

CONTENTS

CONTENTS.....	i
ABBREVIATIONS AND SYMBOLS.....	iv
1 INTRODUCTION.....	1
1.1 <i>Fusarium</i> head blight.....	1
1.2 <i>Barley yellow dwarf virus</i> (BYDV).....	8
2 MATERIAL AND METHODS.....	13
2.1 Plant material.....	13
2.2 BYDV vector and virus inoculation.....	13
2.3 Inoculum production of <i>Fusarium culmorum</i> and <i>F. graminearum</i> , inoculation of wheat heads and disease evaluation.....	15
2.4 Determination of thousand kernel weight (TKW).....	16
2.5 Analysis of ergosterol in grain.....	16
2.5.1 HPLC conditions.....	17
2.6 Analysis of trichothecene mycotoxins in grain.....	17
2.6.1 Solvolysis procedure I (SPI).....	19
2.6.2 Standard operating procedure (SOP).....	19
2.6.3 Solvolysis procedure IIa (SPIIa).....	20
2.6.3.1 Solvolysis procedure IIb (SPIIb).....	20
2.6.4 Cleanup.....	20
2.6.5 GC/ECD.....	21
2.6.5.1 GC/MS.....	21
2.6.6 Apparatus.....	22
2.6.7 Reagents.....	22
2.7 Quantification of phenolic compounds.....	23
2.7.1 Free phenolic compounds.....	23
2.7.2 Wall-bound esterified phenolic compounds.....	23
2.7.3 HPLC conditions.....	24
2.7.4 Quantification of lignin.....	24
2.8 Determination of pigments.....	25
2.9 Translocation experiment.....	25
2.9.1 Exposure of flag leaves to $^{14}\text{CO}_2$	26

2.9.2	Determination of the radioactivity in the plant material.....	26
2.10	Tissue processing for electron microscopy.....	27
2.10.1	Immunogold labelling for β -1,3-glucanase and chitinase.....	27
2.10.2	Immunocytochemical controls.....	28
2.10.3	Quantification of labelling.....	28
2.11	Statistical analysis.....	28
3	RESULTS.....	29
3.1	Relative humidity and temperature.....	29
3.2	Fusarium head blight development.....	30
3.3	Thousand kernel weight.....	32
3.4	Ergosterol content in grain.....	35
3.5	Trichothecene contents in grain.....	36
3.6	Evaluation of additional yield and morphological parameters.....	39
3.6.1	Ear weight, kernel weight per ear and shoot weight.....	39
3.6.2	Ear weight minus kernel weight.....	43
3.6.3	Shoot weight minus ear weight and shoot weight minus kernel weight.....	44
3.7	Peduncle length.....	46
3.8	Total stem length.....	48
3.9	Wall-bound phenolic acids and lignin contents.....	50
3.9.1	Wall-bound phenolic acids content.....	50
3.9.2	Lignin content.....	52
3.10	Pigment content.....	54
3.11	Translocation experiments.....	56
3.11.1	In 2001.....	56
3.11.1.1	Cv. 'Agent'.....	56
3.11.1.2	Cv. 'Petrus'.....	62
3.11.2	In 2002.....	68
3.11.2.1	Cv. 'Agent'.....	68
3.11.2.2	Cv. 'Petrus'.....	74
3.12	Ultrastructural and immunocytochemical studies.....	80
3.12.1	Infection process of wheat spikes after single floret inoculations with <i>Fusarium graminearum</i> in control and BYDV-infected wheat plants.....	80
3.12.2	Immunocytochemical localization of β -1,3-glucanase and chitinase.....	87

CONTENTS

iii

4 DISCUSSION.....	92
5 CONCLUSION.....	113
6 SUMMARY.....	115
7 ZUSAMMENFASSUNG.....	119
8 REFERENCES.....	123