

## Review

for the thesis of A.K. Rakhmetullina "Characteristics of miRNAs binding with mRNAs of transcription factor genes of agricultural plants" presented for defense in the specialty "6D070100-Biotechnology" for the degree of Doctor of Philosophy (PhD)

A.K. Rakhmetullina entered the doctoral program of Al-Farabi KazNU in 2018 and, after enrolling, she immediately started active work. While studying for a master's degree, she showed a penchant for studying plant genomes it was the reason why she proposed a doctoral thesis related to agricultural plants. Along with this, she identified a poorly studied direction relevant for Kazakhstan. Although Kazakhstan possesses vast land resources, the country is still far from obtaining high yields for a number of reasons, including a variety of climatic conditions and biotic factors. Therefore A.K. Rakhmetullina opted for the study of the molecular mechanisms of increasing the productivity of agricultural plants as the goal of her research.

The key proteins that regulate plant growth and development are transcription factors. These proteins are divided into families, each of which determines many characteristics of productivity. A.K. Rakhmetullina conducted a voluminous analysis of the literature on transcription factors and selected the most important and numerous of them in order to study their molecular genetic properties as much as possible. Due to her good knowledge of English, she was able to analyze a large volume of foreign articles on the topic of the thesis. In the course of studying the literature on this problem, she came to the conclusion that the activity of many transcription factors is regulated by miRNAs. However, there was very little information on the synthesis of which transcription factors regulate miRNA and to what extent. These circumstances determined the choice of the topic of the thesis - Characteristics of miRNAs binding with mRNAs of transcription factor genes of agricultural plants. Actually, A.K. Rakhmetullina independently formulated research tasks and actively began to solve them.

Having shown a high working capacity and having defined a clear program of actions, A.K. Rakhmetullina quickly received important results, which were published in the materials of several international conferences and became the basis for high-quality articles. The new results obtained on the assessment of the effect of miRNA on the expression of genes of plant transcription factors were not immediately evaluated by the editorial staff of the journals, but finally the reviewers were convinced that the obtained data were of the high significance. As a result, the thesis materials were published in rating journals. The clearly expressed desire of A.K. Rakhmetullina to search for something new became the basis for studying the possible influence of plant miRNAs on human genes.

Plants are considered mainly as a source of human nutrients. However, the medicinal properties of plants are known, and A.K. Rakhmetullina decided to study the effect of miRNAs on the expression of human genes, including transcription factor genes. To our surprise, plant miRNAs, being highly resistant

and capable of entering human blood, can regulate the expression of human genes. Moreover, the obtained data have shown that these miRNAs can influence genes involved in the development of oncological and cardiovascular diseases. Of course, these results must be confirmed in "wet" lab experiments, but this hypothesis is a new direction in the study of the influence of plant miRNAs on the human body.

In general, A.K. Rakhmetullina carried out a voluminous research at a high scientific level, successfully solved all the problems and achieved the set goal. I believe that A.K. Rakhmetullina prepared the full-fledged thesis containing new results of practical and theoretical significance. This gives me reason to recommend the thesis for defense for a PhD in the specialty 6D070100- Biotechnology and to confer A.K. Rakhmetullina PhD.

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