

Abbreviations.....	VIII
Zusammenfassung.....	X
Abstract.....	XII
1. Introduction.....	1
1.1 Heterogeneity.....	1
1.2 Current state of research.....	2
1.3 Hypotheses and Questions.....	5
2. Materials and Methods.....	6
2.1 Plant material.....	6
2.2 Growth Conditions.....	6
2.3 Split root pots.....	6
2.4 Irrigation system.....	7
2.5 Nutrient solution.....	8
2.5.1 Steady-state nutrition and relative growth rate (RGR).....	8
2.5.2 Experiment for determination of the RGR of maize.....	9
2.6 Harvest of the plants.....	13
2.7 Structural and functional Parameters.....	13
2.7.1 Structural Parameters.....	14
2.7.1.1 Development of the plants.....	14
2.7.1.2 Biomass.....	14
2.7.1.3 Root structure.....	15
2.7.1.4 Leaf area.....	15
2.7.2 Functional Parameters.....	15
2.7.2.1 Photosynthesis.....	15
2.7.2.2 Metabolites.....	16
2.7.2.2.1 Extraction of chlorophyll and carbohydrate.....	16
2.7.2.2.2 Chlorophyll.....	17
2.7.2.2.3 Soluble carbohydrates.....	17
2.7.2.2.4 Starch.....	19
2.7.2.2.5 Free amino acids.....	19
2.7.2.3 C, N and S content.....	20
2.8 Statistics.....	21
3. Results.....	22
3.1 Structural parameters.....	22
3.1.1 Development of the plants in the experiments: structural measurements.....	22
3.1.1.1 Number and average actual state of the leaves.....	22

3.1.1.2 Leaf area	24
3.1.3 Biomass.....	24
3.1.3.2 Total dry matter	24
3.1.3.3 Shoot biomass.....	25
3.1.3.4 Root biomass.....	26
3.1.3.5 Shoot/root ratio	28
3.1.4 Root structure	29
3.1.4.1 Root surfaces	29
3.1.4.2 Root length	30
3.1.4.3 Specific root length	31
3.1.5 Findings of the structural parameters	33
3.2 Functional Parameters	35
3.2.1 Development of the plants in the experiments: functional measurements	35
3.2.1.1 Photosynthesis	35
3.2.1.2 Chlorophyll.....	36
3.2.2 Internal nutrient concentration.....	36
3.2.2.1 C/N ratio	36
3.2.2.2 C/S ratio.....	44
3.2.3 Metabolites	47
3.2.3.1 Sugars and Starch.....	47
3.2.3.2 Free amino acids	52
3.2.4 Findings of the functional parameters	53
3.3 Summary of structural and functional parameters.....	54
4. Discussion	56
4.1 Development of the plants during the experiments	56
4.2 Impact of heterogeneously supplied nutrients on biomass	57
4.3 Impact of nutrient heterogeneity on the internal nutrient concentration of the plants...59	
4.3.1 Carbon.....	59
4.3.2 Nitrogen	60
4.3.3 Sulphur	61
4.4 Regulation of root proliferation	62
4.5 Effect of nutrient heterogeneity on photosynthesis and chlorophyll concentration.....62	
4.5.1 Photosynthesis	62
4.5.2 Chlorophyll.....	63
4.6 Impact of heterogeneously distributed nutrients on metabolites in the plants	63
4.6.1 Sugar and starch	63
4.6.2 Free amino acids	64

4.7 Conclusion.....	65
4.8 Outlook.....	65
5. References.....	67