Plant diseases caused by fungi result in considerable yield losses of cultivated plants worldwide. One of the most affected species is white lupin, a grain legume with high seed protein content and regarded for beneficial influence on soil structure and fertility. Unfortunately, white lupin is very susceptible to anthracnose, the most devastating lupin disease caused by fungi. The appearance of anthracnose in Poland in mid-90 wiped out white lupin fields and practically eliminated this species from the list of economically viable crop plants. International efforts aimed at testing the world white lupin seed collection, representing more than 20 countries, revealed that only several primitive and closely related accessions from mountainous region in Ethiopia as well as a few Lebanon and Azorean accessions are anthracnose resistant. These lines will be assayed in the project to study molecular mechanisms underlying white lupin resistance to anthracnose.

Generally, plant resistance is based on quick recognition of the fungus and arrest of its development before colonization of host organism. Plant recognizes both specific products released by growing fungus as well as chemical compounds derived from destroyed host cells. The effectiveness of plant defense response and eventual survival of the infection depends on the promptness and accuracy of pathogenic threat recognition. If succeeded, the cascade of biochemical signals is launched, resulting in hypersensitive response based on programmed cell death in the infection site. Specific biochemical substances are deposited and plant cell wall compounds are crosslinked to construct physical barriers hampering further growth of the fungus. Moreover, a range of bioactive chemical compounds are produced and accumulated to provide a plant long-term acquired systemic resistance.

In the project, defense reaction of white lupin to inoculation by a fungus causing anthracnose disease will be subjected to comprehensive evaluation, encompassing those levels of response mentioned above. Therefore, a model will be established, describing particular phases of resistance response and underlying molecular mechanisms. The implementation of the project will also address the forward-looking question regarding the possibility and validity of hypothetical introduction of this trait to future white lupin breeding programs.