



Yu Jing Zhu (Autor)

Efficiency of *Bacillus thuringiensis* with Abamectin on different agricultural pests and their natural enemies



RHEINISCHE FRIEDRICH-WILHELMUS-UNIVERSITÄT

**Efficiency of *Bacillus thuringiensis* with
Abamectin on different agricultural pests
and their natural enemies**

Yu Jing ZHU



Cuvillier Verlag Göttingen

<https://cuvillier.de/de/shop/publications/2373>

Copyright:

Cuvillier Verlag, Inhaberin Annette Jentzsch-Cuvillier, Nonnenstieg 8, 37075 Göttingen,
Germany

Telefon: +49 (0)551 54724-0, E-Mail: info@cuvillier.de, Website: <https://cuvillier.de>

<u>CONTENTS</u>	Page
1 INTRODUCTION.....	1
2 MATERIAL AND METHODS.....	3
2.1 Laboratory experiments.....	3
2.1.1 Rearing of arthropod pests and natural enemies.....	3
2.1.1.1 Arthropod pests.....	3
2.1.1.2 Natural enemies.....	4
2.1.2 Using biocides and insecticides.....	4
2.1.2.1 Preparation of biocide GCSC-BtA.....	4
2.1.2.2 Other insecticides.....	8
2.1.3 Characteristic of GCSC-BtA.....	8
2.1.3.1 Detection of GCSC-BtA bioconjugating process by using HPLC..	9
2.1.3.2 Qualitative analysis of GCSC-BtA characteristic by using HPLC..	9
2.1.4 Efficiency of GCSC-BtA on different agricultural arthropod pests and their natural enemies.....	9
2.1.4.1 Efficiency of GCSC-BtA against agricultural arthropod pests.....	10
2.1.4.2 Side-effect of GCSC-BtA on natural enemies.....	11
2.1.5 Mode of action of GCSC-BtA against agricultural arthropod pests.....	12
2.1.5.1 Insecticidal activity.....	13
2.1.5.1.1 Stomach toxicity.....	13
2.1.5.1.2 Contact toxicity.....	14
2.1.5.1.3 Systemic toxicity.....	15
2.1.5.1.4 Fumigant toxicity.....	15
2.1.5.2 Antifeedant effect.....	16
2.1.5.2.1 Feeding inhibition.....	17
2.1.5.2.2 Deterrency.....	17
2.1.5.3 Sublethal effect.....	17
2.1.6 Factors affecting the efficiency of GCSC-BtA.....	18
2.1.6.1 Arthropod species.....	19

2.1.6.2	Developmental stage.....	19
2.1.6.3	Temperature.....	19
2.1.6.4	Exposure time.....	20
2.1.6.5	Persistence.....	20
2.2	Field experiments.....	21
2.2.1	Efficacy of GCSC-BtA against pests and its side-effect on natural enemies in alfalfa pasture.....	21
2.2.2	Efficacy of GCSC-BtA against pests and its side-effect on natural enemies in tea garden.....	22
2.2.3	Efficacy of GCSC-BtA against pests and its side-effect on natural enemies in broccoli field.....	23
2.3	Statistical analysis.....	24
3	RESULTS.....	26
3.1	Laboratory experiments.....	26
3.1.1	Characteristic of GCSC-BtA.....	26
3.1.1.1	Detection of GCSC-BtA bioconjugating process by using HPLC..	26
3.1.1.1.1	Demonstration of formation of bioconjugation product	26
3.1.1.1.2	Distinguishing bioconjugation product from the reactants.....	27
3.1.1.1.3	Distinguishing bioconjugation product from two-reactant combinations.....	29
3.1.1.2	Qualitative analysis of GCSC-BtA characteristic by using HPLC...	30
3.1.2	Efficiency of GCSC-BtA on different agricultural arthropod pests and their natural enemies.....	32
3.1.2.1	Efficiency of GCSC-BtA against agricultural arthropod pests.....	32
3.1.2.2	Side-effect of GCSC-BtA on natural enemies.....	33
3.1.3	Mode of action of GCSC-BtA against agricultural arthropod pests.....	35
3.1.3.1	Insecticidal activity.....	35
3.1.3.1.1	Stomach toxicity.....	35
3.1.3.1.2	Contact toxicity.....	36

3.1.3.1.3	Systemic toxicity.....	37
3.1.3.1.4	Fumigant toxicity.....	37
3.1.3.2	Antifeedant effect.....	38
3.1.3.2.1	Feeding inhibition.....	38
3.1.3.2.2	Deterrency.....	38
3.1.3.3	Sublethal effect.....	39
3.1.4	Factors affecting the efficiency of GCSC-BtA.....	40
3.1.4.1	Arthropod species.....	41
3.1.4.2	Developmental stage.....	42
3.1.4.3	Temperature.....	43
3.1.4.4	Exposure time.....	44
3.1.4.5	Persistence.....	46
3.2	Field experiments.....	48
3.2.1	Efficacy of GCSC-BtA against pests and its side-effect on natural enemies in alfalfa pasture.....	48
3.2.1.1	Effect on pests.....	48
3.2.1.2	Effect on natural enemies.....	50
3.2.2	Efficacy of GCSC-BtA against pests and its side-effect on natural enemies in tea garden.....	51
3.2.2.1	Effect on pests.....	51
3.2.2.2	Effect on natural enemies.....	52
3.2.3	Efficacy of GCSC-BtA against pests and its side-effect on natural enemies in broccoli field.....	54
3.2.3.1	Effect on pests.....	54
3.2.3.2	Effect on natural enemies.....	55
4	DISCUSSION.....	57
SUMMARY.....		71
REFERENCES.....		74