Table of Contents

Chapter 1: General Introduction 1

1 The sunflower (*Helianthus annuus* L) 1

1.1 Origin and proliferation 1

1.2 Botanic characteristics 2

1.3 Oil production 2

2 Solvent-extracted sunflower meal 5

2.1 Composition 6

2.2 Protein 6

2.3 Phenolic content 7

3 Polyphenols 9

3.1 General overview 9

3.2 Chlorogenic acid in SEM 11

4 Polyphenol-protein interactions 13

4.1 Non-covalent interactions 16

4.2 Covalent interactions 17

5 Trihydroxy benzacridine derivates 21

6 Aim 22

Chapter 2: Protection of protein from ruminal degradation by alkali-induced oxidation of chlorogenic acid in sunflower meal 31

1 Introduction 33

2 Materials and methods 35

2.1 Alkali treatment of sunflower meal 35

2.2 Chemical analysis 35

2.3 Crude protein fractionation and estimation of ruminally undegraded crude protein 36

2.4 Intestinal digestibility of ruminally undegraded crude protein 37

2.5 Data treatment and statistical analysis 38

3 Results 39

3.1 Chemical composition 39

3.2 Color development 39

3.3 Statistical relationships 39

3.4 Crude protein fractions 40

3.5 Ruminally undegraded crude protein 41

Dieses Werk ist copyrightgeschützt und darf in keiner Form vervielfältigt werden noch an Dritte weitergegeben werden.
Es gilt nur für den persönlichen Gebrauch.

3.6 Optimization and verification of predictive models 42
3.7 Estimation of intestinal digestibility 43
4 Discussion 45
5 Conclusion 48
Chapter 3: Evidence for the Formation of Benzacridine Derivatives in Alkaline-Treated Sunflower Meal and Model Solutions 53
1 Introduction 54
2 Results and Discussion 56
2.1 Color Development in SEM Extract and Model Solutions 56
2.2 UHPLC-DAD-MS/MS Analysis 58
3 Experimental Section 65
3.1 Plant Material 65
3.2 Chemicals and Reagents 65
3.3 UHPLC-DAD-MS/MS 66
4 Conclusions 68
Chapter 4: Concluding remarks 71
List of abbreviations 81
Summary 83
Zusammenfassung 85

Dieses Werk ist copyrightgeschützt und darf in keiner Form vervielfältigt werden noch an Dritte weitergegeben werden.
Es gilt nur für den persönlichen Gebrauch.