SUMMARY

In the context of natural regeneration, oak trees develop lengthy taproots, allowing them to draw water from deep soil layers. This access to water resources that are less prone to intermittent shortages during droughts significantly enhances the overall condition of oak stands. Consequently, the direct sowing of acorns into the soil, which facilitates deep rooting, proves to be advantageous for successful oak cultivation. However, the continuity of afforestation hinges on oak production in both open fields and container nurseries. Applied agrotechnical techniques have been found to bring about adverse changes in the root systems, resulting in taproot damage - a critical issue, particularly for oak trees since taproots do not regenerate once damaged. The harm caused to the taproot in container nurseries triggers the proliferation of lateral roots. Nonetheless, these lateral roots lack the growth potential necessary to reach the deeper soil layers. As a result, container seedlings with shallow root systems face a higher risk of perishing due to prolonged droughts. To date, the research concerning the quality of seedlings produced in container nurseries has primarily centered on phenotypic assessment, neglecting the molecular aspects governing various stages of plant growth, including the development of root systems. While the mechanisms underlying primary root growth in model plants are well understood, delineating the molecular factors that oversee taproot growth remains indispensable for comprehending the broader processes that regulate overall root system growth, including the taproot, within natural conditions. Conversely, a comprehensive grasp of the regulation by endogenous factors, pertaining to both the elongation and growth inhibition of taproots within seedlings obtained through container production, remains elusive. Nevertheless, this understanding assumes paramount significance for the long-term implications of nursery production.

This dissertation's primary objective was to unravel the molecular factors underpinning the growth of roots in pedunculate oak (*Quercus robur* L.) and to discern the distinctions in these factors' levels between container-grown seedlings and post-transplantation stages. The study material encompassed both taproots and lateral roots of pedunculate oak, cultivated in both rhizotron and container systems. To evaluate the repercussions of container production on subsequent root system growth, the research evaluated seedlings initially raised in containers and later transplanted into the rhizotron system. Diverse morphological root structures, including taproots at various stages of elongation following acorn germination, underwent transcriptome analysis, alongside the quantification of plant hormones in oak roots.

The study unveiled variations, both at the transcriptome and hormonal levels, within the taproots and lateral roots of seedlings originating from different cultivation systems. Factors impeding taproot growth during the container cultivation of oak seedlings, in contrast to those cultivated in rhizotrons, were conclusively identified. Furthermore, the study shed light on the activation of several molecular responses integral to the process of taproot regrowth in seedlings transplanted from containers. A profound understanding of these molecular mechanisms holds the potential to reshape nursery practices in a way that promotes taproot growth following seedling transplantation into field conditions.