Modeling the calculation of application rate of plant growth regulators in winter wheat (*Triticum aestivum*)

Cereal production is subjected to the risk of lodging. Lodging may reduce seed yield and quality. It can be prevented primarily by cultural practices like adequate choice of variety, late sowing dates, low plant densities and appropriate nitrogen fertilization. Plant growth regulators can reduce length and increase stability of stems to minimize lodging risk additionally. The effect of plant growth regulators is based on an intervention in the plant hormone balance. Choosing the exact dosage depending on current conditions is the difficulty of the application of plant growth regulators. An excessive application rate may result in a reduction of yield because of the intense intervention in plant growth. By application of an insufficient amount there is still a high avoidable lodging risk. So the main problem is to come to a compromise between preventing lodging and potential yield reduction.

The aim of this thesis was to model the calculation of application rate of plant growth regulators in winter wheat. The model can be used as decision support system to come to the described compromise and can contribute to calculate the optimal application rate. The modeling was based on field trials realized by the plant protection services of the federal states in the years 2009 – 2013. The trials were evaluated overall and comprehensive. The evaluation and modeling was executed variant-specific by discriminate analysis. The application rate was modeled taking account of lodging resistance of variety, sowing date, soil type, temperature, global radiation, soil moisture and beginning of vegetation. The factors individual reaction of variety, plant density and nitrogen fertilization had to except from analysis because of missing data. The modeling was performed for the solo applications of CCC, Moddus, Medax Top, CCC + Moddus and CCC + Medax Top and the spraying sequences ‘CCC,CCC’, ‘CCC, Moddus’, ‘CCC, Medax Top’, ‘CCC, CCC + Moddus’ and ‘CCC, CCC + Medax Top’.

The generated models deliver good results according to the statistics, but they contain scatteredly nonconformity in correct representation of biological coherences with the result that the models do not work absolutely correct. This nonconformity can be primarily ascribed to the used data basis. Independently, in this thesis a good method for modeling the application rate was constructed, which can be used in a prospective development of a decision support system and it can be also transferred to other types of grain and products. In combination with demonstrated optimization options good basics approaches for a model development were shown, which can be continued in prospective research in this topic and which generally indicate that the feasibility of such a decision support system is possible. This thesis can be used as a basis for the further development of a practical model for calculating the application rate of plant growth regulators.