Temperature is one of the environmental factors that have a considerable impact on the development and activity of nematodes. These animals are one of the most numerous groups of multicellular animals that live in the soil. To date, over 8,000 species of soil nematodes have been described, 10% of which are plant parasites. The most harmful of them include root-knot nematodes (of the Meloidogynidae family), which may feed on over 3,000 plant species and cause considerable damage to crops. A representative of this family, the Northern root-knot nematode (*Meloidogyne hapla*), is common in Europe. It is particularly dangerous to crops since it may live on a broad spectrum of host plants. Its pathogenicity is increased also due to its high resistance to low temperatures, which allows it to survive even severe winters in such countries as Norway or Sweden.

To date, studies on this animal group focused on the physiological response of their bodies to thermal stress, such as the effect of temperature on the egg development and the hatching of individuals in the second development stage (so-called juvenile stage – J2). It has been observed that temperature affects the number of lipid droplets built up in the bodies of J2 juveniles, which is of immense importance since it influences the survival rate of these nematodes and their efficiency in inhabiting the roots of host plants. It has also been demonstrated that temperature affects the size (length, width) and body weight, as well as the motility rate of nematodes.

However, available literature reveals no reports of studies linking the molecular response mechanism in a cell to the physiological response of the whole organism to thermal stress. Within a cell, the body reacts to thermal stress e.g. by increased activity (expression) of heat-shock genes (the so-called *hsp* genes). *Hsp* genes are commonly found in the genomes of various organisms – from bacteria to humans, and are responsible for the production of heat-shock proteins (Hsp). Hsp perform chaperone function in a cell by mitigating or attenuating the effects of stress factors. An increased synthesis of Hsp lowers the risk of cell damage during stress and/or promotes their regeneration. Most of the *hsp* genes sequences found in nematodes became known owing to studies conducted on free-living model nematode *Caenorhabditis elegans*. In the Northern root-knot nematode's genome only the sequence of *hsp*-90 gene, which encodes Hsp90, has been identified to date, and its variability range in two populations has been compared. Other *hsp* genes, which encode Hsp100, Hsp70, Hsp60, Hsp40 and the so-called low molecular Hsps, have not been studied yet in nematodes feeding on plants. The intended study will involve selected *hsp* genes (*hsp*-90 – only its sequence has been described, *hsp*-1, *hsp*-6, *hsp*-110, *hsp*-60, *dnj* -19, *hsp*-12.1, *hsp*-43) that have not been described yet in *M. hapla.* The study of the level of changes in the transcription (transcription profiling) of these genes under various temperatures and exposure time will be carried out for this species for the first time ever.

The study will also include the relation, which has not been yet analysed in nematodes, between the level of *hsp* gene expression and the selected fitness parameters of *M. hapla* at varying ambient temperatures. The intended study will make it possible to determine whether the level of *hsp* gene expression has a noticeable effect on such fitness parameters as growth, body mass, motility and the level of energy reserves in J2 individuals of *M. hapla.* The study will focus on the egg stage and the J2 stage since these stages live outside the host plant and are most exposed to the direct effects of external factors, including ambient temperature.

The results of the study can be used to develop methods to reduce the harmfulness of *M. hapla* in crops. For several years, studies have been conducted on biotechnological methods to combat plant parasitic nematodes, e.g. either directly by “silencing” gene expression in the parasite’s body or indirectly by modifying the gene expression in the host. Gene silencing involves a reduction or a total eradication of gene expression. In the studies on phytophagous (plant-feeding) nematodes, the silencing of genes caused i.a. inhibition of giant cell development in the host plant, limited motility of J2 juveniles and thus reduced infectivity, as well as disturbance of the localisation of host plant’s roots by the nematodes at this stage. Based on the findings of the project, it would be appropriate to undertake similar research also on silencing *hsp* genes in the Northern root-knot nematode. Silencing particular *hsp* genes may help reduce the adaptability of *M. hapla*, which can be a new direction in combating that plant parasite. *Hsp* genes respond with higher expression also to a wide range of chemical stressors, such as heavy metals, changes in the soil salinity or pH. Understanding the transcriptional response of *hsp* genes to various chemical compounds could contribute to developing chemicals, which would effectively reduce the number of those parasites in crops.

The results of this project could provide vital data on heat-shock genes in the Northern root-knot nematode.