and combined action of 200 ppm PH ₃ v	with
$80 \pm 5\%$ CO ₂ at various grain temperatures	148
V-Conclusion.	165
Vl-Summary.	169
VII-References.	174
IX-Arabic Summary.	