Contemporary conditions of maintenance of livestock animals are far from natural and typical of an individual species. This problem is doubled in the case of the honeybee. This is related to the fact that the bee colony lives in two environments. One is the natural environment outside the nest and the other is the nest made of wax combs. Adverse changes in the natural environment are primarily an effect of intensification of agriculture. In turn, changes inside the nest usually involve standardisation and enlargement of comb cells associated with the widespread use of artificially manufactured wax foundation with a standard cell size (5.50 mm). The cell size in an original nest was in the range of 4.90-5.10 mm, and cells of the same comb could vary in size. They were usually smaller in the comb centre and bigger at the periphery. Observations and preliminary investigations conducted in the apiary of the Institute of Biological Basis of Animal Production, University of Life Sciences in Lublin, indicate that replacement of the natural variability in the honeycomb cell size by one uniform size impairs the natural ability of the bee colony to adapt to changing environmental conditions. This statement is supported the fact that colonies kept on two types of combs (with standard and small cells) in the same nest were characterised by significantly higher vitality and efficiency than colonies kept only on one- size cell combs (either standard or small size cells). This phenomenon has not been described so far, and we have called it behavioural overdominance of colonies. We have ascribed it to the cooperation between workers reared in combs differing in the cell size (standard/small).

The current knowledge of the consequences of the aforementioned standardisation and enlargement of the size of honeycomb cells is insufficient. Probably in favourable conditions, the negative effects of this change were unnoticeable; hence, there were no indications for addressing this issue. However, the honeybee currently faces numerous threats ranging from changes in the environment to parasitic infestations. Considerable losses of bee colonies in particular affecting developed countries have been named CCD (Colony Collapse Disorder). In our opinion, the loss of bee colonies can be halted not only by development of preparations improving the beekeeping situation but also by simultaneous development of apiary technologies supporting the natural resistance of bee colonies and their adaptability to the changing adverse environmental conditions. A measurable effect of such a strategy will be improvement of the quality of bee products. As indicated by our observations, keeping bee colonies on two types of combs in the same nest can be such a biotechnical method for enhancement of the vitality of bee colonies and thus for limitation of losses thereof. This similarity of the nest structure to the natural arrangement triggers yet unknown processes increase the vitality of bee colonies. Therefore, we have designed research aimed at exploration and elucidation of these processes. From the scientific point of view, the results of our research will complement knowledge about the honeybee biology and behaviour in terms of cooperation between workers in the colony and their predisposition to perform specific tasks. As a result, the investigations will provide understanding of natural processes enhancing the potential of bee colonies to adapt to environmental conditions.

The research problem is also of great practical importance, especially in developed countries, including Poland. In these countries, there are substantial losses of bee colonies and a considerable decline in the health status of bee survivors accompanied by the increasing significance of bees. In developed countries, food security and partly energy security (biofuels) largely depend on pollination by bees. The development of modern beekeeping also depends on the direct benefits achieved by beekeepers. Here, the possibility of the practical application of the method of keeping colonies on two types of combs is worth emphasising. Our research will assess whether this method can be regarded as a biotechnical procedure that significantly increases the vitality of bee colonies and, hence their production efficiency, including pollination capacity.